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**Boots on the ground
are part of the solution.**
Transitioning agriculture towards
sustainability together.



By Kylie Leonard
2023 Nuffield Scholar
February 2024



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I wish to thank the below Investing Partners for their support over my scholarship period and beyond

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In submitting this report, the Scholar has agreed to Nuffield New Zealand publishing this material in its edited form.

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Executive Summary

A reduction of Greenhouse gases is being demanded through our value chains. Farmers need to be at the table of change, not on the menu. The boots on the ground are part of the solution and need to be part of discussions and decisions. Farmers must remain profitable to enable change.

In the aftermath of the World Wars, nations prioritised food security and production, leading to increased international trade. Post-COVID, global discussions now revolve around food and fuel security, climate improvements, and sustainability. Agriculture is recognised as crucial in finding solutions to these challenges, with responsibility extending throughout the entire value chain, not just to farmers. Trade plays a pivotal role in resource sharing and environmental sustainability, exemplified by New Zealand's dairy industry, which exports 95% of its products.

However, the dairy industry faces environmental pressures, both domestically and internationally. Successful mitigation programs emphasise voluntary, trusted, and measurable approaches, such as those seen in the Catskills Watershed and Arla's 80-point program.

To avoid dairy becoming the new coal and instead be part of the climate solution, financial solutions driven by Environmental, Social, and Governance (ESG) targets are crucial. Companies setting ESG targets are viewed as more successful and profitable, leading to increased access to capital. Green loan funds globally highlight the growing importance of sustainability in business.

Consumers' demands for greenhouse gas reductions are not met with a willingness to pay, but rather through pressure from ESG stakeholders, investors, and employees. Market and capital access is now contingent on meeting social expectations, such as sustainability plans.

Transition payments through the value chain offer a solution, alleviating the burden falling solely on farmers and ensuring their economic viability during the transition to more sustainable practices that reduce greenhouse gases. Brands and customers, such as Nestle and Mars, are recognising the need to support farmers through this transition. However, structuring payments is complex, with brands currently willing to pay for greenhouse gas reductions but not yet for other nature-positive outcomes.

A reverse auction model or transition payment system could provide a platform for change, enabling farmers to choose their level of participation and providing compensation for their efforts in adopting sustainable practices. New Zealand's unique farming system, facilitated by cooperatives like Fonterra, presents opportunities for collective action and innovative solutions.

By embracing ESG principles and transitioning towards sustainability, agriculture can ensure continued access to markets and capital while addressing environmental challenges. Early adopters stand to eliminate their risks and become experts in sustainable farming practices, shaping the future of agriculture for generations to come.



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Foreword

I started my Nuffield journey with a strong hunch that ESG was going to have an impact on the cost of finance behind the farm gate in the near future. I have written my report for fellow Farmers and the governors of dairy processors to highlight the direction of travel for the cost of capital risk to our businesses and how transition payments through the value chain can enable faster and fairer spread of costs for the adoption of change and the risks involved.



Acknowledgements

Firstly I would like to thank my family, my husband Rick, our daughters Kate, Isla and Eloise, my parents and Rick's parents, as well as our extended families for all of their support, encouragement and enabling this incredible experience.

I would like to express my sincere gratitude and appreciation to Rural Leaders and Sponsors for awarding me the prestigious Nuffield Scholarship. It is an honour to receive this scholarship, which enabled me to pursue advanced studies and research in the food and fibre sector globally. Lisa and Annie, your kindness, encouragement and support has been incredibly valued. Hamish Gow, your challenge, support and genuine care has enabled a huge journey of growth.

I am deeply grateful for the opportunity to engage with leading scholars and experts in the field, expand my knowledge, and contribute to advancements. I would like to extend my heartfelt thanks to the selection committee for their confidence in my potential and for granting me this remarkable opportunity.

I am also indebted to my mentors, Alison Watters and Tracy Brown, colleagues, friends, and family for their unwavering support, encouragement, and guidance throughout my journey. Their belief in me has been instrumental in reaching this milestone, and I am profoundly grateful for their invaluable contributions.

I look forward to leveraging the knowledge and skills gained through this scholarship to make meaningful contributions to the food and fibre sector and society at large.

To the people and organisations around the world, thank you for the time, information and insights you have shared with me. I value the hospitality I was afforded, the network and connections I have made across the globe. I look forward to continuing to develop these relationships for the betterment of the global food and fibre sector.

The group of scholars I was privileged to travel with on the Global Focus Program thank you for your comradery, compassion and challenge. The journey would not have been the same without the combination of the '9'.

To my fellow New Zealand 2023 scholars, James, Kerry and Matt. Thank you for your genuine friendship and teamwork. I am pleased to consider you my extended whanau and look forward to the years ahead and our continued learning together.



List of abbreviations and key term definitions

Brands

A brand is a unique combination of tangible and intangible attributes, including a company's name, logo, symbol, design, and reputation, that distinguishes it from competitors in the marketplace. It represents the identity and image of a company or product in the minds of consumers and serves as a promise of quality, consistency, and value. There are tangible attributes, the physical elements of a brand that customers can see, touch, or interact with directly. This includes elements like the company's logo, name, symbol, packaging, and specific product features. As well there are intangible assets, these are the non-physical aspects of a brand that contribute to its identity and perception. This includes elements like the brand's reputation, perceived value, personality, emotional connection with consumers, and overall customer experience. Together, these tangible and intangible attributes form the essence of a brand, shaping how consumers perceive and interact with it in the marketplace.

Capital (Financial)

Financial capital refers to money or funds that are available for investment or to finance business operations. It represents the financial resources that individuals, businesses, or governments have at their disposal to acquire assets, undertake projects, or meet financial obligations. It plays a crucial role in driving economic activity, facilitating investment, innovation, and growth. It enables access to the resources needed to start or expand operations, invest in productive assets, develop new technologies, and create wealth. Effective management and allocation of financial capital are essential for optimizing returns, managing risks, and achieving long-term financial objectives.

Carbon

Carbon is a chemical element with the symbol "C" and atomic number 6. It is a non-metal that is essential for life, as it is a key component of organic compounds found in living organisms, including proteins, carbohydrates, fats, and nucleic acids.

Carbon neutral at the product level

(Based on ISO 14021, 2016)

All the GHG (or CO₂e) emissions from all stages of the product life cycle, and within the specified processes, have been reduced, removed or, as a last resort, accounted for through a system of offsets resulting in a product that has a carbon footprint of zero.

Climate change

Climate change refers to significant and long-term shifts in climate patterns, typically resulting from human activities such as burning fossil fuels, deforestation, and industrial processes. These activities release greenhouse gases, such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), into the atmosphere, which trap heat and lead to alterations in the Earth's climate system.

Climate risk



Climate risk refers to the potential adverse impacts or consequences of climate change on human societies, economies, ecosystems, and infrastructure. It encompasses a wide range of risks arising from changes in temperature, precipitation patterns, sea levels, extreme weather events, and other climate-related factors.

Consumer

A consumer is an individual or entity that purchases goods or services for personal or household use, consumption, or enjoyment. Consumers play a central role in the economy by driving demand for products and services, thereby influencing production, pricing, and market dynamics.

Eco services, short for ecosystem services

Refers to the benefits from ecosystems. These services such as food, water, and raw materials and regulating services such as climate regulation, flood control, and disease regulation; supporting services such as nutrient cycling, soil formation, and pollination; and cultural services such as recreation, spiritual enrichment, and aesthetic enjoyment. Ecosystem services are essential for human well-being and are integral to economic activities, social interactions, and cultural practices. They contribute to human health, livelihoods, and quality of life, and their preservation is critical for sustainable development and environmental conservation.

Environmental, Social, Governance (ESG)

ESG stands for Environmental, Social, and Governance, and it refers to a set of criteria used by investors, businesses, and others to evaluate the sustainability and ethical impact of a company's operations and business practices.

Environmental (E): This aspect focuses on how a company interacts with the natural environment and manages its environmental impact. Key environmental factors include carbon emissions, energy efficiency, waste management, water usage, pollution, biodiversity conservation, and climate change resilience.

Social (S): This aspect examines a company's relationships with its employees, customers, communities, and other stakeholders. Social factors include labour practices, employee relations, diversity and inclusion, human rights, health and safety, community engagement, product safety, and supply chain management.

Governance (G): This aspect evaluates the quality of a company's corporate governance structures, policies, and practices. Governance factors include board composition and diversity, executive compensation, shareholder rights, transparency, ethics, risk management, regulatory compliance, and business ethics. ESG criteria are used by investors to assess the sustainability and long-term viability of companies and to make informed investment decisions that align with their values and objectives. Companies that demonstrate strong ESG performance are often perceived as more responsible, resilient, and sustainable, which can enhance their reputation, attract investment capital, and mitigate risks associated with environmental, social, and governance issues.

Greenhouse gases (GHGs)



Gases that trap heat into the atmosphere, therefore contributing to the warming of the planet. They are often expressed as CO₂e (carbon dioxide equivalent) in terms of their GHG impact levels over time using CO₂ as a reference.

Carbon dioxide equivalent (CO₂e)

Carbon dioxide equivalent is a simple way of comparing the warming potential of a range of GHGs (including carbon dioxide and methane) by converting their amounts to the equivalent amount of carbon dioxide.

The Paris Agreement

In 2015, to respond to the threat of climate change, countries around the world convened in Paris under the United Nations Framework Convention on Climate Change. They agreed to keep global temperature rises below 2 degrees Celsius (°C) above pre-industrial levels, and to work toward a 1.5°C limit.

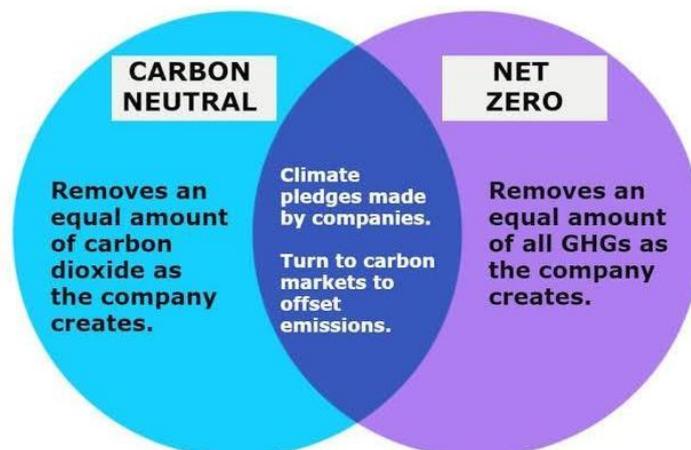
Nature positive

Nature positive refers to actions or initiatives that contribute to the restoration, preservation, or enhancement of natural ecosystems and biodiversity. Being nature positive involves adopting practices that go beyond mitigating environmental harm to actively promoting the regeneration and resilience of ecosystems. A nature positive approach emphasises the importance of restoring degraded habitats, conserving biodiversity, reducing pollution, and mitigating climate change impacts. It involves adopting sustainable land management practices, promoting reforestation and afforestation efforts, protecting endangered species, and implementing conservation measures to restore ecosystem health and functioning. Being nature positive aligns with sustainable development and environmental stewardship.

Net zero at the corporate level

(Based on the Science Based Targets initiative)

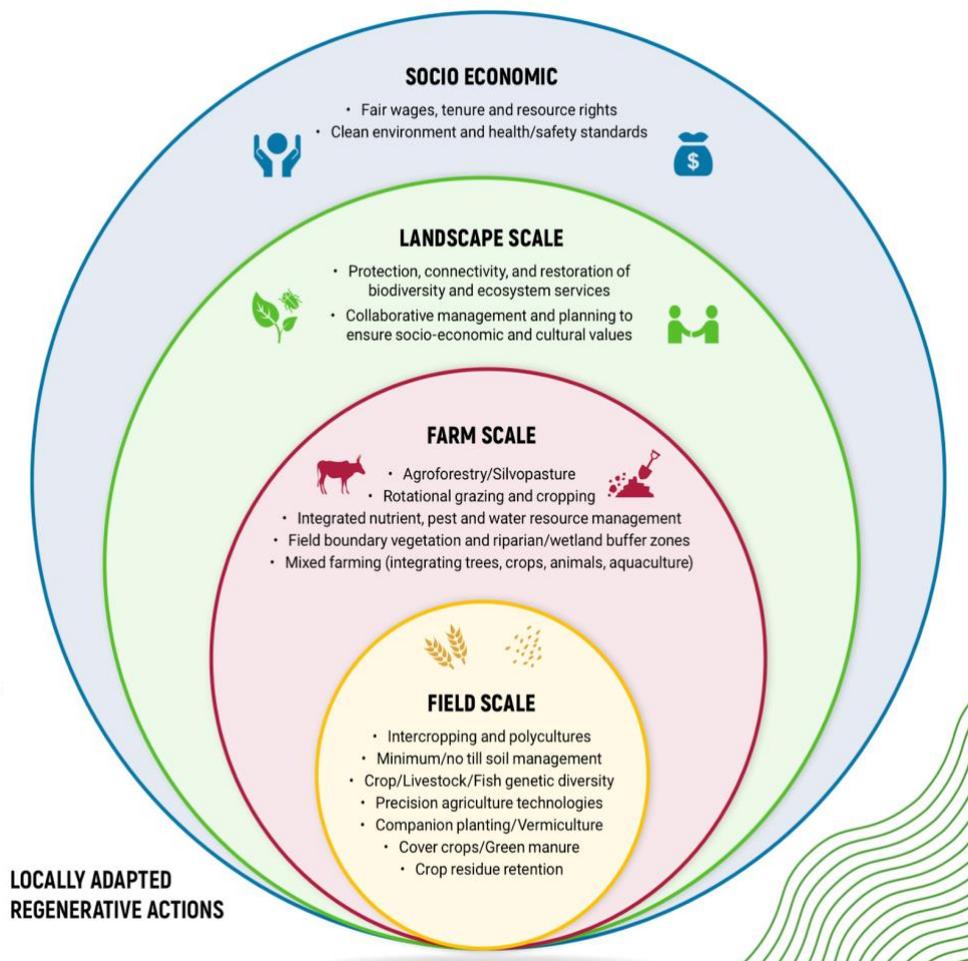
Net zero emissions are achieved when anthropogenic emissions of GHGs to the atmosphere are balanced by anthropogenic Scope 3 removals over a specified period. The climate metric used here is CO₂ equivalent (CO₂e), and all GHG emissions are in scope.





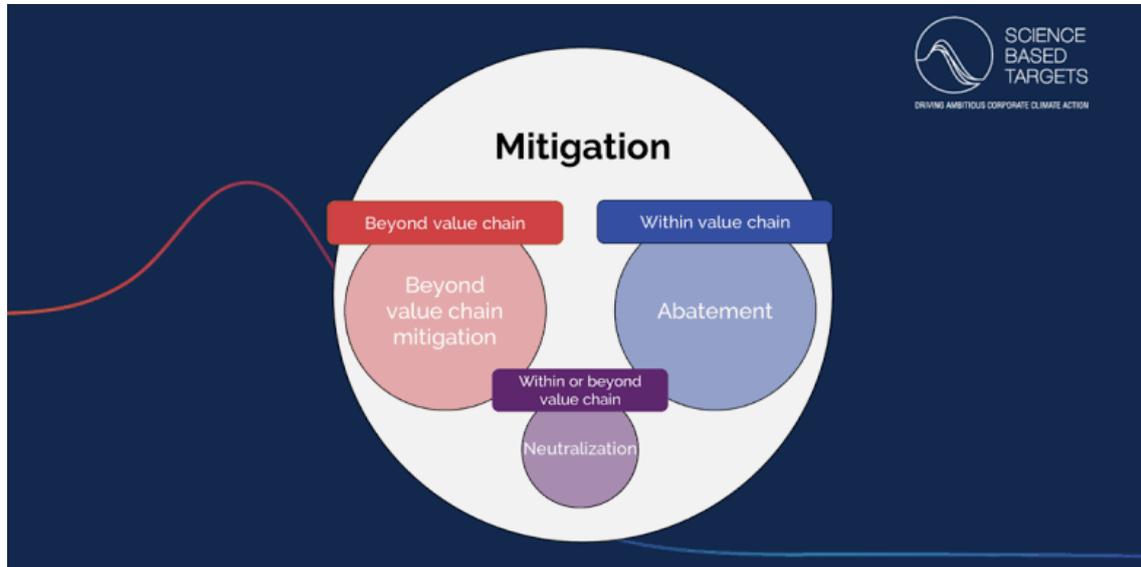
Regenerative agriculture

Regenerative agriculture aims to create farming systems that are not only productive and profitable but also environmentally sustainable, socially equitable, and resilient to climate change. By restoring ecosystem health and functioning, regenerative agriculture contributes to soil conservation, water quality improvement, biodiversity conservation, and climate risk mitigation, while also supporting the long-term viability of agricultural livelihoods and communities.



SBTi

The Science Based Targets initiative (SBTi) is a collaborative effort between CDP (formerly the Carbon Disclosure Project), the United Nations Global Compact (UNGC), World Resources Institute (WRI), and the World Wide Fund for Nature (WWF). SBTi provides a framework and guidance for companies to set science-based targets (SBTs) for reducing greenhouse gas (GHG) emissions in line with the latest climate science and the goals of the Paris Agreement.



Scope emissions

Scope emissions refer to the different categories of greenhouse gas emissions produced by an organisation or entity. They are classified into three main scopes:

Scope 1 emissions: Direct emissions from sources owned or controlled by the organisation, such as on-site fuel combustion and vehicle emissions.

Scope 2 emissions: Indirect emissions from the generation of purchased electricity, heat, or steam used by the organisation.

Scope 3 emissions: Indirect emissions from sources not owned or controlled by the organisation, including those associated with the supply chain, employee commuting, and business travel.

Sustainability

Sustainability economics seeks to integrate principles into economic theory, policy-making, and decision-making processes at all levels, from local to global. It emphasises the importance of reconciling economic development with environmental protection and social equity to achieve long-term prosperity, profitability and well-being for current and future generations.

Value chain

A value chain is a systematic sequence of interconnected activities and processes that collectively add value to a product or service from its conception to its consumption by end-users. It encompasses the entire lifecycle of a product or service, including design, production, distribution, marketing, and consumption. The value chain is the transformation of raw materials or inputs into finished goods or services through a series of value-added activities, from farm to manufacturer to end Brand.



Value Chain
[ˈvɑːl-(.)yü ˈtʃɑːn]

A business model that describes the full range of activities needed to create a product or service.

Investopedia



Objectives

As I began my Nuffield scholarship I set out to find the answer to key questions. I didn't know what I didn't know and kept my mind open to other ideas and concepts.

These were my initial questions

1. What impact is ESG going to have on finance behind the Farm gate?
2. How can systems be designed and implemented on productive land to enhance biodiversity, soil health, and agricultural productivity in a nature-positive manner?
3. What are the most effective regenerative farming practices that can be adopted on productive land to promote nature-positive outcomes while ensuring food security and livelihoods?
4. How do different crop rotation and cover cropping strategies impact soil carbon sequestration and overall ecosystem health on productive land, contributing to nature positivity?
5. What innovative technologies and approaches can be employed to minimize the ecological footprint of industrial agriculture and transform it into a nature-positive endeavour on productive land?
6. What policy frameworks and market mechanisms can incentivize farmers to transition towards nature-positive agricultural practices on productive land, fostering sustainable landscapes and conservation?

My experience of Nuffield was so much larger than these questions. These questions kept me focused but I have also included my other major learnings at the back of this report.



Chapter 1: Introduction

Following the world wars most nations were focused on incentivising food security and production. "After World War II, international trade increased dramatically."¹ This is the scene and the words heard across continents as I travelled. Post Covid the world over is discussing food security, fuel security and the symbiotic relationship with climate improvements and sustainability. We are globally becoming aware of the potential impacts of climate risk and the need for mitigation. Solutions need to be built for agriculture and built by agriculture. The burden of responsibility for this change requires everyone in the value chain, not just the farmer. If farmers can earn more through the value chains, the more change they can make. Cows consume what humans cannot and turn it into nutrition for us. Farmers exist to feed our fellow humans.

Globally, each nation I visited had a focus on food and fuel security, concerned with a deficit in both. Most countries still have agricultural subsidies in place, however New Zealand's ceased in the 1980's.

Dairy has supported New Zealand as a nation and ensured the nation's economic success, this was highlighted again during the covid pandemic.

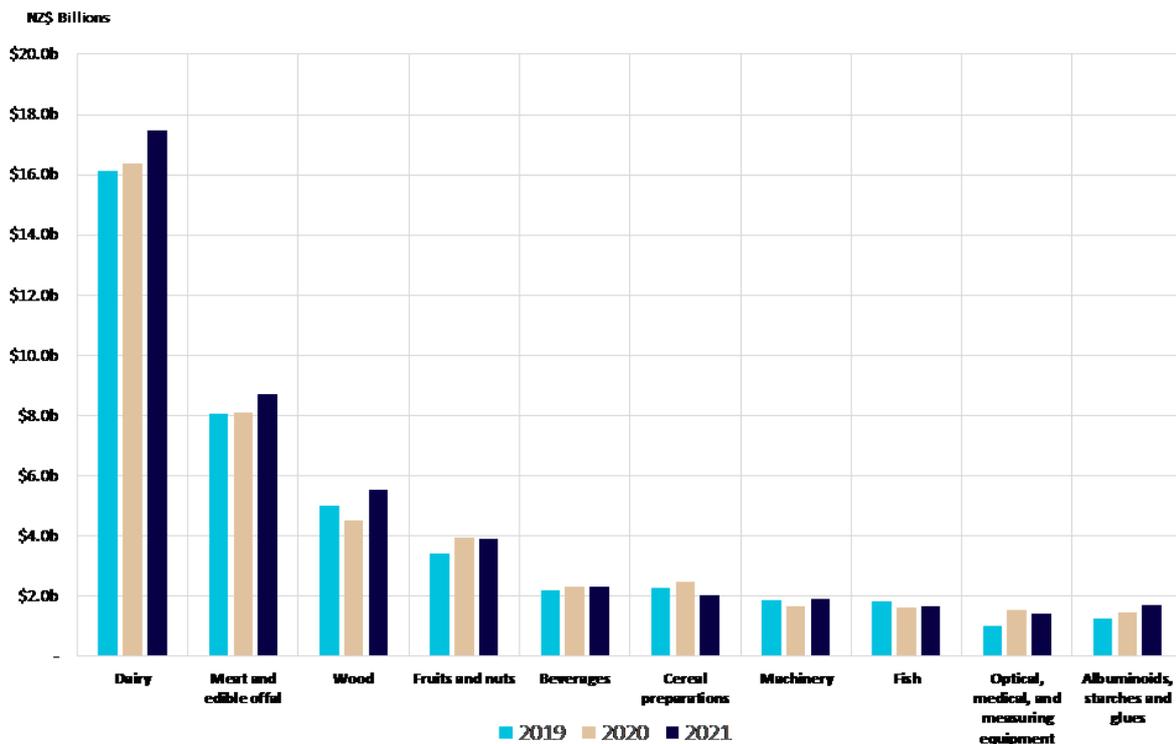


Figure 1: New Zealand's top 10 annual food exports



Trade is good for the environment, essentially trade is the same as sharing; sharing of resources. New Zealand produces more food than it needs to service its domestic market, 95% of dairy is exported/shared with the world.² Many countries are lacking food resources, for example Norway recently considered moving to self-sufficiency but was not able due to a lack of soil, this was discussed in a keynote presentation at the World Dairy Federation Forum, Chicago, 2023. However, the Western World is no longer hungry, so we need to justify our existence as Farmers.

A lack of regulation swung the pendulum in a direction and now it appears to be swinging strongly in the other direction. Regulation models drive a minimum standard, swinging the pendulum too far in the other direction. Whereas incentives and financial transition payments, when voluntary, encourage innovation, leadership and the rising of the bar of actions and behaviours. We need to find a place of steadier equilibrium for the dairy industry. *"We need greater recognition of farmers as stewards of biodiversity and natural resources, along with adequate incentive structures to help us manage the natural environment as an integral part of our farming operations."* Arnold Puech d'Alissac World Farmers Organisation President 18 January 2024

There are two directions of environmental pressure on Farmers, one nationally, water quality, the other one internationally, encompassing the reduction of GHG's and emerging direction of nature positive services provision. The two have become confused at a domestic level and the drivers of each. Confusion leads to delayed action. These pressures and issues need to be divided to create transparency to clearly understand each issue.

The domestic water quality issues affect the Dairy industry's social license to operate and need local solutions in catchment areas. Whereas Nature positive services including Greenhouse gases are an international pressure from Capital providers relating to their risk profiles in lending. These new risk profiles relating to ESG have risen following the Global Financial Crisis 2007 to 2009 and the creation of the global banking supervision committee and Basel 1, 2 and 3 principles with the purpose of enhancing financial stability.

There are examples of successful mitigation programs in both areas internationally from the Catskills Watershed in Upper State New York to the Arla 80 point program for farmers. My observations of the keys to success with these programs are that they need to be voluntary, trusted, transparent, scalable and measurable.

1.1 Is Dairy the new coal or is it part of the solution?

At the Dairy Sustainability Framework, DSF, symposium in Chicago, October 2023, the challenge was laid - it is not what we need to do but the how. Historically, we have faced many challenges, for example milk quality and somatic cell count. There were many lessons learned from this - measure, benchmark where you are now, levers for change and incentivise (information can incentivise change too).

Dairy can be part of the climate solution, a triple win, nutrition, livelihood and environment.



Chapter 2: How did we get here?

Food companies and retailers have made public commitments to collectively reduce more than 100 million metric tons of greenhouse gas emissions by 2030. Despite the progress in corporate target-setting, the reduction of Scope 3 emissions, which typically come from the production of raw materials like milk, has been a significant challenge.

Agriculture's potential to have a positive impact on climate and especially access to capital through ESG targets, has many companies looking to their farmer suppliers when it comes to lowering products' environmental footprints. Innovative practices and technologies exist that will help agriculture realize major gains in on-farm sustainability, however, perceived risks, long payback periods, and upfront investment requirements continue to delay adoption of these solutions. With economics at the heart of the matter for farmers, financial solutions will be as important in advancing on-farm sustainability as the practices themselves. As described by Martin Reiter.³ *"The underlying issue industry specific... is cycle times... Each industry has their own characteristics.... Farming cycles are characterised by extremely slow cycle times.... like if you are a chef where you can have a line of steaks and your cycle time is 5 minutes, if you screw it up, you do another one, it is very hard not to make a good steak if you have 20 raw steaks in front of you and you have enough time.... In contrast, think about farming, you plan, then you harvest a year later so in your whole life as a farmer you might see forty harvests and a chef could make forty steaks in half an evening.... The effect on your psyche is being risk averse, if you screw it up one of your forty shots is gone.... To think about this, agriculture is not an industry that changes easily.... finance underwriting risk can help to manage the transition ... to share the risk with the farmer."*

Insetting livestock nature positive transition payments in the marketplace provides companies in the animal protein value chain the opportunity to make meaningful progress toward their Scope 3 greenhouse gas reduction goals. The carbon offset markets have become untrusted due to a lack of transparency.

Market driven factors are leading to companies setting ESG targets, which relate to social license to produce and especially access to capital. This has then led to lenders analysing financial success of companies with ESG programs being more successful and profitable and thus a lower risk when lending. I was unable to discover if they had the money and resources to create ESG programs or ESG programs made them more profitable.

There is also an increasing amount of green loan funds available, \$7 trillion globally.

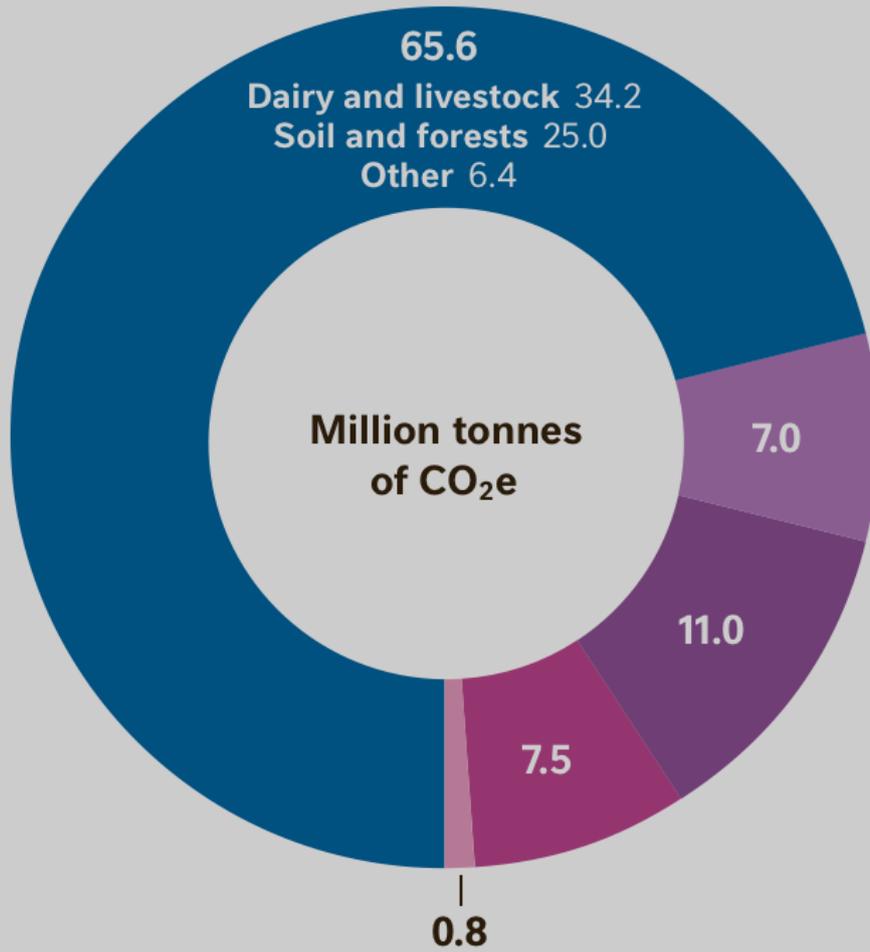
Sustainability is a cost and risk to business.⁵ Commercialisation is viewed as an opportunity and a challenge for land owners. There are pushes or demands for sustainability.

Brands/Customers such as Nestle and Mars, have made claims in their board rooms relating to sustainability with targets attached.



Nestlé's in-scope GHG emissions by operation

million tonnes of CO₂e, in 2018

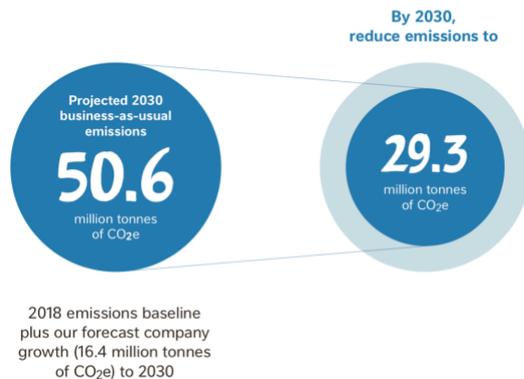




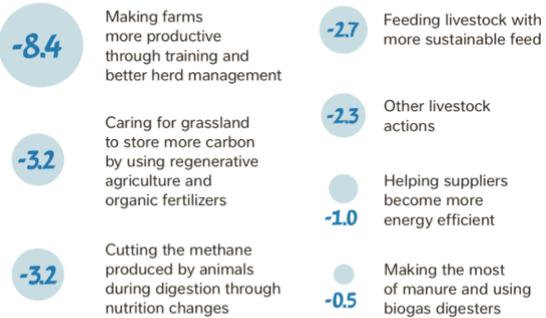
SOURCING OUR INGREDIENTS SUSTAINABLY Dairy and livestock

Dairy and livestock supply chain emissions and reductions, 2018 to 2030

million tonnes of CO₂e



Actions to reach our 2030 emissions goal¹



These came without a plan or reality check of “how to”, but the challenge of now you have to go and do this, landing with Farmers. Most of these were set 3 to 4 years ago, progress has been limited and now the lack of progress has been highlighted. They have SBTi goals and are trying to work out how to solve this problem. Many projects and approaches have been tried but have not been able to be scaled and replicated.

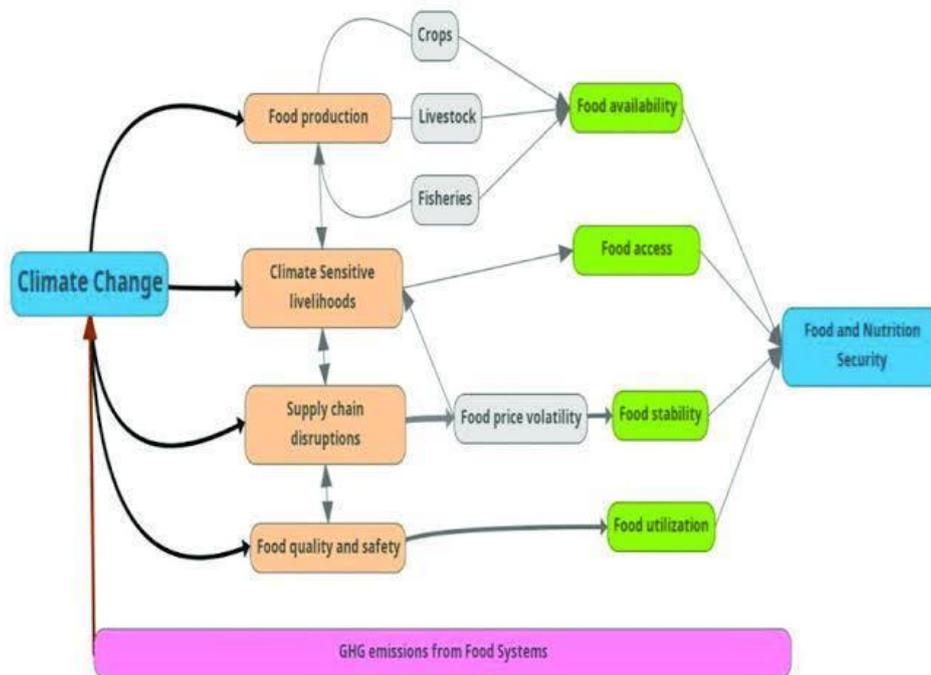
Manufacturers are being asked to provide solutions to help Brands achieve their goals, Brands are bringing to them programmes and approaches that are not appropriate to their region, situation and are not scalable. Brands are frustrated by Manufacturers lack of progress and are now saying if you are unable to provide details of a direction of travel in ESG they will no longer buy from them.

This is limiting market access, not directly from carbon emissions but Brands believing manufacturers' direction of travel in this space. Farms providing products can be 30-40% of the GHG footprint of the Brand/Customer through their value chain, scope 3 emissions.

Farmers are fatigued, they have done and are doing many great things in the environmental space but are not being recognised for them. Domestic issues such as water quality have been confused with global issues relative to Nature Positive outcomes such as reducing Greenhouse gases.

Combined together, the current situation is Brands/Customers that have ambitious ESG goals. Manufacturers that feel they are between a rock and hard place and are not sure how to implement what the Brands are demanding in this space. Alongside all of these challenges, Farmers are saying this will not work and are the ones that carry most of the burden. There is a disconnect between these symbiotic relationships.

A symbiotic relationship; climate change and food systems.



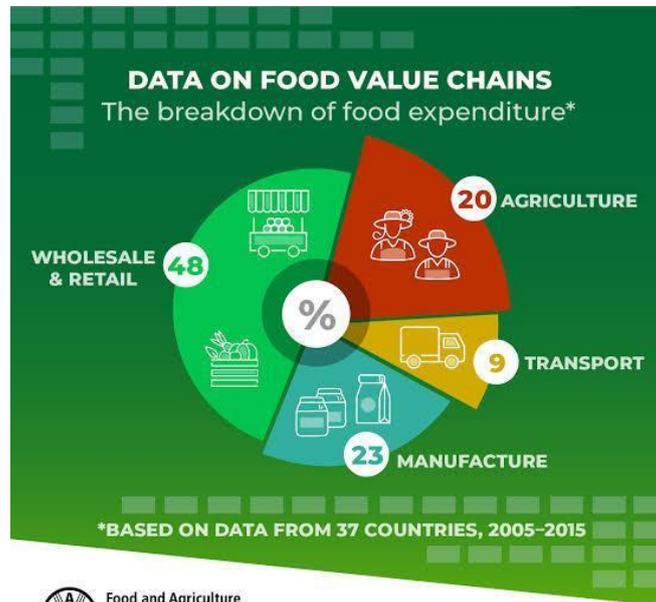
A way forward is to have sustainably produced products providing a solution to Brands; the boots on the ground can help the shoes on the carpet with solutions. It also alleviates manufacturers needing to tell Farmers how to farm. If the supply chain is being asked to achieve the set targets, there is a transition cost associated. Brands are becoming more aware of transition costs and are wanting to fund Farmers directly for actions as noted.

'On a personal note, the part that really blew me away was that the farmers I met all had a similar story to tell. It took three or four years of increased investment and reduced yield before finally these new methods got traction; they had almost had to give up. So, there's a valley of tears'.

What became clear to me is: we as the buyer from these farmers, have to actively help them because, otherwise, these people will not be able to make this transition. They're the most exposed in this supply chain. It's not enough for us just to insist that this has to be done. We have to help them with technical assistance, the premiums that we pay and sometimes financial assistance, to make it through that valley of tears'.

Mark Schnider CEO Nestle

So who pays? Consumers are demanding GHG reductions but ultimately the consumer is not prepared to pay. They are like a two headed snake saying they want something but are not prepared to take the action and pay. There was no evidence on my travels or research of any consumer prepared to pay more for more sustainably produced dairy products. So where does the money come from?



This direction of travel is not consumer driven. It is being driven by ESG stakeholders, investors and employees to enable ongoing social license to operate. Market access is now materialising with social expectation demands such as an animal welfare plan, sustainability plan, workforce program and child labour expectations being met. Consumers assume these considerations have been dealt with prior to products arriving at the supermarkets. These are also highlighted as supply chain risks for Brands.

Taking this into consideration seeing the consumer is not prepared to pay, the payment comes through the supply chain and adds a cost so payments are tricky to structure. So far it has been seen that brands are willing to pay for greenhouse gases reductions and in some cases regenerative agriculture, not yet animal welfare or other Nature positive outcomes. Sustainability can be described as what is willing to be paid for. Brands might be asking but it comes down to what they are actually willing to pay for, this may change with time. This could be flipped around where Farmers and Manufacturers offer ecosystem/nature positive services they know they are able to provide and Brands choose to use them to meet their targets, thus offering insets instead of offsets. A transition payment versus a subsidy. Another option discovered with a behavioural economist at Guelph University is a reverse auction that could be a positive platform for change as well beyond the current urgent change. See Chapter 5 for a description.

As food and fibre producers we need to lean into this space to enable continued access to capital financial markets at a reasonable expense or we will see the impact of increased capital costs which will have a direct effect on our Profit and loss statements and CAPEX.

The burden of responsibility requires all, not just the farmer but right through the value chain.



Chapter 3: Follow the money to find out why

Part of the challenge I found while researching was to discover where the drive from ESG was coming from, eventually it led back to Basel. All banks have to go to the international finance markets to get their funding. To gain funding banks must meet the Basel III international banking regulations.

Basel III refers to a set of international banking regulations developed by the Basel Committee on Banking Supervision. Basel III was introduced to strengthen regulation, supervision, and risk management within the banking sector post the global recession 2008. It builds upon the earlier Basel II framework and aims to enhance the resilience of banks and promote financial stability. Below is a general description of Basel III. Basel III introduces more stringent capital requirements for banks, focusing on improving the quality and quantity of capital held by financial institutions. Common Equity Tier 1 (CET1) capital is emphasised to enhance a bank's ability to absorb losses. Basel III includes a leverage ratio to restrict the build-up of leverage in the banking sector. This ratio measures a bank's capital against its total exposure. Liquidity standards are introduced to ensure that banks have sufficient liquid assets to meet their short-term obligations. The Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR) are key components of Basel III's liquidity framework. Basel III addresses counterparty credit risk by introducing measures like the Credit Valuation Adjustment (CVA) risk framework. The framework aims to account for the risk associated with changes in the credit quality of derivative counterparties. Enhanced risk management practices and governance standards are emphasised, encouraging banks to have robust risk management frameworks and board oversight. Basel III introduces additional requirements for Systemically Important Financial Institutions (SIFIs) to mitigate the risks posed by globally significant banks. Basel III allows for the use of macroprudential tools by regulators to address systemic risks and enhance the stability of the financial system. Basel III has been subject to a phased implementation timeline, allowing banks and regulators time to adapt to the new standards gradually.⁶

Funders of capital must consider all of their risks. ESG and climate are now being viewed as key risk tools.

ESG (Environmental, Social, and Governance) factors and Basel III, though addressing different aspects, share a connection in promoting sustainable and responsible business practices within the financial sector.

Basel III indirectly addresses environmental concerns by promoting stability in the financial system. However, the E in ESG focuses explicitly on the environmental impact of a company's operations. Financial institutions, under Basel III, are encouraged to consider environmental risks in their risk management practices.

The S and G in ESG encompass social and governance aspects of business conduct. Basel III emphasises good governance practices within financial institutions to ensure sound risk management and compliance. It aligns with the G in ESG.



Both Basel III and ESG frameworks emphasise the importance of effective risk management. Basel III focuses on financial risks, while ESG considers broader risks related to sustainability and ethical business practices.

Basel III aims to enhance the stability of the financial system over the long term, aligning with the sustainable and long-term perspective promoted by ESG principles. In summary, while Basel III primarily addresses financial stability and risk management, its principles align with the broader goals of ESG, encouraging financial institutions to integrate environmental and social considerations into their practices. This integration reflects a growing awareness of the interconnectedness between financial stability, sustainability, and responsible corporate behaviour.

Another perspective is the size and scale of the food industry. Nearly a quarter of the top companies ranked as the biggest in the world by Food Engineering magazine are dairy based. The total sales of \$103.8 bn in 2022. Their biggest opportunity to make nature positive action is through the supply of raw product, therefore the farmer and providing financial support directly to enable this.

As described by the chief procurement and sustainability officer at Mars, they now consider four components during the procurement process - Sustainability, Price, Quality, Science research and development instead of just price. Amanda also shared that dairy is nutrition and indulgence, consumers want to feel good as they enjoy it.

Eventually these principles will have an effect on finance behind the farm gate as the use of these financial risk measures will continue to expand. Being part of a voluntary program enables Farmers to make incremental change, to learn from other farmers and ensure the early adopters are financially supported for the risk they take.



Chapter 4: Case Studies

PERFECTION IS THE ENEMY OF PROGRESS, WINSTON CHURCHILL

While there might not be a fully developed model of transition payments through the value chain there are examples of initiatives around the world that New Zealand manufacturers and farmers can take note of to enable a starting point.

We see a starting point such as In 2023 the USA established the Climate Smart Commodities Program which has created 141 agreements investing \$3.1 billion to provide technical and financial assistance to farmers for nature positive practices on a voluntary basis. As well as this the National Institute for Food and Agriculture has received funding from the Inflation Reduction Act which allocates \$300 million to enhance measurement, recording and validation (trusted and transparent methods) for enteric methane emissions on a larger scale.

Following are some international case studies as examples.

The purpose is to look at models of financial support for farmers around the world via the value chain for Nature Positive actions.

1.1 Case Study 1, Arla foods 80 point sustainability programme

Arla is one of the largest dairy companies in the world. It is a Danish-Swedish cooperative dairy company known for producing a variety of dairy products, including milk, cheese, and butter.

In October of 2023 Arla announced an 80 point system for their farmers. Again, a voluntary system where farmers can select from a smorgasbord of climate positive actions which are then verified through a trusted and transparent model and they receive funding for these actions. There is up to 3 eurocent per kilo of milk. It is anticipated that there will be additional points and funding in the future.

There are 5 key areas:

1. Manure handling
2. Use of sustainable feed
3. Use of renewable energy
4. Biodiversity and carbon farming activities
5. Knowledge building

The Arla sustainability incentive model builds on climate check data to reward past and future actions.

The Quality Assurance Programme is outlined in the diagram below.

The actions that have the most positive impact on sustainability will lead to the most points.



1.2 Case Study 2, Cargill

Cargill is an American multinational corporation specialising in food, agriculture, nutrition, and risk management. As one of the largest privately held companies in the world, Cargill operates across various sectors, including crop and livestock farming, food processing, trading and distribution. It plays a significant role in global food supply chains and agricultural markets.

Cargill Reconnect is a voluntary, market-based regenerative agriculture/nature positive program which helps farmers improve soil health and decarbonise the agriculture supply chain.

Farmers enrolled in the program can choose the practices that are best suited to their operation's unique growing conditions, which includes planting cover crops and implementing reduced- or no-till farming. These practices help sequester carbon in the ground, build soil resilience and improve water quality.

In addition to providing technical support and resources to enable farmer success, the program offers an environmental market opportunity for participants, who are then able to connect with some of the world's largest companies actively seeking to reduce their environmental footprint while supporting regenerative agriculture.



1.3 Case Study 3, Athian

Athian is an international technological data enterprise focusing on agriculture. They have partnered with Elanco and California Dairies amongst others. They have created a platform to provide a trusted, transparent and measured system for ecosystem change, linking farmers and markets together.

Athian enables environmental sustainability for animal agriculture through the use of software to aggregate, certify, and fund greenhouse gas reduction plans throughout the entire livestock value-chain.

Athian has created an industry-led platform to fund GHG reduction projects within the livestock value chain – enabling producers to make systemic changes that reduce their carbon footprint while optimising their operations, and allowing downstream processors, retailers and brands to make good on their “Scope 3” sustainability commitments.

Athian's *Sustainable Livestock Systems* platform is an industry-based analytics tool powered by AI that enables the livestock industry to make good on its sustainability commitments by providing carbon “insetting” credits. Athian's carbon credit marketplace provides quality greenhouse gas credits that fund livestock producers' sustainability measures.

Digital Monitoring, Reporting and Verification Services

A robust monitoring, reporting and verification (MRV) capability is essential to the credibility of project measurement, methods and outcomes for livestock producers. Monitoring, reporting and verifying greenhouse gas reductions have traditionally required labor intensive onsite processes. As a result, it takes years for a producer to see a return on investment. Real-time (or near-real-time) reporting and verification is critical for the livestock supply chain to successfully meet their sustainability goals.

To streamline the MRV process, the Athian Sustainability Platform includes a Digital MRV solution for measurement, recording and verification. By focusing on the



digitisation of the MRV process, relevant to animal agriculture greenhouse gas projects, and leveraging integrations to source data systems on-farm and along the value chain, this can effectively scale the MRV process to meet the operational needs of livestock producers. Athian's Digital MRVI reflects existing MRV program guidance and best practices from organisations such as the Verra, SustainCert, Carbon Disclosure Project (CDP), World Resources Institute (WRI) and Organisation for Economic Cooperation and Development (OECD).

Athian partners with accredited Validation and Verification Bodies (VVBs) to perform the necessary third-party review to ensure the accuracy and credibility of Athian credits. These VVBs will be accredited by the ANSI National Accreditation Board (ANAB) and in accordance with ISO 14064-3:2019, 14065:2020 and 14066:2011.

Registry Services

Athian provides real-time registry services, encompassing both emissions inventories for producers and carbon credit accounting for the purchasers of credits. Together, these two aspects of the Athian Registry constitute the complete system of record for entity-level emissions, verified GHG reductions and certified carbon credits. The full chain-of-custody traceability provided by the registry is critical to establishing ownership and preventing double counting of quantified, verified GHG reductions.

The Athian Registry Emissions Inventory houses a verified emissions baseline for an entity and tracks how it changes over time. It relates quantified emissions to each emissions source and associates verified GHG reductions back to these sources.

The Athian Registry Carbon Credit Accounting function mints certified carbon credits from verified GHG reductions. It tracks credit ownership and related transaction history from minting to retirement. Activity within the Registry Emissions Inventory is reflected in real time and continuously reconciled to the transactional history within its emissions reduction ledger.

Marketplace

The livestock value chain includes a large number of diverse producers, and any successful sustainability effort must provide real-time incentives to enable broad-based producer participation. The Athian marketplace is where producers gain visibility for their sustainability measures, while offering associated carbon credits for sale. Processors, retailers and brands can quickly locate, qualify and acquire carbon credits generated by producers within their value chain (scope 3) – credits they need to meet their public net-zero carbon footprint and GHG reduction sustainability commitments. They can also discover available climate-smart producers that meet their profile and source new suppliers for the commodities they need, knowing they have the sustainability characteristics they desire.

Software as a Services (SaaS) platform is purpose-built using blockchain technology to ensure Athian carbon credits meet the highest standards of security, integrity and transparency. Marketplace operations are designed and managed according to a rigorous governance framework, derived from the same systems built to meet the compliance and reporting requirements of regulated financial institutions.



Athian's low-friction, scalable marketplace is provided at no cost to producers, guaranteeing that disadvantaged and traditionally underserved groups have equal access to carbon credit monetization. Sale of these credits generate funding critical to securing broad adoption and ongoing viability of new and emerging on-farm sustainability interventions required to meet Scope 1 and Scope 3 climate goals. The Athian system markets the credits, and passes 75% of every credit sold to the producer on a monthly basis. The remaining 25% pays for Athian's costs, validation and verification services, and any other partner fees.

Athian is verifying its first farms and creating, certifying and selling carbon credits within the dairy value chain. This means:

- Dairy farmers of all sizes now have the opportunity to implement on-farm sustainability interventions, measure the impact and participate in third-party verification for their greenhouse gas emissions reductions. The resulting carbon credits can be offered for sale in Athian's livestock carbon insetting marketplace.
- Companies in the dairy value chain (such as consumer-packaged goods companies and food retailers) can then purchase those carbon credits as contributions towards achieving their Scope 3 emissions reduction goals.
- With the purchase of these credits, economic value is returned to the farmer via the sale while supporting the U.S. dairy industry progress towards their own environmental commitments of greenhouse gas neutrality by 2050.ⁱ
- Over the long term, this marketplace will expand to other livestock & poultry.

"Athian's first carbon credits for dairy are an exciting and crucial step as they demonstrate the ability to tangibly quantify and verify greenhouse gas emissions reductions and create monetary value for farmers for their efforts," said Paul Myer, CEO of Athian. "This marketplace, specifically designed for the animal protein industry, is different than traditional offsetting carbon marketplaces because it keeps the value-economic value as well as positive environmental value-in the animal protein value chain."

Empowering Farmers with Economic Opportunities

Despite widespread awareness of carbon markets by farmers, only 3% of farmers are participating in these markets today, according to a recent survey cited by the U.S. Department of Agriculture (USDA). Creating an inset market model that works with recognized supply chain partners makes it easier for farmers to measure and implement rigorous verifications, will help break these barriers to entry and accelerate progress.

Jeff Simmons, President and CEO of Elanco Animal Health. "As a leader in animal health, we've focused first on delivering enteric methane reduction solutions to producers. If the entire U.S. dairy industry leveraged this intervention, it would avoid 4.7 million metric tons of CO₂e emissions annually from enteric, feed and manure emissions. This is a game changer for value creation throughout the food chain, and it's just the start. Environmental sustainability needs to be grounded in farmer profitability."⁸



1.4 Case Study 4, Catskills watershed

Domestic or national social license to operate relates to water and water quality, in one generation society has moved from thanking a farmer to cursing a farmer. Water is a domestic issue that requires domestic solutions.

However, in Upper state New York they have turned the sentiment around. Farm and forest landowners in the New York City Watershed region work to protect water quality on behalf of nine million New York residents. Through the use of Whole Farms Plans, Forest Management Plans and Conservation Easements to help farmers, forest professionals and private landholders address water pollution concerns on properties located in the Croton and Catskill/Delaware Watersheds.

Internationally recognized as a successful example of public-private partnership, strategic watershed management approaches benefit the general public through incentivized, on-site practices performed on private lands. This partnership model, referred to as "Payment for EcoServices" or PES, empowers private landowners to be surface-water stewards of New York City's drinking water. Landowner willingness to participate in upstream water quality programs continues to provide New York City residents with over 1.1 billion gallons of clean drinking water each day.

The success is directly related to:

- Voluntary landowner participation within the watershed.
- Farmers learning from other farmers they trusted that were the early adopters and risk takers.
- Water-quality recommendations in the Whole Farm and Forest Management.
- Plans are funded by the New York City Department of Environmental Protection, U.S.D.A, U.S. Forest Service and other funding sources.

The Catskills Watershed, a vital source of drinking water for millions in the New York City area, faced challenges related to water quality and ecosystem health. The Catskills Watershed Protection Case Study details the initiatives taken to safeguard this critical natural resource. The Catskills Watershed supplies water to New York City. Some 30 years ago there was an issue of the water supply not being potable for human consumption. The filtration project to solve the issue was quoted circa \$1-2 billion. Initially the state tried to regulate farmers, which they refused. A voluntary approach was then launched providing farmers with financial support from the state to make positive actions on farms that led to positive water outcomes. The focus was placed on 10 lead farmers in the district. A model of trust and transparency was developed and led through the soil and water outcomes organisation.

These farmers led the way and shared their experience with fellow farmers - farmers trust other farmers. All farmers in the watershed now participate in the voluntary



program. The New York Water supply is secure and safe, farmers are encouraged to farm – a very positive result for everyone.





Figure 2: Farmers from the Catskills Watershed. This farm has received over \$3 million to fund effluent storage, two calf barns and a cow stall.



Figure 3: New effluent store, relocated to protect the watershed.

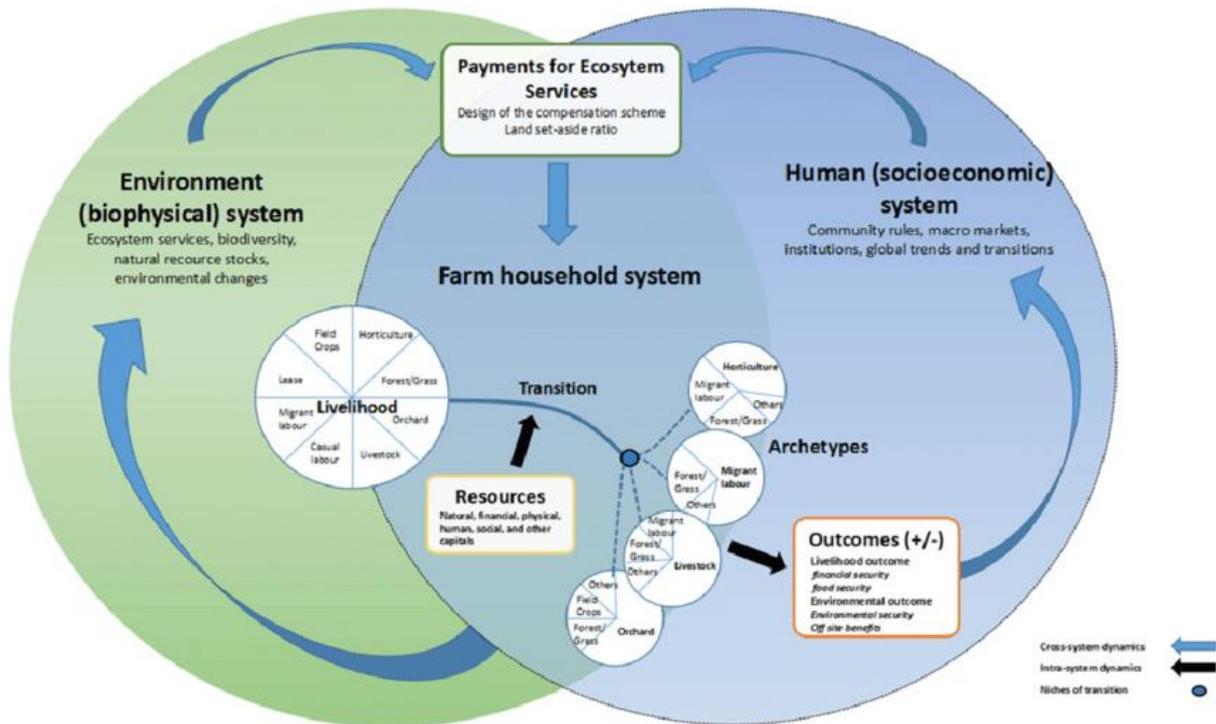


Figure 4: Another Watershed family with their concreted feed storage, supported by the Watershed Project.



Chapter 5: Opportunity for New Zealand

5.1 Transition payments



Farmers are at the intersection of landscape Nature positive action and GHG reductions. Farmers need to be economically viable to remain. Farmers need financial support through the transition time of making nature positive changes

Ecosystem services certification programs are initiatives that assess and recognize businesses or landowners for their efforts in providing environmental benefits, also known as ecosystem services. These programs aim to encourage sustainable practices that contribute to biodiversity development and conservation, carbon sequestration, water quality improvement, and other positive environmental outcomes.

Here's how eco-services certification programs generally work:

Certification programs establish criteria and standards that define environmentally sustainable practices. These criteria often cover aspects like soil health, water management, habitat conservation, and biodiversity enhancement.

Farms or businesses interested in certification undergo a verification process. This may involve on-site inspections, data collection, and assessments to ensure compliance with the established standards.



Certification programs often have different levels or tiers, indicating varying degrees of environmental performance. Higher levels may represent more comprehensive or advanced sustainable practices.

Certified entities receive incentives, recognition, or both. Incentives can include access to markets willing to pay premiums for sustainably produced goods. Recognition provides a marketing advantage, signalling to consumers and stakeholders that the certified entity is committed to environmental stewardship.

Certification programs often encourage continuous improvement. Certified entities may be required to demonstrate ongoing commitment to sustainability and participate in periodic reviews.

These programs play a crucial role in promoting sustainable nature positive practices across various industries, including agriculture. They align with the growing consumer demand for environmentally friendly products and services, providing a mechanism for businesses to showcase their commitment to ecological responsibility.

How does society know this is working? How do we measure success?

Accounting for nature-positive or ecosystem services certification programs involves establishing clear methodologies for measuring, monitoring, and reporting the environmental benefits provided by certified entities. Here are key considerations:

Develop specific metrics and indicators that align with the goals of the certification program. This may include metrics for biodiversity conservation, carbon sequestration, water quality improvement, and other relevant ecosystem services.

Conduct baseline assessments to establish the initial environmental conditions. This provides a reference point for measuring the impact of certified practices over time.

Implement robust data collection systems to track relevant environmental data. This may involve on-site measurements, remote sensing technologies, or a combination of both. Regular monitoring ensures ongoing compliance and performance evaluation.

Engage third-party verification services to independently assess and validate the environmental performance of certified entities. This helps build trust in the certification process and ensures objectivity.

Quantify the ecosystem services provided by certified entities. Valuation methods can help assign economic value to these services, providing a basis for recognizing the financial benefits of nature-positive practices.

Adhere to established reporting standards for environmental accounting. This may include internationally recognised frameworks or standards specific to the nature-positive certification program.

Foster transparency by sharing data and results with stakeholders. Clear communication about the environmental impact of certified practices enhances credibility and helps consumers make informed choices.



Maintain flexibility in the accounting framework to accommodate evolving scientific knowledge and best practices. Regularly review and update the methodologies to reflect advancements in understanding ecosystem services.

Integrate nature-positive accounting into existing reporting systems and financial frameworks. This helps ensure that environmental considerations are woven into broader business or organisational strategies.

Establish feedback mechanisms to gather input from certified entities, stakeholders, and experts. This continuous feedback loop contributes to the refinement and improvement of the certification program and its accounting processes.

By integrating these elements, nature-positive or ecosystem services certification programs can establish a robust accounting framework that accurately reflects the environmental benefits achieved by certified entities. This, in turn, strengthens the effectiveness and credibility of such programs. This can provide to Brands a good, better and best level of product.

Some examples of current nature positive standards are:

ISO 14001 - Environmental Management Systems: ISO 14001 sets out criteria for an environmental management system, providing a framework for organisations to minimize their environmental impact. While not specifically for nature-positive services, it emphasises continuous improvement in environmental performance.

The Natural Capital Protocol: This framework provides guidelines for businesses to measure and value their impacts and dependencies on natural capital, aiming to integrate natural capital considerations into decision-making processes.

The Economics of Ecosystems and Biodiversity (TEEB): TEEB is a global initiative focused on recognizing, demonstrating, and capturing the value of nature. While not a certification program, it provides insights and methodologies for incorporating the value of ecosystems and biodiversity into decision-making.

B Corp Certification: B Corporations are businesses that meet high standards of social and environmental performance. The certification process evaluates a company's impact on its workers, customers, community, and the environment.

Rainforest Alliance Certification: This certification focuses on sustainable agriculture, forestry, and tourism. It includes criteria related to biodiversity conservation, ecosystem services, and the well-being of local communities.

Forest Stewardship Council (FSC): FSC certification is specific to responsible forestry practices. While not directly related to nature-positive services, it emphasises sustainable and environmentally friendly forest management.

New Zealand also has the opportunity to use milk processors such as its co-operative to advantage and use a landscape approach or using the current programs such the Fonterra co-operative difference structure further.



The current land sector removal situation cannot work for commodity food production as the land Management unit has to follow the product segregated all the way through. This is where an ecosystem approach through our co-operative is the solution. Taking all farms and creating one unit. Not every farmer can do the same thing, some can do more, some less but can count together through our cooperative. Some farmers will produce milk, others will provide ecoservices and will be paid for the separate services. Fonterra has the ability to market services through the value chain for customers that need this value addition proposition. Insetting rather than offsetting. The challenge is going to be the accounting system, measuring and reporting (trusted and transparent).

For nature positive payments to be made through the value chain there needs to be a mechanism that is trusted and transparent to measure outcomes. Nature Positive Accounting can be done, the Global Dairy Platform is about to release a model to do so in 2024. Land use efficiency needs to be considered also in the calculation, as an example for every hectare farmed in Europe another 4 hectares are used from abroad to provide supplement and support their production. Excellent nature positive accounting systems are essential to protect New Zealand Dairy.

Establishing New Zealand dairy farms as an ecosystem for nature-positive outcomes involves implementing nature positive agricultural practices. This includes rotational grazing, biodiversity, agroforestry, and soil health improvement. To ensure financial rewards for landowners, incentivize eco-services through certification programs that recognize and compensate for sustainable practices. Collaborative initiatives and partnerships between stakeholders can foster a holistic approach, promoting both environmental conservation and economic viability.

To consider all dairy farms as one interconnected dairy farm for enhanced environmental outcomes, implement integrated management strategies:

Holistic Planning: Develop a unified environmental management plan that spans all Fonterra farms. This should address water quality, soil health, biodiversity, and carbon sequestration.

Data Sharing and Technology: Utilize advanced technologies for data collection and sharing among farms. This can enable real-time monitoring, optimizing resource use, and identifying areas for improvement.

Regenerative Practices: Promote regenerative agriculture practices across all farms, including rotational grazing, cover cropping, and agroforestry. These methods enhance biodiversity, soil health, and carbon sequestration.

Collaborative Research: Encourage collaborative research initiatives to continually refine and improve sustainable practices. Sharing findings and best practices can benefit all farms within the Fonterra network.

Education and Training: Provide ongoing education and training programs for farmers to ensure consistent adoption of sustainable practices. This could include workshops, webinars, and on-farm demonstrations.



Certification Programs: Establish or participate in certification programs that recognize and reward environmentally friendly practices. This can create market incentives and financial rewards for farms adhering to sustainability standards.

Eco-Services Compensation: Explore opportunities for compensating Fonterra farmers for providing eco-services, such as carbon sequestration or biodiversity enhancement. This could involve government programs, carbon markets, or private-sector partnerships.

Transparent Reporting: Implement transparent reporting mechanisms to track and communicate the environmental performance of Fonterra as a whole. This transparency can build trust among consumers and stakeholders.

By adopting an integrated and collaborative approach, milk processors can create a model for large-scale dairy farming that prioritizes environmental stewardship while maintaining economic viability for all involved farmers.

5.2 A reverse auction

Another way to establish the transition payment could be the concept of a reverse auction. This is being explored by a behavioural economist at Guelph University.

A reverse auction for ecoservices involves sellers competing to provide environmental services or ecosystem-based solutions. This type of auction can be used by organisations or government bodies seeking to procure services related to ecological restoration, conservation, or sustainable practices. Here's an overview of how a reverse auction for ecoservices could work:

The buyer: which could be a brand, governmental agency, environmental organisation, or private entity, clearly defines the ecoservices they are seeking. This might include reforestation, wetland restoration, carbon sequestration, or other environmentally beneficial Nature positive services.

Ecoservice providers: Farmers which could be companies specialising in environmental services, conservation Non-Government Organisations (NGOs), or other relevant entities, are invited to participate in the reverse auction.

Sellers submit bids that not only include pricing but also detail the specific ecoservices/Nature positive services they can provide, methodologies employed, expected environmental outcomes, and any additional benefits they offer.

The auction takes place in real-time, and participants can see the current leading bid along with relevant details about the services being offered.

The auction has a defined duration during which ecoservice providers can adjust their bids and service offerings to remain competitive.

The buyer may include sustainability criteria in addition to cost, such as the ecological impact of the proposed services, adherence to environmental standards, and innovative approaches to enhance ecosystem health.



Participants have visibility into the leading bid, encouraging competition and innovation in eco service offerings.

Some reverse auctions allow for automatic bidding adjustments based on predefined rules. Sellers may need to meet specific qualification criteria to participate.

The buyer evaluates bids not only on cost but also on the quality and environmental impact of the proposed ecoservices.

The eco service provider with the most favourable bid, considering all criteria, is awarded the contract to provide the specified ecoservices.

The buyer and the winning eco service provider finalize the terms of the contract, including project timelines, reporting requirements, and any other relevant details.

This approach encourages competition among ecoservice providers/Farmers, while ensuring that the awarded contract aligns with the buyer's sustainability goals and environmental impact expectations. The payments go directly to the Farmer, enabling further Nature Positive outcomes due to economic decisions. The process facilitates transparency, innovation, and efficiency in the procurement of ecoservices. It is also voluntary which is a key to success as seen in the case studies.



Chapter 6: Conclusion

Brands or Customers of New Zealand agriculture have made sustainability claims in the board rooms (shoes on the carpet, not boots on the ground) without consideration of what could be done or how. The reason for these claims are market driven and related to access to capital. To enable these claims to be met, corporations now need to go back through their value chain to achieve their emission reduction targets. The further back they go through their value chain, to scope three is where the most reductions can be made and this lands with farmers.

Consumers of the product are not prepared to pay more for sustainability and make the assumption that social license expectations have been met prior to goods arriving at the supermarket. Farmers cannot afford to pay alone for Nature positive actions, hence transition payments need to be through the value chain to support ecosystem or nature positive services. Farmers sit at this intersection of the transition but cannot afford to fund this alone. Farmers also cannot afford to not take action as their cost of capital will increase due to the perceived risk for investors. In a post covid environment New Zealand society also cannot afford to fund the change via subsidies like we see elsewhere.

There are a number of programs already set up around the world focusing on insets instead of offsets such as the case studies earlier in this report. New Zealand farms in a different system to the rest of the world, hence our solution also needs to be unique, part of this is that in New Zealand we have the advantage of our co-operatives enabling us to work together as a collective to achieve solutions.

The best solutions, due to our unique way of farming, is to offer a reverse auction. As the Global Dairy Trade Platform is already in place, it or the offer of a transition payment system for voluntary actions that farmers can select from e.g. expanding the Fonterra co-operative difference payment. These solutions give farmers options and a voluntary choice of how much to participate and to what level. While the transition program might not be perfect we need to start to make incremental changes to our systems so we can continue to access affordable capital for our farming businesses. Our Brand customers are seeking action and direction of travel which will need to evolve. Both of these options are scalable, transparent and thus able to be trusted. New Zealand already has experts able to provide measuring systems such as Ekos and Verdi.

While there will be laggards, the early adopters are able to eliminate their risk as they will be compensated, they will also be able to become the experts, farmers always trust a farmer. If we fail to build it, it will be built by someone else. We need to lean into ESG to ensure our access to markets and capital now and into the future.



Chapter 7: Big lessons

As I travelled and researched I came across themes and concepts that often repeated and had an impact. These big lessons do not relate directly to my research but are important.

- (a) For transition and other programs to be successful there is a recipe for success that I have seen across the world. Providing open, integrated and unbiased data sharing for participants and observers provides transparency. Programs also need to have accurate and equal measurements that are easily understood as a starting measure but also to show improvements. Successful programs are scalable and transferable as well. When combined this leads to the ultimate outcome of a trusted program.
- (b) Symbiotic relationships in agriculture play a vital role in promoting soil health, plant growth, and ecosystem resilience, contributing to sustainable and environmentally friendly farming practices. Understanding and harnessing these relationships can lead to more resilient, productive, and environmentally sustainable agricultural systems.
- (c) Rewarding early adopters - in other industries the early adopters can make the most success but in farming our cycles are so long they often miss out. How can we provide more support as a sector?
- (d) Celebrate other farmers - Farmers learn from other Farmers because they trust them. It is one of very few non-competitive business environments. How can we celebrate and encourage those that are willing to help others, the time they give and the knowledge that they share?
- (e) Boots on the ground verses shoes on the carpet being included in decision making.

The One Health model provides valuable insights and approaches that can be adapted for addressing wicked problems, which are complex, multifaceted challenges that defy straightforward solutions. Key learnings from the One Health model for tackling wicked problems include using a systems maps to identify all of the stakeholders that should be at the decision table, especially those with their boots on the ground. Wicked problems often involve interconnected systems with multiple stakeholders and variables. By taking a holistic view and considering the interactions between human health, animal health, environmental health, social factors, and economic drivers, stakeholders can better identify leverage points for intervention and anticipate unintended consequences by using different perspectives. Wicked problems require interdisciplinary collaboration to address their complexity effectively.

The One Health model promotes collaboration between experts from diverse fields, including human health, veterinary medicine, environmental science, social sciences, economics, policy, the people directly affected - the Farmers and community engagement. By bringing together a range of perspectives, knowledge, and skills,



stakeholders can generate innovative solutions and navigate the trade-offs inherent in addressing wicked problems. Wicked problems are characterized by uncertainty, ambiguity, and evolving dynamics. The One Health approach emphasises adaptive management, which involves iterative learning, experimentation, and flexibility in response to changing conditions and varying disciplines working together to achieve the best outcomes. By adopting adaptive management strategies, stakeholders can test hypotheses, monitor outcomes, adjust interventions, and learn from both successes and failures over time. Wicked problems often have social, cultural, and behavioural dimensions that require community engagement and participation. By involving communities in problem-solving processes, acknowledging their local knowledge and values, and building trust and partnerships, stakeholders can develop contextually appropriate solutions that are more likely to be accepted, adopted, and sustained. By focusing on upstream interventions that address root causes and strengthen resilience in human, animal, and environmental systems, stakeholders can reduce the likelihood and impact of future wicked problems.

The One Health model underscores the importance of considering ethical dimensions in decision-making processes, including principles of fairness, inclusivity, and transparency. By engaging stakeholders in ethical deliberations, acknowledging diverse perspectives and values, and prioritizing equitable outcomes, stakeholders can navigate the ethical complexities inherent in addressing wicked problems. The One Health model provides valuable guidance for tackling wicked problems by embracing systems thinking, interdisciplinary collaboration, adaptive management, community engagement, prevention, resilience, and ethical considerations. By applying these principles in practice, stakeholders can work together to address the most pressing challenges facing human, animal, and environmental health and well-being. Guelph University is using the One Health Model across faculties for all bachelor degrees.

7.1 Independent benevolent facilitator of extension

Looking at Land Grant University models of extension for farmers the US model showed positive examples for current research getting to Farmers faster, with more trust and transparency. There University staff divide their work between research and providing extension. They are connected to the boots on the ground.

- (a) Separation of domestic and international issues - so often the two get intertwined and create confusion. Separation creates clarity and the ability to simplify the issues.
- (b) Follow the money to define the issue - During my research and travels I often tried to find the solutions or motivations in the wrong places. I have discovered that following where the money comes from finds the answers.
- (c) On 26 February 1937, the 32nd President of the USA, President Franklin D Roosevelt, wrote to all State Governors in the USA. In his letter, he made the case for effective soil management, including the powerful phrase: 'The nation that destroys its soil, destroys itself' Soil porosity is gaining traction as a climate risk mitigation tool. Soil porosity refers to the amount of open space or pores within the soil. These spaces are essential because they allow air, water, and plant roots to move through the



soil. Imagine soil as a sponge: the more pores it has, the better it can soak up water and let air, especially carbon, in. Porous soil helps plants grow because their roots can spread out and access water and nutrients more easily. It also helps water from rain or irrigation to soak into the ground instead of running off, which can prevent erosion and conserve water. So, soil porosity is like the soil's ability to breathe and hold water, making it a key factor in healthy plant growth and a healthy environment. Rain is the new earthquake for insurances.

7.2 Food is health

The soil microbiome refers to the diverse community of microorganisms living in the soil, including bacteria, fungi, archaea, viruses, and protozoa. These microorganisms play crucial roles in soil health, nutrient cycling, plant growth, and ecosystem functioning. The soil microbiome interacts with plant roots, organic matter, and soil minerals, forming complex networks and symbiotic relationships that influence soil fertility, structure, and resilience. Soil microbiome impacts human health via the food eaten. Soil microorganisms play essential roles in decomposing organic matter and recycling nutrients in the soil. They break down complex organic compounds into simpler forms that plants can absorb, releasing nutrients such as nitrogen, phosphorus, potassium, and micronutrients.

Healthy soil microbiomes contribute to nutrient-rich soil, which supports the growth of nutrient-dense crops. Beneficial soil microorganisms form symbiotic relationships with plant roots, providing plants with essential nutrients, water, and protection against pathogens. Healthy soil microbiomes contribute to strong, resilient plants that are more resistant to pests and diseases. The composition of the soil microbiome can influence the nutritional quality of crops grown in the soil.

Soil microorganisms contribute to the synthesis of vitamins, enzymes, antioxidants, and other bioactive compounds in plants. Eating nutrient-rich foods grown in healthy soil can contribute to overall human health and well-being. The soil microbiome indirectly influences human health through its impact on the gut microbiome. Consuming fresh fruits, vegetables, and other plant-based foods grown in nutrient-rich soil introduces beneficial soil microorganisms into the gut. These microorganisms can interact with the resident gut microbiota, promoting diversity and balance in the gut microbiome, which is associated with improved digestion, immune function, and overall health.

Exposure to diverse microbial communities in soil and food can support the development and maintenance of a healthy immune system. Consuming a diverse range of foods grown in healthy soil contributes to exposure to a diverse array of beneficial microorganisms, which may help regulate immune function and reduce the risk of immune-related disorders. Overall, the soil microbiome plays a critical role in shaping the nutritional quality of food crops and indirectly impacting human health through the food we eat. Supporting soil health and biodiversity through sustainable agriculture practices can contribute to a more resilient food system and better human health outcomes. Kari Dunfield, a soil scientist at Guelph University is currently researching and identifying microbes in soil that reduce methane emitted by cows.



7.3 New Zealand's unique position

The globe is talking about regenerative agriculture. You have to degenerate to regenerate, New Zealand is not at that point. New Zealand has some of the youngest soils in the world and are starting at a different point.

This has the potential to be our marketing point of difference through the entire value chain. Dairy ingredients are often key in indulgence foods such as chocolate - a selling point and market claim for customers of New Zealand dairy - luxury that is Nature Positive so can be enjoyed with less guilt.

While a visitor from Canada was on our farm he commented "If my vegan friend could see how your animals live and are treated on your farm, he would drink milk and eat meat."

We have a system that is so different from the rest of the world, we need to share that story.

Always remember the people. "*He aha te mea nui tea o? He tangata, he tangata, he tangata!*" What is the most important thing in the world? It is people, it is people, it is people!



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