

I wish to thank the Kellogg Programme Investing Partners for their continued support:

Strategic partners



Programme partners



Media and supplier partners



Disclaimer

In submitting this report, the Kellogg Scholar has agreed to the publication of this material in its submitted form.

This report is a product of the learning journey taken by participants during the Kellogg Rural Leadership Programme, with the purpose of incorporating and developing tools and skills around research, critical analysis, network generation, synthesis and applying recommendations to a topic of their choice. The report also provides the background for a presentation made to colleagues and industry on the topic in the final phase of the Programme.

Scholars are encouraged to present their report findings in a style and structure that ensures accessibility and uptake by their target audience. It is not intended as a formal academic report as only some scholars have had the required background and learning to meet this standard.

This publication has been produced by the scholar in good faith on the basis of information available at the date of publication, without any independent verification. On occasions, data, information, and sources may be hidden or protected to ensure confidentiality and that individuals and organisations cannot be identified.

Readers are responsible for assessing the relevance and accuracy of the content of this publication & the Programme or the scholar cannot be liable for any costs incurred or arising by reason of any person using or relying solely on the information in this publication.

This report is copyright but dissemination of this research is encouraged, providing the Programme and author are clearly acknowledged.

Scholar contact details may be obtained through the New Zealand Rural Leadership Trust for media, speaking and research purposes.

Contents

| | |
|--|----|
| Acknowledgements..... | 4 |
| Executive Summary..... | 5 |
| Introduction | 6 |
| Aims and Objectives..... | 7 |
| Methodology..... | 8 |
| Findings and Discussions..... | 8 |
| 1.0 What is the problem? | 8 |
| 1.1 Health Epidemic | 8 |
| 1.2 Soil degradation | 9 |
| 2.0 Defining nutrient-dense food | 11 |
| 2.1 How do we easily measure nutrient density?..... | 11 |
| 2.2 Why do we need nutrient-dense food?..... | 12 |
| 3. We have a health epidemic in part driven largely by either poor nutritional food content and/or poor dietary choice. Is a focus on food-as-medicine important for our primary sector? | 13 |
| 4. Opportunities and challenges that are needed in our current model for this to become reality. | 14 |
| 4.1 Mindset change..... | 14 |
| 4.2. Education | 15 |
| 4.3 Connecting producer and consumer | 16 |
| 4.4 Collaboration..... | 16 |
| 4.5 Leadership..... | 17 |
| Recommendations | 19 |
| References | 20 |
| Personal Communication..... | 20 |
| References | 21 |

This report is opinion and not the view of employer or any other entity, unless expressly shown in the text.

Acknowledgements

I would like to firstly thank Farmlands Co-operative for the support and encouragement of my participation in the Kellogg Rural Leadership Programme. To Jess and Nick who have given me the support and confidence to tackle challenges, and to all the Farmlanders I work with, whose support and guidance on my leadership journey has been a major contributor to my development.

To the many people I interviewed formally and informally – thank you so much for your passion, insights and for sharing your experience and expertise on this topic. You all provided great value and knowledge.

To my friends and family, a massive thank you for your patience and support while listening to my endless conversations about this report and most importantly keeping me focused when I really needed it.

To the Rural Leadership Trust for making this opportunity possible – the past six months have been challenging and incredibly insightful. Dr Patrick Aldwell, Scott Champion, Anne Hindson and Lisa Rogers – thank you for delivering such a fantastic programme.

Finally, to the group of like-minded Kelloggers that made up Cohort 40. Thank you for making this journey an unforgettable experience and sharing your expertise and passion for the future of our industry. I believe we can genuinely lead from the middle and I am excited for the journey ahead.

Executive Summary

“Let food be thy medicine, and let medicine be thy food” – Hippocrates. The idea of food-as-medicine has been around for many years. It is not until recently that consumers are leading the charge, prioritising products and ingredients that are novel, nutritious, locally sourced and ethically produced.

In both a local and global context, primary industries are facing challenges with changes in consumer behaviour. These are often strongly driven by social media trends and awareness of environmental factors involved in the methods of growth and production of food, leading to shifting food purchasing trends. The New Zealand primary sector is no different to other global producers, however an increase in the focus by the public on ‘food-as-medicine’ is creating an opportunity for New Zealand producers to fill a potential gap in the market.

Increasing demand for nutritious, safe and healthy food grown in an ‘environmentally friendly’ way has become ever more prevalent. It is well documented there is a continued and alarming rate of increase in preventable diseases, especially of the non-communicable diseases (NCD) type such as cancer, heart disease and diabetes. This trend allied with potentially catastrophic pressures on our environment, especially in the form of climate change, gives rise to a combination of major challenges for society as a whole but especially for agriculture and medicine globally.

New Zealand is in a position to take advantage of this situation and create strong markets due to its size, relatively highly educated (by global standards) agricultural workforce, and innate ability to innovate rapidly. It can add value to its export (and domestic) markets by way of capitalising on the astonishing lack of focus that has so far been paid to the nutrient content of food by consumers and producers. This will empower farmers to become educated and focussed on healing, enhancing and protecting the soil from which they derive their livelihood. It will also pass on a worthwhile heritage to future generations, while simultaneously positioning itself as a global leader in premium nutrient-dense food production.

My aim for this commentary is to create a discussion piece for our industry leaders and to help the primary sector develop a potential common goal or value proposition. I want to challenge our thinking about how we tackle the changes that are facing our industry.

This research uses a combination of a literature review and qualitative analysis. This allowed me to apply critical thinking, draw key themes and identify areas of key importance.

From this research, my recommendations include:

- Market a strong value proposition for our primary industry and gain support from the government, to ensure we have economic viability
- Facilitate better education for our growers, farmers and our own consumers, so they have the ability or option to produce and/or consume nutritionally dense food
- Create better collaboration between leaders not only within the primary industry, but across the nation
- Implementation of soil measurement and consistent production standards so that we are genuinely producing nutrient-dense food

More work is required to understand how soon testing of our food will be economically and practically viable, thereby changing the economic landscape for our producers. The inevitable increase in value

of what they produce will be reflected in what extra profit will accrue from the production of nutritionally dense food – not the volume. This will simultaneously bring enormous quantifiable benefit for the environment.

With change comes opportunity, and challenges, to evolve our market strategy and to feed our families and the world with more nutritious food. Growth occurs at the border of challenge and support.

Introduction

In both a local and global context, primary industries are facing challenges with changes in consumer behaviour. These are often strongly driven by social media trends and awareness of environmental factors involved in the methods of growth and production of food, leading to shifting food purchasing trends. The New Zealand primary sector is no different to other global producers but an increase in focus by the public of ‘food-as-medicine’ is creating an opportunity for New Zealand producers to fill a potential gap in the market.

A radical transformation of the global food system is urgently needed. Without action, the world risks failing to meet the UN Sustainable Development Goals (SDGs) and the Paris Agreement. Today’s children will inherit a planet that has been severely degraded and where much of the population will increasingly suffer from malnutrition and preventable disease (E.A.T Lancet Commission, 2019).

In our current system we export our produce into commodity markets. The purpose of this report is a thought leadership piece, investigating what it would take to move New Zealand primary producers to produce nutrient-dense food into a premium market. New Zealand has an opportunity to be relevant, disruptive and agile in a global market that is rapidly changing. There is a need to produce nutrient-dense food as consumers are demanding healthy diets. The nutrient density of food is set to become an enormous sales tool, whereby the purchasing public can determine the true value of their food purchase. This will enable them to compare between different producers of the same commodity and vote with their purses accordingly.

Unhealthy diets are responsible for 11 million preventable deaths globally per year, even more than smoking tobacco. As a result, globally, around 70 per cent of consumers are actively making dietary choices to help prevent conditions such as obesity, diabetes and high cholesterol. Limiting salt, sugar and trans-fats is important, according to new research. Even more so is ensuring we get enough of the vitamins, minerals and micronutrients that contribute to wellbeing and help fight chronic diseases (Sainsbury Future of Food Report, 2019).

A healthy diet can be defined as one which promotes a state of physical, mental and social wellbeing and not merely the absence of disease (E.A.T. 2019). The third of the 17 UN Sustainable Development Goals is to have Good Health and Wellbeing. One of the targets for the achievement of this goal is to have reduced by one third premature mortality from non-communicable diseases by 2030 through prevention and treatment, as well as to promote mental health and wellbeing (United Nations Sustainable Development, 2019).

Sales of food and beverages that offer validated health claims were expected to reach US\$54 billion by 2017, mainly in the key markets of Japan, the USA and Europe. Emerging economies, particularly in Asia, are also beginning to demand more of these products (Plantandfood.co.nz, 2019).

Global food systems will be seriously challenged to sustainably feed the world nutritiously. However, New Zealand has the land mass, climate, skills and the brand ability to produce nutrient-dense food. The consumer pursuit of wellness has become a powerful entity that can be capitalised on by our primary sector, with a risk another country could capitalise on this critical subject and gain a prominent foothold in the market. If that happens, it will mean that we as a nation miss an opportunity to lead and set the agenda. It is likely, in that case, that we will be prescribed to.

The challenge we face is that globally our soils are losing the ability to function optimally due to multiple interacting factors. A leading contributor is the continued use of soluble synthetic fertilisers. The resultant loss and imbalance of minerals and vital biology inhibits rather than enhances and integrates the vital soil-plant health equation. New Zealand, like most countries, has followed a paradigm of production almost at any cost to soil health and the environment. Thus far there has been little will or even interest in the ability to produce food that is nutritious. The resultant impacts go further than the environment – it impacts human health. We are entering a perfect storm with increasing reliance on synthetic fertilisers, pesticides, herbicides and fungicides, all of which play their part in compounding climate stressors. This leads to reduced resilience in food production systems and poorer outcomes for food producers (Masters, N. 2019).

It is important to note that this topic covers an interplay of interrelated factors that contribute to this subject. It includes the health of our soils, environment, plant, animal and human health, water and sustainability. These are vital ingredients of a functioning and healthy ecosystem. I chose to focus on what it will take for the New Zealand primary industry to produce nutrient dense- food.

Aims and Objectives

The objectives of this study focus on gaining a better understanding of what it would take for the New Zealand primary sector to produce nutrient-dense food.

Within this project I have focused on:

- What is the current problem?
- We have a health epidemic, in part driven by either poor nutritional food content and/or poor dietary choice. Is a focus on food-as-medicine important for our primary sector?
- What are the opportunities and challenges that are needed in our current model for this to become reality?

I would like this report to be used as a discussion piece for our industry leaders and to help the primary sector develop a value proposition. I want to challenge our thinking about how we tackle the changes that are facing our industry.

Methodology

The methodology I used for this research paper included a literature review of the future of food. The resources included both domestic and international research papers, opinion pieces, industry reports and case studies.

Secondly, a qualitative approach was conducted using semi-structured interviews. I wanted to gain a thorough understanding from three different key groups of people. In total, I formally interviewed ten people:

- Nutritionists and Soil Scientists
- A selection of primary industry leaders
- Businesses that are leading the way in producing nutritious foods in their own markets

The interviews were conducted after the literature review where key themes were identified. The interview questions were based on this and were semi-structured with open questions. The key themes were identified – I have explored these in my findings and discussion. I analysed these themes while looking at common messages that came out, along with interpreting different responses and what that meant for each topic.

Findings and Discussions

1.0 What is the problem?

1.1 Health Epidemic

Humans are facing a global disease crisis. 2.1 billion people are overweight. The world has seen more than a ten-fold increase in the number of obese children and adolescents aged 5–19 years in the past four decades – from just 11 million in 1975 to 124 million in 2016 (Who.int, 2019).

This is occurring at alarming rates – it is widespread and an epidemic. Four per cent of the U.S. population had a chronic disease in 1965. In 2015, 46% of American children were diagnosed with a chronic disease (Zach Bush MD, 2019). The World Health Organisation reported that of the 56.9 million global deaths in 2016, 71% were due to non-communicable diseases (NCDs). Unhealthy diets are responsible for 11 million preventable deaths globally per year (Future of Food, 2019).

Around 1.3 million New Zealanders are obese and New Zealand obesity rates have tripled in last 30 years (Warren, B. 2019). If these numbers don't alarm us enough, we are also seeing that cancer rates in New Zealand have increased by 18% over the past 10 years. Dr. Patterson Stark, a practitioner of Lifestyle Medicine, explains "just diet alone, can reduce the risk of degenerative disease by 80%" (Masters, N. 2019).

Medical professionals are particularly overwhelmed by the scale of the problem. There are substantial disagreements and arguments within the medical profession as to the causes of the major NCDs (cancer, coronary heart disease, diabetes and obesity). However, we don't have to have all the answers to all the arguments right now. As a first and significant step, we can improve the

nutritional value of food we are producing and therefore its economic value. We need to move the ball forward by starting somewhere.

It is important to note that in my interviews a common comment was that it was only low socio-economic consumers that were part of the health epidemic, and they weren't going to be able to pay a premium for nutrient-dense produce. However, I believe that to be an inaccurate oversimplification. It is often the affluent who are stricken with cancer and CHD, whereas less wealthy groups suffer more with diabetes and obesity. Human populations in underdeveloped countries have differing health conditions in comparison to those in the developed world. The 'China study' is a case in point and bears this out with great statistical significance. In more developed countries, more than half of the population are on more than two medications by the age of 65 (Masters, N. 2019).

Sustainability, integrity and transparency for our customers is becoming more important. The nutrition, health food and supplements categories are experiencing huge global growth. If our markets and our consumers are transitioning in their drivers for purchase, we should be reacting.

The health supplement business is a multi-billion-dollar industry. A significant amount of the public's expenditure that currently goes towards supplements could be transferred to the spend on food. This would provide what the consumer needs and wants but in the natural, highly absorbable and gut-friendly format of nutrient-dense food.

1.2 Soil degradation

Plant and human disease have staggering parallels. We treat human disease with drugs, and the same goes for plant disease. The only consistent winners are the companies that are producing the drugs for both plants and humans.

The rise in the use of synthetic fertilisers, adoption of new technologies and new methods of cultivation came as part of the Green Revolution. This occurred between the 1950s and late 1960s. The application of soluble fertilisers created an enormous increase in production that led to huge changes in agricultural practices. It was during this time that soil degradation began. No one paid any attention to the cost of using herbicides and pesticides, along with the loss of soil biology and soil carbon, on the environment. The driver has always been production – producing more meant that you could produce more for a lower price.

This created a loss of topsoil, carbon and life in the soil. Farmers (at no fault of their own) have been allowed to believe soil is like a test tube – they can put things on it with no consequence. Currently, inputs on-farm are going up while production is going down. The answer to combat the demand for increased production while alleviating disease pressure etc. has been to put more products on. This creates a challenging circle with heightened disease levels. It is now that we need to look at current methods and have the courage to ask the question, while looking at our systems with a different lens. Poor soil health is having dramatic impacts on the environment, food nutrient density and human life.

Our farm systems are generally reliant on the use of the 'big three': the soluble fertilisers Nitrogen (N), Phosphate (P) and Potassium (K). Dependence on these has created a loss and 'lock up' of minerals in our soils and created an imbalance in our soil matter. The reliance on the soluble salt fertilisers is in no way malicious. It is a result of unintended consequences.

In a similar parallel to medicine and human diseases, there are many disagreements and divergent views on how soils should be viewed and how they could or should function. We can be sure that if we keep doing what we have been doing, we are likely to keep getting more of the same results. Unfortunately, the current status quo is very beneficial for certain groups whose profit margins are derived from the current outlook and resultant management practices.

It is important to define soil health and like most contentious ideas, there are many definitions around. The USDA (United States Department Agriculture) defines a healthy soil as: "the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals and humans" (Masters, N. 2019).

It all starts with the soil. If you have good soil health, you have good plant health. This will produce either a plant that will be consumed by a human, or a nutrient-dense plant that is then eaten by stock, which can then later be consumed by humans.

There are four key principles of soil management: air management, water management, decay management (soil biology) and nutrient management. They are the major principles at work – if we do not do the basics of these, we risk escalating our soil health. This will have dramatic impacts on the environment, the food we produce and subsequently, human health.

Arguably the most ignored and most important to be rectified at this critical stage of soil dysfunction is that of the soil biology. If the underground workforce are performing the functions that they are designed to do then anaerobic bacteria (which produce fermented pickled by-products like alcohols, formaldehyde and methane to name but a few) are minimised. Beneficial fungi will be encouraged and assist nutrient recycling, as well as improving water retention in the dry and prevention of flooding and consequent nutrient loss through run-off in the wet. It is through the actions of soil micro-organisms that plants are able to obtain nutrients in the correct ratio (assuming the nutrients are present) from the soil. They are inextricably linked with and drivers of decomposition cycles, without which profitability of all types grinds to a halt (Masters, N. 2019).

It should not be lost on us that the very subject of this degradation could and should be our closest ally in combating the effects of climate change. The world's soils hold three times as much carbon as the atmosphere and over four times as much carbon as the vegetation. With 82% of terrestrial carbon in soil (compared to only 18% in vegetation), soil represents the largest carbon sink over which we have control. Soil is also the world's largest store of terrestrial diversity, with over 95% of life forms being underground. Sequestering humified carbon in soils represents a practical, permanent and productive solution to removing excess CO₂ from the atmosphere. By adopting regenerative soil-building practices, it is practical, possible and profitable for broadacre cropping and grazing enterprises to record a net sequestration of carbon in the order of 25 tonnes of CO₂ per tonne of product sold (after emissions accounted for) (Jones C.E. 2008).

2.0 Defining nutrient-dense food

The term nutrient-dense or nutrient density is used regularly in the literature and can be ambiguous. The term has been thrown around a lot and will only become more of a 'buzzword'. As Nicole Masters refers to in her book, *For the Love of Soil* – “the greenwashing of the terms ‘regenerative’ and ‘nutrient density’ is inevitable. It has already begun. Corporates and Agri-Chem companies are seizing upon the marketing opportunities and are offering their watered-down version to the masses. Without measurement, these phrases lack integrity” (Masters, N. 2019).

Some scientific groups refer to the meaning of nutrient-dense as the ratio of the nutrient content to the total energy content of the food. Therefore, the nutrient density is expressed in terms of the amount of a specific nutrient (in weight) per 1,000 calories. For example, a big, juicy gala apple might have 10 nutrients per calorie, and a smaller, denser gala apple might have 20 nutrients per calorie. The smaller apple would then be twice as “nutrient-dense” as the larger apple (Bionutrient.org, 2019).

However, for other groups and certainly for the purpose of this topic, nutrient density can be more specifically referred to as the nutrient profile of a particular food. This nutrient profile provides information about the presence of nutrients known to influence health.

With an increase in consumer awareness of the strong link between diet and health, there is a need to understand why creating nutrient-dense food is important. There has never been more of a need to test food, and with markets driven by demand the Bionutrient Food Association identified that consumers are now wanting to know the nutritional value of the food they are purchasing.

It is not beyond the realms of possibility to imagine going to the farmers market and being able to flash a light at two carrots, or a cut of meat, and having the ability to compare the nutritional value of that produce in real time. With the Gen Alpha generation having grown up with the world at their fingertips, and not knowing anything other than transparency, value through technology – and ongoing disruption to the food chain – is both a need and an opportunity.

Conversely, a new risk is that of producers promoting their foods as ‘nutrient-dense’ and having no way of backing up their claim.

2.1 How do we easily measure nutrient density?

Dan Kittredge started the Bionutrient Food Association with the mission to increase the quality in food supply. Known as one of the leading proponents of nutrient density, Dan has been working to demonstrate the connection between plant health, soil health, carbon sequestration, crop nutritional value, flavour and human health.

During an interview in March 2019, Dan Kittredge describes the fact that we know the composition of some planets outside our solar system, yet we don't know the composition of the food that we eat as a burning issue. Bionutrient Food Association has built and calibrated a consumer tool that with a flash of light can be used to identify relative nutritional value in food. This tool is based on a spectrometer that you have to purchase.

While the technology is limited to that of a spectrometer, Dan has said the technology behind the measuring will be capable of being transferred into a smartphone chip within the next few years. That will put the ability to measure food into the hands of the consumer –a game changing development that could feasibly (or inevitably) change the farming landscape forever. In this scenario food producers will be paid for their efforts tied to ecological and biologically sound soil husbandry, growing healthy crops and thereby producing nutrient-dense food.

One of the current obstacles to measuring nutrient density is the cost of testing food. Increased numbers of consumers are demanding to know what is in their food. The ability of a relatively cheap hand-held device being available now (in the form of a spectrometer), with which to measure one's potential purchase, will likely be a potent driver for cost-effective solutions to be created. A smartphone app is the most likely scenario.

There will be a need for the creation of a spectrum of nutritional variation in crops so that a relevant conclusion can be shared i.e. 23 out of 100 for one carrot, whereas a more nutrient-dense carrot could score 86 out of 100. In parallel to this, there is likely to be a method of measurement of toxicity, which allows for measurement of chemicals etc. used to produce that food. This technology will show what residues remain.

2.2 Why do we need nutrient-dense food?

The reason for food consumption can easily be overlooked. The whole point of it is to provide nutrition. If you are eating something that is empty of nutrients, you will be deficient in key minerals that are imperative for cell regeneration, and there is increased risk of disease. That can take many forms, but some of the more well-known are mental health imbalances, auto immunity issues and NCDs.

Human health requires whole, diverse and complete nutrients and vitamins from food that is low in heavy metals and toxins. The quality of these foods intrinsically relies upon the organic matter, biology and mineral function that food was grown upon (Masters, N. 2019).

The saying 'you are what you eat' is quite literally the most important factor. Our bodies are made up of the things that we eat, and this is a major reason for the great interest in food and the growing food movement. Many people have correlated processed foods, genetically modified foods, and foods that have carcinogens as negative to their own personal wellbeing.

The point is that the nutrients in your food, which is what your body constantly uses to build and re-build itself, have a key role to play in your overall health. As your body begins to find itself without the key minerals it needs to go completely through its biological processes, it begins to degenerate (Bionutrient.org, 2019).

The third of the 17 UN Sustainable Development Goals is to have Good Health and Wellbeing. One of the targets for this goal, is by 2030 to have reduced by one third premature mortality from non-communicable diseases through prevention and treatment and promoting mental health and wellbeing (United Nations Sustainable Development, 2019).

Creating nutrient-dense food is not only good for human health, but it is also simultaneously improving soil health and improving the land. This would drive in changes to the way we farm. This

opportunity is leading to productive farms who in turn can support healthy communities, healthy economies and a healthier future.

3. We have a health epidemic in part driven largely by either poor nutritional food content and/or poor dietary choice. Is a focus on food-as-medicine important for our primary sector?

“We have a good horizon for us to do more than just show up to work and clip the ticket and go home” – Roo Hall, Pāmu.

Farming systems in New Zealand need to change. The primary sector is being faced with challenges around our farming practices as consumers values change. One visible shift is from consumers who are placing value on food that is good for their health. They are becoming more educated about what they eat and the impact it has on them. There have been conversations for years about moving from a volume to value model, but very little has changed. We are now being driven by consumer demand and awareness around the way that food effects our health and the requirement for our food to be nutrient-dense.

The food industry is currently undergoing enormous transformation, according to Plant and Food. “The global food and beverage industry is growing at around 5% a year and global expenditure on food products by consumers is expected to reach US\$20 trillion by 2030. Key trends for new product development are in health, convenience, naturalness and sustainability. New foods based on fruits and vegetables fulfil many of the demands of the premium consumer. The intrinsic ‘health halo’ of natural produce make ingredients derived from fruits and vegetables highly sought after in the global marketplace” (Plant and Food, 2019).

Consumers are leading the charge, prioritising products and ingredients that are novel, nutritious, locally sourced and ethically produced.

As a primary sector we need to get better at designing our own value proposition to meet this market demand. A value proposition, in its simplest form, is a promise that delivers a benefit or set of benefits to a customer. Importantly though, the benefit promised must answer a very real need that group of customers has or will have in the future. We need to change our focus and understand the unmet need of consumers that are demanding nutritious food. In our current model, farmers are good at what they do but they do not invest down the value chain. There is an opportunity to understand these markets better, so we can move away from being price takers and selling commodity products.

The opportunity is in value maximisation. We need to achieve more value in the marketplace. With the pressures around our environment, farming practices and shift in consumer values, the way we use our land in New Zealand is going to have to change. This will come from providing nutrient-dense food to consumers that value this.

An example of a company that has responded well to consumer signals is the High Health Alliance – a joint venture between Headwaters, Alliance Group and MPI that has developed TE MANA lamb. They found that the right combination of genetics, management and feeding can alter the fat profile of lamb and produce animals that are healthy, while delivering a healthier product for consumers.

“This is an innovative product resulting from transformational thinking about the end-product, and driven by the vision, commitment and collective expertise of farmers, science and business, supported by Government” (Richards, Richards 2019).

New Zealand has a reputation for high quality natural produce and environmental sustainability. The New Zealand food sector produces enough food to feed more than 20 million people, around five times its population. Primary production accounts for the vast majority of the sector, and agri-food exports are predicted to treble by 2025, to around \$58 billion. This growth will be through the production of new high value food and beverage products, combined with value chains that enhance the delivery of New Zealand products to its premium customers (Plantandfood.co.nz. 2019).

We need to reposition New Zealand food products in the premium nutrition space. Marketing health benefits for New Zealand food means we are not only reliant on telling our story better, but it provides us with a full story. The aim would be to say we have healthy soil, that produces healthy plants that produces food and/or animals that are nutritionally dense and therefore helps the health of our consumers.

If New Zealand wants to remain relevant on a global stage, we must prioritise this. Our strategy for value creation needs to be nutrition-based produce. Our consumers are becoming more educated through technology and are increasingly researching the food they want to eat. Their goal is to ensure the quality and nutritional quality of their food is high.

4. Opportunities and challenges that are needed in our current model for this to become reality.

4.1 Mindset change

“This is monumental – what we are going to do in the next 5 years is the biggest change in agriculture since 1987 when shit hit the fan” – Rob Hewett, Silver Fern Farms

Farmers of today are going to be at the centre point of transformational change. Farmers are equipped with tenacity of spirit; they have strong problem-solving skills and can think outside the box. However, a change in mindset is critical to being able to operate in a different space. A willingness to step outside the norms takes great courage and commitment (Masters, N 2019).

To begin a journey of changing land use or farming practices, we need to be able to clearly tell farmers why the change needs to occur. They need to see and understand the value. This can be articulated by firstly creating a value proposition for our primary sector, and then show them how. Showing the farmers how to do this is vital. If they don't know or understand how to do it, it doesn't exist. The key is showing them how – then supporting them to take the first step.

We have to transform our producers' relationship to our food chain. There is a need for a change in perception about different farming practices – adding new tools to our toolbox will be essential for our industries, farmers and growers to tackle the future in agriculture. A paradigm shift in thinking will be required for both our industry bodies and our growers and farmers.

The real change will come from our younger generation, who are learning the technological know-how as part of their day to day lives. This gives many the innovation skill-set to be disrupters. This generation are displaying more growth mindsets than fixed mindsets – they are thinking about what the future holds and what they need to do to be a part of it. Ten years ago businesses were happy with being a commodity focused business – they were satisfied with saying 'we sell meat'. Today, the younger generation that are moving into farming businesses are motivated by opportunity. People with growth mindsets view challenges and failures as an opportunity for growth. In recent years we have seen this does take a very different way of thinking. It is not easy and will take a ground swell from the younger generation. There are already many farmers who are questioning why they are spraying chemicals onto their crops, just as they are being sent off to the consumer.

Traditional thinking creates barriers to driving change and opportunity, so in order to move forward it is important that all growers and farmers understand how they can financially thrive, how their farm can thrive and how the people they are producing for can thrive.

Waiting for legislation to force change is a lazy, unproductive way to create change. Sell the why to our farmers – show them the value in producing food that provides value to customers, not only in the 'story' and the taste of the produce but creating food that also supports their health.

4.2. Education

Education is one of the most powerful tools to drive change.

We need to educate the consumer, by communicating the value of the food through transparency.

Educate the consumer – We need consumers to understand the impacts of food on health. There is a market that is already aware of the effects that food has on their health. This is only going to grow through education. Technology will be an enabler here as tools will be developed so they can see for themselves. The power is in the hand of the consumer.

There is a need to provide consumers with the information necessary to make educated purchasing decisions regarding their food choices. There will be an increasing understanding of the core importance of food quality in the health and welfare of their families (Bionutrient.org, 2019).

Faced with an epidemic of Type 2 Diabetes, medical institutions across California have introduced 'shop with your doc' food programmes, where healthcare providers offer in-situ nutritional advice from a professional healthcare practitioner. Another pilot, Geisinger Health Systems' 'Fresh Food Pharmacy', targeted illness stemming from food insecurity by providing fresh produce and educating patients on lifestyle approaches to better manage their disease (Sainsbury's Future of Food, 2019).

Educate the producer – A critical current issue in the food supply is that in general, farmers (particularly pastoral farmers) get paid by quantity not quality. The principles and techniques necessary for growers to produce much higher quality food are freely available. Until producers understand why they could or should produce nutrient-dense food and economic incentives are structured in a way that makes it in the interest and economically worthwhile for the grower to pay attention to nutritional quality, only a select few will be open to change. There are a minority few

that have embraced these changes and some who have already felt the push from the industry. The likes of Pāmu Farms are producing sheep and deer milks that are developed for health benefits.

Producers see themselves as custodians of the land. They want to leave a legacy and a better place for future generations to come. Current farming practices have been in place for years and have been approved practices. It's only in the last few years that we are realising there is an opportunity to produce in a way that is better for the soil, the environment, the health of consumers and directly benefits farmers' wallets. Our producers will need to understand and learn skills to produce top-quality, nutrient-dense foods. A study of the basic soil-forming processes is a pre-requisite to good soil husbandry. Without this background we tend to view soils as perpetual and fail to consider the dire consequences of soil destructive practices. To fully appreciate our conservation problems, consequences and ultimate solutions, we must review the basics of the soil forming and soil enhancing processes.

There are many giants within this sphere, who have dedicated their professional careers to this subject. Recognising their contributions, while listening to their advice and recommendations, will need to happen with utmost speed. There will also be a need for education around the global marketplace and market trends, so they understand how they fit into the global ecosystem. If we don't stay relevant as a sector, we will suffer. It's imperative that our producers are educated around this environment.

4.3 Connecting producer and consumer

Everywhere we look in New Zealand, small businesses are doing their own thing to create value and to meet the demand of the customer. They lack scale and size – and most importantly the growers lack the connection with the consumer.

Growers that don't connect with the consumer don't see the potential value – therefore don't want to change. There is a real need to create these connections. If our growers can see what the consumer is demanding, the producer will then understand their need to stay relevant.

Generation Alpha have grown up with transparency, and with the world at their fingertips. They are seeking transparency around their food. Technology starts measuring the nutrients or toxins with foods. The consumer has the power to make a choice around the value of what they are buying but in the current environment there are no measurables in this space. There is a lack of consistency around how a consumer knows that this piece of meat is 'better' than this piece of meat. Other than brand, there is no way of telling at present. This will change with the development of technology in the near future.

The consumer is a critical piece of the puzzle when it comes to facilitating an increase in quality in the food supply. We need to ensure our growers understand the certain segment of consumers who are demanding higher quality produce. This will then allow them to understand the market and help change the actions of farmers. Growers can then grow to standards that are consistent with consumer buying behaviours.

4.4 Collaboration

“To choose the harder right instead of the easier wrong” (Craig N, 2018).

For our industry to accelerate and remain relevant, the impact will come through collaboration. The challenge is getting the right people on the page with the right mandate. The need and desire for collaboration is high within the industry, however it is important that we understand the reasoning for collaboration in the first place.

New Zealand agri industries have a history of competing on all parts of the supply chain, versus defining and collaborating in the pre-competitive space (Future of Farming, 2019).

We are at a crossroads with globally connected consumers and regulations. Change is coming at us at a fast rate. We need to move quickly as an industry. We need to get the right people around the table for true collaboration to occur. Collaboration is about agreeing on the same purpose, putting own agendas to the side and working together for the greater good.

There is a difference between co-operation and collaboration. It is important to understand the difference. Collaboration brings previously separate organisations into a new structure with full commitment to a common mission. Partnerships create a formal relationship and understanding of the common mission, but authority still rests with the individual organisations versus co-operation, which is an informal relationship that groups work alongside each other for a common goal (Hyde, R 2019).

True collaboration will come when you can use data/customer insights etc. in the area you specialise in and share amongst the industry. The industry needs to be comfortable with a value proposition. We need to create a sharing environment and get past all the “political bullshit”. In our current environment the people that need to initiate collaboration are defending their own jobs. Without working together, agreeing on a future vision for our primary sector, it will be like asking the turkey to vote for an early Christmas.

Collaboration is around becoming more efficient in the ways we work together. In the past, particularly in the meat sector, consumer insights have been kept close to processors’ chests. Farmers aren't changing their farming practices because they aren't being told too. We compete internally, where we should be working together as an industry. We need to have visibility of consumer insights and share these – companies like TE MANA lamb and Spring Sheep Milk are doing this – consumers are driving them to produce what they are producing.

Until we start to collaborate effectively as a primary sector, we will keep skinning our knees and be reliant on commodity pricing – our inability to collaborate will limit our future success.

There needs to be more outcome-driven focus from cross-sector collaborations between industry leaders, our business leaders and our government. This collaboration needs a common thread, and that thread is nutrition (Elliot A, 2019).

Although agriculture, nutrition, and health are closely related, they are often dealt with in isolation and an integrated approach will be necessary in order for change to occur.

4.5 Leadership

True leading is about going where no one else has gone (Craig N, 2018).

With a need more than ever to make some considerable change in our industries, strong leadership is critical to our ongoing success as a food producing country. Historically in the primary sector it has

all been about patch protection. We have skinned our knees in the red meat industry, however with the changes we are facing as a sector, we must work together. This is now bigger than the individuals.

What is on the horizon is new and it creates uncertainty. People don't like change. There are risks associated with changing our model and targeting a different market. In order for this to happen, we need to have strong leadership built around the three C's: Clarity, Concise and Confident. Our leaders need to ensure we have clarity on what we are doing, we need to be concise in what we communicate to our producers and we need to be confident in the decisions that are made.

There is a need to understand what key characteristics are needed in order to lead our industries in a new direction. The real challenge is for New Zealand to move away from a commodity market. It will either be done to us or by us. Hopefully by us.

Conclusions

To remain relevant in a changing market and environment, we need to recognise we do not need to feed the millions. That is not our bread and butter – we don't have millions of acres to produce mass food. We have the opportunity to create nutrient-dense food and regenerate our soils, without having to intensify and compromise our environment. This can be achieved all while delivering value back to both consumer and grower.

Our focus and efforts need to be on regenerating our soils, producing nutrient-dense food, designing our own value proposition and making some critical shifts in order to remain relevant and play to our strengths.

Farmers of today are going to be at the centre of transformational change. In order for change to occur in our primary sector, one of the critical shifts will be the mindset of our producers. The shift will come from our younger generation who are being innovative. This generation are displaying more growth mindsets than fixed mindsets. They are thinking about what the future holds and what they need to do to be a part of it.

Education is one of the most powerful tools to drive change. There are two audiences that need better education on this topic – the consumer and the producer. There is a need to provide consumers with the information necessary to make educated purchasing decisions regarding their food choices, to understand the core importance of food quality in the health and welfare of their families.

It is critical that our producers and consumers are better connected. Growers that don't connect with the consumer don't see the potential value, therefore don't want to change. There is a real need to connect. If our growers can see what the consumer is demanding, the producer will then understand their need to stay relevant.

Growers understand how to produce healthier food, and consumers have the ability to make purchasing decisions based on quality. This will lead to a shift in the decisions that buyers, wholesalers, and retailers make regarding where they source the food they deal in (Bionutrient, 2019).

The consumer is a critical piece of the puzzle when it comes to facilitating an increase in quality in the food supply. We need to ensure our growers understand the certain segment of consumers who are

demanding higher quality produce. This will then allow them to understand the market and help change the actions of farmers.

We are at a crossroads with globally connected consumers and regulations. Change is coming at us at a fast rate. We need to move quickly as a sector. We need to get the right people around the table for true collaboration to occur. Collaboration is about agreeing on the same purpose, putting own agendas to the side and working together for the greater good.

Until we start to collaborate effectively as a sector, we will keep skinning our knees and be reliant on commodity pricing. Our inability to collaborate will limit our future success.

Global food systems will be seriously challenged to sustainably feed the world to a high-nutrition standard. However, New Zealand has the land mass, climate, skills and the brand ability to produce nutrient-dense food. The consumer pursuit of wellness has become a powerful entity that can be capitalised on by our primary industries, or there is a risk of another country capitalising on this critical subject.

Recommendations

“Without change there is no innovation, creativity, or incentive for improvement. Those who initiate change will have a better opportunity to manage the change that is inevitable” – William Pollard.

For New Zealand to produce nutrient-dense food and to make progress in this field my recommendations are as follows:

One proposition, one primary sector

- Creation of a value proposition for our primary sector. We need to better identify our target market and clearly understand their needs, behaviours and preferences. This will take collaboration from the right people around the table, across a wide range of industries. We then test the market after a concerted drive to better educate consumers about the benefits of nutrient-dense food, as well as their ability to measure this in the marketplace. Feedback will be communicated back to the growers – this will drive growers’ behaviour to produce if we are filling an unmet need.

Connect and collaborate

- Connect leaders and learners (producers who are forward thinking) with other farmers already involved in producing nutrient-dense food and regenerating their soils. They need to be collaborating and sharing the inevitable teething problems, and methods to avoid or mitigate the likely problems that will arise in changing the old patterns of behaviour. It will also be important to identify mentors such as Nicole Masters, Christine Jones, Dan Kittredge, Joel Salatin, Graeme Sait, Arden Anderson, Zac Bush et al., who are and have for a considerable period been involved in this movement. It will be prudent to establish focus groups, both regionally and nationally, to help monitor progress and provide forums for discussion groups. Collaboration with other farmers globally who are making this work will also be critical.

Soil ‘Warrant of Fitness’

- Implementation of soil measurement and consistent producing standards so that we are genuinely producing nutrient-dense food. Measuring soils and the probability of having paddocks labelled according to their levels of function in the future is both likely and inevitable – it should become part of normal farming practice. There will be a need to have standardisation of soil testing systems, as well as their interpretation. A degree of common understanding of the recommendations that flow from these tests is vital – at the moment the range of soil tests available differs considerably. The soil testing will need to include at least levels of minerals in soil, humus depth and activity, carbon content and the composition of and functional capacity in the soil food web.

Government support

- Enablement from the government for producers is crucial if we are expecting farmers to implement sustainable regenerative practices. This may come at a cost initially but will become more economically viable as their soils improve, input costs begin to decline, and outputs rise. Farmers may struggle to see the benefit for them, especially in the transition phase, towards regenerative farming practices. They are likely to resist having to fund this change themselves. Government incentives will greatly assist farmers to transition. There will be a need to help farmers farm by ability – you have to farm by ability for farmers to sustain business. Economic viability is crucial for the entire farming sector. Education around this is vital and needs to be provided not only for growers. The public will need education around the health benefits for people eating the nutritious food, while understanding the benefits that accrue not only to themselves but also to the environment in which it is being grown. This flows on to the health of the planet as a whole.

References

Personal Communication

Elliot, A. Nuffield Scholar, Personal communication 2019

Hall, R. Pamu, Personal communication 2019

Hewett, R. Silver Fern Farms, Personal communication 2019

Horsbrugh, A. Farmlands Co-operative, Personal communication 2019

Hyde, R. Nuffield Scholar, Personal communication 2019

Leslie, W. Headwaters, Personal communication 2019

McDonald, T. Spring Sheep Milk, Personal communication 2019

Masters, N. Integrity Soils, Personal communication 2019

Milne, G. Alliance, Personal communication 2019

Ross, J. First Light Foods, Personal communication 2019

Warren, B. Be Pure – Clinical Director, Personal communication 2019

Wheeler, E – Senior Manager, Agri-Food KMPG, Personal communication 2019

References

Bionutrient.org. (2019). Bionutrient Meter Development Kit | Bionutrient Food Association. [online] Available at: <https://bionutrient.org/site/bionutrient-meter> [Accessed 27 Oct. 2019].

Craig, N. (2018). Leading from Purpose. Hachette Books.

EAT. (2019). EAT-Lancet Commission Summary Report - EAT. [online] Available at: <https://eatforum.org/eat-lancet-commission/eat-lancet-commission-summary-report/> [Accessed 17 Aug. 2019]. (EAT, 2019)

Farmersfootprint.us. (2019). Pesticides and Our Immune System | Farmer's Footprint. [online] Available at: <https://farmersfootprint.us/2018/11/02/pesticides-and-our-immune-system/> [Accessed 17 Aug. 2019]. (Farmersfootprint.us, 2019)

Jones C.E. 2008. Our soils, our future

KPMG, (2018). KPMG Agribusiness Agenda 2018. Retrieved from <https://home.kpmg.com/nz/en/home/insights/2018/06/agribusiness-agenda-2018.html>

KPMG, (2019). KPMG Agribusiness Agenda 2019. Retrieved from <https://home.kpmg/nz/en/home/insights/2019/06/agribusiness-agenda-2019.html>

L. M. Condrón , K. C. Cameron , H. J. Di , T. J. Clough , E. A. Forbes , R. G. McLaren & R. G. Silva (2000) A comparison of soil and environmental quality under organic and conventional farming systems in New Zealand, *New Zealand Journal of Agricultural Research*, 43:4, 443-466, DOI: 10.1080/00288233.2000.9513442

Masters, N. (2019). For the love of Soil.

Plantandfood.co.nz. (2019). Growing Futures: Food Industry. [online] Available at: <https://www.plantandfood.co.nz/growingfutures/food> [Accessed 29 Sep. 2019]

Richards, D., Richards, D. and 2017, T. (2019). *The Omega Lamb Project wins at New Zealand Innovation Awards 2017 - TE MANA*. [online] TE MANA. Available at: <https://temanalamb.com/omega-lamb-project-wins-new-zealand-innovation-awards-2017/> [Accessed 28 Oct. 2019]. (Richards, Richards and 2017, 2019)

Sainsbury's Future of Food (150th Anniversary report), 2019. Retrieved from <https://www.about.sainsburys.co.uk/~media/Files/S/Sainsburys/pdf-downloads/future-of-food-08.pdf>

United Nations Sustainable Development. (2019). Health - United Nations Sustainable Development. [online] Available at: <https://www.un.org/sustainabledevelopment/health/> [Accessed 29 Sep. 2019].

Warren, B. (2019). Why Is Our Food So Nutrient Deficient? [online] BePure Ben Warren. Available at: <https://www.bepure.co.nz/blogs/news/new-zealand-foods-empty-nutrients> [Accessed 17 Aug. 2019]. (Warren, 2019)

Who.int. (2019). A broad spectrum of health challenges. [online] Available at: https://www.who.int/gho/publications/world_health_statistics/2018/EN_WHS2018_Part3.pdf [Accessed 14 Sep. 2019].

Zach Bush MD. (2019). FARMING - Zach Bush MD. [online] Available at: <https://zachbushmd.com/farming/> [Accessed 30 Sep. 2019].