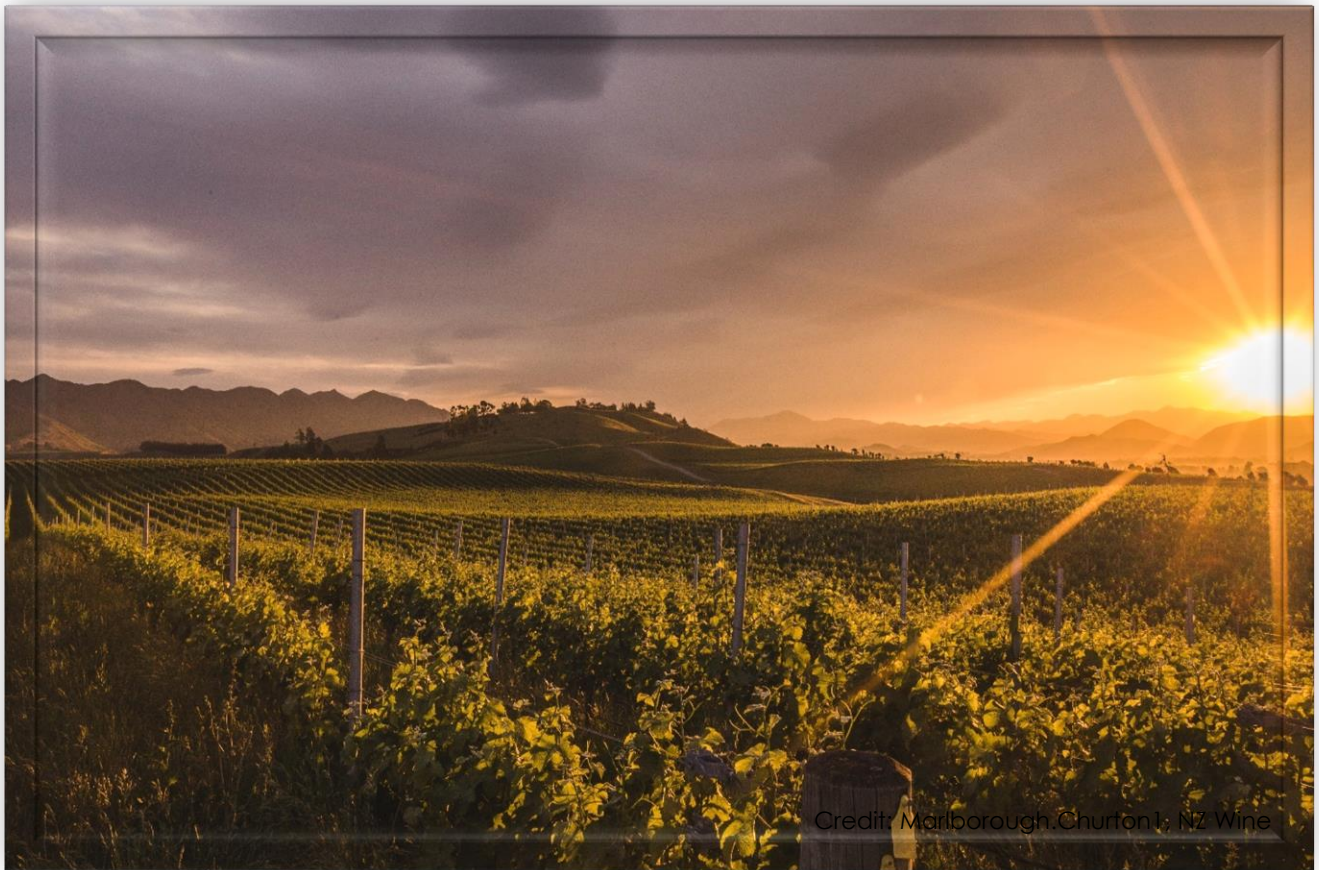




SHAPING THE FUTURE OF AOTEAROA'S FOOD SYSTEM - A SCENARIOS ANALYSIS



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2 EXECUTIVE SUMMARY

This report seeks to draw insights from the global response to Covid-19 and evidence from actions currently underway in New Zealand's food and fibre sector to predict the likely future scenario for the global food system in 2030. Given this likely scenario, the report will identify areas of opportunity for New Zealand to pursue to position itself to succeed in a changed future food system.

Analysis provided in this report relies heavily on a scenario mapping exercise undertaken by the World Economic Forum (WEF) in 2017 titled '*Shaping the future of global food systems: a scenarios analysis*.' My research will seek to unpick these scenarios to answer the below focal question:

“According to the four potential worlds provided by the WEF (2017), what is the likely scenario for the global food system in 2030 and how can New Zealand position itself to succeed?”

Findings demonstrate that in 2030, the world's food system will make significant shifts towards being more resource-efficient, with reasonable market connectivity showing a balanced focus between local production and trade.

This future provides the platform to achieve an aspirational food system that is efficient, sustainable, inclusive and delivers healthy and nutritious food to the world. In doing so, the world can improve its food system and contribute towards achieving a large majority of the Sustainable Development Goals agreed by the United Nations (UN) in 2015. To get to this state, significant investment must be made in climate and environmentally responsible actions to lower the overall emissions and pollution profile of the sector. Shifts in consumer habits are already signalling a preference for healthy, safe, environmentally sustainable, and ethically produced food. Food innovation is enabling new product development to help keep products relevant. Green economic recovery strategies following short term Government responses to the pandemic are highlighting various Governments' prioritisation to rebuild back economies within planetary boundaries, putting our ecological and social systems first.

2.1 REDESIGNING AOTEAROA'S FOOD SYSTEM

New Zealand is well positioned to succeed in any likely future global food system scenario. However, disruption from Covid-19 and the various impacts on the food and fibre sector from putting social and ecological considerations first, has signalled that change is required. For New Zealand's food and fibre sector to remain relevant and lead aspirational change towards an aspirational food system in 2030, this report recommends that, as well as pursuing the opportunities noted in section 8.4 of this report, the below actions should be taken. Further detail on the below recommendations can be found in section 11.

1. Taking action towards initiatives as set out in the sectors' ***Fit for a Better World*** roadmap.
2. Co-investing in a **centre of excellence to share market insights** and improved data coordination and access.
3. As noted in *Fit for a Better World* (2020) **removing trade barriers and maintaining market access** through developing appropriate ethical and environmental standards to keep up with the changing food system and international market consumption trends.
4. **Developing a fit for future horticulture system and supply-chain** by:
 - using our competitive advantage to invest in intellectual property and new commercial opportunities from native fauna;
 - incentivising and supporting the uptake of new horticulture and novel product development through capability building and connecting growers with a pathway to market; and
 - incentivising collaboration between Government, business and research institutes to invest in horticulture and bio-technology.

5. **Pursuing new / innovative structural changes to the food and fibre sector labour market** by:
 - ensuring education institutes are providing agriculture, horticulture and agribusiness study opportunities;
 - appropriately recognising the skillset required for jobs in the food and fibre sector and reflecting this in remuneration; and
 - improving cross-sector collaboration to provide a national network of accommodation for seasonal employees in multiple industries.
6. **Proposing regulatory change for industries likely to experience market failures such as honey.**
7. **Supporting marketplaces for start-ups, novel products and new horticulture** by considering the appropriateness and economic viability of creating regulations or incentives that guarantee shelf space in all supermarkets for New Zealand products.
8. **Taking action to adapt food supply chains and improve supply chain resilience** through:
 - ensuring local authorities maintain a space for local markets to operate safely in a Covid-19 environment;
 - investment by industry bodies and businesses in e-platforms, and digital marketplaces; and
 - encouraging co-investment in a feasibility study for New Zealand to own a small shipping fleet to enhance supply-chain resilience.
9. **Increasing the availability and affordability of nutritious and healthy food on the domestic market** by:
 - pioneering food business to doctor models;
 - increasing Government and public health investment in nutrition education and regulating food deserts to maintain a minimum quality of access to healthy food; and
 - exploring the feasibility of removing GST on fruits and vegetables for domestic consumption.

LITERATURE REVIEW

3 INTRODUCTION TO THE WORLD ECONOMIC FORUM SCENARIOS MAPPING ANALYSIS

A key focus of the WEF is the future of food security and agriculture. The international community has committed to the Sustainable Development Goals, of which include ending hunger and establishing nutritious, sustainable food systems. In collaboration with Deloitte global consulting, WEF released *Shaping the future of global food systems: a scenarios analysis* (2017) to answer whether leaders were taking the necessary actions to reach these goals. It discusses four potential future worlds based on the degree of connectivity in our markets and how efficient resources are used.

The United Nations (UN) population division predicted in 2019 that we would need to feed a global population of 8.5 billion people in 2030. Considering these predictions, the WEF sought to map scenarios that focussed on the question:

“How will food systems nutritiously and sustainably feed 8.5 billion people in 2030?”

Although this paper explores future scenarios without the context of Covid-19, the assumptions on which these scenarios are based are largely relevant in a post-Covid-19 context.

To tackle the focal question, the scenarios analysis firstly identifies predictable forces of change and trends that are relatively certain. It then builds around forces of change that will most profoundly and unpredictably impact the focal question. These forces of change still stand despite disruption of Covid-19.

A summary of these key known trends as noted by the WEF (2017) are outlined below in table 1, and key uncertainties are outlined below in table 2.

Table 1: Summary of key known trends outlined by the WEF (2017)

Domain	Certainties	Explanation
Social Change	Demographic trends	The expectation that global population growth will remain relatively steady from now until 2030 and will reach 8.5 billion. The WEF also considers that mega cities will continue to grow, further compounding the strain on food systems. It is estimated by 2050, over two thirds of the global population will live in cities.
	Malnutrition	This exists in three forms: undernourishment, micronutrient deficiencies and over-nutrition. Nearly 800 million people are starving, over 2 billion people suffer from micronutrient deficiencies, meanwhile over 2 billion adults are overweight. Non-communicable diseases are the result of poor nutrition and health habits, which are now the leading cause of death in all regions except Africa.
Economic Shifts	Macroeconomic trends	The expectation that inequality of wealth will continue to grow, and that economic growth will be sluggish. The world's richest 1 percent of the global population hold more wealth than the rest of the world combined, and 80 percent of the world's poorest live in rural areas.

Environmental Trends	Natural resources	The ongoing depletion of natural resources, in particular, for food consumption. The global food sector accounts for 70 percent of water withdrawal. Water demand is expected to increase by 40 percent by 2030 according to the McKinsey Water Resource Group (2009). Climate change will also be an ongoing factor with the assumption that average temperatures will continue to increase by 2.7C and 3.7C by 2100, even with efforts to curb emissions.
Technology Advances	The development of new technologies	New innovation will continue, but it is likely the impact of this will not be evenly distributed. Food systems will transform through bio-innovation, gene editing, robotics, big data, artificial intelligence and machine learning. Such technology will produce a significant amount of data and rely heavily on internet connectivity. Over 4 billion people still do not have access to the internet, and the speed of connectivity is slowing.

Table 2: Summary of key uncertainties outlined by the WEF (2017)

Domain	Uncertainties	Explanation
Social Change	Consumption trends	Will people choose to consume healthier, more balanced diets or diets high in animal-based protein and sugar, salt and fat? Will consumers demand food that is produced in an environmentally sustainable way? How will consumer opinion evolve regarding food produced through new technologies?
	Geographic	How will urbanisation and the growth of mega cities affect demand, especially among net-importing countries?
Economic Shifts	Commodity market and trade shifts	Will nations engage in cooperative trade through open markets or adopt more isolationist policies? How will confidence in commodity markets evolve? Will markets be more resilient or more volatile? What will be the impact of trade policies on global and local markets? Will food systems become more centralised or more localised and where will decision-making power be held?
	Food affordability	Will the price of food accurately and consistently capture the externalities of health costs and environmental impact? Will there be an increased number of breadbaskets that supply most of the world's food?
Environmental Trends	Adaption to climate change	How will policy and business decisions affect climate mitigation and adaptation in food systems? How will climate change and other threats impact the long-term productive capacity of ecological systems, including soil health? How will an increased scarcity of water impact food production?

		What will be the rate of energy consumption, and from which sources?
Technology Advances	Adoption of new technologies	What will be the rate of large-scale adoption and availability of new technology as it pertains to food? Will technological innovations be designed primarily for affluent or poorer populations? How will the benefits and risks of technological advances be distributed? Which disruptive technologies will emerge as game-changers in food and agriculture?
Political Developments	Shifts towards nationalism	How will the security landscape evolve? What will be the evolution of nationalistic tendencies in governments, with what implications on food systems? How will migration impact food production and what implications will it have for food security?

Taking these trends into account, to decide on the two most critical uncertainties, the WEF focussed on various possibilities from disruptive technologies through to migration and assessed these possibilities against a range of criteria. The two most critical uncertainties as the focus for this analysis are:

1. Demand Shift

For the purposes of the research by the WEF (2017), demand shift encompasses the nature of future demand for food and agricultural commodities focussing on the impact of environment and nutrition on consumers' choices. The scale for demand shift therefore stretches from resource-intensive consumption through to resource-efficient consumption (WEF, 2017).

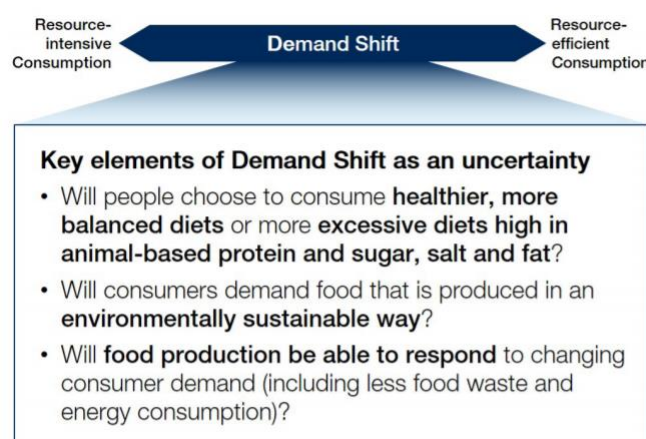


Figure 1: Key elements of demand shift uncertainty (WEF, 2017)

2. Market Connectivity

Market connectivity is correlated to the degree of uncertainty in relation to the openness of trade, trust in and resilience of commodity markets and inclusivity of technological innovations. The scale for market connectivity stretches from high connectivity in markets, to low connectivity in markets (WEF, 2017).



Figure 2: Key elements of market connectivity uncertainty (WEF, 2017)

The Scenarios: Four Potential Future Worlds

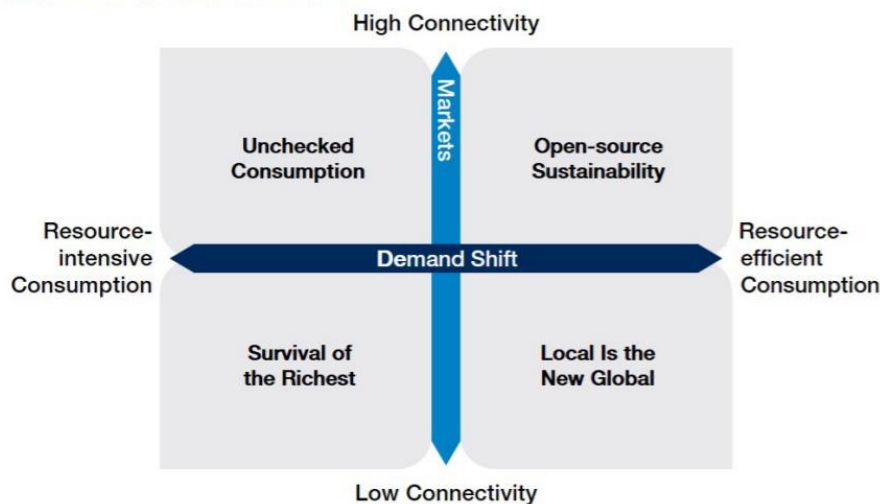


Figure 3: The four potential future worlds as determined by factors in figures 1 and 2 (WEF, 2017)

The matrix above reveals four scenarios of future global systems:

- **Survival of the richest** – A world of resource-intensive consumption and disconnected markets, the global economy is sluggish and inequality has increased. (Difference between the have and have-nots).
- **Unchecked consumption** – Strong market connectivity and resource-intensive consumption, this is a world of high GDP growth and high environmental cost.
- **Open-source sustainability** – This future links highly-connected markets and resource-efficient consumption, the world has increased international cooperation and innovation, but may leave some behind.
- **Local is the new global** – this world has fragmented local markets with resource-efficient consumption, resource-rich countries focus on local foods, whereas import-dependent regions become hunger spots.

3.1 ANY OF THESE SCENARIOS COULD BECOME REALITY IN 2030

The scenarios analysis favours a pivot towards open-source sustainability in their modelling to meet human needs and feed a global population of 8.5 billion within planetary boundaries, in 2030. The WEF (2017) believe that today's food systems require a fundamental transformation to achieve this.

Furthermore, transforming the world food system is complex and highly dependent on several other factors including; labour availability, infrastructure, environmental conditions, technology and access to capital. Any significant redesign of the food system will require uplifting the performance and functionality of a number of other systems that we rely on for food production and distribution.

Success of the 17 Sustainable Development Goals (SDGs) in 2030 (agreed by UN member states in 2015) relies on a functioning and effective global food system. In line with the SDG's, the WEF (2017) has developed four core aspirations for the global food system.

- *Inclusive* – ensuring economic and social inclusion for all food system actors, including smallholder farms, women, indigenous and youth.
- *Sustainable* – working to mitigate environmental impacts and resource degradation by striving for circular agricultural systems that use renewable forms of energy.
- *Efficient* – producing adequate quantities of food for global needs, whilst minimising waste.
- *Nutritious and Healthy* – the provision, accessibility to and availability of diverse nutritious and safe foods for a healthy diet.

These four core aspirations are used as outcomes, by which guide the recommendations set out in section 11 of this report.

Definitions

Nutrition

"an adequate, well balanced diet combined with regular physical activity."

World Health Organisation (WHO)

A sustainable food system

"delivers food and nutrition security for all in such a way that economic, social, and environmental bases to generate food security and nutrition for future generations are not compromised."

United Nations

3.1.1 DEVELOPMENT WITHIN THE WORLD'S PLANETARY BOUNDARIES

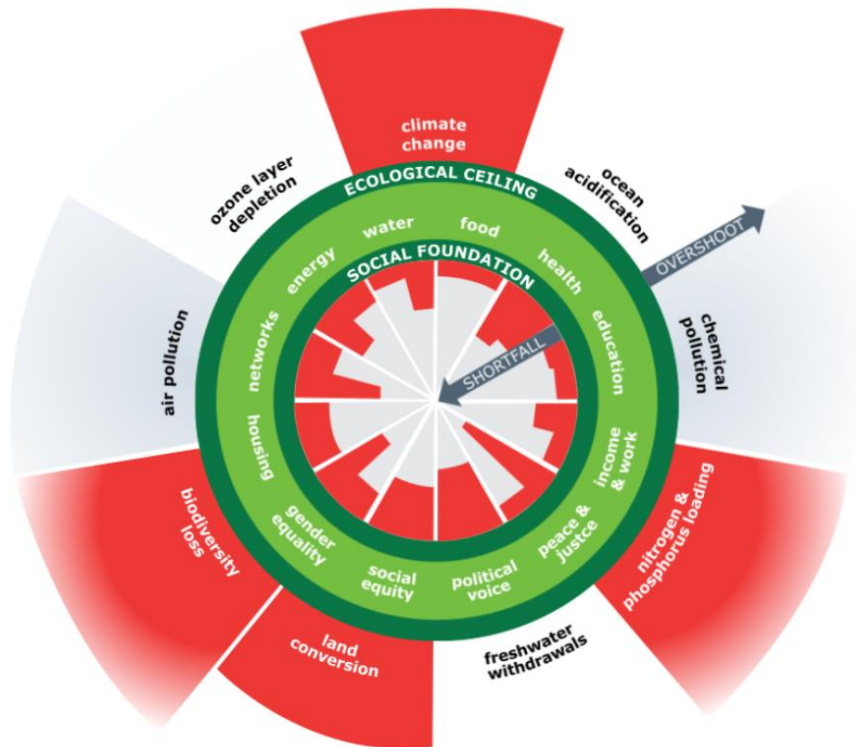


Figure 4: The doughnut of social and ecological boundaries (Raworth, 2017)

The WEF (2017) refers frequently to development within the earth's planetary boundaries. One of the most widely known and applied economic models to human development was first published by Kate Raworth in the Oxfam report "A safe and just space for humanity" (2012). Raworth explains 21st century economics as making sure no one falls short on life's essentials (from food, housing, healthcare and political voice), while ensuring that collectively in working to achieve this, we don't overshoot our pressure on Earth's life-supporting systems. We fundamentally depend on these systems from soil fertility, to a stable climate and a protective o-zone layer. She captures these concepts using a doughnut (figure 4).

The environmental ceiling consists of nine planetary boundaries, beyond which lie unacceptable environmental degradation and potential tipping points in Earth's systems. The twelve dimensions of the social foundation are derived from internationally agreed minimum social standards and align with the SDG's 2015. Between these social and planetary boundaries is the environmentally safe and socially just space where humanity can thrive.

Raworth (2017) explains that all economic growth must remain within these boundaries, surpassing the social foundation or ecological ceiling will have detrimental effects on humanity. In regard to our food production system, it is therefore key that we produce food that minimises contribution to the environmentally unsafe boundaries (outer doughnut), and socially unjust boundary (inner doughnut). Achieving such a careful balance, augments the importance of data collection and measurement of our food production systems. However, significant work is still required to understand what successful measures would look like.

4 METHODOLOGY

This research will use thematic analysis based on two key forms of inquiry: literature review and semi-structured interviews.

Section 3 of this report consists of a literature review. The paper largely centres on *Shaping the future of global food systems: a scenarios analysis* (2017). Further literature examined looks at the global economic outlook following immediate Covid-19 disruption and the impacts of this on the global agricultural system. Scholarship which describes Covid-19 disruption to the agricultural system of New Zealand is also analysed.

Section 8 of this report contains views from the sector, obtained through semi-structured interviews. Engagement was conducted with a range of leaders either at Director, General Manager or Chief Executive level in the food and fibre sector. Engagement spanned industry organisations and companies across the meat and wool, dairy, horticulture, seafood, processed foods and other products and training sectors. Please see table 3 below for a list of entities engaged and number of total interviewees per site.

Table 3: Summary of organisations and companies interviewed

Industry Organisations	Number of Interviewees	Companies / Māori entities	Number of Interviewees
Beef and Lamb New Zealand	1	Rabobank	1
Horticulture New Zealand	1	Fonterra	4
Primary ITO	4	Mainfreight	4
Apiculture New Zealand	2	AFFCO	3
Meat Industry Aotearoa	1	Zealong Tea	3
Deer Industry New Zealand	1	Tegal	2
Food and Grocery Council New Zealand	1	Villa Maria	4
Seafood New Zealand	2	Pernot Ricard	2
Dairy Companies Association of New Zealand (DCANZ)	1	Delegat	2
Poultry Industry Association New Zealand	2	Goodman Fielder	1
New Zealand Wine	3	The Organic Dairy hub	2
Vegetable Growers Association	2	Tainui Group Holdings	2
Citrus New Zealand	2	Ngāti Mutunga Asset Holding Company	2
		Pouarua Farms	1
		Tauranga Port	3

Interviews were structured around the below key questions:

1. What are your immediate and future challenges and opportunities?
2. In line with the Government's economic aspirations and roadmap for the food and fibre sector *Fit for a Better World*, how are you positioning your company/organisation to be more productive, sustainable and inclusive?
3. What is your organisation/company strategy?
4. Where are you currently targeting investment and why?
5. How has your business or membership been affected by Covid-19?
6. What lessons have you learnt and what changes are you implementing in response to this?
7. If money was no barrier, what would you change to support the prosperity of your particular domain within the food and fibre sector?

A summary of engagement can be found in section 8 of this report. It splits findings into four core themes based on sector priorities according to; productivity, sustainability and inclusivity. The fourth theme addresses opportunities. These themes draw on the sector and Government's agreed strategy *Fit for a Better World*, as well as drawing on lessons from Covid-19.

Within these four broad themes, it is possible to identify sub-themes. The sub-themes help to summarise key interventions that the sector is taking, and key areas of opportunity that were identified by the organisations and businesses. Sub-themes are set out in more detail in section 8 of this report and summarised below in table 4.

Table 4: Summary of themes and sub-themes from sector engagement

Productive	Sustainable	Inclusive	Opportunities
Research and development	Minimising and offsetting carbon	Partnering with Māori	Market insights and data
Attracting the best premium through marketing and brand	Decarbonising manufacturing	Collaboration and coordination	Horticulture
Markets as the driver of decision making	Sustainable packaging	Recruiting more staff	Labour market restructure
Improving traceability	The environment, animal welfare and ethics	Improving skills recognition in the sector	Regulatory change
Partnership and Collaboration	Water and waste	Leadership	Improving on-farm practice and outputs
		Connecting back to the community	Supporting start-ups
			Removing trade barriers
			Improving energy efficiency and cost
			Improving the supply-chain

4.1 HOW TODAY'S CHOICES WILL SHAPE TOMORROW'S WORLD

The scenarios in the WEF (2017) paper offer core insights into significant changes required to realise a world food system that is inclusive, sustainable, efficient, nutritious and healthy.

Overall, the paper notes that consumption habits and behaviours will make or break global health and sustainability. These consumption habits are particularly relevant to increasing the uptake of more resource-efficient diets. It discusses that putting nutritious and sustainable food on every plate will require a fundamental redesign of food production systems, largely putting emphasis on the quality rather than quantity of agricultural production.

Climate change will affect all future scenarios and pose a significant threat. Communities, social stability and economic wellbeing are intrinsically linked to access to the land and food production. Significant climate shifts will transform resource accessibility and the productive capacity of particular food systems in various parts of the world.

Food system dynamics are likely to exacerbate inequality within and between nations, particularly in relation to a scenario based on more resource-intensive demand. Poverty and malnutrition are linked in a vicious cycle. Access to food in rural environments can be limiting where rural farmers in developing countries can often be significantly malnourished. Equally the urban poor are affected by price and access to healthy and sustainable food options.

The fourth industrial revolution technologies and other innovations may revolutionise food systems but introduce new challenges. Innovations will reshape how we produce, manage and demand food in select markets, but these impacts will be unevenly distributed.

5 GLOBAL ECONOMIC OUTLOOK

The Global Economic Prospect report released in January 2021 by the World Bank, forecasts that global growth will shrink by around 5 percent this year, signalling the deepest recession since World War II. However, global growth is expected to moderate to 3.8 percent in 2022. The World Bank (2020) predicts Covid-19 will have a particular impact on investment and human capital in emerging markets and developing economies suggesting that it could take more than a decade to recover from the economic fallout of the pandemic. This will hinder progress towards key development goals for certain regions, however over the forecast period, recovery is expected to strengthen as confidence, consumption and trade gradually improve, supported by a global vaccination programme. These assumptions are highly dependent on successful procurement and distribution of vaccines, that the virus will respond positively to the vaccine and that financial stress incurred from the pandemic triggered by high debt levels, will not impinge on interventions to curve the virus.

The World Bank recommends that an appropriate balance must be struck between the risks associated with high debt levels and premature fiscal tightening policies that may slow the economy. They note that alongside strong global cooperation, investment priorities for governments should be:

- safeguarding health and education;
- digital technology;
- green infrastructure;
- improving governance; and
- enhancing debt transparency.

Swinnen and McDermott (2020) discuss the impact Covid-19 has had on global food security. The policy interventions such as lockdowns and social distance requirements, accompanied by various national recessions have triggered major disruptions in food value chains. Inevitably, this has resulted in dramatic shifts for the food and nutrition of billions of people around the world. The impacts differ based on the type of commodity, the resource-intensity of the food systems, and the level of economic development.

As noted in Swinnen and McDermott (2020), Laborde et al. (2020) predict that for every percentage point of global economic slowdown, the number of people living in poverty would increase by 2 to 3 percent worldwide. Their estimates show that in developing countries, in the absence of strong policy interventions, the number of people living in poverty could increase by up to 150 million predominantly in Africa and South Asia. The impacts of more people falling into poverty correspond to a decline in nutrition. People shift from more nutritious foods like fruit, vegetables and dairy products towards cheaper less nutritious foods when they have less income.

5.1 THE IMPACT OF COVID-19 ON GLOBAL FOOD SYSTEMS

Recent scholarship points to a number of disruptions in our food system that largely align with the insights drawn from the scenarios analysis produced by the WEF. Covid-19 has accelerated a number of changes in our food system that have shifted our consumption habits, exacerbated inequality and incentivised the uptake of technology in the food sector. Many economies have also used Covid-19 as an opportunity to reset investment towards a "green recovery."

5.1.1 WHAT IS A "GREEN RECOVERY?"

The OECD (2021) define a "green recovery" as the term used to describe environmentally positive investments and interventions including regulatory reform, following the Covid-19 pandemic, in the hope that green measures are sufficient to enable transformation towards long-term climate and environmental objectives. Examples of green measures provided by the OECD (2021) include grants, loans, tax reductions or other subsidies and regulatory changes targeting the energy, transport, food production, waste, biodiversity, and water sectors.

5.1.2 POLICY RESPONSES TO COVID-19

The Food and Agriculture Organisation of the United Nations (FAO) (2020) report into agricultural trade and policy responses during the first wave of Covid-19 explains that the pandemic had a dual shock effect on both supply, and demand concerning agricultural markets. Measures to control the spread, although varying across nations, have impacted on supply-chain activities from production, processing, logistics and retailing. Border and travel restrictions have changed immigration settings leading to labour shortages in the sector; limited access to inputs such as oilseeds, fertilisers, and pesticides; reduced capacity in food processing; and challenged the distribution of food products. In addition to this, other measures such as significant reductions in income, restrictions on the movement of people and the closure of restaurants and food services have induced rapid changes in food consumption patterns.

Swinnen and McDermott (2020) state that disruptions are concentrated in labour-intensive nodes of the value chain. Supply chains in wealthy countries have been more resilient as they are more capital and knowledge intensive. However, wealthier countries, such as Aotearoa have noticed significant impacts on harvesting due to decreases in migrant labour. Labour-dense processing such as meat processing, and hospitality have also been affected.

The FAO (2020) notes efforts from Governments kept disruption in global basic foods such as seeds, cereals, fruits and vegetables minimal. However, disruption to consumption patterns had a larger impact on beverages, fish and non-food commodities like cotton and cut flowers. The FAO describes several policy interventions Governments made to respond to the induced concerns over food security and food safety as being relatively short-lived. These include export bans or quotas on specific commodities, in some cases import restrictions or requirements for certificates to prove a Covid-19 negative test on shipments.

As trade restricting measures can significantly alter the balance between global food supply and demand, the international community responded very swiftly through joint ministerial declarations and non-binding commitments, to refrain from using trade restrictions. Several countries also increased flexibility and efficiency in trade related procedures such as by accepting e-certificates for sanitary and phytosanitary requirements or simplifying import-licensing procedures. Global supply chains were also more resilient as trade is undertaken by large capital-intensive and coordinated enterprises that can mostly adjust to disruptions geographically and temporally.

The FAO (2020) foresees that with the overall global market seeming robust, the challenge of food security is not food availability, but rather food access. The FAO forecast that for developing countries, acute and chronic food insecurity is expected to increase. Largely in part to rising unemployment and reduced remittances from workers abroad. Social safety nets are crucial to help the vulnerable ensure ongoing access to food.

Swinnen and McDermott (2020) state that the pandemic has prompted discussions about the vulnerability of the world's food systems and food security, including the roles of different types of supply chain such as local vs global.

The FAO urges the international community as a whole to continue supporting vulnerable groups in promoting access to food, ensuring open markets and uninterrupted trade flows, and avoiding actions that can jeopardize the food security situation particularly in developing countries dependent on food imports.

5.2 THE IMPACT OF COVID-19 ON INEQUALITY

Oxfam (2020) refers to the virus as the "inequality virus." It took nine months for the fortunes of the top 1000 billionaires to return to their pre-pandemic highs. For the world's poorest, recovery could take a decade. Demographic inequalities have also been exacerbated, globally women are overrepresented in the sectors of the economy hardest hit by the pandemic and in many countries, the death rate for indigenous and minority populations is disproportionately higher than that of white people.

According to Antonio Guterres (UN Secretary General), Covid-19 has been likened to an x-ray by some, which has revealed fractures in the societies we have built. It is exposing fallacies and falsehoods such as: that the free market can deliver healthcare for all, that unpaid care work is not work, that we live in a non-racist world, and that we are all in this together.

The International Monetary Fund (IMF), the World Bank, and the Organisation for Economic Cooperation and Development (OECD) have all expressed deep concern that the pandemic will drive up inequality all over the world. This view is also supported by a number of surveys conducted with economists across the world. 87% of respondents said income inequality would rise as a result of the pandemic.

Swinnen and McDermott (2020) express this notion in relation to food security. Firstly, the poor are the most affected as it directly affects, sometimes their only productive asset, labour. Secondly, whether through rising food prices, falling incomes, or both, people will have less real income to pay for their food and will adjust accordingly. This effect is exacerbated where one has less income. Rozelle et al. (2020) as stated in Swinnen and McDermott (2020) found that rural families suffering from income losses cut back on nutrition, buying more grains and staples in bulk at low cost instead of more expensive goods like meat and produce.

Covid-19 has also caused disruptions to public programmes providing food, nutrition and health services to poor people. Due to the closure of schools, food programmes in countries like India and throughout Latin America, seized. Meaning that there is a significant risk of food insecure children. In Latin America, 85 million school children receive healthy food through the public programme (Swinnen and McDermott, 2020).

6 THE IMPACT OF COVID-19 ON NEW ZEALAND'S ECONOMY

COVID-19 has disrupted the New Zealand economy. Our tourism and education sectors have experienced significant change in scale and offering, our labour markets and immigration settings have been reconfigured, but global demand for our food continues to increase.

The pandemic has had a major impact on social wellbeing and the economic landscape of Aotearoa. The Wellbeing Budget 2021, notes that the retail, trade and accommodation industries were hit hardest which has had a disproportionate impact on young people, Māori, Pasifika and women, exacerbating pre-existing inequities in labour market outcomes. However, as the economic recovery continued, unemployment reduced to 4.7 percent in March 2021, from 4.9 percent ending

December 2021, showing some of these impacts have subsided. Figure 5 shows that the Treasury records real production GDP as contracting by 11.0% in the June 2020 quarter, with a solid rebound of 12.8% over the next two quarters. Supported by robust household spending and a buoyant housing market, forecasts show real production GDP as steadily increasing in June 2025.

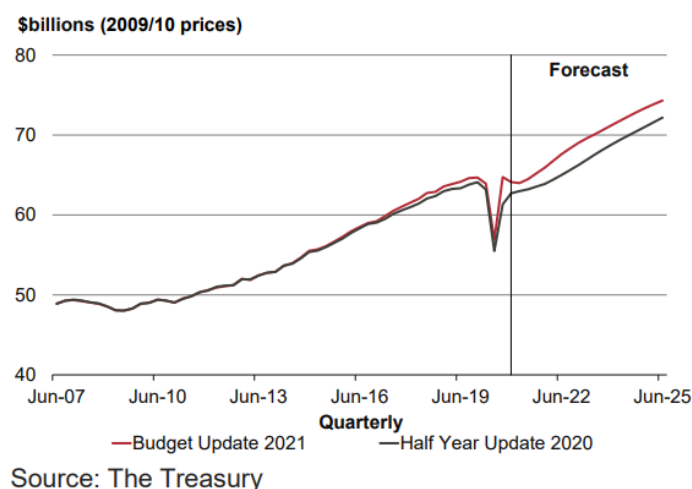


Figure 5: Forecast real production GDP growth for New Zealand (Wellbeing Budget, 2021)

6.1 THE IMPACT OF COVID-19 ON NEW ZEALAND'S FOOD SYSTEM

New Zealand's food and fibre sector emerged from Covid-19 relatively in good shape, despite a series of challenges arising from the Covid-19 pandemic. Food and fibre sector export revenue is forecast to fall 1.1 percent in the year ending June 2021 to \$47.5 billion as some sectors such as dairy, meat, wool and seafood saw demand limited by Covid-19 related restrictions (SOPI, 2021). Meat and wool export prices fell over the past year, particularly products destined for restaurants, however this was offset with the largest red meat production volume since 2008 (figure 6).

Consumer demand for fruit and wine strengthened since the pandemic, but production and labour impacts have limited supply for products such as cherries, apple and wine. Kiwifruit however had a higher yield with export revenue set to exceed \$3 billion by the year ending June 2023. Overall, for the year ending June 2022, export revenue is forecast to rebound to reach \$49.1 billion as demand begins to recover for New Zealand's main export products in destination markets. Efforts to ease the labour supply situation and resolve supply chain disruptions are expected to contribute to a recovered sector.

Global trade volume is expected to increase. However, according to the SOPI (June 2021) the relatively positive short-term outlook for global trade is stained by regional disparities, continued weakness in services trade and lagging vaccination timetables, particularly in developing countries. COVID-19 still represents the greatest threat to the outlook for trade, as new waves of infection could easily undermine any hoped-for recovery.

Supply chains also remain constrained, ongoing disruptions caused by COVID-19 around the world are influencing the movement of goods across borders for both air and sea freight. Port congestion and shipping delays due to reduced freight capacity continue to be an issue, both here and abroad. For New Zealand, this translates to increased risk of perishable products spoiling before they reach customers, or reduced shelf life for some of our products.

Given the strong global demand for shipping containers and limited shipping capacity, major transshipment ports are experiencing delays. In New Zealand, the Ports of Auckland have been

heavily congested since December quarter 2020 and shipping lines have been deploying additional vessels to move empty containers to other regions.

In addition, increasing shipment costs, shipping delays, and a container shortage are all putting upward pressure on import prices for key primary sector inputs, such as machinery, fertilisers, and feed. As a result, farmers, growers, and processors are facing higher production costs.

New Zealand exports have benefited from global price increases for primary commodities. This upward trend in commodity prices has been supporting New Zealand's export revenues, a welcome indicator when tourism and hospitality sectors are currently struggling with the lack of international visitors. The SOPI signals that we are not completely in the clear, and New Zealand export performance hinges on the recovery of its main trading partners.

Year to 30 June	Actual				Forecast				
	2017	2018	2019	2020	2021	2022	2023	2024	2025
Dairy	14,638	16,655	18,107	20,135	19,050	20,420	20,730	21,400	22,020
Meat & wool	8,355	9,542	10,176	10,678	10,380	10,420	10,660	10,910	11,170
Forestry	5,482	6,382	6,883	5,539	6,250	6,430	6,520	6,620	6,760
Horticulture	5,165	5,392	6,134	6,500	6,650	6,780	7,260	7,620	8,020
Seafood	1,744	1,777	1,963	1,855	1,780	1,730	1,830	1,880	1,920
Arable	197	243	236	290	270	280	290	295	300
Processed food and other*	2,639	2,709	2,854	3,004	3,080	3,000	3,000	2,850	2,910
Total exports	38,220	42,700	46,355	48,001	47,460	49,060	50,290	51,575	53,100
% Change	+2.4%	+11.7%	+8.6%	+3.6%	-1.1%	+3.4%	+2.5%	+2.6%	+3.0%

Source: Stats NZ and MPI.

* Processed food and other includes live animals, honey, and processed food.

Figure 6: Food and fibre sector export revenue 2017-25 NZ\$ million (SOPI, June 2021)

7 AN OPPORTUNITY TO RESET – COMPLEX CONSIDERATIONS

Looking ahead, Bardsley *et al.* (2020) describe Covid-19 as providing the push to reset in a way that aligns strongly with the values of Aotearoa. They highlight that global financial markets have shifted towards valuing characteristics of sustainable business models and consequently increasing demand for reporting frameworks that measure all inputs into the production process from farm to table. This signals a move from a linear to more circular food system.

According to Bardsley *et al.* (2020), the declaration of New Zealand as COVID-free has improved our global reputation and provides a platform on which to leverage our food and fibre products. The shift as Bardsley *et al.* (2020) explain will reflect a future based on values. Consumer demand for high quality food and information on food provenance is growing. Such attributes include safety, nutritional value, animal welfare, carbon footprint and environmental protection.

7.1 PUTTING THE ENVIRONMENT FIRST

Bardsley *et al.* (2020) consider that it is critical our environment is put first. They allude to the possibility that New Zealand's pastoral systems may be reaching their biophysical limits to growth and even sustainability. Our food production system will need to head towards carbon neutrality, this means addressing large issues such as land-use, water-access rights and water-quality issues. Furthermore, they note that the realities of climate change will alter our pastoral farming system and heighten the

risk of biosecurity incursions which will impact on plant and animal health, production processes and biodiversity.

They note key environmental issues as:

- Land-use competition and inappropriate land use.
- Soil degradation and loss.
- Water rights and use.
- Irrigation and water quality.
- Excessive use of synthetic nitrogen and other fertilisers.
- Biodiversity decline.
- Pollution of aquatic ecosystems from ill-advised land use.
- Climate change effects that will reduce productivity or force changes in types of activity.
- Biosecurity failures resulting in incursion of weeds, pests and animal diseases.
- Increased detection of pesticide residues (as a result of better technologies) in New Zealand's markets, possibly leading to the imposition of non-tariff barriers.

7.2 FURTHERING INVESTMENT IN TECHNOLOGY

They refer to our innovation eco-system as key to achieving our environmental and food sustainability goals. The science system must better organise itself to address strategic issues facing the sector. Better access to data is crucial, although datasets exist (e.g. soil type maps and predicted rainfall patterns), they are not readily accessible, in part because of data sharing and intellectual property (IP) issues. It is also not necessarily communicable to farmers and farm advisors.

There is increasingly a call for consumption habits to favour plant-based foods over ruminant-based industries to help mitigate the environmental impacts of production. The fourth industrial revolution is poised to transform agribusiness through big data, sensor technology, artificial intelligence and biotechnology. Robotics offer opportunity for harvesting and processing in horticulture sectors, while vertical farming and hydroponics could shorten supply chains and improve food security particularly within major cities.

Technology offers insight into advanced nutrition and absorption, synthetic proteins and sustainable food packaging.

7.3 FOOD WASTE AND CIRCULAR ECONOMY

Currently, our post-harvest supply chains use a lot of power, both for transport and for cooling. Food waste is a big issue, particularly for fruit. Bardsley *et al.* (2020) note efficiencies in the supply chain can be achieved through co-product development so no potential products are wasted, while also curbing overproduction and overstocking. AI could help to eliminate food waste from our production systems, while significant behaviour change and consumer awareness of smart eating can be a further focus to minimise food waste in consumer households.

7.4 FOOD SECURITY AND NUTRITIONAL QUALITY

New Zealand produces food for the world, yet food insecurity exists within our borders. According to the New Zealand Health Survey 2019/20, 1 in 3 adults are obese. Poor diets can be attributed to a lack of access to and the high cost of, nutritious food. Moreover, finding reliable information on nutrition in the face of marketing campaigns for cheap fast food can further contribute to the burden of non-communicable disease that the country faces.

Research shows that the nation's fast-food habit has been driven in part by cost and time factors. New Zealand does not foster a culture around eating that prioritises our relationship with food. High

rates of non-communicable disease in disadvantaged communities are largely linked to the above issues.

If New Zealand is to equitably recover from Covid-19 and position our future food system to be sustainable, inclusive, efficient, healthy and nutritious we must address the quality, availability and cost of food for New Zealanders, some of whom have limited disposable income. The question regards how we promote equitable nutrition, health, environmental and food sovereignty values in our food system as critical to realising wellbeing of our future generations and country's economic goals.

7.5 CHANGES IN CONSUMER PREFERENCES

New Zealand Trade and Enterprise (NZTE) conducted a market study in partnership with Kantar (2021). The study took with insights from over 14,000 shoppers, to understand the change in consumer attitudes and behaviours in New Zealand's six major export markets; China, Australia, the United Kingdom, the United States, Singapore and Japan. The research used eight key purchase drivers across all markets: taste, affordability, brand, product safety, health, freshness, ethical product, and whether the product is on trend. The results of the study can be found in figure 7 below.

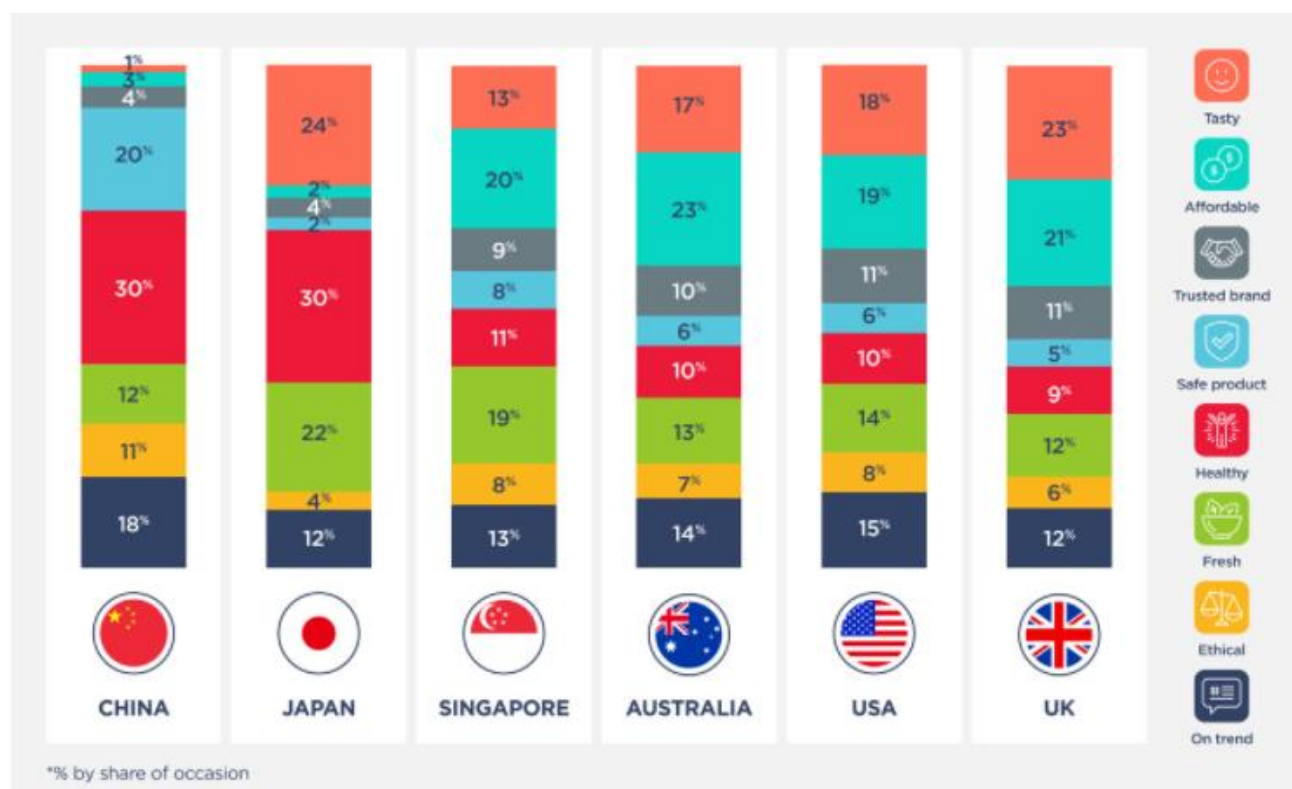


Figure 7: Summary of market preferences from Kantar research (NZTE, 2021)

The results show a few key differences within markets. For example, health and safety is significant in China, whilst health, taste and freshness are important in Japan. In western markets affordability, taste and brand are the key drivers. NZTE (2021) notes that ethical and on-trend purchase drivers can command a higher premium. As shown in figure 8 below, in most markets the ethical and on trend drivers deliver a higher premium. This is most pronounced in the United States where 23 percent of share of the on trend and ethical products can deliver 45% in value.

According to the Agribusiness Agenda (2021) China accounted for 55% of tradable exports in the year to March 2021. With such a large concentration of our products in the Chinese market, it is

important to respond to their signals. The Chinese Government is currently actively promoting the benefits to health from good nutrition, with a strong focus on dairy (which has helped support dairy prices over the past year). This signals New Zealand businesses should prioritise producing and marketing healthy products.

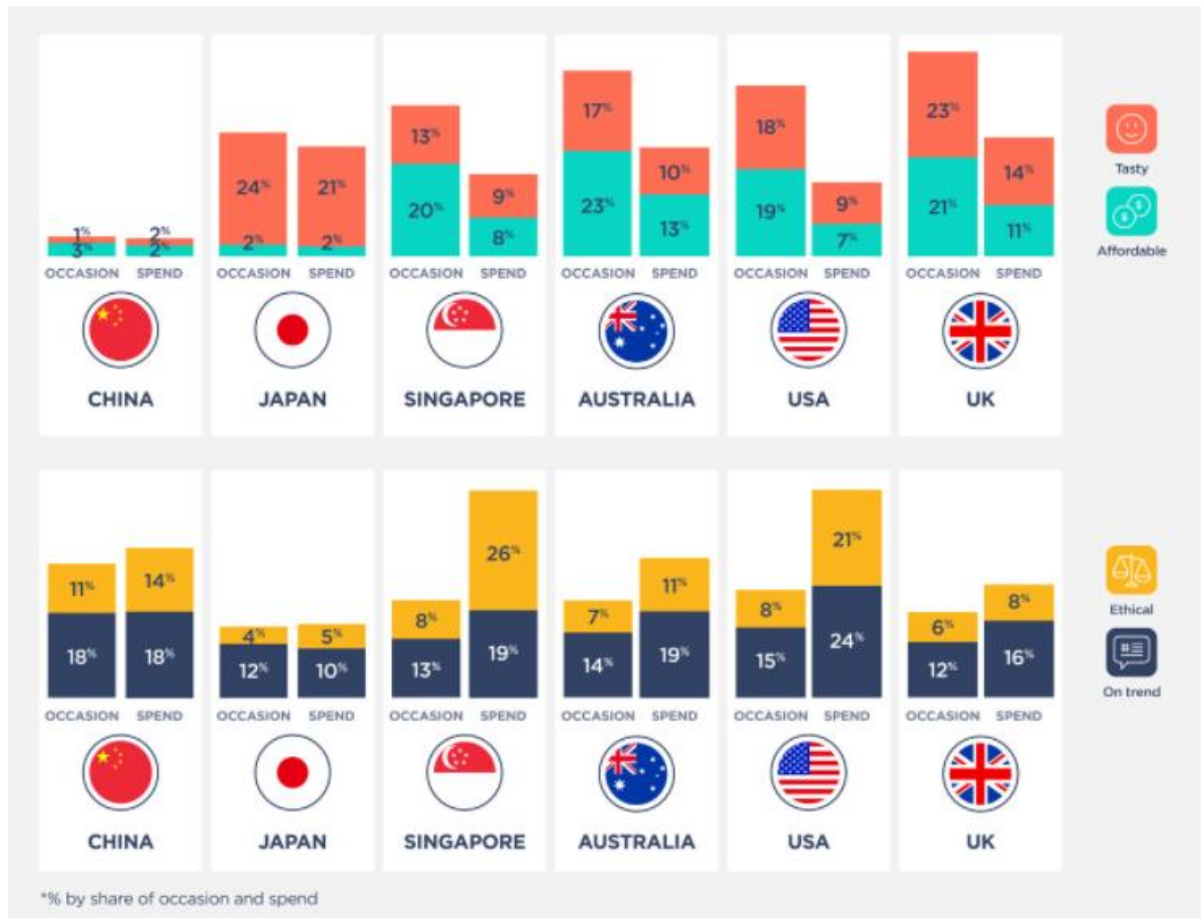


Figure 8: Comparison between value from ethical and on-trend products to safe and affordable (NZTE, 2021)

NZTE recommend that to connect an ethical product with consumers, it is important to be authentic to the company's values and the story of the product, including highlighting animal welfare practice, and ensuring relevant certifications (allergens, organic) are maintained. This evidence supports the conclusions put forth by Bardsley *et al* (2020) that New Zealand's food system has the opportunity to move towards a values-based industry. NZTE (2020) also explain that delivering a premium and higher value from a product can be achieved through focussing on safety, health and brand. Figure 9 highlights shows these critical considerations to improve product value.



Figure 9: Pyramid showing added value from product attributes (NZTE, 2017)

7.6 FURTHER OPPORTUNITIES AND CHALLENGES

Bardsley *et al.* (2020) note a number of challenges that require New Zealand to evaluate existing paradigms, business models and mindsets in many aspects of the food and fibre sector. Aotearoa is experiencing similar challenges at a domestic food system level as our world food system. These challenges and opportunities are set out in in table 6 below. The table also makes an assumption based on global trends about whether this disruption / shift is likely to continue.

Table 5: Challenges and opportunities for New Zealand's food and fibre sector (Bardsley *et al.*, 2020)

Disruption / Shift	Trend	Likely to continue
Border closures, international trade issues and supply chains.	Consumers buying online – packaging and food safety key consideration.	Yes
Top-end food market disrupted due to the wide scale shut down of hospitality and international tourism.	Temporary markets and food offerings key consideration.	No
Move towards protectionism, localisation and shorter supply lines due to disruption in global supply chains.	New Zealand shift to self-reliance for a complete production to consumption value chain.	Unlikely
Workforce - Decline in labour for harvesting and specialist skills in the sector.	Long-term labour force for the sector and more support for agriculture higher education.	Yes
Consumer Preferences - Internationally seeing a trend for local food sources (the proliferation of farmers' markets).	Will New Zealand's local products continue to strive for the high value end of the market? How will this decrease accessibility for New Zealanders with less disposable income?	Likely
Heightened awareness of health risks associated with food.	Traceability and provenance are key considerations.	Yes

Business Models - Dominated by small and medium enterprises that may not be of scale to turn consumer preferences into food solutions.	Consideration for more collaboration for research and partnership with larger food manufacturers.	Yes
Overreliance on capital gain from smaller farms (exception of Māori holdings).	Need to transition from New Zealand's farming ownership / business model – key consideration is the aggregation into larger units to favour an income-based model and incentivise diversification.	Yes
Leveraging Māori values to access new markets.	Food security, food supply and food sovereignty are of significant importance for Māori agricultural production – key opportunity to build on this for broader New Zealand food resilience.	Yes
Mental wellbeing of our growers and producers as isolation and decline of rural communities is experienced in some locations.	Mental health of our farmers is a continued concern– key consideration to incentivise regional migration from urban centres.	Yes
Strengthening brand Aotearoa.	Putting our country's values front and centre for recognition in high-value markets – key consideration on how Te Taiao can address this need.	Yes

Bardsley *et al.* make recommendations for New Zealand moving forward including:

- developing a clear narrative around sustainable food production for New Zealand and turning this into a national brand;
- investing in accurate environmental data and assurance systems to validate claims made to global consumers;
- investing in long-term strategic research required and addressing barriers that may inhibit research into life science technologies;
- investing in traceability and data sharing for producers;
- investing in broadband across the rural sector;
- increasing effort to protect our free trade agreements, and market access in a world moving towards protectionism; and
- developing a national marine strategy that supports aquaculture development and the preservation of marine ecosystems.

It is also promising to see several of these recommendations are currently reflected in the food and fibre sector's *Fit for a Better World* 10-year roadmap, which shows the sector is reasonably aligned on the direction and prioritised transitions required to improve the sectors' overall performance and future outlook.

VIEWS FROM THE SECTOR

8 INVESTMENT

A lot of investment and business improvement is taking place in all parts of the food and fibre sector.

Engagement with the companies and industry bodies (set out in table 3 and table 4) showed significant redesign of our food system and various activities in production is taking place. Whether this be through improving on-farm practice and methods, changing labour structures in the sector, improving data accessibility and knowledge sharing or investing in research and development for new technology and tools to improve the productivity, sustainability and inclusiveness of the food and fibre system.

Drawing on lessons from Covid-19, and New Zealand's economic aspirations to transition to be more productive, sustainable and inclusive, findings from the sector have been summarised according to four themes: current actions or investments the organisation or company is pursuing to be more **productive, sustainable** and **inclusive**. The fourth theme draws on lessons from Covid-19 and current investment signals, to identify any **opportunities** interviewees suggested which would enhance the performance of the organisation, company or sector.

These themes, productive, sustainable and inclusive also align closely with the World Economic Forum's definition of a thriving global food system described as inclusive, sustainable, efficient, nutritious and healthy.

8.1 PRODUCTIVE

8.1.1 RESEARCH AND DEVELOPMENT (R AND D)

Significant investment in R and D is taking place in the sector.

Animal

In the animal sector genetics are a major focus to improve herd health, address animal welfare concerns and decrease the inputs of production whilst maximising outputs. Investments are being targeted towards the feasibility of dairy-beef, reducing bobby calf populations and exploring efficiencies of feed to improve the life cycle of beef cows. The red meat sector continues to prioritise R and D to utilise farm animals for other products, such as animal fat and proteins for new health products.

Herd health is still a major focus for the red meat sector with major programmes underway to improve facial eczema and internal parasites.

R and D continues to be a priority for Fonterra. Their Palmerston North facility is looking into alternative and higher value milk products, hand sanitizer namely being a product that is performing well given the pandemic.

Technologies like Halter have caught the eye of large companies like Fonterra, these electric collars for cows that act as virtual fences, also gather data to monitor a cow's health and could significantly change the way we fence properties and manage our herds.

For a number of Māori organisations, the potential of sheep's milk has become a focus. Feasibility studies into sheep's milk are being explored on the Chatham Islands and in Taranaki where land is being converted into non-dairy. Tainui Group Holdings is investing in a genetics programme with Waikato milking system to look into its potential.

While the international structure of the poultry industry means the majority of research into animal genetics and breeding is undertaken offshore, the poultry industry makes significant investment in feed, water and barn infrastructure such as lighting and humidity, to maximise efficiency of production and growth cycles.

Seafood

In the seafood sector, gear technology improvements remain a key priority for productivity. Enhancements are being made to fishing practice largely around landings, discards and longline fishing vessels. Investment is prioritised towards improving automatic bait technology, wet tags to avoid by-catch, discard shoots that can automatically measure fish, and improvements to net selectivity to further minimise by-catch.

The seafood sector is also investing largely in technology and research that supports aquaculture in seaweed and the open ocean.

Horticulture

The horticulture sector is prioritising automation from harvesting and IP. Zealong tea is New Zealand's only commercial tea grower. They are looking to improve productivity through developing harvest technologies and grading machines. The development of this technology would be a first for the industry and provide an opportunity to sell internationally. They are also looking to plant specific herbs for export, where there is currently no international certified organic supply.

Production methodologies

Companies like Villa Maria Estate and Tegal also took pride in their automated manufacturing and packaging line. Investments in robotic technologies to bottle and package wine have increased the number of bottles produced per hour. Similarly, majorly investing in an automated production line has enabled Tegal to process about 52,000 chickens per day in their Auckland factory.

Meanwhile, First Fresh New Zealand who is a major citrus supplier to the domestic market has taken the global lead as the first citrus enterprise to sign on to 'Spectre', the computer vision fruit sizing tool developed by New Zealand start-up Hectre.

8.1.2 ATTRACTING THE BEST PREMIUM THROUGH MARKETING AND BRAND

Many companies are looking to add value and increase productivity through story-telling particularly linked to product provenance, branding and marketing.

The food and grocery council New Zealand have seen a major shift towards health and wellness.

Organic Dairy Hub generates a premium largely from leveraging their organic status and following a low cost, low input farming system model to generate a value-added product (including using antibiotic free cows). The Hub exports fresh bottled A3 milk (A2 cows that are farmed organically).

Beef and Lamb are continuing to invest in the *Taste Pure Nature* campaign and the Deer industry has invested in a 7-year programme called *Passion 2 Profit*. The programme relies on the collaboration of the five largest venison marketing companies and aims to increase the amount of New Zealand venison sold in chilled form year-round, at higher prices, through developing common brand values and positioning New Zealand venison into new markets. The *Made with Care* campaign has had a positive impact on wine and deer exports. The deer industry gained significant value from its premium Cervena branding.

New Zealand Honey has increased investment in regional honey branding and marketing.

Certain wine companies like Delegats rely on their brand and reputation for sales, largely as this has been built over generations. Delegats specialises in only 7 products and has largely built success based on their *Oyster Bay* brand. Their strategy is on volume growth by tripling sales into the United States and exploring opportunities to get their Pinot Gris into high end markets.

8.1.3 THE MARKET AS A DRIVER OF DECISION-MAKING

Younger drinkers are wanting more choice with their beverages, beyond wine and Pernod Ricard has registered this. Pernod Ricard is looking at all beverages, including low alcohol, low calories and non-wine options.

Sometimes, true value lies in a product, where there may be less perceived value. AFFCO discussed how some markets in Asia and the Middle East prefer to receive the whole carcass of our red meat, rather than packaged and prepared cuts. These markets feel more assurance from receiving a product as close to its original form, for a number of reasons such as safety, intended use and provenance. This is an example of how the definition of value add is forever dynamic and highly dependent on the end market.

We are seeing food manufacturers actively respond to market signals. Goodman Fielder for example is investing in importing a range of plant-based food to meet the increased domestic demand for plant-based alternatives. The Food and Grocery council have also signalled a shift towards health and nutrition in New Zealand's market as a key priority for many of their members.

8.1.4 IMPROVING TRACEABILITY

Traceability provides benefits for the consumer in regard to food safety, biosecurity, environmental and ethical production characteristics such as animal welfare and quality control.

The Deer industry has focussed effort towards VelTrack, largely for its Korean and Chinese markets. VelTrack enables velvet to be tracked across the supply chain in response to food safety or biosecurity issues, so that risks can be managed and contained. a traceability scheme for venison

A lot of organisations and businesses are focussed on data gathering to tell their story. This links to increasing customer demand to know where their product has come from, and what inputs went into its production. DCANZ is investing in improving data on the domestic market, so they can begin to help members diversify their product offering and better suit the domestic market.

Organic dairy-hub data on milk composition shows that it is strengths apart from other milk production. They are investing in replicating this across all their farms, along with ensuring their farmers maintain a low-stocking rate, low tillage and remain self-contained. However, biodiversity in climate and soil significantly impacts milk composition. As there is no current data in New Zealand about organic farming systems, they are running trials and farm studies to quantify outputs of their farms, to contribute to better benchmarking for organic farm systems. This includes looking at the use of seaweed to reduce dairy farm emissions.

Villa Maria estate is highly focussed on marketing and branding to extract value from their product. Their new organic range *Earth Garden* has unique labelling equipped with a QR code that tells the provenance story of the wine through their app to connect more intimately with the consumer.

Furthermore, in the supply-chain, Mainfreight have made investment into their cool chain integrity including using tracking devices on products. Innovation in and around their cooling methods, along with traceability of environmental conditions for the product, allowed them to get fresh milk into

China and consequently build the company's knowledge base around food safety and market access requirements for other high value perishable goods such as seafood.

8.1.5 **PARTNERSHIP AND COLLABORATION**

The way we work, and partnering, is a core priority to keep businesses productive. Pouarua farms has partnered with Lewis Road Creamery to supply raw milk. As part of their nitrogen loss programme, they have planted Mānuka and partnered with Comvita to place 700 hives on site for honey production.

8.2 SUSTAINABLE

Sustainability is a theme that came through strongly for many food and fibre sector businesses and organisations.

8.2.1 **MINIMISING AND OFF-SETTING CARBON**

Beef and lamb New Zealand have been helping their members understand how to offset their carbon emissions as a large proportion of sheep and beef farmers do not have topography, soil or climate conditions to diversify into other varieties of low carbon production.

Fonterra has invested in a tool for their farmers to measure on-farm emissions and has sustainability advisors helping 10,000 co-operative members to develop farm environment plans.

On-farm environmental considerations are deeply rooted in the values of many Māori agribusinesses. Ngāti Mutunga is investing in research for seaweed production and uses for methane sequestration, which geographically fits well given their location on the Chatham Islands. Pouarua farms have initiated their forever planting plan of 10,000 plants annually, and having drains on farm every 100m. Diversification into blueberries and fertiliser trials to reduce nitrogen loss are also priority investments for Pouarua.

Tainui Group Holdings have already planted their land suitable for production forestry and do not have land necessarily suitable for horticulture due to water constraints. However, they are prioritising the environment and focussing on converting several dairy farms into maize cropping, sheep dairy and chickens.

Further along in the supply-chain, logistics company Mainfreight has fully electrified their forklift fleet, the sales team use hybrid or electric vehicles and their sites utilise solar energy captured on the building's roof. Given the company is a logistics company, transport emissions are a large contributor of the business' overall emissions profile. They are investing in electrifying metro trucks and have invested in measuring the carbon footprint of goods from port to port. Mainfreight is investing in an invoice level detail that shows the total carbon emissions per shipment for customers so that they can make an informed decision when choosing how they move their goods through the supply-chain.

Tauranga Port, whilst also electrifying their vehicle fleet and using hybrid straddles, have noted that the global shift towards larger ships and New Zealand's capacity to receive them at port is a positive for minimising carbon emissions. Big ships offer 30% less carbon per container. Furthermore, investment in a multi-million-dollar debarking facility reduces trucks on the road correlating to less carbon emissions and congestion overall.

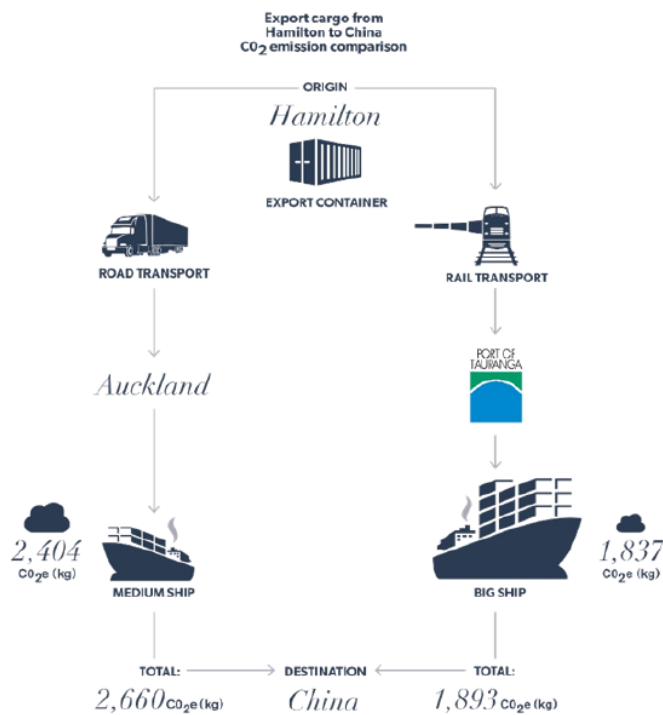


Figure 10: Infographic on carbon emissions for a medium ship versus a large ship (Tauranga Port, 2021)

Maria, Pernod Ricard and Goodman Fielder are invested in projects that recycle soft plastics and other plastics such as bread bag tags, into fence posts. Villa Maria notes that glass bottles account for 40% of their carbon emissions as a business. They use Visy glass as a supplier. Visy glass is exploring sustainable glass products using recycled glass. Villa Maria are also investing in plant-based plastics for packaging, and they are also looking into the feasibility of exporting wine in bulk to increase the volume that can travel to export markets per shipment and in doing so, decrease their overall emissions profile.

8.2.2 DECARBONISING MANUFACTURING IN THE SECTOR

Industry have begun focussing on minimising process heat from the manufacturing process. For example, Goodman Fielder have invested in heat recovery technology for their bakeries and are looking at investing in natural gas usage to reduce the amount of water that requires evaporation in the sugar refining process. Fonterra have been partnering with the Government Investment in Decarbonising Industry (GIDI) fund to convert fossil fuel sources of energy into other forms. Fonterra has begun converting their coal burners into biomass boilers.

8.2.3 SUSTAINABLE PACKAGING

Sustainable packaging is an area of focus largely for food and beverage industries. Villa

8.2.4 THE ENVIRONMENT, ANIMAL WELFARE AND ETHICS

The consumer is becoming more conscious about ethics in the production of the food they are eating. Many food and beverage companies are mindful of this such as Fix and Fogg whose butters are all GMO-free, vegan friendly and don't use palm oil.

The financial sector is prioritising environmental considerations when looking at approving finance in the sector. Rabobank has invested in a client benchmarking tool to capture on-farm activity including health and safety, animal welfare and environmental performance. Rabobank foresees that non-financial risks often become financial risks and so are looking to provide guidance and standards for their customers.

Soil health is also an area of focus for many of our farmers and growers. Zealong tea are working with soil scientists to identify ways of increasing and retaining water and nutrients in their soil, to reduce fertiliser use. Zealong created their own organic compost to use on-farm. The Vegetable Growers Association have discussed the importance of rotation for soil health and preventing pests and disease. They describe tools such as overseer as not fit for purpose to measure rotational cropping. Leaderbrand is looking into ways of measuring nutrient leaching from their crop rotation methods, which includes working with overseer to further diversify their product capacity.

Furthermore, significant work is underway in New Zealand to transition from agrichemical pest management to agroecological crop protection. Citrus New Zealand is a programme partner with Lighter touch who are leading work in this area. Villa Maria have invested in on-farm trials using tussock under vines as a means of weed control, instead of using round-up and have begun testing deeper irrigation lines so that the water feeds the roots of the vines rather than the weeds, which require management.

The apiculture industry is progressing work on improving animal welfare for bees, they support the development of a code of welfare for bees under the Animal Welfare Act 1999.

The seafood industry is investing in seafloor vessel improvements to avoid damage to the marine seafloor environment.

8.2.5 **WATER AND WASTE**

Many farm systems are looking at water storage and creative ways of ensuring they have access to appropriate irrigation. Zealong tea is beginning work to expand their manmade lake to help with on-farm irrigation.

Mainfreight have started to purify water collected from rooves in their New Zealand branches such as Auckland, Kaitia and Whangarei to recycle it and fulfil needs such as showers, drinking water and cafeteria use. They partner with customers internationally to run a recycling programme to reuse packaging and sustainably source recyclable packaging. Furthermore, other logistics companies such as Tauranga port have installed netting for dust suppression from roadside logging bays, and have established methyl bromide recapture systems.

For the animal sector such as dairy, beef, lamb and deer, stock exclusion from freshwater sources is taking place, and farmers have begun producing farm environmental plans.

Food processing requires large volumes of water. The food and grocery council noted many food and beverage companies are looking to move towards a circular economy. Several Wellington breweries are working to minimise water use in production, and recapture water used to clean kegs and give to other beverage companies to help flavour products. Fix and Fogg have used glass jars that are fully recyclable, and their end of production butters are turned into lucky dip butters.

8.3 **INCLUSIVE**

It is evident from our engagement that almost every part of the food and fibre sector is seeking to recruit and retain staff, particularly at the harvest and production end of the supply chain.

8.3.1 **PARTNERING WITH MĀORI**

The animal sector is investing in the strength of their Māori partnership through transforming decision-making structures, co-developing extension programmes and improving data accessibility, measurement and evaluation frameworks. Fonterra have bolstered their Māori agribusiness team to help their farmers realise their goals for their whenua. Whittakers chocolate have also invested in Māori language packaging to show support for initiatives like Māori language week.

The honey industry have thrust support behind standing up the iwi charitable Mānuka trust to protect the tradition and cultural knowledge of Mānuka.

8.3.2 **COLLABORATION AND COORDINATION**

Ensuring that different parts of the sector are collaborating is crucial for success. The honey industry is acutely aware of the challenges in their industry through the majority of beekeeping operators being relatively small, but a number of the largest exporters in the industry proportionately large. Apiculture New Zealand are working on building value for membership so that this can foster a new business model that better coordinates access to data for beekeepers and honey product manufacturers, market access opportunities, a more equitable distribution of revenue and biosecurity readiness and response planning.

Sharing insights and product knowledge is a dominant pillar within several industry organisations. Citrus New Zealand share their crop prediction tool with smaller nut and fruit groups. Other organisations continue to invest in existing platforms for collaboration like the New Zealand farm assurance plus programme that collectively serves the red meat and wool industry to deliver assurance to customers in regard to integrity, traceability, biosecurity, food safety, environmental sustainability, animal health and welfare.

8.3.3 RECRUITING MORE STAFF

Primary ITO supports over 25 primary industry sectors and subsectors through their pathways into primary industries programme, whilst looking to fund over 10,000 more apprenticeship spaces over the next 4 years.

Several organisations are running a cadetship scheme. The Food and Grocery council, DCANZ in partnership with Massey and Fonterra in particular, are attracting young people into the industry, with specific focus on Māori, Pacific and women. The seafood industry is also investing in targeted campaigns and recruitment drives, to get more people into the sector. Rabobank support school programmes in urban centres to take school leavers on fieldays and attract them into the sector.

Zealong tea are investing in onsite accommodation for seasonal workers, and employing staff from around the world interested in organics and tea production so that they can attract the best tea makers from around the world.

For other parts of the sector, geography is the largest constraint to growth. On the Chatham Islands, for industry expansion and growth, people are required. This a major challenge, as the unemployment rate is extremely low in the region. The region is investing in agribusiness models that require low labour inputs.

8.3.4 MORE FORMAL RECOGNITION OF SKILLS IN THE SECTOR

Several industries within the food and fibre sector have noted that the perceived lack of value for the skills required to work in the industry, are a deterrent to attract new talent. Several horticulture producers would like to see the skills required to operate in their industries recognised as more highly skilled, and see tertiary institutes doing more promotion for careers in the Primary Sector. Primary ITO have invested in investigating a new passport for work concept which will help potential employees identify the skills they currently have and how they are transferable to the food and fibre sector, it also simplifies the assessment process so that the skills obtained by those undergoing training is better reflected to the job needs.

Fonterra continues to invest their high skilled, high paid jobs in the regions so that talent is retained in regional New Zealand.

8.3.5 LEADERSHIP

Growing the leaders for the future is an area of investment for many organisations. Tainui is investing in incentivising rangatahi to pursue land-based careers, from property development, geology right through to farming and agribusiness. They are also connecting urban Māori back to the land through a number of open days and events. Horticulture New Zealand has run a leadership programme which helped more than 275 graduates excel in their chosen field and has co-funded programmes to help managers progress their careers.

Several organisations have a business strategy that is **intergenerational**, and often these businesses are not focussed on attracting talent, so much as retaining existing staff through promoting a vibrant and valuing workplace culture.

Mainfreight have a number of initiatives underway that value and celebrate employee success. They have invested in a marakai to support the operation of their cafeteria. The cafeteria feeds all staff at a small monthly cost.

Similarly, many wine businesses such as Pernod Ricard, Delegat and Villa Maria maintain a successful workplace culture through their family business models that prioritise intergenerational sustainability and wellbeing.

8.3.6 CONNECTING BACK TO THE COMMUNITY

Pouarua farms encourage locals to visit the farm and cultivate harakeke, planted for water management purposes, which is used for mahi toi. They also have a neighbourhood approach to environmental measures, where they included neighbours in discussions about their approach to greenhouse gas emissions, water protections and nitrogen loss.

Rabobank co-invest with Kiwiharvest to minimise food waste and provide a food rescue service.

8.4 OPPORTUNITIES

Several opportunities were flagged by the businesses and organisations interviewed. Insights from the various companies and organisations showed that Covid-19 has placed pressure on them to maintain their viability, whilst adapting to lessons learnt from the pandemic and make decisions that better prepare them for the future. In response, a number of opportunities highlighted below are areas that the interviewees genuinely believe would improve the state of the sector, but which are deprioritised due to capacity constraints.

8.4.1 MARKET INSIGHTS AND DATA

1. Discourse from the sector shows that markets are extremely important to drive New Zealand's production choices. There is a lack of coordination and understanding about our export markets. Investment in a centre of excellence for consumer insights that can be shared across various parts of the sector specific to different commodities would hugely benefit all parts of the food and fibre sector. This would be welcomed by several industries like wine, seafood, and deer. These industries had to quickly respond to the closure of hospitality and high-value markets around the world from Covid-19, and consequently locate new markets for their product.

2. Data accessibility and interoperability was mentioned several times as a key enabler of performance. The meat industry association believes there is the opportunity to lesson learn from genome sequencing in apple tracing technologies and apply this to meat tracing.

8.4.2 HORTICULTURE

3. There is a significant capability gap in building the knowledge and sharing tools for growers of new horticulture and those wishing to transition their farms to more diverse crops.
4. Developing a comprehensive strategy for the horticulture sector is required to identify areas of potential growth in New Zealand. Such a strategy should address the barriers to realising this growth, opportunities for new horticulture development given changes to climate and import opportunities, capability and information needs to support those wanting to pursue farm conversion and a comprehensive and coordinated approach to labour and innovation to keep the industry relevant and competitive.
5. The horticulture sector also identified a need to ensure domestic market settings are fair and accessible, so that growth of the sector is not constrained by access to market. Tauranga Port noted, that even if we wanted to expand kiwifruit exports, they are very near capacity in terms of volume that can be carried. Given New Zealand's vulnerabilities in our supply chain, logistics for getting these high value perishable goods to international markets would also have to be factored into projections for horticulture growth.

8.4.3 LABOUR MARKET

6. Covid-19 has shown that many of the approaches to sourcing labour in the food and fibre sector were heavily dependent on foreign expertise and hence unsustainable with border closures. There has been underinvestment in food and fibre sector skills, promotion of agribusiness and jobs in the sector as a career and leadership development within New Zealand. It was noted by several organisations that more coordination for funding workforce development programmes would benefit the sector as a whole. This includes expanding the criteria for institutions like Primary ITO to confirm funding eligibility through the Tertiary Education Commission.
7. More creative ideas to address workforce shortages are needed. Accommodation, seasonality of the work, amount of training required, and pay are some of the barriers mentioned by the interviewees. Several organisations see an opportunity for a moveable workforce that is interchangeable with other sectors like tourism. They also see the opportunity to invest in accommodation (such as seasonal accommodation in ski resorts) in particular regions to house seasonal workers, or more flexibility in the university calendar to attract cohorts of students through certain seasonal jobs.
8. In addition to labour shortages, several companies have discussed the impacts of post-Covid-19 leading to burnout for many staff. There are many opportunities to continue investing in flexible work arrangements where possible, technologies to improve workplace efficiency, fostering personal development, recognition and reward and good workplace culture. The sector could benefit from collaborating where possible and partnering with

fellow companies to deliver similar services. Sector bodies could send staff on secondment into policy making agencies to reduce the workload of submissions, working groups and consultation in the policy making process.

8.4.4 REGULATORY CHANGE

9. Entry barriers in the apiculture industry are low. Consequently, the industry has seen supply outstrip demand in some cases with a risk to detracting value from New Zealand honey. Incentives to plant certain trees to produce specific forms of honey are low as boundary stacking frequently takes place, giving way to the free rider effect. The apiculture sector has highlighted the need for regulation, such as through an apiculture act. Such regulation could increase barriers to entry and maintain minimum standards, such as for biosecurity. Such regulation would bring the industry on par with others and potentially contribute to ensuring the true value of honey is realised and equitably distributed. It may also help provide transparency to bee populations in New Zealand and whether they are sufficient to service expected pollination needs.

8.4.5 IMPROVING ON-FARM PRACTICE AND OUTPUTS

10. Almost every organisation or company engaged discussed the opportunities to continually improve on-farm practice. One of the most important opportunities for the wine and chicken industry was to improve diversity of breed and contribute to readiness and response capability building for biosecurity.
11. Water storage was also noted as a constraint on land-use and diversification decision making. Several farmers in the Waikato have signalled interest in the remediation plans for solid energy mines, in the hopes that retired opencast mines can provide some form of water storage for the region.
12. Although the New Zealand narrative has been to increase value, instead of volume, some businesses and organisations are still looking for volume increases. Capacity to increase volume of production has been noted by the deer industry, wine production companies with land capacity and niche new horticulture and milk sectors.

8.4.6 SUPPORTING START-UPS

13. Supporting start-ups with more marketplaces for product incubation should be a priority if we want to encourage innovation in the food and fibre sector. Concerns were raised regarding the pathways for the food and beverage industry to access the domestic market and supermarkets.
14. The Chatham Islands presents a unique opportunity for a new agri-business model of which markets a unique product. The opportunity to learn from King Island, and their "King Island Cream" enterprise would be a scenario worth exploring for the Chatham Islands, especially in utilising fish waste to manufacture into other products, like neutraceuticals.

8.4.7 REMOVING TRADE BARRIERS

15. Apiculture New Zealand believes there is significant opportunity in the honey industry to explore neutraceuticals and other products for non-Mānuka. However, at present the HS code for which we identify non-Mānuka does not provide sufficient detail to differentiate the product. HS code improvements for 'other' honey could increase the value of non-Mānuka honey, honey products and neutraceuticals.
16. Similarly, the deer industry has signalled an opportunity for the Asian market to reap the health benefits of velvet and deer bones if market access can be gained.

8.4.8 IMPROVING ENERGY EFFICIENCY AND COST

17. The cost of energy in rural communities and the availability of renewable sources for processing and manufacturing is a large challenge for the sector. Policy restrictions on natural gas to replace coal leaves limited alternatives for energy sources for process heat. Investment towards the utilisation of biomass produced from farming systems could have the potential to generate capacity to provide sustainable and cost-effective alternatives for process heat.

8.4.9 SUPPLY-CHAIN IMPROVEMENTS

18. The last opportunity that came through for many businesses was the desire to make a more resilient and diverse supply-chain. New Zealand needs to think creatively about how we get our product to market. Covid-19 spurred the move for businesses to diversify their home delivery options, e-commerce and online ordering platforms. Although these methods were relatively successful, global freight congestion is an ongoing problem, with fines for missing delivery deadlines unpalatable for most. Capacity issues still remain regarding securitisation of the cool chain, physical transport logistics and global shipping and airfreight capacity. The opportunity to coordinate several sectors within New Zealand to charter ships, may be the mid-term solution to logistical problems. New Zealand may need to think long-term about investing capital in securing shipping channels, whether that be through investing in our own ship(s) or strengthening more frequent cluster activity with the south pacific.
19. Domestically, increasing the forms of market for the sale and purchase of food and grocery would help diversify over-reliance on two supermarket companies in New Zealand. Investing in physical infrastructure to house permanent or semi-permanent open-air markets is a suggested opportunity particularly for urban centres and provincial cities.

APPLYING THE SCENARIOS ANALYSIS TO AOTEAROA

9 APPLYING THE SCENARIOS ANALYSIS FROM THE WEF

To answer the key research question:

“According to the four potential worlds provided by the WEF (2017), what is the likely scenario for the global food system in 2030 and how can New Zealand position itself to succeed?”

We can apply the New Zealand context as discussed in section 8 of this report which covers evidence from domestic food and fibre organisations and businesses about current priorities and future opportunities, and the literature review in section 3 that discusses:

- the current global economic context including new economic frameworks which take into account the Earth's resources and planetary boundaries;
- current global aspirations for the food and fibre sector heading towards 2030;
- the domestic economic and market context; and
- domestic aspirations for the food and fibre sector.

The WEF asks key questions under their scenario analysis regarding demand shift and market connectivity (as per section 3):

demand shift – questions focus on the types of food people demand. The primary test whether food is produced in an environmentally and ethically sustainable way, with minimal food waste that is nutritious and healthy.

market connectivity – questions focus on the degree of free-flowing international trade, trust in global markets, the sharing of intellectual property and innovation and access to capital for smaller farm holders.

In the New Zealand context, signals show a shift towards improved environmental on-farm practice and the economic capacity to transition to more ethical, higher value production. It is likely that by 2030, New Zealand will move towards resource-efficient production, which will also reflect shifts in demand habits as resource-efficient consumption has become a key trend in a number of our international markets. However, in terms of market connectivity, although New Zealand relies on a fully integrated global trade system, given the economic impact of Covid-19 on the rest of the world, it is possible that market connectivity may not be as open as anticipated in 2030. This can largely be linked to the increased use of protectionist trade policies and public funding to protect local producers in a number of New Zealand's key international markets.

It is likely that, based on the WEF Scenario analysis, 2030 will represent a world which has reasonably shifted toward the scenario “local is the new global” and “resource-efficient consumption.” As noted below in figure 11.

The Scenarios: Four Potential Future Worlds

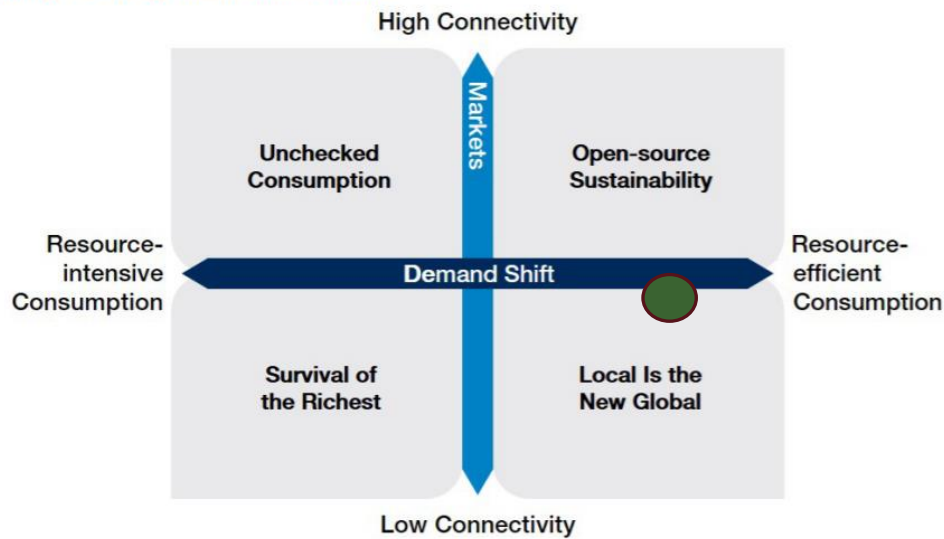


Figure 11: Four potential worlds as per WEF, 2017 with likely global scenario based on insights

9.1 EARLY SIGNS THAT A SIGNAL TO THIS SHIFT IS A REALITY

The two scenarios that favour resource-efficient consumption; “open-source sustainability” and “local is the new global” are further developed in the WEF scenario descriptions through describing the early signs that signal a shift will occur to the various realities. Using the information in this report, assumptions about whether these signals are likely can be made. These early signs and assumptions are detailed below in table 7 and 8.

Open-Source Sustainability	Assumption based on status quo
New and effective checks and balances and measures are in place (<i>including regulations in capital markets and technology.</i>)	Deprioritised for many world Governments based on economic recovery packages.
Food loss and waste decrease to 5% of global production.	Requires significant redesign of food systems, infrastructure, coordination, and technology. Unlikely.
There is greater access to capital for farmers in developing countries.	Unlikely given global economic outlook, however, this depends on countries' economic recovery policies yet to be determined.
Climate metrics and broader accounting regulations are in place – including net-zero deforestation.	Feasible to reach climate metrics and accounting, however incentives to stop deforestation and replant are misaligned in current global context.
Private sector agriculture R and D investment growth has decreased and slowed innovation due to open-source information creating a disincentive for long-term R and D.	Unlikely, as very far from open-source information and a connected economy.
There is a reduction in urban migration.	Data shows that urban migration is slowing but will continue for most of the world.
A broad shift in refugee policy prompts a transition from aid to economic transformation in the urban and rural environments.	Unlikely, Governments are currently focussed on domestic economic recovery following Covid-19 pandemic.

Table 6: Early signs that a shift to open-source sustainability is occurring (WEF, 2017)

Looking at the assumptions put forth by the WEF, it is clear that New Zealand, and the world are not inching towards the signals that will embrace open-source sustainability. In this scenario, the percentage of the population that is malnourished has reached an all-time low. The economic fallout and inequality created by Covid-19 will likely not lead to a future where malnourishment is a thing of the past.

9.1.1 CLIMATE

The scenario in table 7 predicts that climate change is partially mitigated, there is strong global cohesion and adaptive efforts are well underway. Food systems are resilient as civil society and institutions are strong, and market connectivity enables food redistribution where climate shocks occur.

Evidence would suggest that New Zealand may meet these assumptions through work underway to mitigate carbon in various industries and improve the data and incentives to make informed decisions that benefit the environment. However, it is unlikely that at a global scale, where inequality is still exceptionally high and further exacerbated by high debt levels following the Covid-19 pandemic, that other nations will move toward this future as quickly.

Mutual benefit from a connected world on climate action is achieved through strong civil society institutions and international organisations. Given the geopolitical shifts between China and the US, increased shifts towards populism and increased vocalisation of social inequalities such as the 'black lives matter' movement, it is unlikely that the extent of international collaboration and shared best practice for climate change mitigation will occur on the anticipated scale this scenario predicts.

9.1.2 HEALTH

The scenario in table 7 predicts that policies, business practices and social marketing efforts have increased the accessibility and desire to consume healthy, nutritious food and decreased the affordability and desirability of animal-based protein, foods high in salt, sugar and fat.

In New Zealand, domestic food security and access to affordable healthy food remain significant and growing issues. Engagement with the sector did not show any specific shifts towards focussing on nutritional content rather than yield. Although several industries alluded to improving value through quality, a lot of this emphasis was put on branding or story telling rather than investment in health research to design food and beverage products towards meeting medicinal claims. Engagement with the sector showed that many producers and distributors believe retailers hold the majority of levers to impact on the domestic cost of food in New Zealand.

The consumption shifts noted in table 7 could signal that New Zealand's pastoral products may be affected. AFFCO and other meat producers think not – they are seeing a rise in meat consumption, food insecurity projections and a need for healthy protein. New Zealand companies are not necessarily worried about this shift from an export perspective, but domestic red meat consumption may change based on trends towards more ethical consumption.

9.1.3 TECHNOLOGY

This scenario also predicts that technology and data is openly shared through strengthened cooperation and a careful balance of regulation and innovation. It predicts that technology is

affordable and available and that traceability across the value chain is standard. New Zealand is making moves towards this future, however, the lack of data sharing within New Zealand and within industries is a signal that to achieve this on a global scale, is very unlikely.

Local is the new Global	Assumption based on status quo
There is a decrease in multilateral trade (<i>rise in bilateral agreements, and a downshift in global trade growth forecasts</i>).	Likely – An increase in bilateral agreements and increasing protectionist policies for food are pointing towards this scenario.
There is a rise in local, traditional diet movement globally.	Occurring in New Zealand and around the world although New Zealand is still poised to be a dominant exporting nation.
Governments have set and carefully adjusted prices on carbon and water.	Underway.
Development partners' food aid budgets diminish.	Likely, given debt levels of global nations.

Table 7: Early signs that a shift to “local is the new global” is occurring (WEF, 2017)

In this scenario, the implications for nutrition in the world are mixed, consumers in regions with high productive capacity enjoy healthy diets, but a disconnected market limits others. It is hard to know whether markets will become more disconnected when countries look to implement their economic recovery policies and whether these will favour bolstering domestic agricultural production or enabling existing and increased trade. However, it is evident in the New Zealand context that there are inequities in diets of particular socio-economic groups and access to affordable nutritious food, without significant market disconnection.

9.1.4 CLIMATE

This scenario predicts that the environmental impact of food production is reduced. As the shift towards shorter food chains and more resource-efficient consumption minimises the environmental impact. Evidence from New Zealand growers and producers would suggest that this future scenario is very likely. A preference to know provenance from farm to plate, eat local and support local is helping shape this potential future. A lack of access to foreign markets could make certain regions more vulnerable to climate shocks as they remain isolated in a disconnected market. New Zealand is investing in resilient supply chains and in maintaining market connectivity, it is unlikely that climate shocks would impact on food security for New Zealanders as production volumes are also genuinely high, however, due to the country's reliance on primary sector exports, significant climate shocks could significantly impact on New Zealand's production and hence follow through to overall GDP.

9.1.5 HEALTH

Based on insights from food and fibre businesses within New Zealand, there is very little activity occurring to favour local production and steer away from exports, however, food sovereignty for Māori has become an increasingly important issue. Due to the inequalities in accessing nutritious healthy food in New Zealand, many iwi owned agribusinesses are putting in place strategies to ensure food resilience of their people and promote food sovereignty. An increase in lifestyle block landowners has seen a proportion of smaller producers positioning themselves towards meeting local demand.

9.1.6 TECHNOLOGY

In this future, entrepreneurs are working in silos in disparate markets reducing the impact that innovation is able to have for the world's poorest. Smallholder farmers however are better off relatively as there is local demand for their produce, which empowers local food sovereignty and economic opportunity. Global labour shortages in the food and fibre sector have accelerated the incentivisation to adopt and create new technologies. It is highly likely that these technologies will favour advanced economies and leave developed economies behind due to the concentration of existing capital, and the concentration of existing labour largely residing in poorer nations.

10 CONCLUSIONS

10.1 WHAT DOES THIS MEAN FOR NEW ZEALAND?

Taking into consideration the likelihood that the world is moving towards more resource-efficient production and consumption preferences, with a shift towards supporting local production, New Zealand needs to position itself well to meet the demands of the international market where trade will still be preferred.

The WEF (2017) state that “new and bold smart policies are needed to redesign food systems, with opportunities to adopt a ‘whole of government’ approach to integrate the true costs of food systems; link food, agriculture and environmental policies to healthy diets; and create an enabling environment for inclusive technologies.”

They also state that, “social and ecological priorities should be at the centre of redesigned food systems, including efforts to address structural inequality and meet basic needs, influence new dietary norms and aspirations, and elevate the needs of future generations.”

These aspirations should be rapidly adopted by New Zealand, in line with the SDGs and the UN definition of a sustainable food system.

10.2 RECOMMENDATIONS

To meet the WEF aspirations and definition of a thriving food system as efficient, sustainable, inclusive, nutritious and healthy, the New Zealand food and fibre sector should seek to focus on the opportunities as noted in section 8.4 of this report and explore the below recommendations.

1. **Taking action towards initiatives as set out in the sectors' *Fit for a Better World* roadmap** - A number of opportunities and actions underway signalled by the sector are supported and prioritised in the *Fit for a Better World* roadmap. The sector should embrace the roadmap and take forth initiatives whilst embracing a systems approach, so that productivity, sustainability and inclusivity can be achieved.
2. Positioning New Zealand products for the best markets and understanding the rapid changes within them is key to our ongoing success. Co-Investment between industry organisations, the Ministry for Primary Industries, and New Zealand Trade and Enterprise (NZTE) in a **centre of excellence to share market insights** and improved data coordination and access would significantly improve New Zealand's market position.
3. As noted in *Fit for a Better World* (2020) **removing trade barriers and maintaining market access** is crucial for New Zealand's food and fibre sector. The industry signalled this as a high priority. If New Zealand is to enhance its technological capacity in cellular and health-based foods, appropriate ethical and environmental standards must be developed by the Government to keep up with the changing food system and international market

consumption trends and expectations. The sector requires consistency when it comes to standards, the Government must work quickly to determine what the international market is defining as sustainable, healthy and ethical to appropriately replicate this in New Zealand's regulatory environment. Markets such as China are no longer trusting a product, based on its provenance from New Zealand (Agribusiness Agenda, 2021). It is therefore more important that we invest in standards, science, and evidence to justify the quality of New Zealand products.

4. **Developing a fit for future horticulture system and supply-chain** is crucial.

- a) New Zealand has competitive advantages in horticulture due to being relatively free from pests and diseases, and having suitable water, soil and climate suitability for a variety of cultivation. The *Fit for a Better World* roadmap looks to develop a horticulture strategy. In specific, to leverage New Zealand's competitive advantage, focus should be given to the identification of new commercial opportunities for native flora, of which have particular health benefits such as kawakawa.
- b) New Zealand will always have significant distance barriers and be largely dependent on a tight supply and cool chain to support growth in horticulture exports. To improve resilience of the sector, the horticulture sector could shift investment towards exporting intellectual property for valuable varieties of existing New Zealand production such as apples and onions. This will require new forms of business models, as noted in the agribusiness agenda (2021), which are structured to sell technology and intellectual property for food production systems rather than physical food.
- c) Policies should incentivise growers and producers to import new varieties of fruit and vegetables that will be suitable for New Zealand's future climate and soil conditions. New Zealand should look to similar geographic partners like Chile and Argentina to collaborate and lesson draw to enable the growth of new industries like lucuma, custard apple, nuts and olives. The *Fit for a Better World* roadmap identifies emphasis on the Government increasing its processing capacity for import health standards, however, it does not depict how these will be prioritised. Prioritisation of import health standards in line with enabling new product development and new varieties should be prioritised.
- d) The Ministry for Primary Industries can work with New Zealand Trade and Enterprise to incentivise land diversification to new horticulture. This could be achieved through targeting investment into capability building and subsidising growers and producers wanting to pursue new growing opportunities on-farm and opportunities with novel food products such as fungi and algae. It is important that key agencies such as NZTE assist these new horticulture growers with pathways to market (whether domestic or international) to increase the scale of new horticulture in New Zealand.
- e) Net migration for New Zealanders continues to shift towards urban centres. Urban sprawl is impinging on highly productive soil and new environmental regulations are also putting a strain on land-use capacity. Although new horticulture and diversification from Dairy are still important to achieve economic and environmental outcomes, New Zealand business, universities and Government have the opportunity to work more closely together to innovate. Directing investment towards greenhouse, harvesting, health and lab growing

technologies will improve the efficacy of New Zealand's food production systems for the long-term overall.

5. **Pursuing new / innovative structural changes to the food and fibre labour market** - The fallout from the Covid-19 pandemic has shown weaknesses in New Zealand's labour market model for the food and fibre sector. Skills shortages across all sectors and all disciplines have been experienced, exhibiting the food and fibre sector's overexposure to offshore labour. A full system reset needs to be considered, starting from education right through to accommodation provision and cross-sector workforce capacity.
 - a) Agribusiness, agriculture and horticulture science should be on offer throughout the majority of New Zealand tertiary institutions and universities. Some high schools are able to offer agriculture and horticulture science as an NCEA subject. For those that cannot, ensuring that agriculture and horticulture are incorporated into mainstream geography, economics or science curriculums should be prioritised to raise the profile of the profession. In lifting the profile of the profession, this will improve the perception of skills that the industry currently demands. As skills are generally quite specialised in the food and fibre sector, value must be reflected by remuneration.
 - b) New Zealand also needs to rethink the way that we supply accommodation for a seasonal workforce. Industries may need to consider whether they work together and invest in university style halls of residence for a seasonal workforce that is interchangeable with other seasonal industries such as agriculture, tourism and education. A network of such accommodation across the country, with sophisticated coordination efforts could improve mobility of the workforce. The flexibility of the workforce to shift regions when necessary, could help address seasonal needs in multiple locations.
6. **Proposing regulatory change for industries likely to experience market failures such as honey** - The Government must work to keep regulatory systems fit for purpose and match the amount of disruption occurring in markets. A priority industry for New Zealand likely to experience market failure is the honey industry. New Zealand Government should consider an apiculture act to appropriately regulate activity in the industry and increase barriers to entry so that market equilibrium can be maintained. This will ensure New Zealand honey can maintain quality and value.
7. **Supporting marketplaces for start-ups, novel products and new horticulture** - Investment in novel products and new horticulture requires appropriate marketplaces to sell these products. Covid-19 also showed that New Zealand supermarkets hold significant market power in domestic product incubation and therefore the early success of food businesses in New Zealand. To fully support the success and growth of new products, the New Zealand Government (Ministry of Business, Innovation and Employment) should consider the appropriateness and economic viability of creating regulations or incentives that guarantee shelf space in all supermarkets for New Zealand products. Further work will need to be done here to ensure that supermarket business models remain viable.
8. **Taking action to adapt food supply chains and improve supply chain resilience** - A resilient and cohesive supply-chain is crucial to the success of New Zealand food and fibre sector businesses. At a community level, in addition to supermarkets, communities and local authorities must ensure that local markets are able to operate safely in a Covid-19 world.

- a) Safe space for local produce and products to be sold physically can improve community resilience and access to healthy food. Investment by industry bodies and businesses in e-platforms, and digital marketplaces will provide an extra layer of resilience for many New Zealand food businesses.
 - b) If large New Zealand businesses are able to achieve advanced levels of collaboration, with support of the Government, and if required our trans-tasman allies, investment in a small shipping fleet should be considered. At present, New Zealand companies are chartering private vessels to ensure product can reach the market. If we could progressively own these parts of the supply-chain, this would further enhance the economic viability, business certainty, and resilience of New Zealand's supply-chain.
9. **Increasing the availability and affordability of nutritious and healthy food on the domestic market** - To achieve transformational change, New Zealand needs to ensure healthy and nutritious food is produced and can first and foremost be accessed by all New Zealanders. New Zealand's food and fibre sector is primarily focussed on meeting international markets' needs, improving the value of their product and exporting. The inclusive element to growth, largely focuses on employment and equitable distribution of the economic benefits. In a future state world where local consumption and production will still be highly valued, the food and fibre sector could position itself to better serve the needs of the domestic market and focus more effort on providing access to healthy, nutritious food. Such repositioning would promote a healthy and prosperous nation, improve wellbeing and help address food security. (Noting that the Child Poverty Action Group (2019) has identified 1 in 5 children in New Zealand experience significant food insecurity).
- a) The Agribusiness Agenda (2021) talks about pioneering food business to doctor models. This relies on increasing health research to help understand how nutrition can directly be personalised to medicinal needs. The agenda also discusses marketing the health status of New Zealand food to improve value propositions. The change in consumption demands from China regarding healthy food, as noted in section 7.5 demonstrates the real benefits that can be secured from promoting nutritional benefits of our products. Businesses could begin to position more investment towards health and biotechnology, medicinal food research, lab grown products and leverage novel products as mentioned in recommendation 7 and 4 (e), section 10.2.
 - b) The Government also has a role to play in ensuring that New Zealanders can reap the health benefits of locally produced food. Improving nutrition education for consumers and appropriately regulating unhealthy food and food desserts will help to shift consumption patterns towards more nutritious choices. The Government should also explore the feasibility of removing GST from fruits and vegetables for domestic consumption to assist in the affordability of fresh produce. Both these actions will contribute to improvements in the overall wellbeing of New Zealanders.

This analysis puts forth opportunities for leaders to pursue food system transformation to continue to serve New Zealanders and the world through making smart decisions, with environmental and social outcomes at the core. It set out to answer the focal question:

“According to the four potential worlds provided by the WEF (2017), what is the likely scenario for the global food system in 2030 and how can New Zealand position itself to succeed?”

Although, we are yet to see the green recovery policies of the world take hold, through a comprehensive understanding of the New Zealand context, this analysis has concluded that in 2030 our future food system is likely to be resource-efficient, but operate in a partially disconnected global market. Whether this will help to meet the SDG's is yet to be decided.

New Zealand can begin to position its food system to be more efficient, sustainable, inclusive, healthy and nutritious. Domestically, we have the economic and human capital to pursue a new era of business and ways of working to capture market opportunities and invest in health and nutrition, resilient food supply-chains, resource-efficiency and leverage technology to address social and environmental challenges in our food system. We can achieve this by taking into consideration the recommendations in this report.

Our choices – through action or inaction – will determine our path into an uncertain future.

11 RESOURCES

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