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PROGRAMME



Science communication – Responsibility and  
integrity in New Zealand's primary sector

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## 1.0 Executive Summary

High quality agricultural science underpins New Zealand's primary sector, economy, rural communities, and wider society. The science capability of New Zealand's agricultural sector is largely responsible for our competitive advantage in the global food market. The ability to produce safe, healthy food is highly dependent on robust science, technology, and innovation. NZ agricultural scientists do an outstanding job of translating their research to farmers. This can be measured through the productivity gains we have seen over the past few decades in pastoral farming systems.

There is a disconnection of the public's understanding of what happens to our food and fibre, through the supply chain, from pasture to plate. The objective of this research was to understand how New Zealand's primary industry can communicate the importance of agricultural science more effectively to the New Zealand public, and who should be responsible for doing this. Understanding how the rural community views current government support for agricultural science and science funding is also important. The aim here is to determine how best to ensure that there is a better appreciation of the value of agricultural science to New Zealand's bioeconomy.

Fifteen semi-formal interviews were undertaken with farmers, industry personnel and scientists who work, or have worked, in the public and/or private sectors. Key themes were identified for discussion through thematic analysis. Qualitative data was labelled, collated, and reviewed to identify patterns with a shared meaning.

There were several key findings from this research. Firstly, the research suggests that our primary industry does not communicate our agricultural science effectively to the New Zealand public. The link between the science community and the public need improving to ensure science messages are understood by the urban community. The primary sector needs to communicate simple, consistent messages, which are objective, fact based, and are packaged to resonate with the public and support strong story telling. To find some common ground with our urban counterparts, we need to outline the health, social and environmental impacts of our products, and align this to their values and beliefs. As well as providing information to help people understand the 'why' about our different farming practises.

Respondents' views were divided over who is responsible for agricultural science communication. Some thought scientists, industry, and farmers should individually be responsible - but a collective co-ordinated effort is required. It was evident the primary industry would benefit from having more Honest Brokers (Pielke Jr, 2007) to communicate our messages to society. Honest Brokers are trusted scientists who engage with the public and can provide a wide scope of information to help the receiver make a well-informed evidence-based decision.

A pattern emerged that agricultural science needs political leadership, without politicising the science content. Policy makers need better connection with farmers to understand how farm systems operate. Respondents were of the opinion that central government does not support the primary sector enough through science investment and that the current funding model is not working. Given the importance of agricultural science and innovation to the New Zealand economy and society, this should be a central focus for our government to address.

There is an opportunity for a national conversation about targeted science communication. Several recommendations were drawn from this research. Given the link is missing for scientists to communicate agricultural science to the public, a strategy needs to be built to get agricultural science into mainstream

media. This requires a collective working group with individuals from different areas of the industry supply chain, scientists, media, as well as central government. MPI and CRI's could also develop specialist communication units to transfer science messages to the wider public, not just to farmers, academics, and stakeholders. A further proposal was that the primary industry needs more government support, through funding for agricultural science and a revamp of the current funding system.

The recommendations could start with The Royal Society or the New Zealand Institute of Agricultural and Horticultural Science (NZIAHS), working in conjunction with selected Honest Brokers and the primary industry to have a national conversation on effective science communication. Central government's influence, with a top-down approach, can also have a positive flow on effect, where society sees the value of our industry and especially our agricultural science capability.

## **2.0 Acknowledgements**

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### 3.0 Introduction

New Zealand's pastoral farming industry has been built on agricultural science. Pastoral agriculture has always been New Zealand's 'knowledge industry' (Caradus, 2006). The industry has always recognised the importance of economic performance and productivity, and continually seeks to improve this.

New Zealand's agricultural scientists are at the forefront of farm systems research. Traditionally research is reductionist; it breaks each system into its constituents and examines these in isolation. Systems research incorporates variation and examines the systems with the variables/constituents around it, which can influence its performance (Stevens, 2017). It helps understand the drivers of the system and how the system may evolve with different amendments.

Farmer implementation is the engine that powers New Zealand agriculture (Green, 2017). In New Zealand, there are close connections between science, education, industry, and business with the government as the regulator. To make change and progress, all of these components need targeted innovation and adoption of science.

The idea for this Kellogg project developed from a section of the 2020 KPMG Agribusiness Agenda, 'Scientist of the Future'. The report stated that the scientist of the future will be a world class communicator, who engages effectively with the public, and can explain the issues simply so people can make evidence-based decisions (KPMG, 2020). The Scientist of the Future is also a critical thinker beyond their own area of expertise. KPMG state this would require better funding and recognition systems that value and support training this type of scientist.

Agricultural scientists make up 10% of the scientists in New Zealand (MBIE, 2020). There are agricultural scientists who communicate their work very well, but I could not help but question, aren't scientists employed to 'do the science'? Is it even their individual responsibility to ensure science is communicated effectively to the public?

In today's world, misinformation and disinformation are easily accessible and there is widespread disregard for science and fact. If our science story is more understandable, and we have a community awareness of our food production systems, will this help gain the trust of the New Zealand public? Or will opinion and perception override this?

Agricultural science communication outside of the primary sector is a significant challenge, the aim here is to give the issue some exposure and to get the conversation started.

## 4.0 Objectives

The objectives of this qualitative research were to investigate:

- How can the primary industry communicate science more effectively to the New Zealand public to better connect with them?
- Who should be effectively communicating New Zealand's agricultural science outside of the primary sector?
- The current opinion on government support and funding for agricultural science.

I have focused primarily on the pastoral sector for interviewing candidates and the content in this report, as this is my background, and I am passionate about that sector. It is also New Zealand's largest exporter and one of the largest users of natural resources.

## 5.0 Methodology

The methodology for this research included a literature review of the relevant topics and semi-formal interviews. A total of 15 semi-formal interviews were undertaken with farmers, industry personnel and scientists who work in the public and private sectors.

Key themes were identified for discussion through thematic analysis (The University of Auckland, 2021). Qualitative data was labelled, and this was directed by the content of the data. Specific labels were collated and reviewed to identify patterns with a shared meaning. Themes were then defined and related back to literature.

## 6.0 Literature Review

### 6.1 The Rural Urban Divide – Perception or Reality?

Societal pressure on New Zealand pastoral agricultural systems is increasing. The community has an increasing sensitivity to environmental implications of pastoral farming, and this is driving change (Rowarth *et al.* 2020). The 'rural-urban divide' is a commonly used term in New Zealand media, especially as there is more awareness from consumers of where their food comes from. But is the rural-urban divide real? If you take the influence of mainstream media out of the equation, how do urban New Zealanders really feel about their rural counterparts?

There is currently limited research on this topic. In 2017, UMF research showed rural and urban respondents views towards pastoral farming industries were 'mildly positive' (Ministry for Primary Industries, 2017). On average, 60% of respondents held positive views of sheep and beef farming, and 50% held positive views of dairy farming. However, views had declined overall since the previous UMR survey in 2008. New Zealanders still held generally positive views of the pastoral sector, mainly due to the critical role the primary sector plays in New Zealand's economy. Respondents were also concerned about corporatisation linked to foreign

ownership, water quality and pollution, but viewed the sector as the current option for maintaining and growing the economy. Rural and urban alike are concerned about the same issues.

Beef & Lamb NZ's Hill Country Futures report (2020) states that public perceptions of farming were a challenge for those farmers interviewed. They felt there was a gap between how they were viewed by the public and how they wanted to be understood by the public. The farmers interviewed agreed there is an opportunity to increase the public's understanding using good examples of hill country farming. This would in-turn reduce the perception of the rural-urban divide and connect producers and consumers. Farmers interviewed want good environmental and social outcomes alongside a profitable business model.

Another significant obstacle for sheep and beef farmers is mainstream media. New Zealand's media focuses on bad examples of farming practise, as opposed to showcasing examples of excellent farming practise and compliance. This is what gets traction with the New Zealand public when competing for screen time in the digital landscape. The role of mainstream media and negative coverage of rural stories leads farmers to interpret public discontent with farming practise. Society's expectations about food production are impacting farmers livelihoods, on topics such as transparency of farming practise, environmental sustainability, and climate change (Beef & Lamb NZ, 2020). These expectations will only become greater, with further regulatory controls at the on-farm level. This presents a challenge but also an opportunity, as long as these regulations are backed by robust science.

This perception was also found by Anderson (2020), where in farmer interviews, the 'rural-urban divide' was quoted by the majority as a major cultural challenge. The pressure on farmers generated by a misrepresentation by mainstream media, of the New Zealand agricultural industry, was a frustration. As well as taking stories out of context and media knowing that bad news will sell a lot better than good news.

Anna Jones, a UK Nuffield Scholar, found that when mainstream media portrayed farming to the public, the coverage was clouded by urban bias, knee-jerk distrust of agribusiness, and an overreliance on too few sources with an overt political agenda. Also, among news journalists, there is a lack of agricultural understanding (Jones, 2017). This is similar to what is experienced in New Zealand. Jones also found that globally farmers and industry are fuelling the perceived disconnect through a lack of transparency and defensiveness in the face of challenge.

## **6.2 Science**

The Collins Dictionary defines science as "the study of the nature and behaviour of natural things and the knowledge we obtain about them" (Collins, 2021).

Science New Zealand states that New Zealand's science, research and innovation system works to deepen understanding, and to drive innovation on specific economic, environmental, and social challenges. The research helps to address the most important issues facing the country, and aims for productive, inclusive, and sustainable growth (Science New Zealand, 2020).

Jon Hickford, President of the New Zealand Institute of Agricultural and Horticultural Science states that "science is driven by the quest for knowledge and understanding. It uses a systematic approach, and its methodology relies on accurate and precise measurement, the accumulation of detailed evidence and the robust testing of ideas using universally agreed observation methods and experimentation" (NZIAHS, 2020).

Science also welcomes criticism and debate. Within the normal scientific process, science relies on there being a diversity of views amongst a community of critical thinkers in order to make progress (Hendy, 2016). “Science may be one of the best methods we have for generating reliable knowledge about the world, but science is not perfect” (Hendy, 2016). Science is never certain, as we gain more knowledge on different areas of expertise, science changes. Hendy states, “The uncertain nature of scientific knowledge means that opponents will often be able to find and promote individual studies that bolster their case and sow doubt in the minds of the public, even when the weight of evidence is against them”.

‘Silencing Science’ explores the interactions between science, policy and public. Author Shaun Hendy states “our wellbeing depends on our ability to generate knowledge and scientific evidence, to weigh this evidence, and to make decisions that are informed by this evidence” (Hendy, 2016). Hendy also asserts that we will need to challenge existing relationships between the New Zealand public, our policymakers, and our scientists. He says that an absence of expert comment in the media creates a vacuum, which will inevitably be filled by less informed voices that may be harmful in other ways.

There are seven Crown Research Institutes (CRI’s) in New Zealand who are Crown owned companies charged with the role to undertake research for the benefit of New Zealanders. The primary CRI for the pastoral farming sector is AgResearch and is the largest of the CRI’s in terms of revenue and assets (MBIE, 2016). CRI research is also undertaken in conjunction with universities and the private sector.

### **6.3 Distrust in Science**

People’s distrust in science has never been higher. In contrast, the public have high expectations for science advice. Decision making should be based on evidence and peer-reviewed science. However, science seems to be easily disregarded by members of the public, who reach for fast information, based primarily on emotion and opinion.

Former Special Agricultural Trade Envoy, Mike Petersen, believes people no longer trust in science like they formerly did (Piddock, 2020). Petersen stated that “in the population unfortunately, science is losing its impact, relevance and meaning” when presenting at the New Zealand Grasslands Association virtual conference in 2020. Consumers are more likely to believe specific communities and influencers, but Petersen made the point that Covid-19 could be an opportunity for people to renew their faith in science.

Edmeades (2011) states that the role of science is no longer about discovering new ‘truth’ but supporting the ‘story’ which is perceived to be the truth. Information, most often in digital form, is everywhere in this day and age, and some of it undermines science. Pseudoscience or post-modern philosophy is a breeding ground for false science or disinformation. It plays on emotion and embraces opinion. To add more noise, special interest groups have strategies to undermine the credibility of scientists or evidence-based claims (Hendy, 2016). An example of this is SAFE who create fear amongst the public around farming practise.

Jess Berentson-Shaw is a scientist who has spent her career trying to persuade people to pay attention to, and act upon, research evidence. Humans analyse scientific claims based on our values, beliefs, and feelings. Our emotional response helps form our first impression of the validity of the claim (Berentson-Shaw, 2018). Beliefs are assumptions which we hold to be true, and people use them to help make decisions and explain how the world works. Beliefs are based on information derived from the past, unlike values. Values are concepts and are based on what is important to people. Individual’s values generally do not change. However, how people prioritise values can change. Berentson-Shaw states that ‘finding the helpful values and beliefs that people

hold can help us communicate good evidence more effectively'. People process information (facts and data) more precisely, understand it and engage with it when it is conveyed through a story. Stories are more easily retained.

#### **6.4 Science Communication**

The Honest Broker (Pielke Jr, 2007) outlines the four roles' scientists can undertake when communicating. These include the Pure Scientist, the Issue Advocate, the Science Arbiter, and the Honest Broker of Policy Alternative.

- The Pure Scientist only focuses on the research and has no care for its use or application. And therefore, has no affiliation with decision makers.
- The Issue Advocate concentrates on research effects for political agenda. The Issue Advocate will align themselves with a group to aid its interests and aids in the decision-making process.
- The Science Arbiter removes themselves from policy and politics, like the Pure Scientist, but interacts with decision makers. The interaction is to resolve issues through science.
- The Honest Broker is a scientist who engages in the decision-making process, to expand the choice of information available to the decision makers to increase scientific understanding. The Honest Broker is a trusted advisor.

Stakeholders and public need to trust that advice is accurate and applicable. An Honest Broker or trusted advisor is someone who has the knowledge and skills in this case to assess the entire farm system or issue at hand, can assess and understand the science and full scope of the research (Briese, 2019).

An Honest Broker is a world class communicator, a leader, resilient, relevant, self-aware, consistent, has strong values, is educated, connected, engaging and has excellent critical thinking skills. And because of this the Honest Broker can connect people to purpose and values, and help people understand a balanced view. We have people just like this within our agricultural science community. A good example of this from the wider science community is Dr Siouxsie Wiles, who has been a prominent face throughout the 2020 Covid-19 response.

## **7.0 Results and Discussion**

### **7.1 Science Enhancing the Primary Sector**

When respondents were asked where science is being used to support and create new opportunities for New Zealand agriculture, the main responses were as follows, in no priority order - farm systems and land use change, productivity and profitability, environment (sustainability and climate change), and plant breeding. Several agreed that science has been driven by the signals that markets or government have given.

Farm systems research which has enabled land use change for different sectors has been incredibly important to the pastoral industry. This is linked with productivity and profitability. An example of this is the reduction of 53% in sheep numbers (57.9 million in 1990-91 to 27.3 million in 2018-19) whilst decreasing lamb production by only 9% (Beef & Lamb NZ, 2020). There is concern that profitability may not be a focus for the government going forward when linked with environmental research. A sheep and beef farmer from Gore

stated “science will enable the next change” which is inevitable in the future with more political regulation being imposed on farmers.

Sustainability research related to water quality and agricultural intensification has been and will be increasingly important in the future. There was again concern here from several respondents, as sustainability needs to be balanced with economic return. Climate change, more specifically, the ability to adapt to climate change, identify methane inhibitors, and reduce global environmental footprint. For example, recent research has shown that New Zealand sheep and beef farms are close to being carbon neutral (Case & Ryan, 2020) and dairy farms are the world’s most emissions efficient (Mazetto *et al.*, 2021). Environmental research will be at the forefront over the next decade.

Plant breeding has been crucial to industry productivity and profitability. Examples of this are the development and commercialisation of *Epichloë* endophyte in ryegrass for insect control in the pastoral industry, and Zespri kiwifruit cultivar development in the horticulture industry.

## **7.2 Agricultural Science and Social Licence to Operate (SLO)**

The Sustainable Business Council states that a Social Licence to Operate (SLO) can be “an unwritten contract between companies and society for companies to acquire acceptance or approval of their business operations” (Sustainable Business Council NZ, 2014).

Even though science is the basis of the natural world, people may not trust science and it is easy to be sceptical of it. The public also need to understand that science is truth, but it is not fixed and may change its position as more knowledge is gained. If we do not have science, what do we have to measure, quantify, and validate hypotheses? Well-founded rhetoric?

All individuals interviewed said science was very important for our SLO, and currently it does not play a big part in our SLO. It is required to measure, validate, and quantify our complex farming practises, and to base good farming practise on sound evidence. And importantly to give farmers a clear conscience.

Farmers need good science, to create strong claims against misinformation, to create consumer confidence in a quality product and to back up that they are doing the best job they possibly can. There is a misunderstanding of what occurs on farm, as urban people are generally not exposed to it. We need to explain the impact of farm practise and use science to continually improve. A dairy farm Operations Manager from Canterbury said, “science is the rebuttal”. We must keep explaining ourselves.

Most agreed that there is an overload of information and lots of competing voices with different agendas. The danger is that it is possible to not distinguish between well-founded science and well-founded rhetoric. Some would suggest a current example of this is support shown for regenerative agriculture.

Peoples critical thinking skills are lost and when analysing information, are not aware of the need to remove fear and emotion from decision making. We can assume that public ignorance is to blame and that a solution is to improve the state of science education and boost scientific literacy (Hendy, 2016). Several farmers were of the opinion that we need to be interacting with the public at a young age. One way could be educating them at school about where their food comes from, with permanent modules in the curriculum, so people place more value on where their food comes from.

One former CRI scientist said that the public need to allow the use of genetic breeding technologies to solve problems. For example, to breed plants for climate change mitigation and control the spread of wilding pines.

Better agricultural science communication will help our SLO and relationship with the public in the future. If we are to engage more with the New Zealand public, we need to target the people who will listen, which is the 'middle band' of New Zealand who are curious. Not the extremists, as their views will not be easily swayed, and they will not listen. Middle New Zealand needs to own the knowledge or debate.

### **7.3 Agricultural Science Communication**

Science communication is a complex topic, with many interacting parties and interests. These include farmers, industry, scientists, government, and media.

All respondents agreed that as an industry, we are good at doing the science, but we do not communicate science about food production systems and farming practise effectively to the New Zealand public. However, we do the best with what we have got. The science community and industry do a fantastic job of communicating science to farmers. This is proven by the uptake of science and application on-farm which is evident in productivity and profitability results (Beef & Lamb NZ, 2020). An Agricultural Analyst said "our science is currently communicated well to farmers, but they are not our only stake holders, the urban community are too. We need to have a bigger lens outside of our industry". A sheep and beef farmer from South Otago said, "the link is missing from science to the community".

Results from the interviews concluded that we need simple, consistent messages, which are objective, fact based, and are packaged to resonate with the public. We also need to make it known that our story will change over time as we gain more knowledge. It needs to be delivered in a way where it is interpreted as 'real' and is believable.

Several people said that we need to outline the health, social and environmental impacts of our products, and identify what aligns to their values and beliefs. People will relate to this better than production and systems research. An Agricultural Analyst said we need more clinical studies, to prove the nutritional value of our products and help people understand the 'why' of the related farm practises. This will help our sector find common ground with the New Zealand public. A good example of this is Zespri who have linked their kiwifruit to the health benefits that consumers will experience.

### **7.4 Who is Responsible?**

A strong pattern emerged that our messages need to be simple, relevant and from credible individuals. We do not have a unified science voice to represent the whole primary industry to the New Zealand community. Our industry is a champion of science, but we need to identify leaders who can articulate the science to the public. One university agricultural scientist from Canterbury says that our industry is currently lacking the vehicle for effective science communication.

Views were divided over the responsibility of agricultural science communication. Some thought scientists should be responsible, some stated industry needs to do more, and some thought farmers should tell our story, whilst being linked to scientists and industry - a collective co-ordinated effort where everyone in the value chain reinforces consistent messages.

The majority empathised that scientists are employed to do the science and to be held responsible for communicating it as well, is too much expectation. A sheep and beef farmer from Otago said that the Scientist of the Future might be realistic in 10 years' time. How we get to that point requires a clear strategy.

Several stated that industry should do more so there is better connection between different sectors in the primary industry. However, industry is coming from a fixed position, which may be seen unfavourably by the public.

Several respondents said we need more farmers to tell our story; however, we currently have the same farmers portraying our messages which is 'overkill'. We need more of the 'introverted' farmers to come out and front our industry.

The main opportunity presenting from this is that the primary industry could benefit from more Honest Brokers. The Honest Broker is a scientist who engages in the decision-making process, to expand the choice of information available to the decision makers (or public) to increase scientific understanding. The Honest Broker is a trusted advisor.

Our industry requires a unified voice(s) with a strong name, who can have trust both ways, and sit in front of different audiences. Anderson (2020) believes that a trusted advisor or science communicator can be the agent between stakeholders/public and scientists, facilitating two-way communication. Honest Brokers would work in a supportive role and translate, filter, and facilitate the knowledge exchange. They are able to understand the scientific principles behind a farming practise and can provide an explanation while still maintaining the integrity of the practise.

Scientists who have shared values with members of the public will gain the most credibility with the public. However, Sir Peter Gluckman has previously stated that "Trust can only be maintained if the science advisor upholds the principles and generally acts as an honest broker of knowledge, not as an advocate" (Hendy, 2016). When science advice is perceived as advocacy, then trust in that advice and advisor is degraded, even if the advice is accepted. Pielke (2007) says that advocacy can be justified, but only if scientists are open about their motivations and their authority is not used to mask any bias or political agenda. Society must accept that advocacy by scientists provides an important check on the misuse and misrepresentation of evidence in a democracy (Hendy, 2016).

The concept of top-down and bottom-up communication by a trusted advisor could help our primary sector connect better with the public. The difficulty is in how to apply this idea across our primary industry. Each sector has complex mechanisms and a vast scope of technical information which is a lot for one person to cover. Hearing consistent messages from a variety of different sources makes these messages more credible (Hendy, 2016).

## **7.5 Agricultural Science and Media**

All individuals interviewed said our agricultural science is not visible enough to the New Zealand public and that it needs to be more visible. The agricultural knowledge of urban people is low, but the difficulty is in getting people to show an interest and take the time to understand. Agricultural science is visible to the people who want to find it. However, it is not well advertised and hard to know where to find it.

A sheep and beef farmer from South Otago said more science visibility from our sector will help him feel valued as a producer and help with the pressure from urban New Zealand. Fonterra Open Farms are a great initiative

to allow urban people to see farms. We need to do more of this, but the red tape of health and safety is a barrier. However, this exposure leaves farmers open to criticism if urban people see something they do not understand or that sparks a negative emotional reaction.

Mainstream media is the obvious option to increase our sectors visibility, however, mainstream media do not want the primary sector's stories. Consequently, there are now limited numbers of rural reporters. Mainstream media's demographic is urban readers, and they cannot relate to agricultural content. Good agricultural news stories do not sell, and the wrong things become visible in mainstream media, e.g., 'dirty dairying'.

One scientist stated that rural and urban people have different cultures and these days we have no common ground to connect. This results in the bad stories in the media polarising people which contributes to the perceived (or actual) rural-urban divide. Based on interview responses, rural New Zealanders feel the rural-urban divide is real. We need to find topics to connect with urban New Zealanders on. NZME, who publishes the New Zealand Herald, currently has a touch point of 3.2 million New Zealanders across all of its media platforms. If NZME covered agricultural stories on a daily basis on its mainstream media platforms, and we could find those topics to connect rural and urban New Zealanders with, it would only be positive for the primary industry. They currently have The Country as their rural channel, but agricultural news seldom makes the NZ Herald headlines unless it is negative.

The primary industry should also publicise the fact that agricultural publications, such as Farmers Weekly, are available and free. Country Calendar showcases some farming practise and is delivered in a way that urban people can relate. However, it does not show the full reality of a farm. RNZ (Radio New Zealand) could be another vector for increased media presence if they reported more rural news. RNZ is a Crown entity, has credibility, mostly balanced arguments and covers science.

Social media gives scientists more control over the messages they deliver, as it does not have to be filtered or interpreted by journalists (Hendy, 2016). However, scientists have less freedom to speak their point of view today, for fear of losing their job or they do not feel they have the mandate to do this. Also, a number of CRIs require scientists to get permission before speaking with media (Hendy, 2016). This is a difficult landscape to navigate. University academics have more freedom as opposed to CRI scientists. Several decades ago, scientists could speak their mind and were respected for that. Edmeades (2011) states that for science to work best for society, scientists need to be free to speak openly on matters of public importance, without the fear of losing their job or funding.

Digital platforms are readily accessible, freely available, and widespread. People can access specific topics of interest at their own leisure. The majority of people interviewed agreed social media is important for the primary industry. We need to produce electronic information, so we have the distance removed and the urban touch points. We need to be across all available platforms which can be low cost with mass reach. Social media presence is important to reach out to the younger generation. Several people noted we will still get bad news published on the primary industry, but we need to have a strong support for the good, with fact-based snippets and a clear message. The downside of social media is that everything is visible, and misinformation can be spread quickly. Casey *et al.* (2015) found that the effectiveness of a message can be diluted if it is not planned properly. Any use of social media requires a level of authority to be effective and encapsulates the trust and credibility of the information presented. Some messages, if not strategic, can be lost in the online traffic. Most agricultural entities have effective social media posts. For example, AgResearch and Beef & Lamb NZ always

include a hyperlink with supporting credible information on their posts if the viewer wishes to access more information.

## **7.6 Agricultural Science and Politics**

A pattern emerged that our agricultural science needs political leadership. Policy makers need better connection with farmers and to understand how farm systems operate.

One private sector scientist said the political system does not take the time to understand the science or the value of agricultural science. The decision makers, policy makers and leaders need to understand science - as the primary industry is important to our economy and the wider public. He was also concerned that the government have termed agriculture as a 'sunset industry' and are promoting other industries ahead of the primary industry. Agriculture is an important part of our economy for the future.

A sheep and beef farmer from South Otago said that currently our government has no support for our sector, agricultural science is valuable, and we should be supported, as currently the primary sector is New Zealand's biggest earner. "If our government was behind the primary sector, it would make a huge difference with the public". An Environmental Advisor from Canterbury said, "if we don't have support for our science, our industry will become more regulated".

Hanson (2020) states that the New Zealand public service could be doing a more robust job of understanding public perspectives, including those of farmers and rural communities. The policy design process is missing policy makers connecting with those most affected (Hett, 2020).

Several people interviewed were concerned that policy is shaping our science. And policy makers were using trend analysis as opposed to robust science when developing policy. Also, that the government are letting emotion enter the science debate. Sir Peter Gluckman declared that science comes from a set of standard operating procedures that limit the place of values in the knowledge it produces (Hendy, 2016). Hendy states that the influence of policy on science should be limited, for concern of contamination by outside values that politics holds. Edmeades (2011) asserts that "while it is essential that science is used to inform government policies, the process of science must never be captured by politics". Caradus (2006) said that for innovation to be delivered we need a regulatory process that allows facts to overcome emotion and opinion, and common sense to succeed over political agenda.

Shaun Hendy stated in 'Silencing Science' that in his view, New Zealand needs a Parliamentary Commission for Science to improve relationships between scientists, policymakers, and the public (Hendy, 2016). Edmeades (2011) says science must regain its moral high ground in society and to achieve this, changes to science policy and how science is managed must occur.

A Communications Manager said that there is an opportunity for thought leadership from science to reduce the negative public perception around farming practise. However, there are issues around resourcing this (people and money) and the current contestable funding model restricts this capability. There is an opportunity here to have a national conversation with a wider New Zealand audience about how we communicate science from the primary industry. The Communications Manager suggested having a centralised communication point funded by government, supported by thought leaders from the primary sector. CRI's and MPI could also have a communications division with a primary objective of targeted information transfer to the New Zealand public – not just to farmers, academics, and stakeholders.

## 7.7 Agricultural Science Funding

A strong view was evident when respondents were asked about the current science funding model in New Zealand. People were of the opinion that the government does not support the primary sector through science investment enough and that the current funding model is not working.

Descriptions of the current contestable funding model included 'broken', 'does not work', 'spiders web', 'stuffed', 'dogs' breakfast', 'mostly useless', 'terrible' and 'appalling'. Some agreed that CRI's need more collaboration to achieve efficient and streamlined outcomes. The government needs clarity when aligning investment with outcomes. More targeted and consistent funding is required as well as more non-contestable funding.

One former CRI scientist said we need to invest against the threat of disruption through strategic and applied research. "New Zealand does not celebrate science, Covid-19 has been good for it and good for the agricultural industry", but for an innovative economy, we need to invest more in science to maintain our global competitive advantage. The economic value of science is huge, with flow on effects such as job creation for wider society.

An Environmental Advisor from Canterbury said that not enough is being invested to support the government's current environmental targets. "If we don't fund science adequately, it won't meet expectations, which will drive land use change and have a flow on effect of farmers going out of business".

A university scientist said that the political term is too short, which dictates the funding, and funding changes too often. Science can get some fast wins, but fast science is not good science.

A rural banker from Otago also agreed we need to invest more in science. "If we are going to increase economic export value by \$44 billion over the next decade, like the Primary Sector Council Te Taiao – Fit For A Better World roadmap was developed for, we need to spend money to make money, but we need to spend it in the right places".

One industry leader says that more structure has been added to the contestable funding system but not more funding. Sir Peter Gluckman (Former New Zealand Chief Science Advisor) has previously said we have 'too much end user involvement in the contestable funding system' (Hendy, 2016). Several scientists interviewed said that industry plus government funding models like Sustainable Food and Fibre Futures (SFFF) work well.

In 2018, the total proportion of GERD (gross domestic expenditure on R&D) was 1.3% of GDP. This is the total spend of public and private funds across all industries (OECD, 2020). However, New Zealand is ranked 21 out of 34 OECD countries for R&D investment. The government has committed to support R&D investment reaching 2% of GDP by 2027 across all industries in New Zealand (MBIE, 2019). This will require more investment from the government as well as the private sector. The government currently invests just over \$400 million into primary sector R&D, with an equivalent amount also invested by the private sector (MPI, 2017). Over the past decade, the business or private sector has been increasingly investing in R&D, but the government says the private sector needs to invest more.

The government needs a different approach to how science is funded. The difficulty is in how to fix this to make the process more efficient, and funding more targeted, with more collaboration. Several people interviewed stated they did not know how to solve it. An industry leader said that industry has to help the government sort this out. Morton (2015) states that one of the roadblocks to a more co-ordinated approach to science is the large number of funding bodies. Identification of industry priorities should be agreed by all

parties and co-ordinated through one agency which would ensure the most relevant and important issues could be addressed – in depth.

Green (2017) in his Levy Oration for the New Zealand Grasslands Association stated that he hoped the New Zealand agri-food sector will have realised the value of R&D investment and over the next 20 years we will be investing 2-3 times more in R&D. New innovations will be rolled out to support agriculture. Morton (2016) says there is a need for new research to continue for the primary sector as there is a lag phase between science being carried out and uptake of results. Otherwise, there will be a shortage of validated information in 20 years' time. Farmers also need time to have confidence in new farming practise before taking the risk of adopting it.

Several people interviewed suggested we need to invest more funding into social science around land use change. This is important with looming environmental regulations in the future.

Overall, the feedback I received from respondents aligns with parts of the current National Statement of Science Investment vision (MBIE, 2015). By 2025, MBIE want to see a better performing science system that is larger, more agile, and more responsive and investing efficiently for long-term impact on our health, economy, environment, and society. MBIE also want reduced complexity within the public science system. However, time is passing quickly with little time left to make these changes by 2025.

## **8.0 Conclusions**

Agricultural science communication is a complex problem and each of the topics in this report could be covered individually in more depth. Science communication has many interacting parties, including farmers, industry, scientists, government, and media. The main findings of this qualitative research are concluded below.

Rural New Zealand and the primary industry embrace the agricultural science community. Agricultural science is important to measure, quantify and validate our farming practises. Farmers need good science to create strong claims against misinformation and to create consumer confidence in a quality product. Science is required to back up that they are doing the best job they possibly can. We need to keep explaining the 'why' and impact of our farming practises.

As an industry, we are good at doing the science, but we do not communicate science about food production systems and farming practise effectively to the New Zealand public. We are missing the vehicle for effective agricultural science communication. Simple, consistent messages, which are objective, fact based, and are packaged to resonate with the public are required. This means relating back to people's beliefs and values (Berentson-Shaw, 2018) and outlining the health, social and environmental impacts of our products and farm practises. Science is important for supporting 'story telling'.

Our industry messages need to be from credible individuals, which we have. We do not have a unified science voice to represent the whole primary industry to the New Zealand community. The main opportunity presenting from this is that the primary industry could benefit from more Honest Brokers. We could select several of these to be industry ambassadors and build a team around them. However, the difficulty is in how to apply this idea across our primary industry. Each sector has complex systems and a vast scope of technical

information which is a lot for few people to cover. There is also an opportunity for the primary industry to develop ‘Scientists of the Future’ for engagement with the public.

Policy makers need a better connection with farmers and to understand how farm systems operate. The trend that the government does not support the primary sector through science investment enough and that the current funding model is not working was strong. More targeted and consistent funding is required as well as more non-contestable funding. Our agricultural science needs political leadership, without the science content being politicised.

The agricultural knowledge of urban people is low, but the difficulty is in getting people to show an interest and take the time to understand. Rural and urban people have different cultures and these days we have little common ground to connect. Negative agricultural stories in mainstream media polarise people, which contributes to the perceived (or actual) rural-urban divide. We want New Zealanders to be proud and understand the value of our primary industry, to bridge the rural-urban divide, be more transparent, and all tell our story of food production.

We need an approach to better engage with the New Zealand public, and agricultural science can support that. A huge challenge for the primary sector is to create a strategy to get agricultural science into mainstream media.

## **9.0 Recommendations**

“We must do better” were the words of one scientist interviewed and I could not agree more. However, the vehicle for delivering “better” is currently missing in terms of effective agricultural science transfer to the New Zealand public. I have come up with a series of challenging recommendations to help support this issue, in the hope that at least one might get noticed and picked up by someone.

### **9.1 Introduce Agricultural Science in Mainstream Media**

To increase our connection with New Zealand society, the obvious solution is to find a way to get agricultural science into mainstream media. I personally do not know how to implement this currently, and this was not a primary goal of this research. However, it could be a Nuffield topic for the future. Developing a strategy would personally require a better understanding of how mainstream media operates and their consumer base.

This issue will not be solved overnight, and the initiation of a specialist working group to begin the conversation would be a start. The responsibility of this would have to be a collective effort from all areas of the industry supply chain, scientists, media, as well as central government. But it would be a step in the right direction to gain trust with society and reduce the rural-urban divide. The Royal Society or NZIAHS stand out as possible vectors to facilitate this national conversation.

Prime time news should have a rural snapshot of the week – a positive story of how agricultural science and innovation is contributing to New Zealand society. In an ideal world, a flow on effect of this would be an increase in the number of credible rural and scientific journalists. A direct way to increase the number of skilled people in these roles is to reduce the tertiary fees for courses which lead to this pathway. This will attract

students to study these courses and also realise the employment opportunities and importance of these skills to our media businesses.

### **9.2 Establish Specialist Communications Units**

As mentioned earlier, there is an opportunity for a national conversation and strategy around targeted science communication. MPI and CRI's could develop a specialist unit responsible for science communication to the wider public - not just to farmers, academics, and stakeholders. Communications staff working within these organisations are trained with these skills, but resources are currently lacking, especially funding for this type of work. Public funding to support this would benefit wider society. Therefore, within the science funding system, an allocation to communications teams would be recommended to focus on communicating relevant science around food production to the public.

### **9.3 Political Leadership of Agricultural Science**

I ask Central Government to be mindful to come across as proud of the primary sector, this will help the primary sector build trust and respect with the public. The government needs to consistently reiterate how important the primary sector is to the New Zealand public; how good we are at agricultural science and producing nutrient dense food products. Agriculture is critical for our economy and has positive flow on effects to wider society, which sometimes our political leaders need reminded of. When the public see this support, they will begin to believe the primary sectors value. These good news stories should easily filter into mainstream media – note the word should.

### **9.4 Develop the 'Scientist of the Future'**

Developing the Scientist of the Future comes from the top down, with government support to train selected scientists to become Honest Brokers. They would engage with the public and get exposure to the media. This would help develop the thought leadership of our science community and industry.

The Scientist of the Future would require a specialist training strategy (which may already exist in some organisations within the science community), funding to support the strategy and also allow these scientists to have some freedom to speak around relevant issues and impact on society. This could be done in conjunction with the Science Media Centre.

### **9.5 Reassess Contestable Funding for New Zealand Science**

A recommendation is also for more targeted financial support from our government, through reshaping our contestable funding model and more investment in agricultural R&D. When society recognises this, the primary sector has the potential to become more valued by society. This is a large task, but a working group made up of government officials, industry personal, and scientists could begin a discussion to analyse what is/is not working and how to further enable more innovation through the science system.

## **9.6 Connect the Next Generation**

We need to be continually interacting with people from a young age about where their food comes from and the value of agricultural science. The obvious touch point here is through the education system. There should be compulsory modules within the New Zealand curriculum focusing on where food is produced. I acknowledge that some schools already do this, which is fantastic. But we could be doing more in this space. Growing NZ is a fantastic example of this in action.

This connection must focus on finding common ground between urban and rural society and relate back to people's beliefs and values (Berentson-Shaw, 2018). If we focus on outlining the health, social and environmental impacts of our products and farm practises, this is a good start.

These recommendations are challenging, and I have not presented a firm strategy or solutions for delivering them. I hope this report can help get the conversation started and that New Zealand has more skilled and trusted Honest Brokers of agricultural science that can speak out.

## 10.0 References

- Anderson, S. A. (2020). *Exploring Communication and Engagement Between New Zealand Farmers and Government Relating to Sustainable Agriculture*. Thesis, University of Canterbury.
- Beef & Lamb NZ. (2020). *Compendium of New Zealand Farm Facts*. Beef & Lamb New Zealand.
- Beef & Lamb NZ. (2020). *Understanding our hill country futures - first steps*. Beef & Lamb NZ.
- Berentson-Shaw, J. (2018). *A Matter of Fact: Talking Truth in a Post-Truth World*. Wellington: Bridget Williams Books Limited.
- Briese, L. G. (2019). *Science Communication in Agriculture: The Role of the Trusted Advisor*. Lincoln, Nebraska, USA: University of Nebraska.
- Caradus, J. (2006). 75 years of scientific and technological advances in pastoral agriculture - what will it take to continue to deliver? *Proceedings of the New Zealand Grasslands Association 68*, 33-68.
- Case, B., & Ryan, C. (2020). *An analysis of carbon stocks and net carbon position for New Zealand sheep and beef farmland*. Auckland: Department of Applied Ecology, School of Science, Auckland University of Technology.
- Casey, M., Meikle, A., Kerr, G., & Stevens, D. (2016). Social media - a disruptive opportunity for science and extension in agriculture. *Hill Country - Grassland Research and Practise Series 16*, 53-60.
- Collins. (2021). *COBUILD Advanced English Dictionary*. HarperCollins Publishers.
- Edmeades, D. (2011). Pseudo-science: A threat to agriculture? *Proceedings of the 26th Annual Conference of The Grassland Society of NSW*, 38-47.
- Green, R. (2017). Lessons learnt and future opportunities. *Journal of New Zealand Grasslands 79*, 7-10.
- Hanson, A. (2020). *How might government better understand farmer perspectives?* Lincoln, New Zealand: Kellogg Rural Leadership Programme.
- Hendy, S. (2016). *Silencing Science*. Wellington: Bridget Williams Books Limited.
- Hett, S. (2020). Trust local knowledge: citizens are experts in their own lives. *Policy Quarterly, Volume 16, Issue 2*, 5-8.
- Jones, A. (2017). *Help or Hinder? How the mainstream media portrays farming to the public*. Nuffield Farming Scholarships Trust.
- KPMG. (2020). *KPMG Agribusiness Agenda 2020. Agenda Voices - Listening to diverse perspectives*. KPMG.
- Mazzetto, A., Falconer, S., & Ledgard, S. (2021). *Mapping the carbon footprint of milk for dairy cows. Report for DairyNZ*. AgResearch.
- MBIE. (2015). *National Statement of Science Investment 2015-2025*. Wellington: Ministry of Business Innovation & Employment.
- MBIE. (2016). *Four Year Rolling Review: AgResearch. Report From the Review Panel*. Ministry of Business, Innovation & Employment. Retrieved from <https://www.mbie.govt.nz/assets/4f291b43cd/agresearch-4-year-rolling-review.pdf>
- MBIE. (2019). *Growing Innovative Industries in New Zealand. From the Knowledge Wave to the Digital Age*. Wellington: NZ Government.

- MBIE. (2020, December 15). *MBIE Occupation Outlook*. Retrieved from Ministry of Business, Innovation and Employment: <https://occupationoutlook.mbie.govt.nz/manufacturing-and-technology/scientists/>
- Ministry for Primary Industries. (2017). *New Zealanders' views of the primary sector*. Wellington: UMR.
- Morton, J. (2015). Agricultural science and extension. *Journal of New Zealand Grasslands* 77, 7-10.
- MPI. (2017). *Primary Sector Science Roadmap*. Wellington: Ministry for Primary Industries.
- NZIAHS. (2020, December). Special Issue on Regenerative Agriculture. *AgScience* 57.
- OECD. (2020, December 15). *Main Science and Technology Indicators Volume 2020/1*. Organisation for Economic Co-operation and Development. Retrieved from Organisation for Economic Co-operation and Development: <https://data.oecd.org/new-zealand.htm>
- Piddock, G. (2020, February 9). *Covid could restore trust in science*. Retrieved from Farmers Weekly: <https://farmersweekly.co.nz/#>
- Pielke Jr, R. A. (2007). *The Honest Broker: Making Sense of Science in Policy and Politics*. Cambridge University Press.
- Rowarth, J., Roberts, A., King, W., & M.J.Manning. (2020). New-generative agriculture - based on science, informed by research and honed by New Zealand farmers. *Journal of New Zealand Grasslands* 82, 221-229.
- Science New Zealand. (2020, December 15). *New Zealand Science Systems*. Retrieved from Science New Zealand: <https://sciencenewzealand.org/about/new-zealand-science-systems/>
- Stevens, D. (2017). Systems research: the need for a change of thinking. *Journal of New Zealand Grasslands* 79, 11-13.
- Sustainable Business Council NZ. (2014). *Social Licence to Operate Paper*. Wellington: Sustainable Business Council New Zealand.
- The University of Auckland. (2021, March 8). *Thematic Analysis*. Retrieved from The University of Auckland: <https://www.psych.auckland.ac.nz/en/about/thematic-analysis.html>

## 11.0 Appendix

### Kellogg Rural Leadership Programme Questionnaire – Nicole Morris

*“Science Communication – Responsibility and integrity in New Zealand’s primary sector”*

I grew up on a sheep and beef farm in South Otago, studied at Lincoln University and am now based in Mid Canterbury, where I am the Senior Research Agronomist for Midlands Seed Ltd. I have a natural interest in science, agronomy, food production, farm systems and information transfer.

The agricultural science capability of New Zealand’s primary sector is largely responsible for our competitive advantage in the global food market. Our ability to produce safe, healthy product with the backing of robust science, technology and innovation is hugely important.

In today’s world, misinformation and disinformation are easily accessible and there is a widespread disregard for science and fact. If our science story is more understandable, and we have a community awareness of our food production systems, will this help gain the trust of the New Zealand public? Could this result in people making evidence-based decisions when buying food products? Or will opinion and perception override this?

#### Questions discussed with interviewees.

1. In your opinion, what do you think are the main areas where science is being used to support and create new opportunities for New Zealand agriculture (and your farming sector)?

(E.g. Profitability, productivity, sustainability, new technology, product development, food safety).

2. How is science important for rural New Zealand’s social licence to farm/operate?

(E.g., animal welfare, climate change, water quality, biodiversity).

*The New Zealand Sustainable Business Council defines the Social Licence to Operate (SLO) as the ability of an organisation to carry on its business because of the confidence society has that it will behave in a legitimate, accountable, and socially and environmentally acceptable way.*

3. a. Do you think our agricultural science is ‘visible’ enough to the NZ public?

3. b. Do we need more visibility?

3. c. And why?

4. Do you think we communicate science around food production systems and farming practices effectively to the NZ public?
  
5. a. Who should be responsible for effectively communicating science around food production/farming practices to the New Zealand public?  
(E.g. Scientists, industry, farmers).
5. b. Why should they be responsible?
  
6. a. Will more effective agricultural science communication help the New Zealand primary sector's social licence to farm in the future?
6. b. How and why will this help?
6. c. If this will not help, then what will?
  
7. What role will technology play in the future for New Zealand's primary sector, in terms of science communication?
  
8. a. Social media platforms can be a base for disinformation or 'fake news'. How does the primary sector best utilise/navigate social media?
8. b. Are you of the opinion we need more ambassadors to showcase our products? (Eg. The Beef & Lamb NZ Iron Maidens).
  
9. What is your opinion on government support of our agricultural science and our current funding model?
  
10. Do you have anything else you would like to add about the primary sector's science communication?