Nourishing Resilience: Food Security and the New Zealand Food System

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Faculty of Agribusiness and Commerce

Centre of Excellence in Transformative Agribusiness

LU Excellence Series

March 7th 2024

Overview of the Lincoln University Centre of Excellence in Transformative Agribusiness

The centre aims to be at the forefront internationally of the use of consumer insights, data and knowledge to support the transformation to farm and agribusiness systems that generate greater value from food, fibre and other bio-based products with fewer inputs and a reduced environmental impact.

We work in partnership across the University, Nationally and Internationally to tackle the key challenges facing our food and nutrition systems.

https://www.transformativeagribusiness.co.nz/

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Transformative Agribusiness

Transforming the way value is created by agribusiness

Alternative Energies

Alternative Proteins

Circular Economies

Sustainable Value Chains

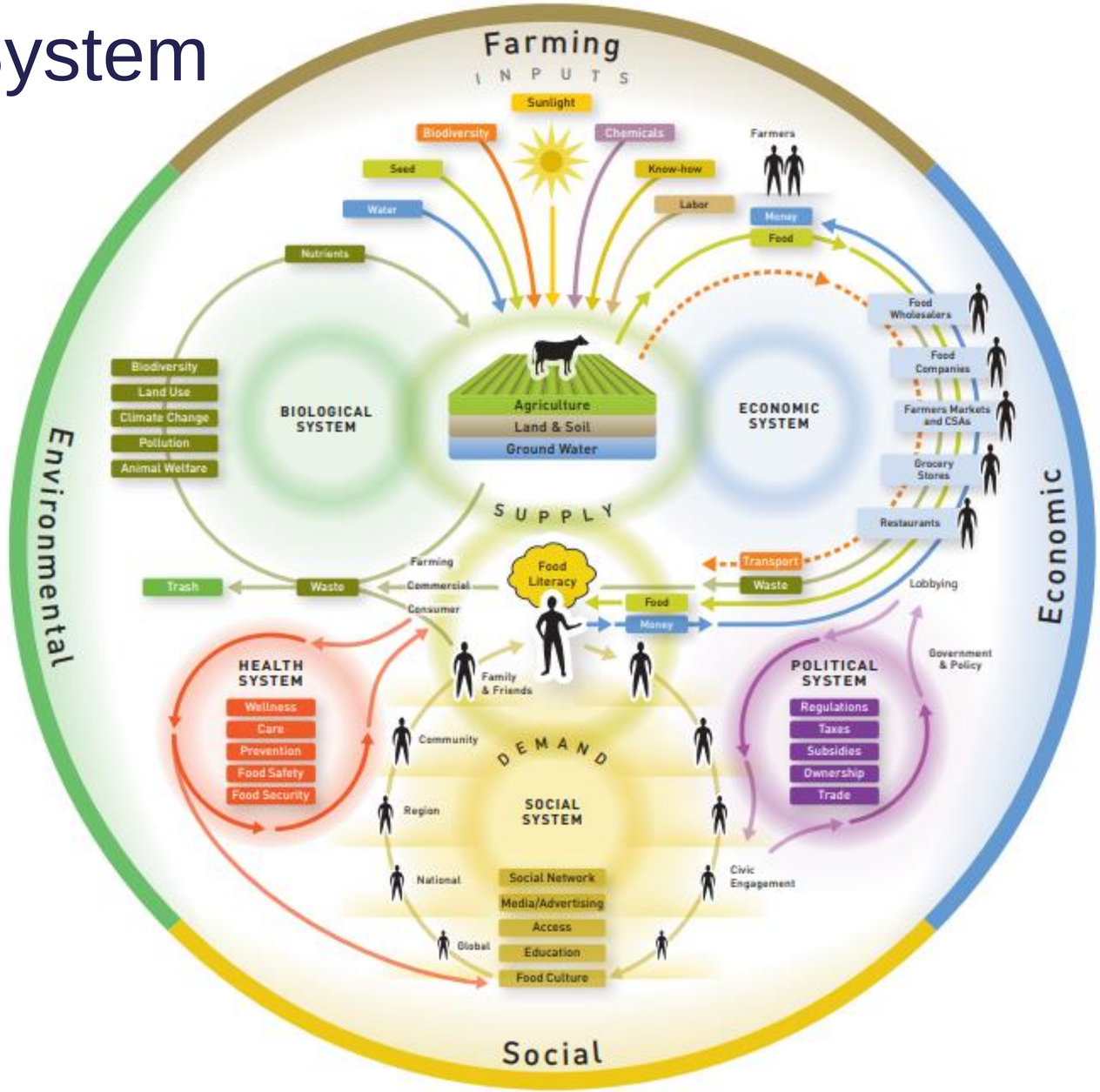
Food Security and The Food System

“Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and. healthy life” FAO

Four Dimensions

- Availability
- Access
- Nutrition
- Stability

‘The fundamental role of New Zealand’s food system is to ensure Food Security for New Zealanders.’ Discuss



Source: Nourish

Availability

- We produce a lot of food!
- What we are not able to produce we can source from imports

Source: Manaaki-Whenua- Landcare

Primary industry exports forecast to hit record $56.2b this year, exceeding estimates

Tina Morrison

June 15, 2023, • 01:29pm 81 Comments Share

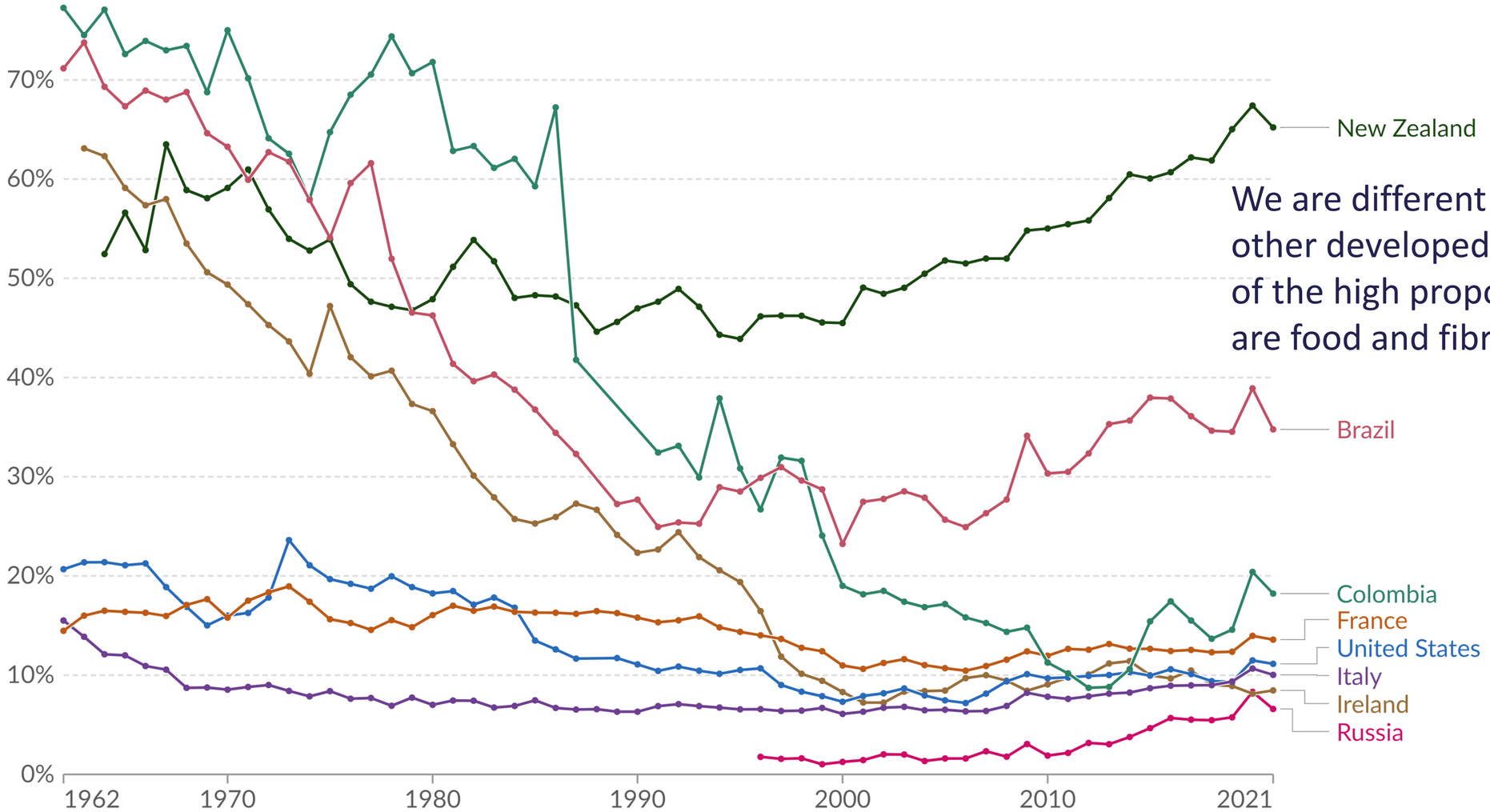
By the numbers: Who is eating all of our food if we make enough to feed 40 million people?

Brianna McIlraith • 05:00, Feb 24 2023

Share of food products in total merchandise exports, 1962 to 2021

Food exports (% of merchandise exports), as per Standard International Trade Classification of products

Our World in Data



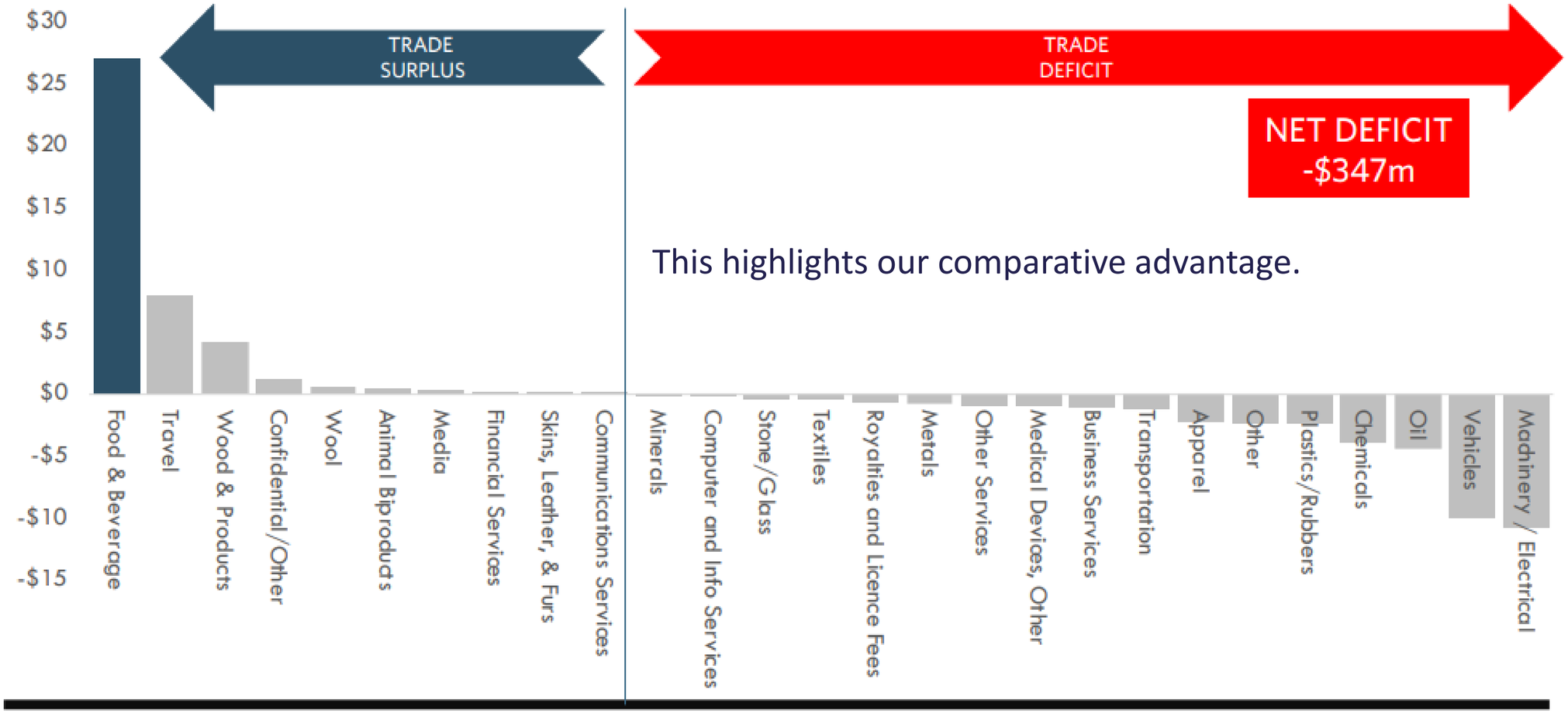
We are different from many other developed countries in terms of the high proportion of our exports that are food and fibre

Data source: World Bank based on data from the World Integrated Trade Solution platform

The food & beverage industry achieves a large trade surplus, while most other sectors are underperforming or in deficit

NET TRADE POSITION IN TOTAL NEW ZEALAND TRADE (EXPORTS-IMPORTS)

NZ$; b; 2017



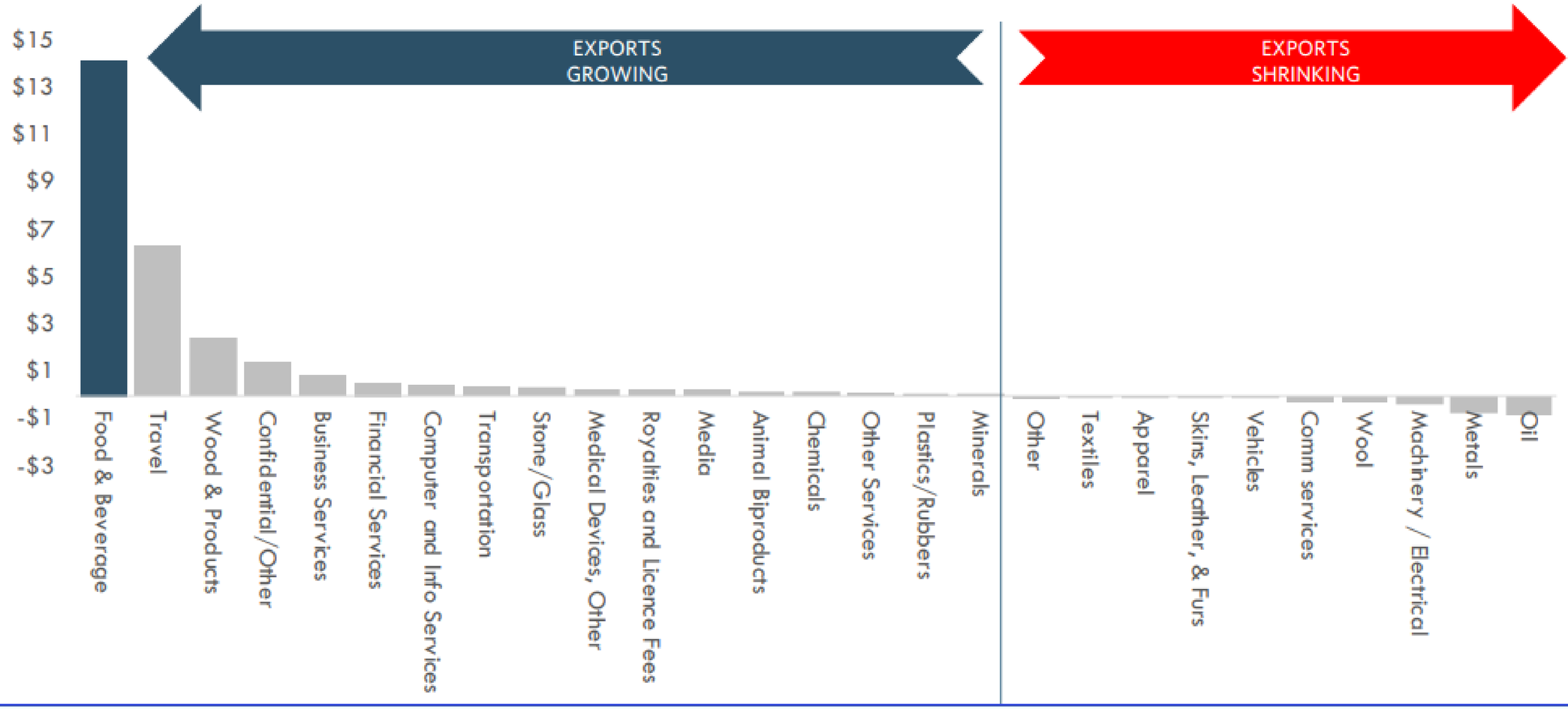
This highlights our comparative advantage.

Source: SNZ; Coriolis analysis and classifications

Food & beverage is growing exports strongly, where most other sectors are underperforming or going backwards

10 YEAR NET CHANGE IN TOTAL NEW ZEALAND EXPORTS

NZ$; b; 2007-2017



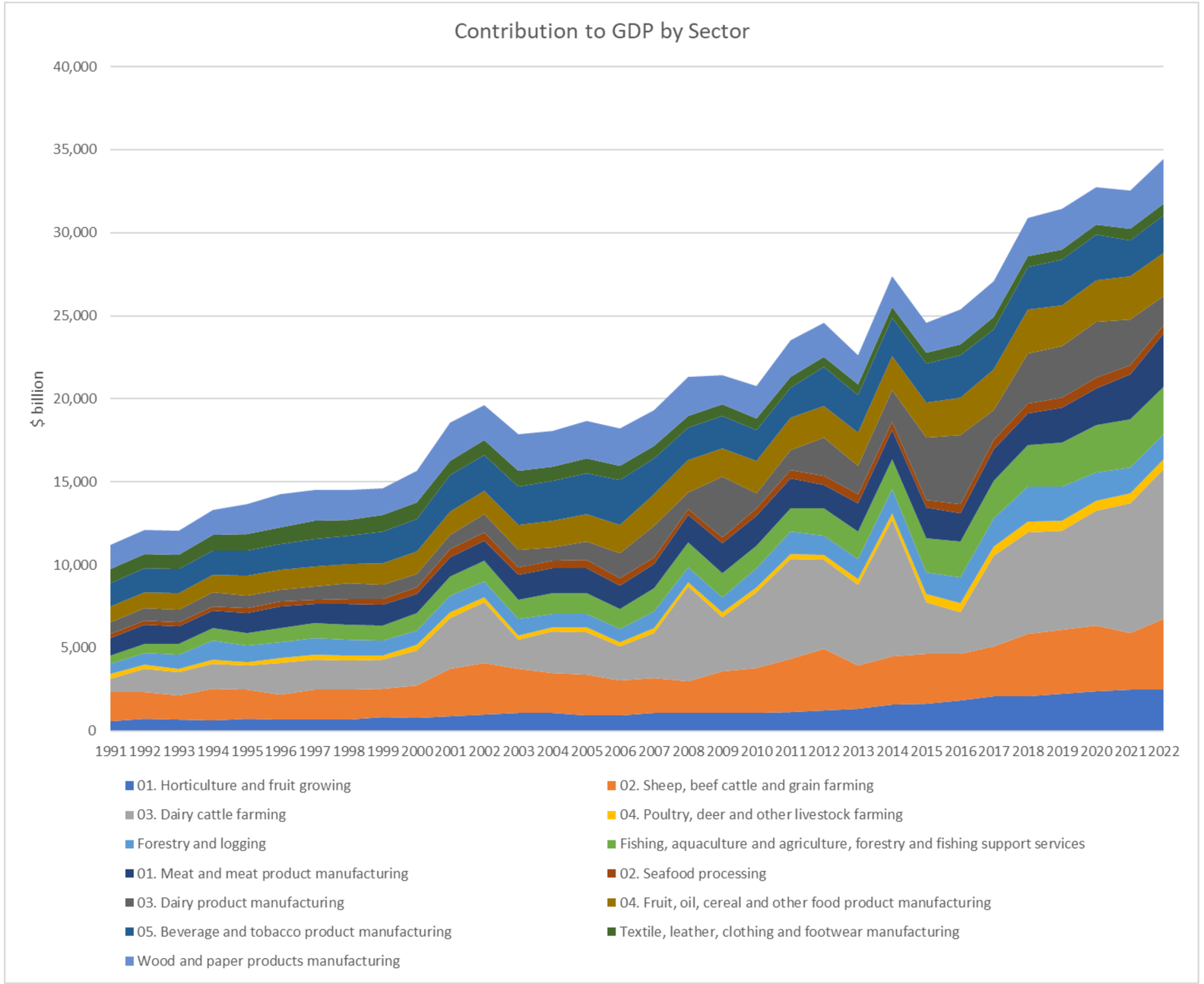
Food and Fibre Contribution to the Economy -

Source: Underlying data from National accounts (industry production and investment) Multipliers from Insight Economics

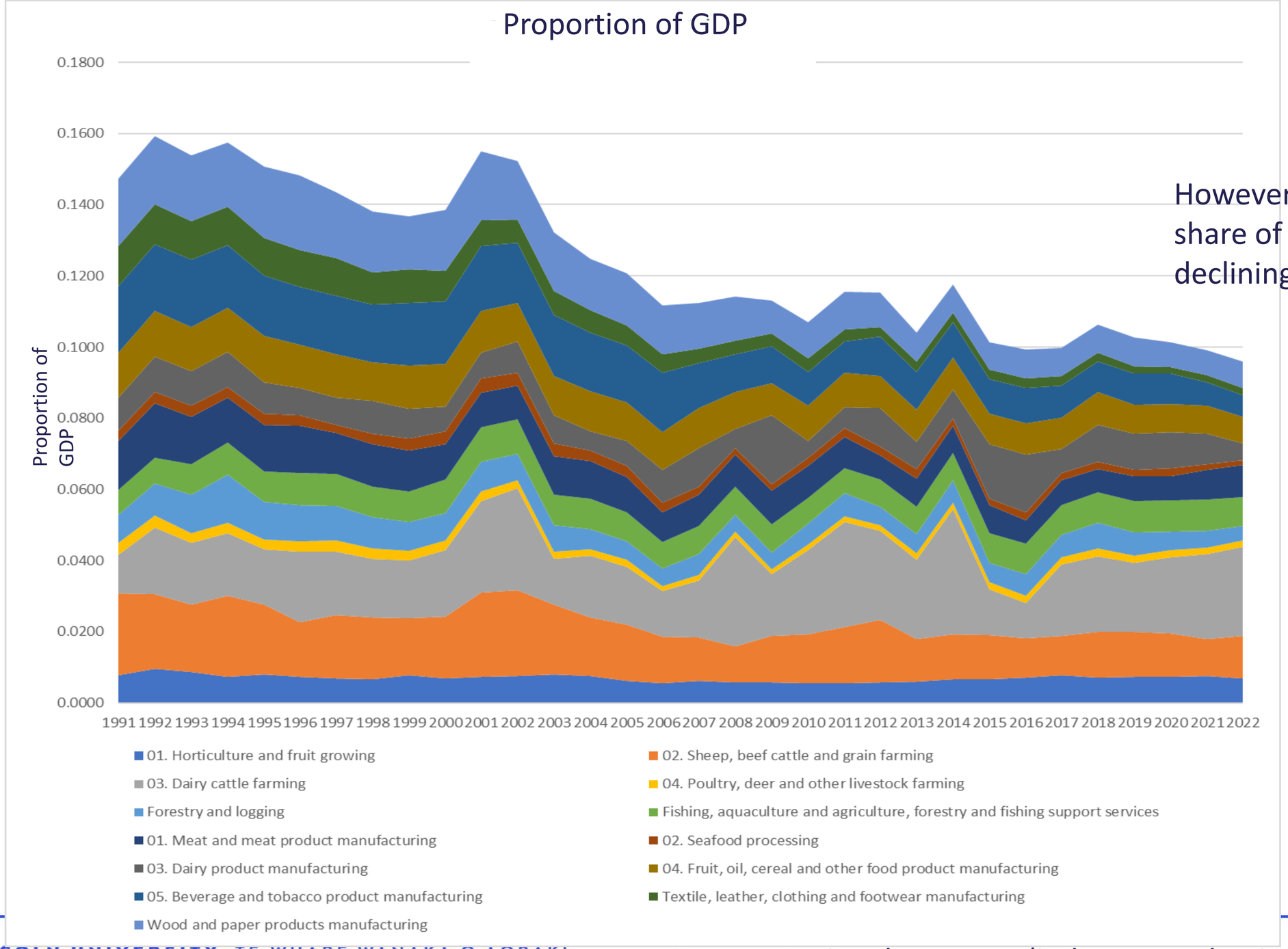
And it is growing…….

Source: National accounts (industry production and investment)

Adding in Processing and Manufacturing



Source: National accounts (industry production and investment)

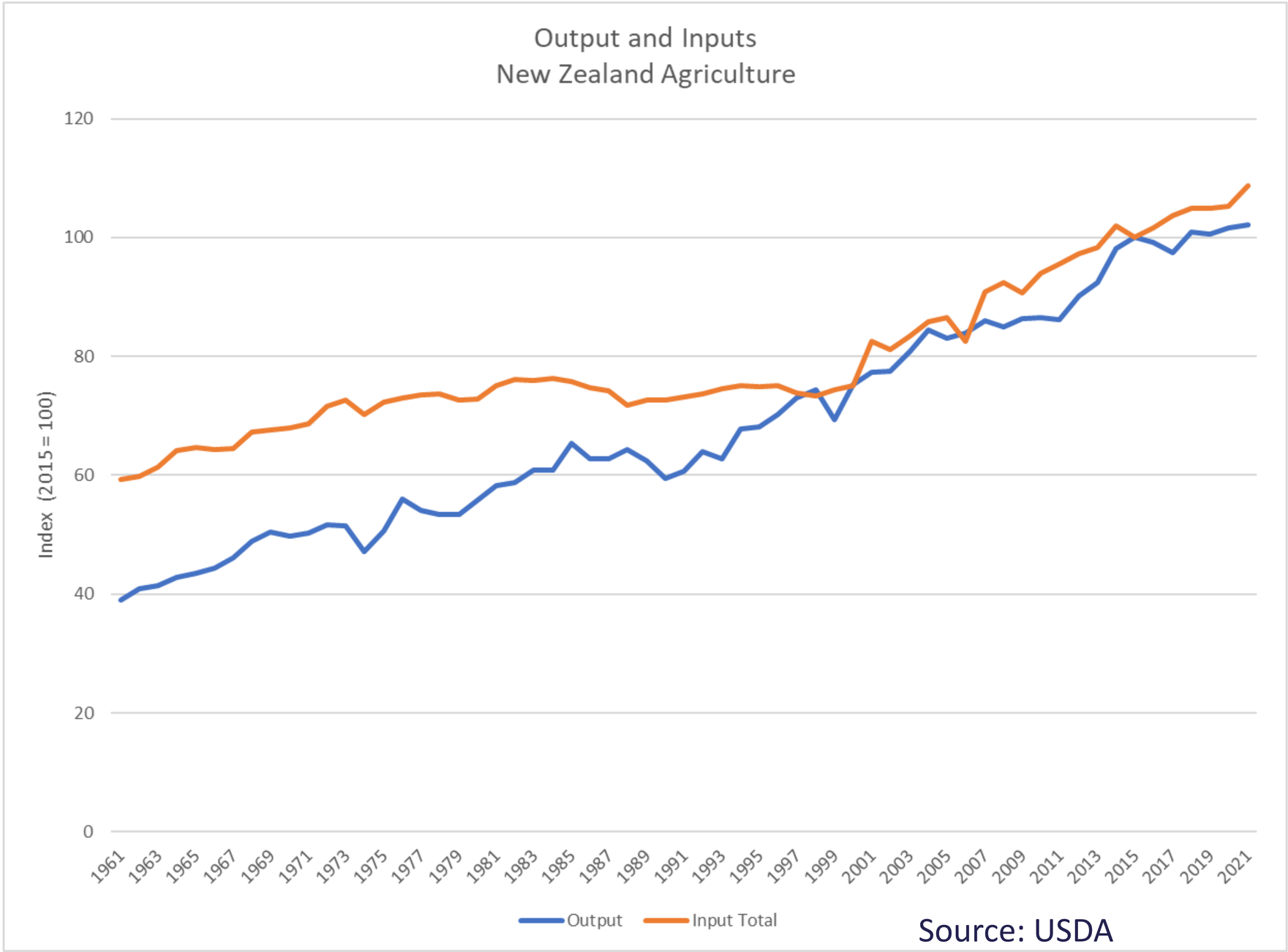


However, of Food and Fibre share of GDP Is declining

Source: National accounts (industry production and investment)

A slight diversion:

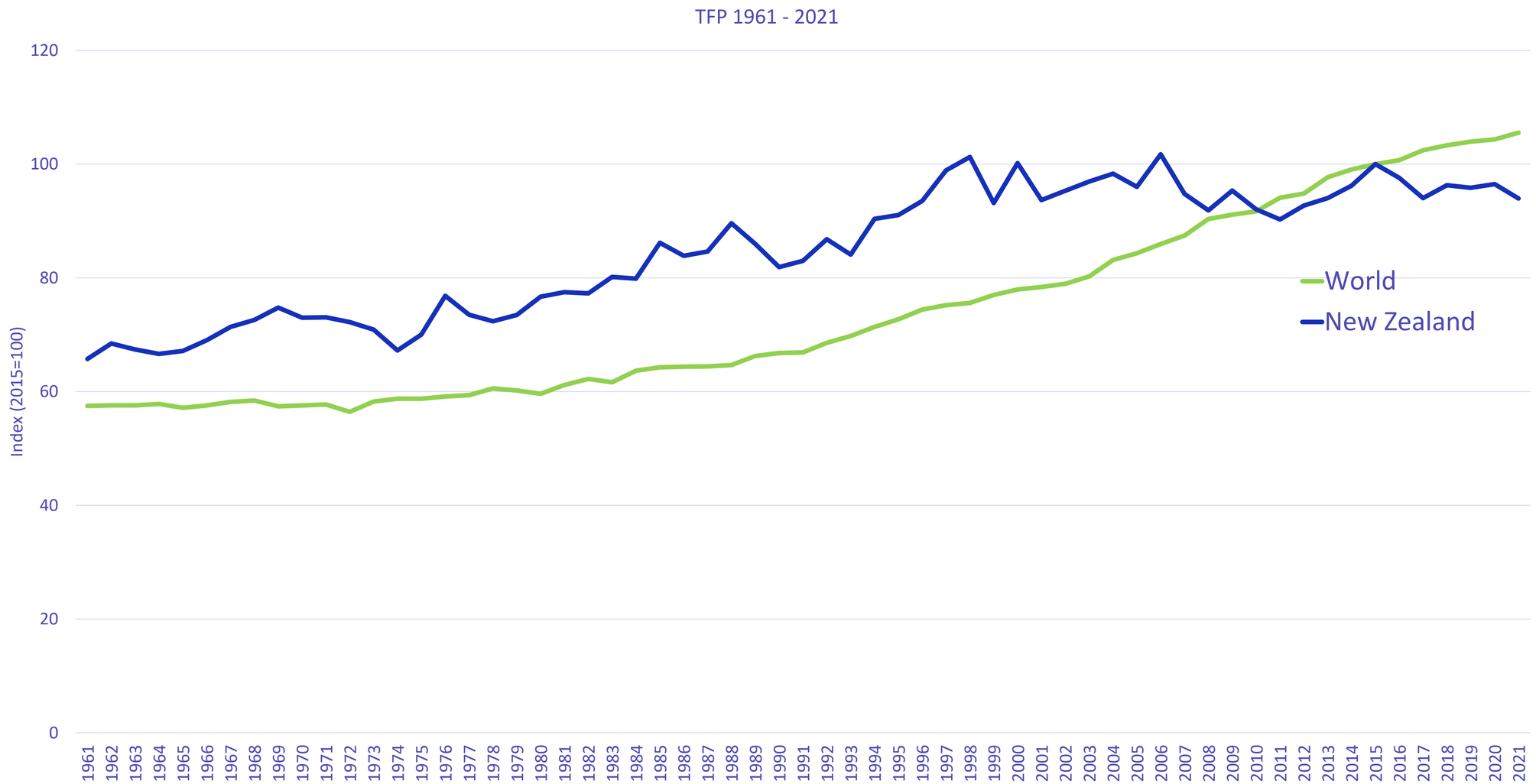
Productivity



Source: USDA

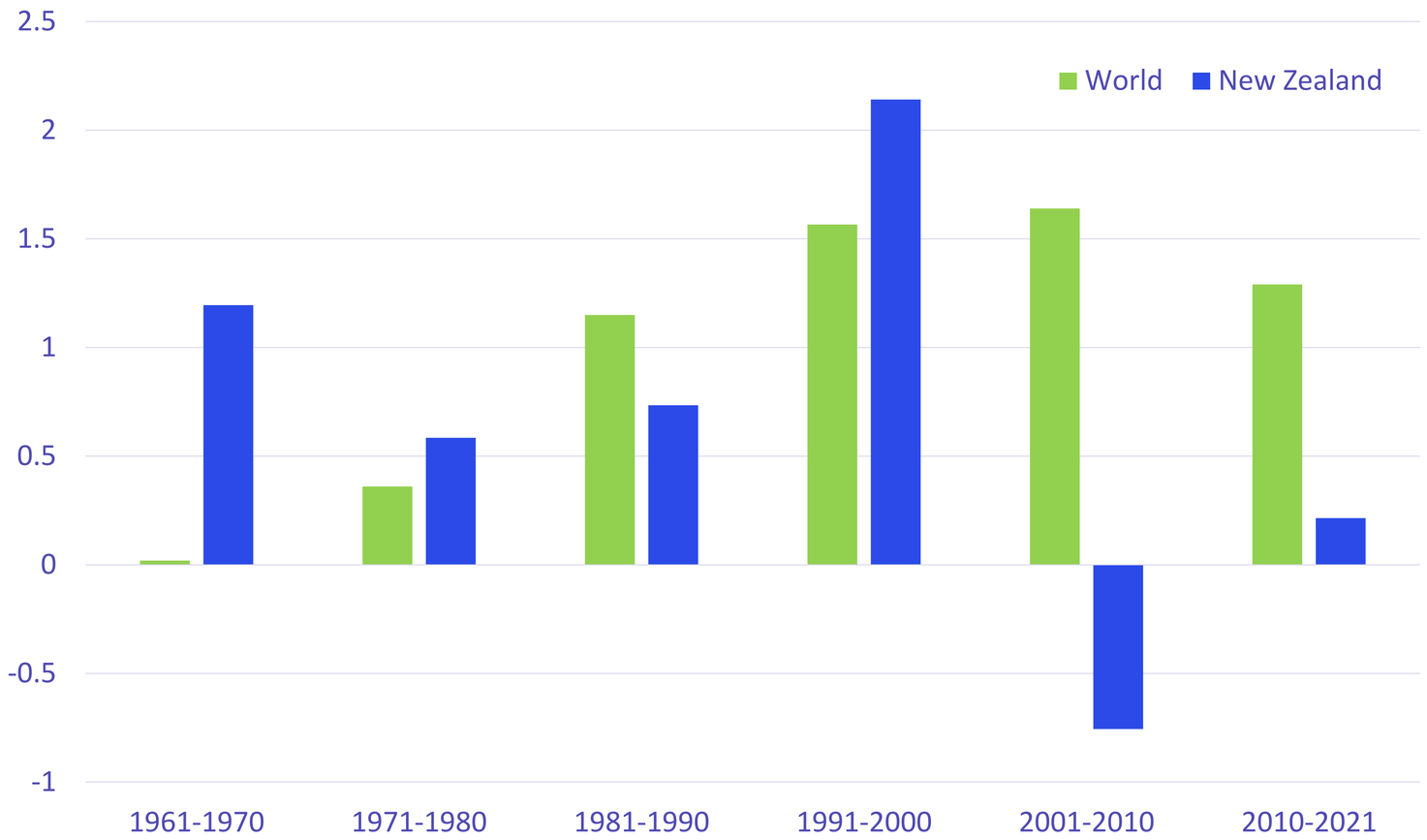
Productivity

Total Factor Productivity (Ratio of Outputs to Inputs) appears to have stagnated in the last 20 years



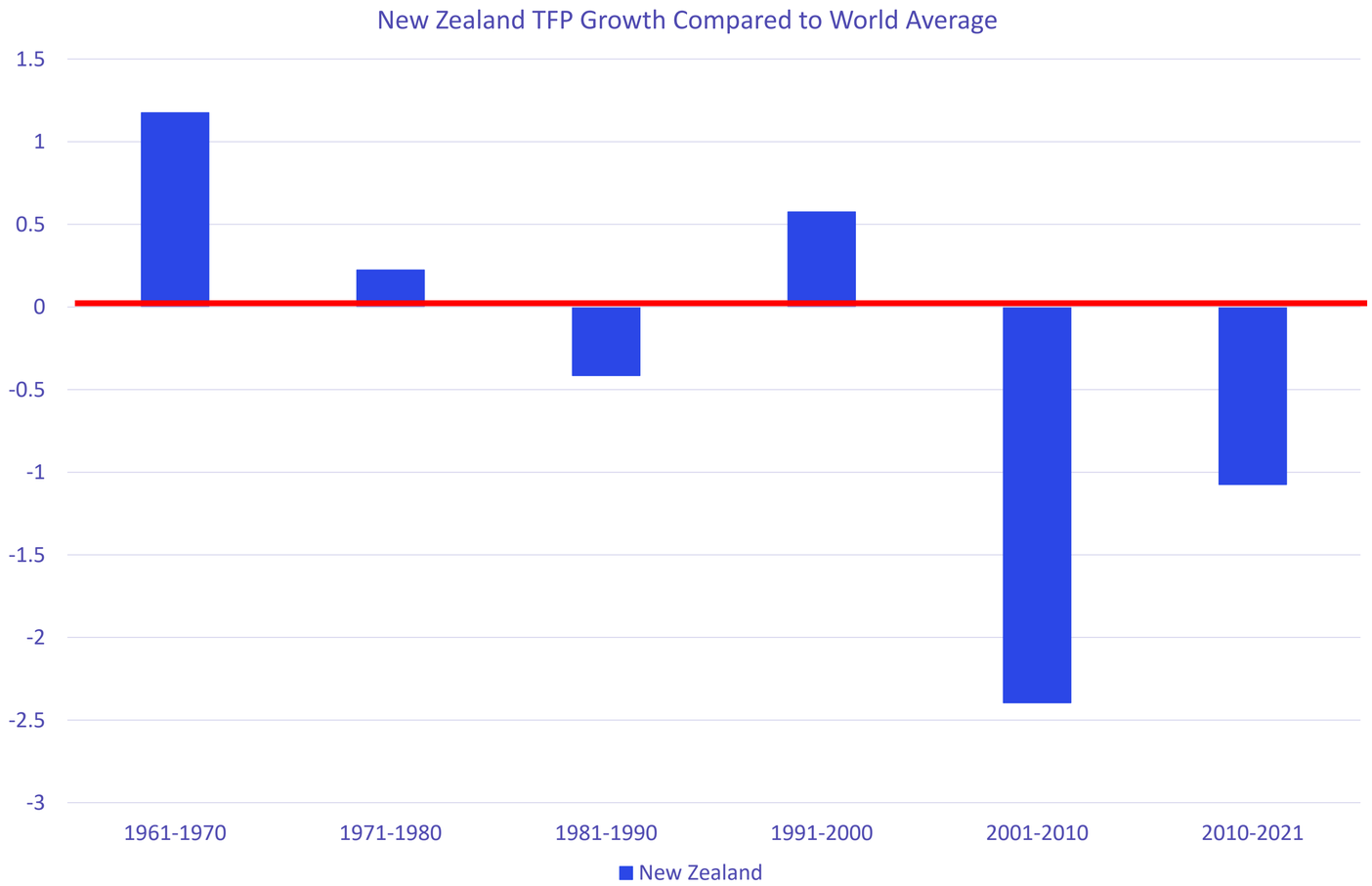
Source: USDA

Average TFP Growth in NZ and World over the last 6 decades



Source: USDA

Difference in Average TFP Growth between NZ and World over the last 6 decades

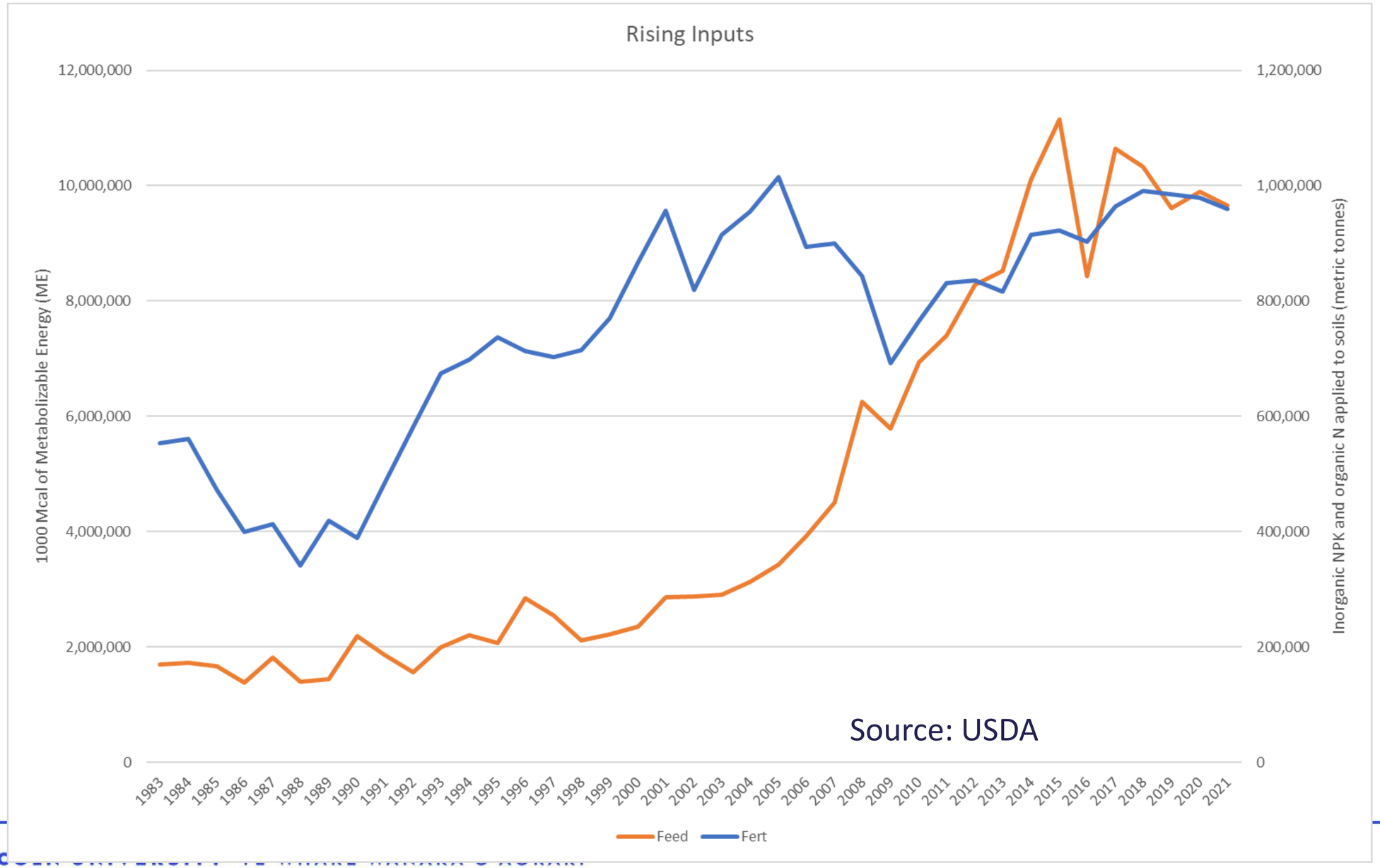


Above the line indicates
NZ growth above world average

Below the line indicates
NZ growth above world average

Source: Derived from USDA

Are we buying output and at what cost?



Inputs have risen significantly

This figure shows increase in Fertiliser and Feed use for example

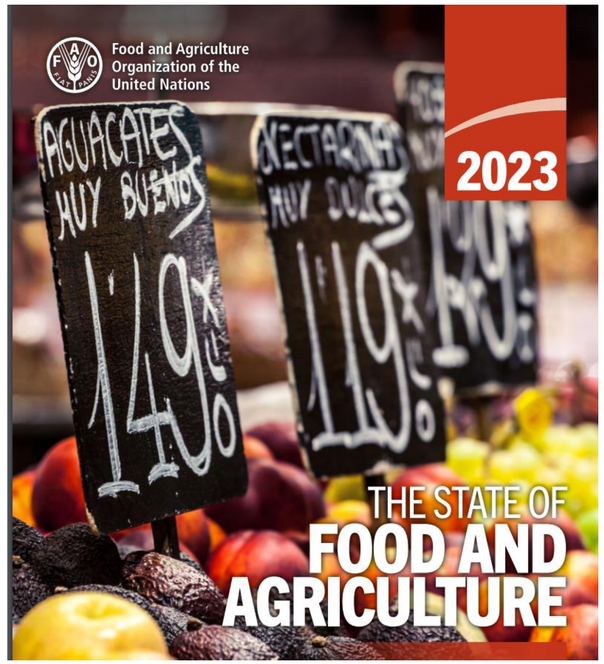
Success come at a price: Pushing Against our Boundaries?

New Zealand has had a successful growth model based on traditional farm enterprises

However, according to the OECD (2017), the country is experiencing:

- water scarcity and quality issues,
- very high per capita greenhouse gas (GHG) emissions,
- threats to biodiversity, and
- significant erosion.

Hidden (or maybe not so Hidden) Costs



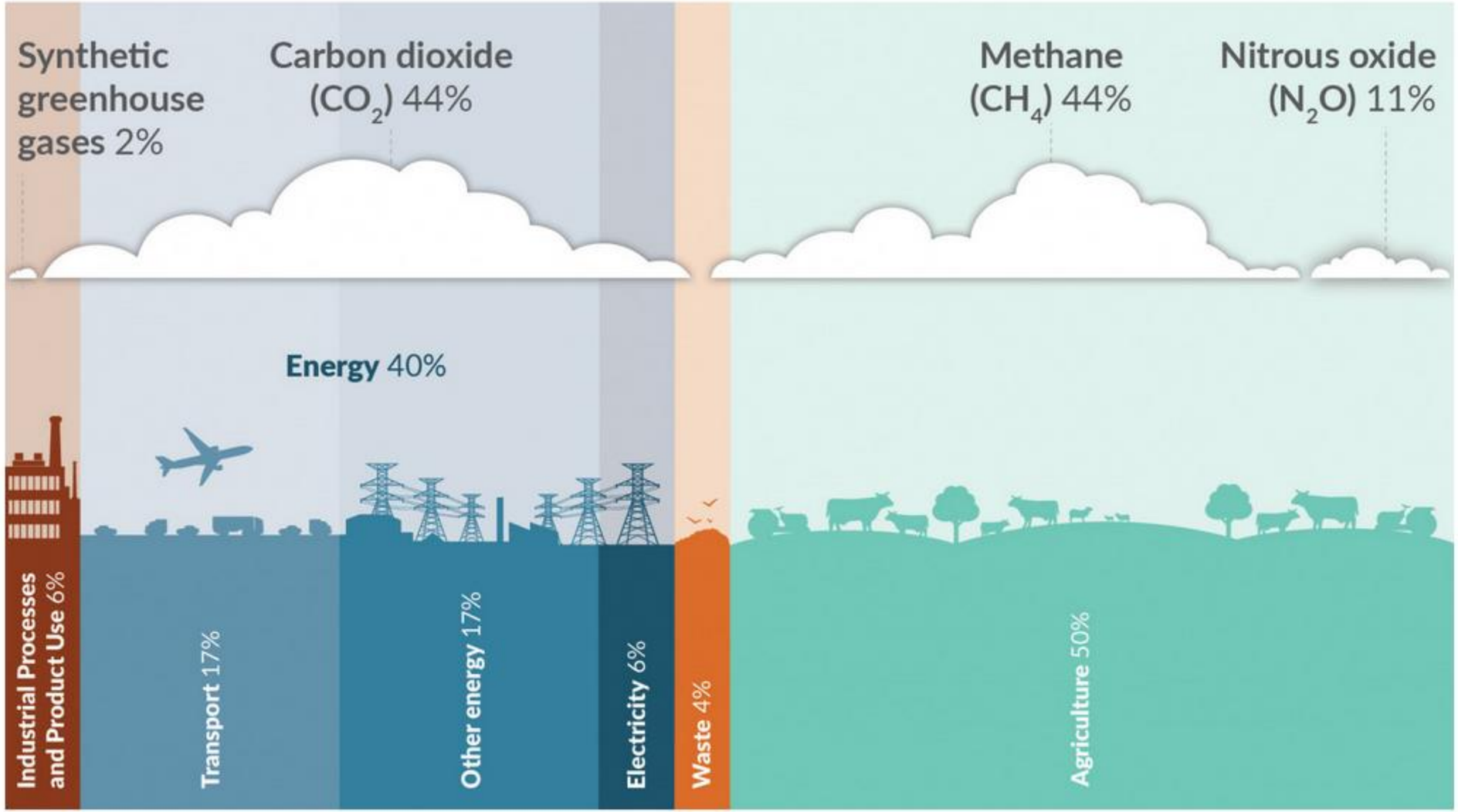
FAO estimates of ‘Hidden Costs’ of NZ Food Production

New Zealand	
Total	-38% 22,007 66%
Environmental	-63% 9,887 100%
Climate ⓘ	3,228
Blue water withdrawal ⓘ	11
Land ⓘ	-173
Nitrogen ⓘ	6,821
Social	N/A
Agrifood worker poverty ⓘ	N/A
Burden of disease (undernourishment) ⓘ	N/A
Health (unhealthy dietary patterns) ⓘ	-36% 12,119 45%

Source FAO 2023

Note: The ranges on the right represent the uncertainty in the quantified hidden costs. At the centre of each range is the expected value in 2020 PPP dollars (millions). On the left-side of the expected value is the lower range (95% chance of exceeding this value) and on the right-side is the upper range (5% chance of exceeding this value). Ranges are expressed in percentage terms relative to the expected value and capped at 100% for visibility purposes

Diversification for Climate Change: Mitigation

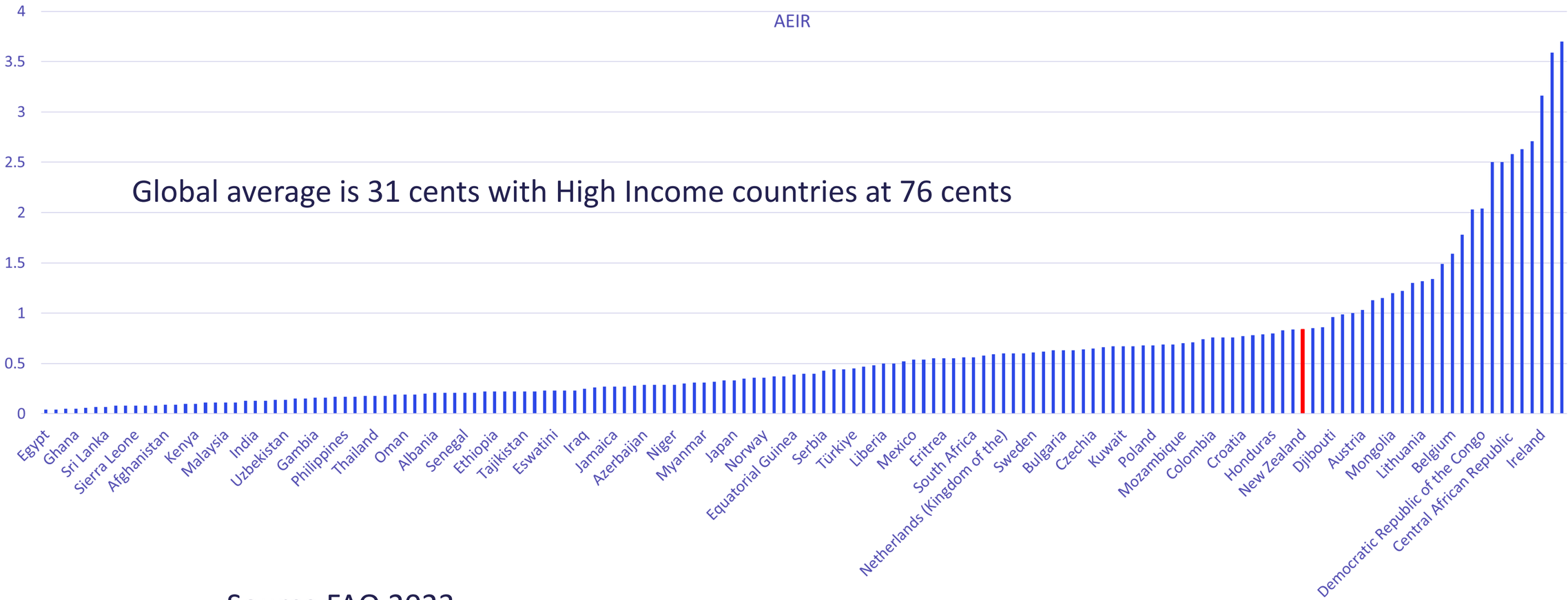


New Zealand's gross greenhouse gas emissions by sector and gas type in 2020

https://environment.govt.nz/publications/new-zealands-greenhouse-gas-inventory-1990-2020-snapshot/#key-findings-of-the-2022-inventory

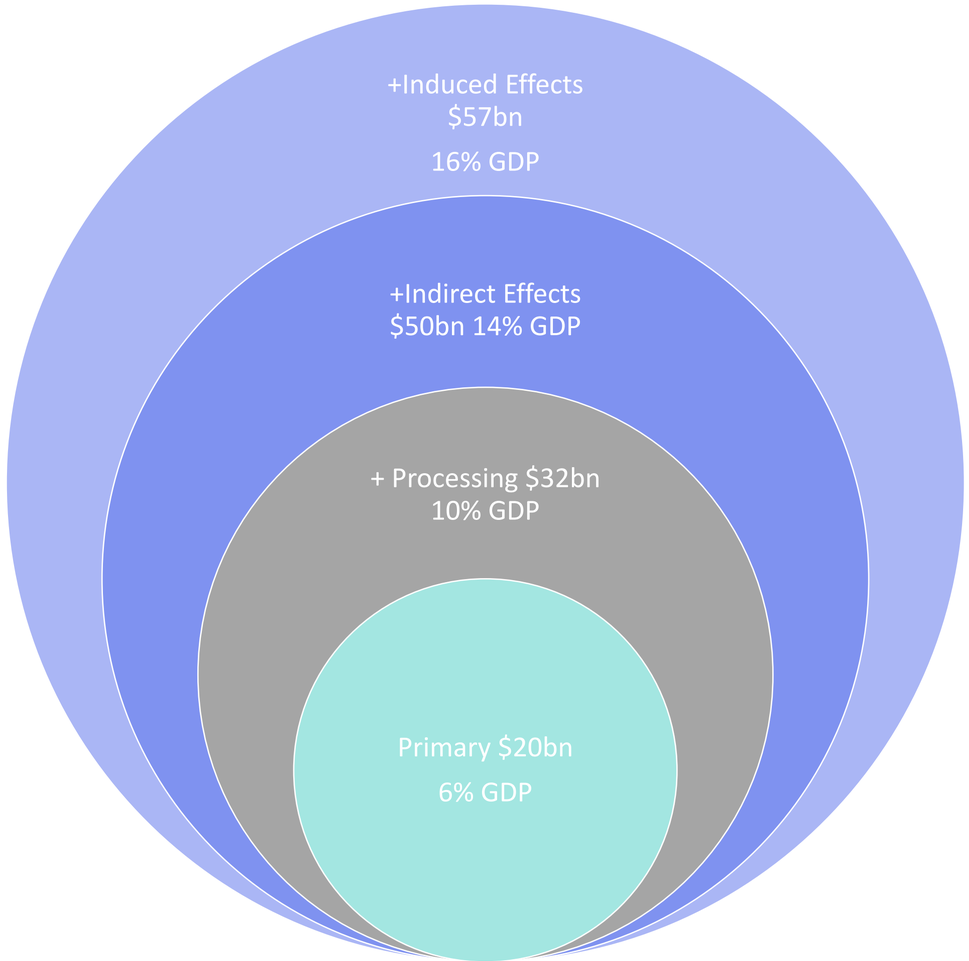
Hidden Costs of Food: Where does New Zealand sit?

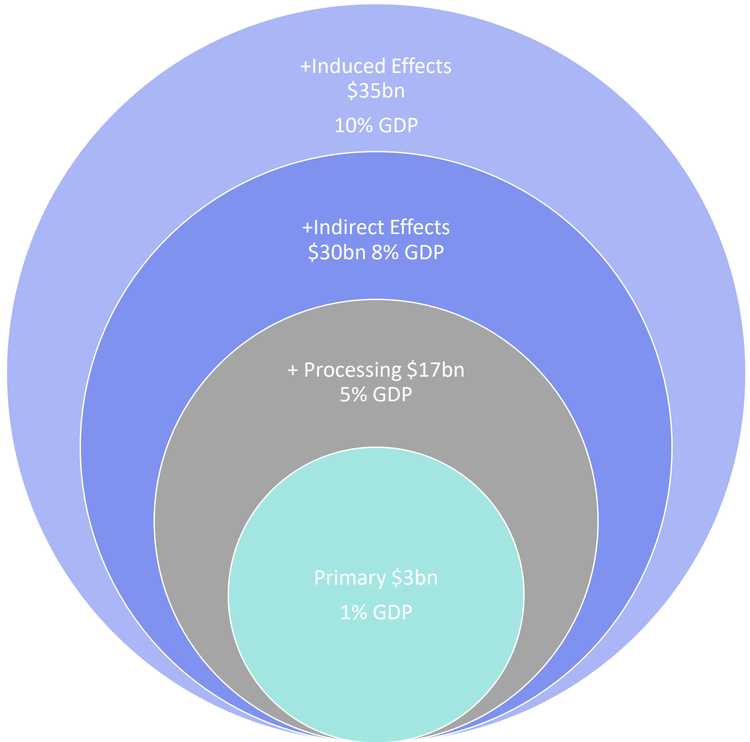
According to FAO report for every dollar of value added from food sector, there are 84 cents of hidden environmental costs in New Zealand



Source FAO 2023

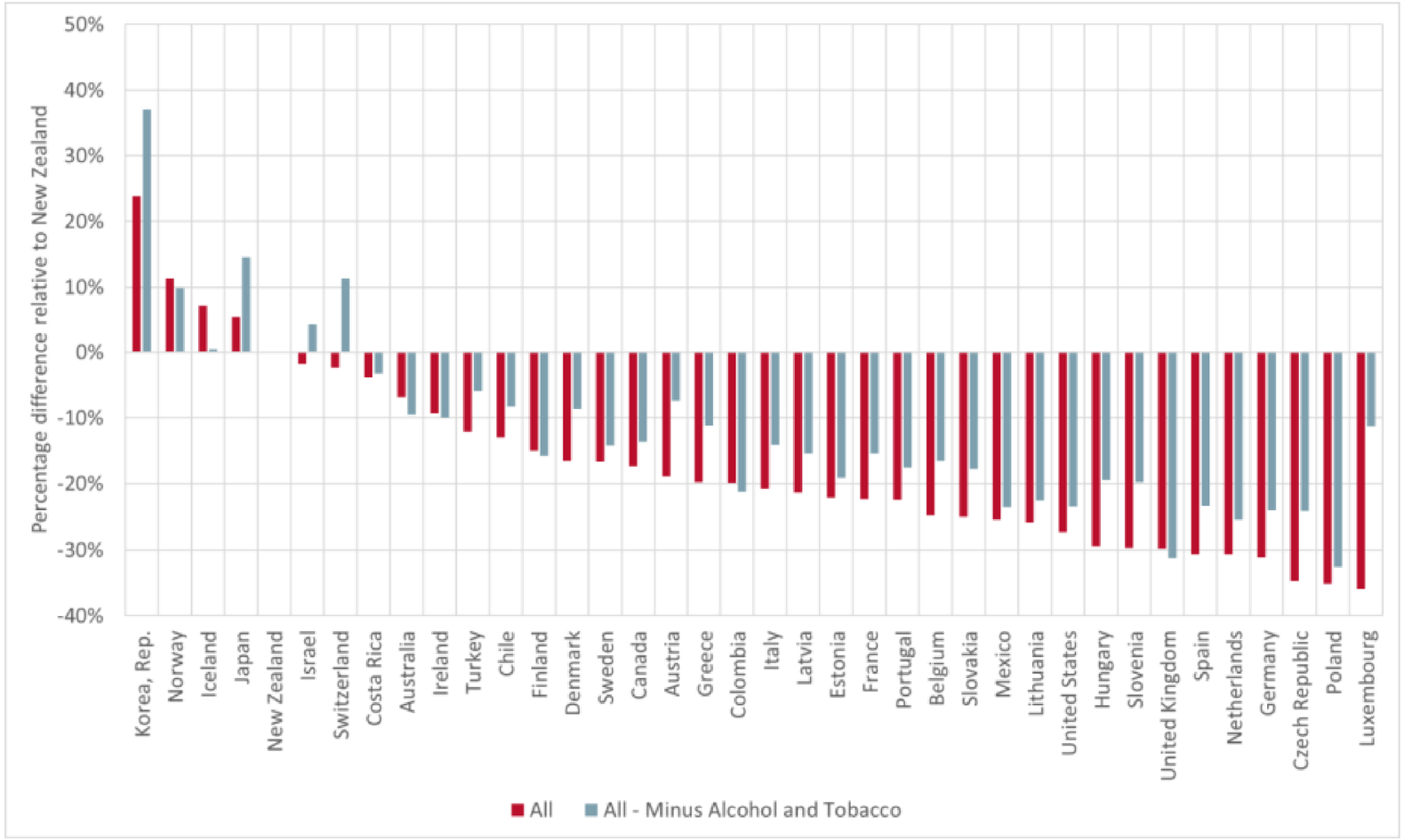
Food and Fibre: If we subtract these ‘hidden environmental costs’ from the value added then the contribution of the sector to the economy declines





Access: Price of Food and Incomes

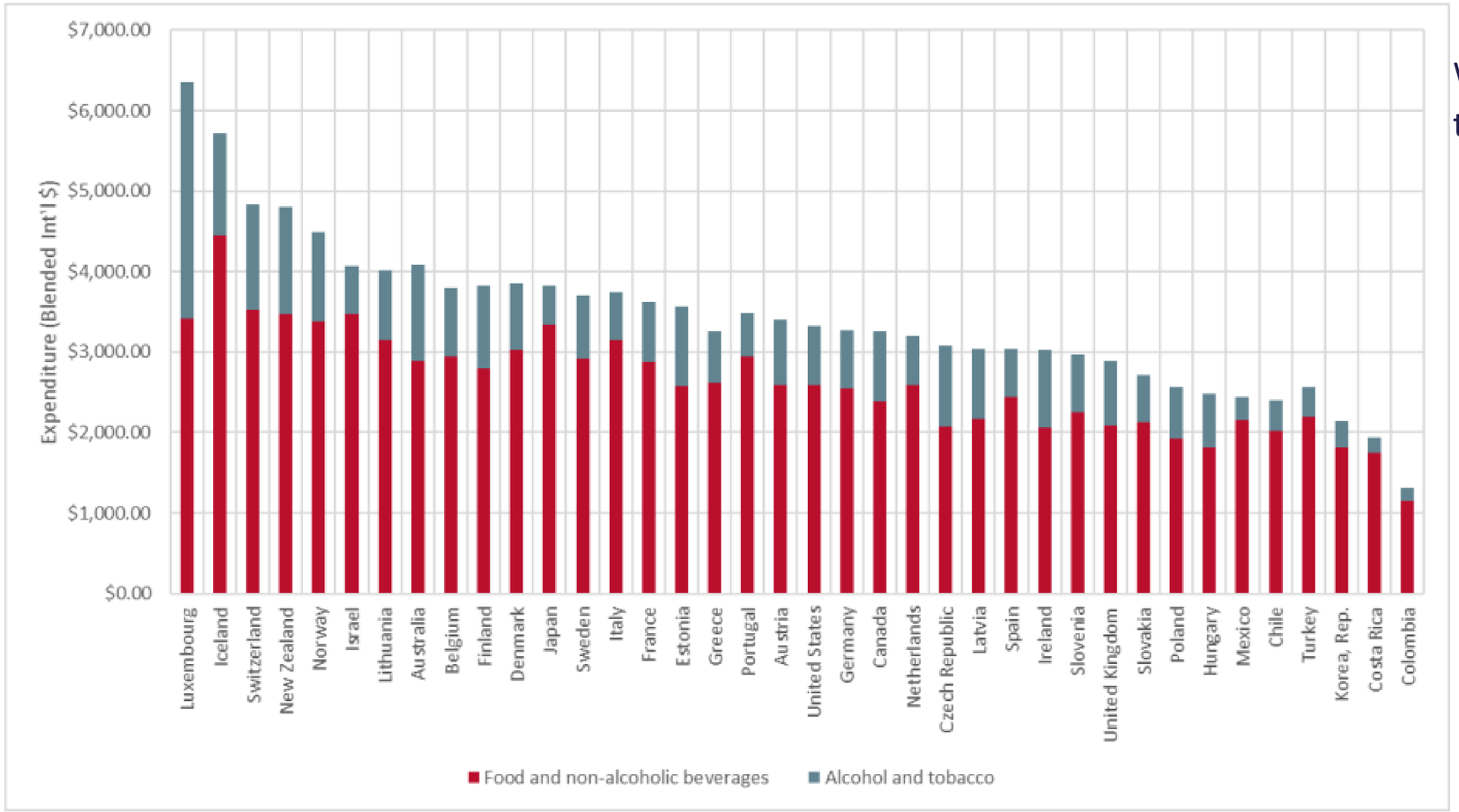
Figure C5 Percentage difference in grocery prices, inclusive and exclusive of alcohol (NZ = 0, blended, 2017)



Source: Commission analysis of OECD dataset.[1425]

We have high food prices in NZ compared to many OECD countries

Figure C6 Per capita grocery expenditure, inclusive and exclusive of alcohol (USD, 2017)

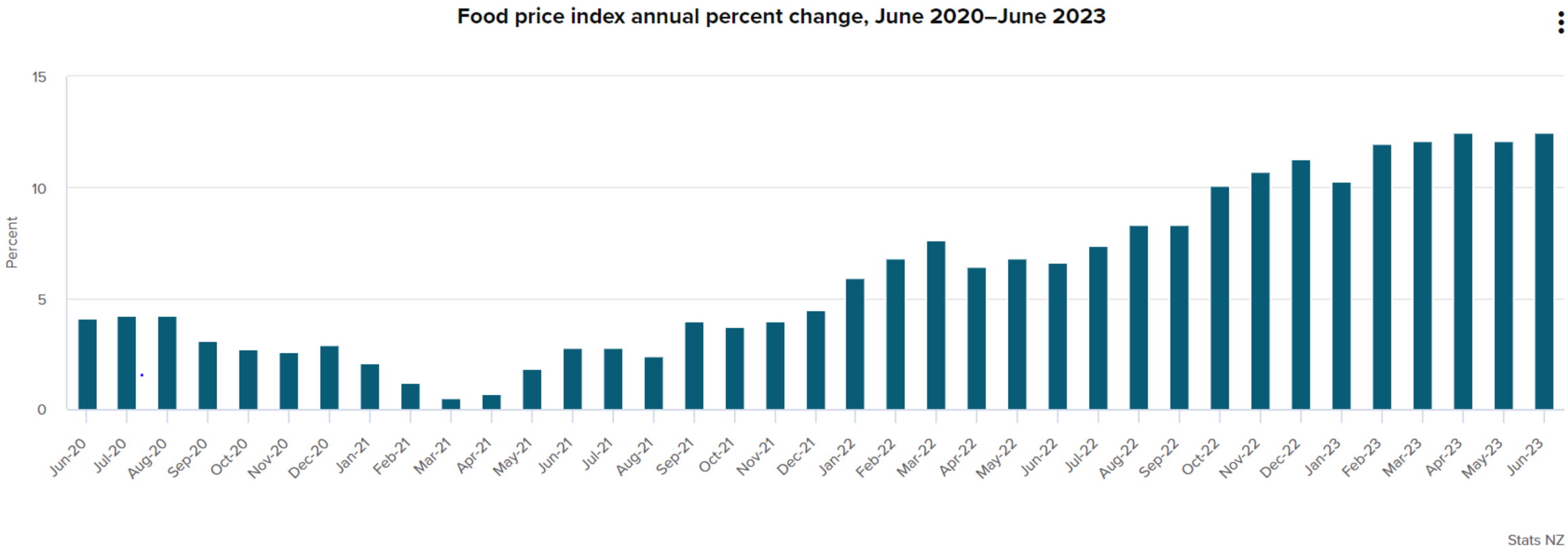


We spend more per person on food than many OECD countries

Source: Commission analysis of OECD dataset.[1426]

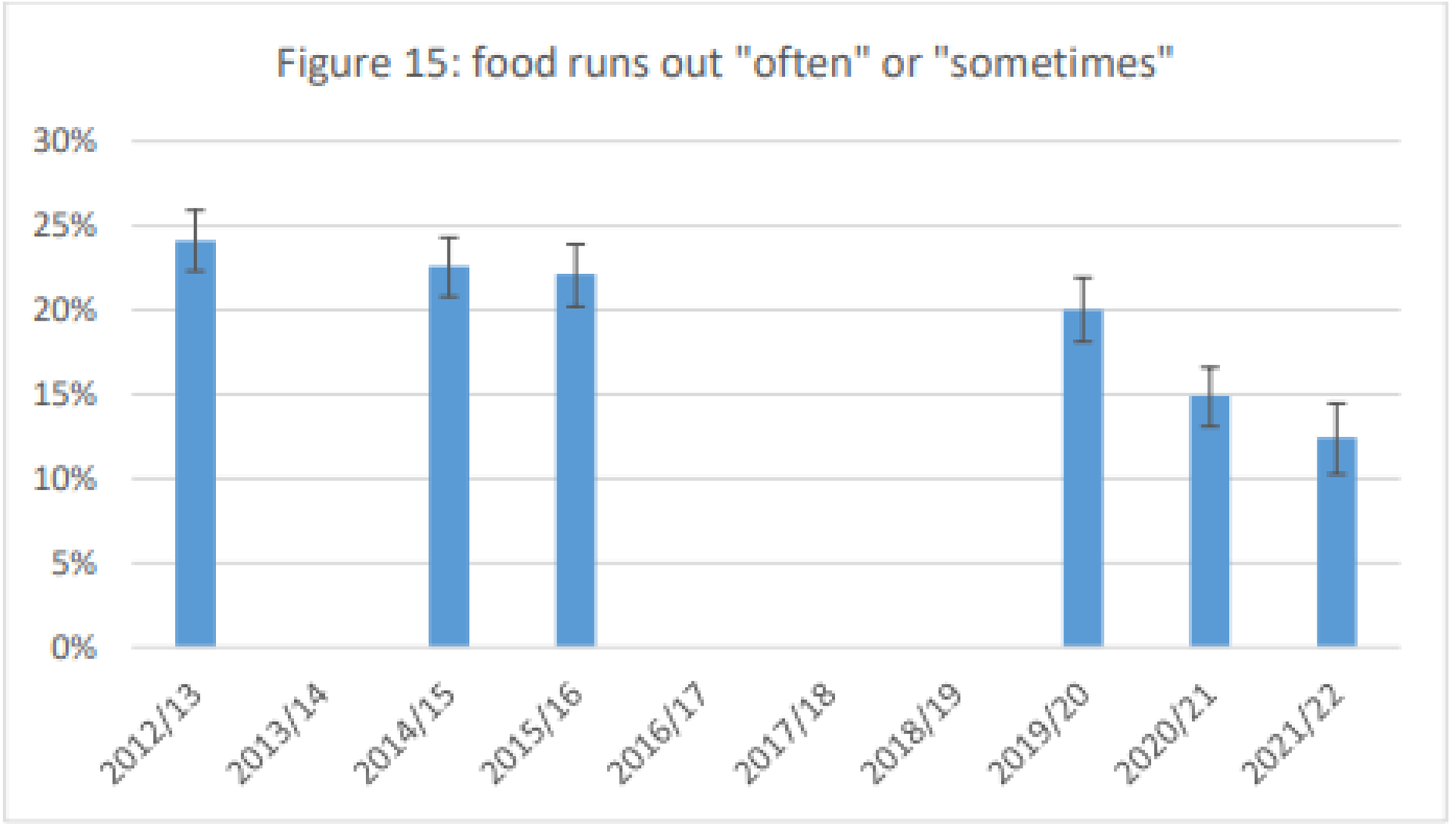
Accessibility: Is a Combination of Price of Food and Incomes

Recent high levels of food inflation



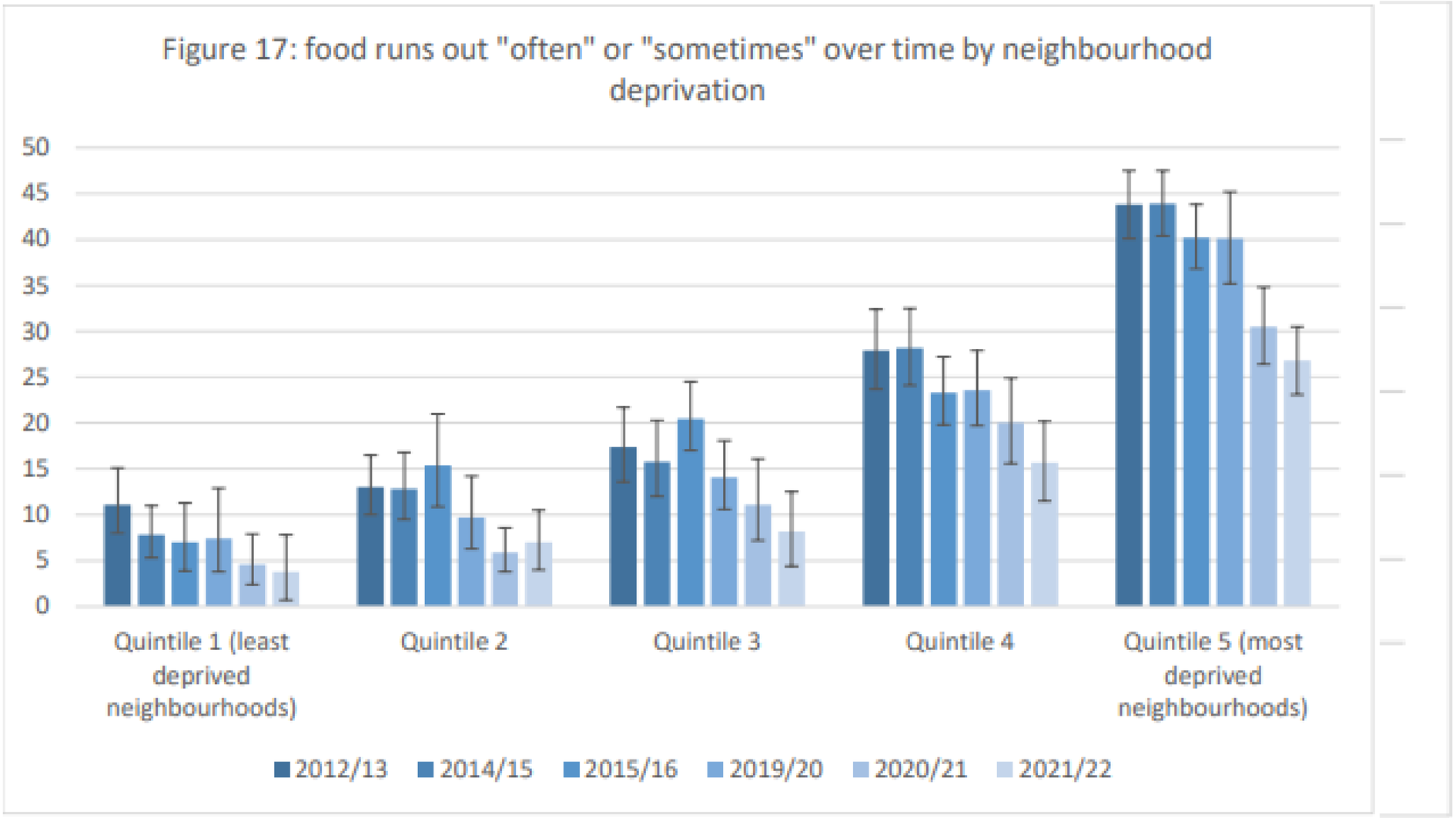
Stats NZ

Accessibility: We are a wealthy country right?



Source: NZ Health Survey, Manatū Hauora

Accessibility: We are a wealthy country right?



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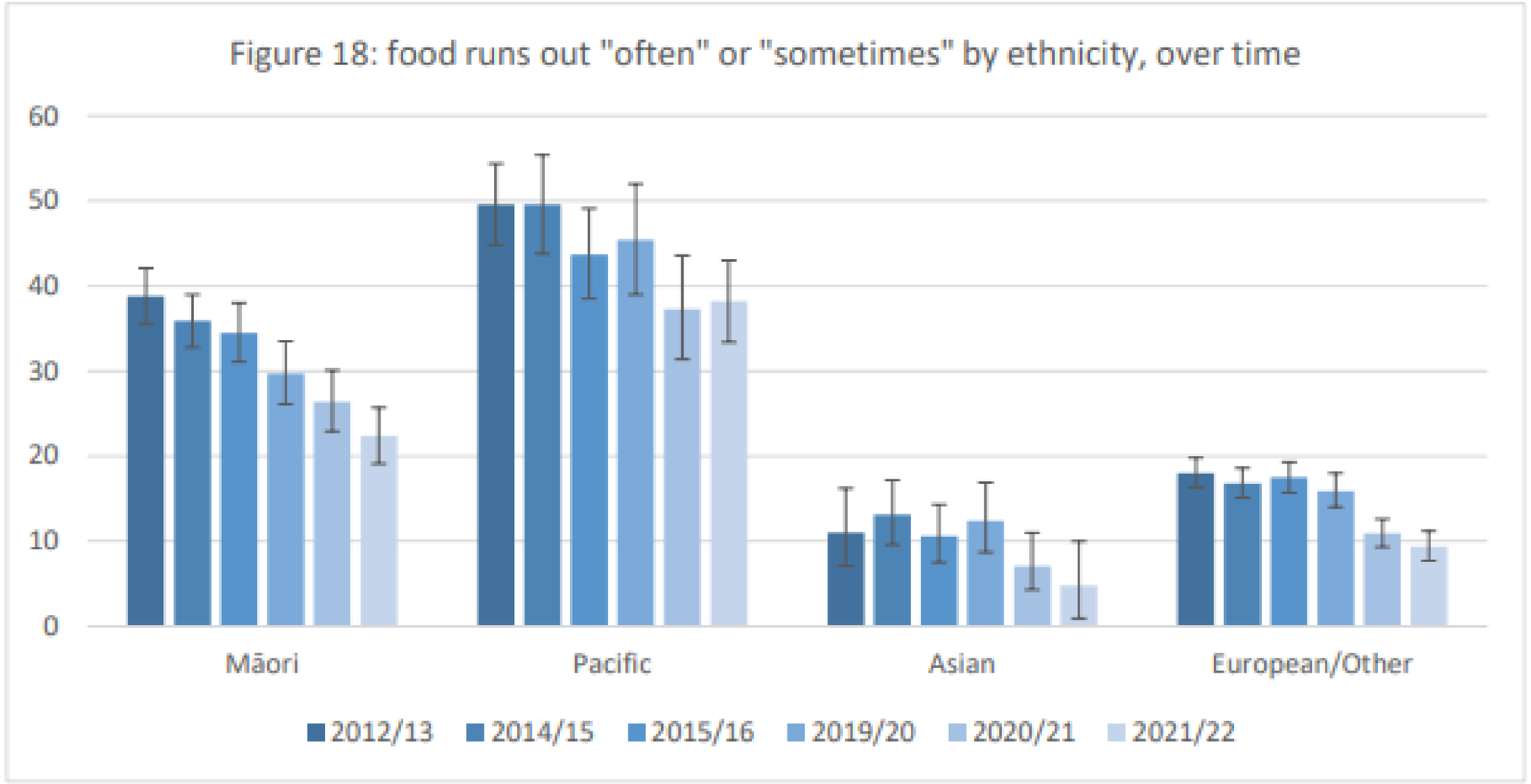
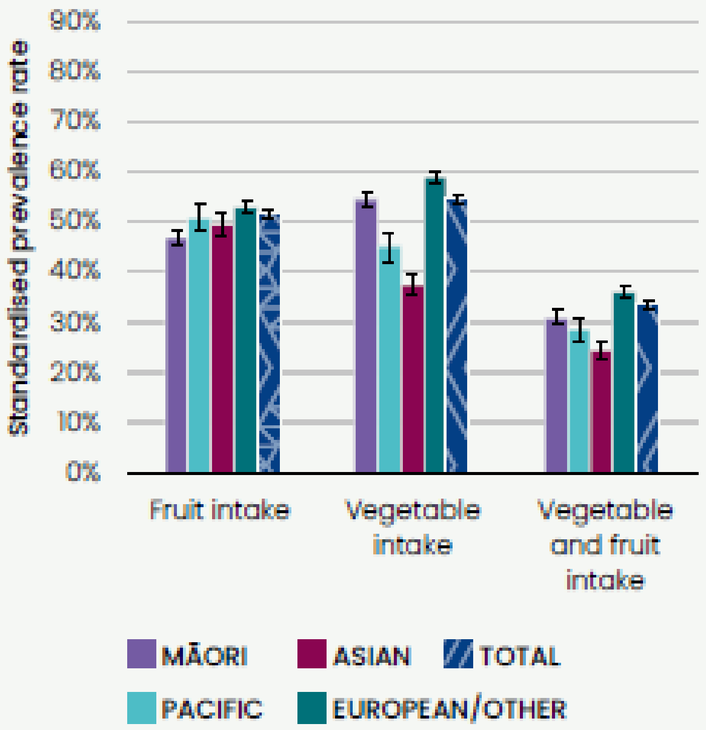


Source: NZ Health Survey, Manatū Hauora.

Nutrition

Figure 36: Adequate fruit and vegetable intake for adults aged 15 years and over (age-standardised) by ethnicity, 2017–20



Source: NZHS 2017–2020

Key facts:

- Aotearoa/New Zealand has the third highest rate of overweight and obesity for adults and children within OECD countries.
- Dietary risk factors, which include overweight/obesity and unhealthy diets, are by far the biggest contributor of health loss in Aotearoa/New Zealand (17.5%).
- Unhealthy diets are heavily influenced by unhealthy, obesogenic food environments, which in turn are influenced by the degree to which healthy food policies are implemented.
- On average, 36% of the food bill for unhealthy foods and drinks.
- There are about 3 times as many fast food outlets and convenience stores per 10,000 people in the most versus the least deprived communities
- Children are exposed to on average 8 ads for unhealthy food per hour during their peak television viewing time.
- Two in five schools still sell sugar sweetened drinks

What makes ultra-processed foods so bad for your health?

They are calorie-rich, nutrient-poor and hard to stop eating

Government food policies

- Health claims regulations
- Government transparency
- Monitoring Systems for obesity & NCDs
- Fiscal policies
- Local zoning laws
- Nutrition impact of trade policies

Local nutrition policies

95% of District Health Boards have a written nutrition policy

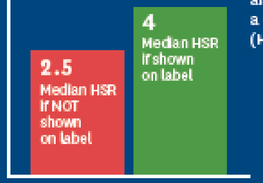
40% of schools reported they have a written nutrition policy

Food supply

34% is the median score for food company commitments to healthy reformulation of products

Food labelling

26% of less healthy packaged foods have a nutrition claim on the front-of-pack



Less healthy foods are less likely to carry a Health Star Rating (HSR) on the label

Cost of diets

36% of the cost of the current NZ diet is for unhealthy food and drinks

While, on average, current, less healthy diets tend to be cheaper than healthy diets, there was a lot of variation of costs

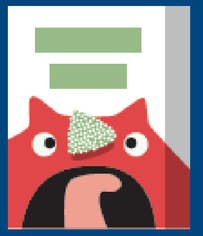
Food prices

Price increases over 10 years were similar for healthy foods (20.2%) and unhealthy foods (20.6%)

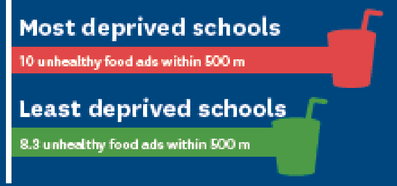
Food marketing to children

8 ads per hour for unhealthy foods on TV during children's peak viewing times

72% of less healthy breakfast cereals for kids displayed a promotional character appealing to children



9 ads for unhealthy foods per km² around schools with more around schools in most deprived areas (10) than least deprived areas (8.3)

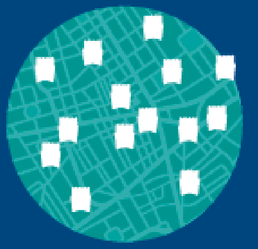


Retail food environments

25% of promotions in supermarket flyers are for junk foods and drinks

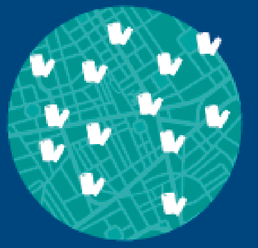
Two-thirds of food promotions in takeaway outlets are for unhealthy food and meals

In supermarkets, for every 1m of shelf of unhealthy food there is 0.4m of healthy food (using indicators of healthy and unhealthy food). In the most deprived areas this is 0.38m and 0.44m in least deprived areas.



There are 13.7 fast food and takeaway outlets per 10 000 people in the most deprived areas and 3.7 in the least deprived areas

53% of sport and recreation centres sell sugar-sweetened beverages



There are 12.7 convenience stores per 10 000 people in the most deprived areas and 4.5 in the least deprived areas

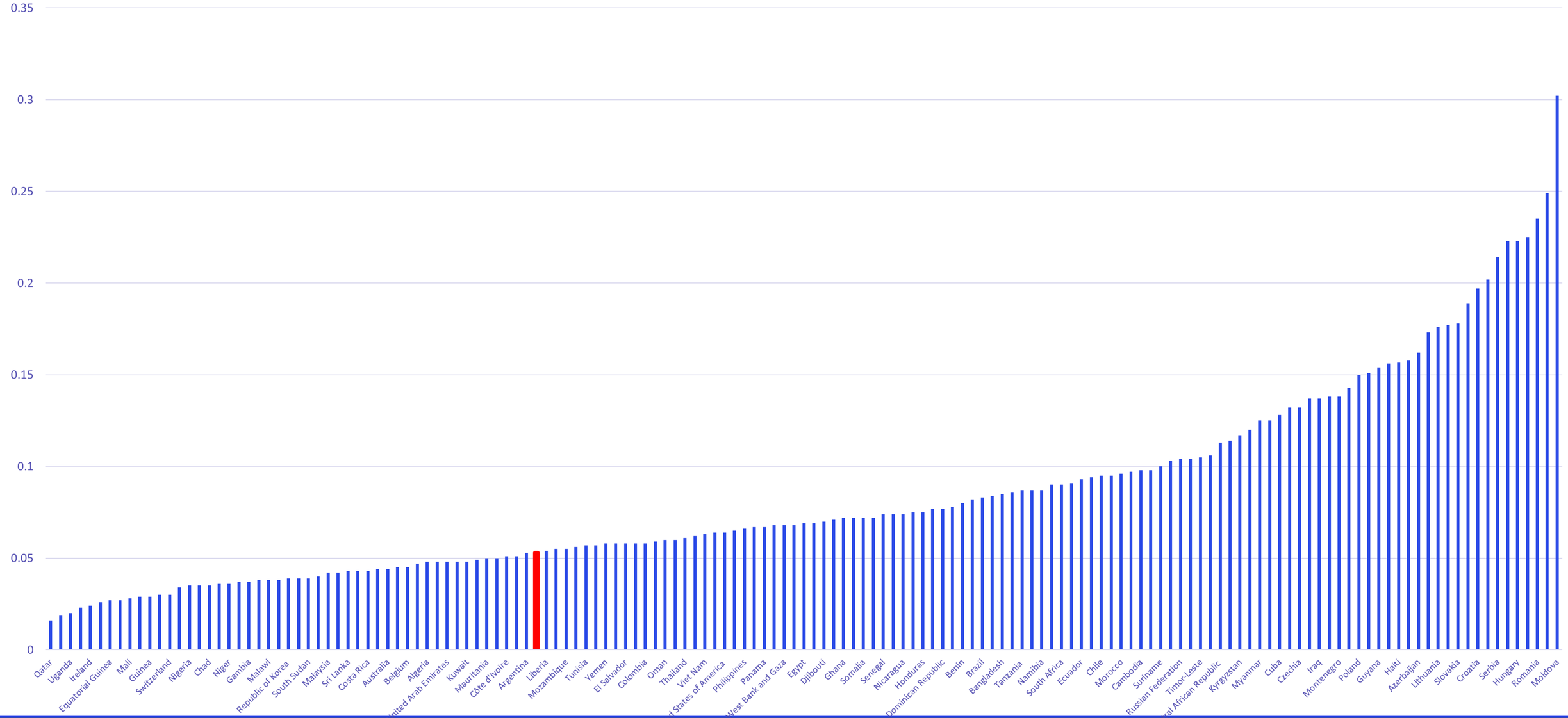
There are 2.4 convenience stores and takeaway outlets within 500 m of urban schools with more around the most deprived schools (2.4) than the least deprived schools (1.8)

School food environments

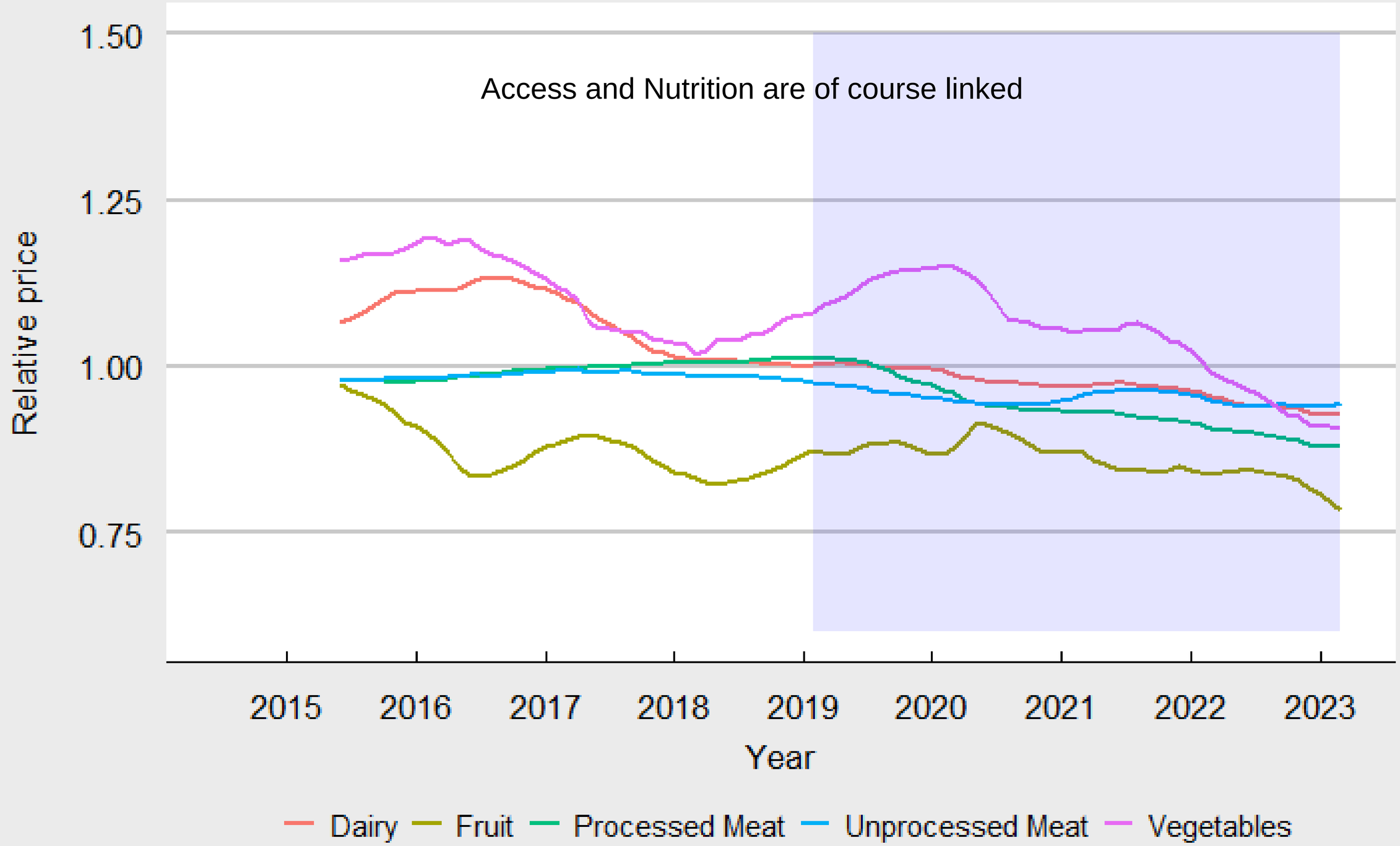
Two-fifths of schools sell sugar sweetened beverages. More of the least deprived schools (44%) sell sugar-sweetened drinks than the most deprived schools (34%).

INFORMAS
Benchmarking food environments

Costs Associated with Diet: Where does New Zealand sit?

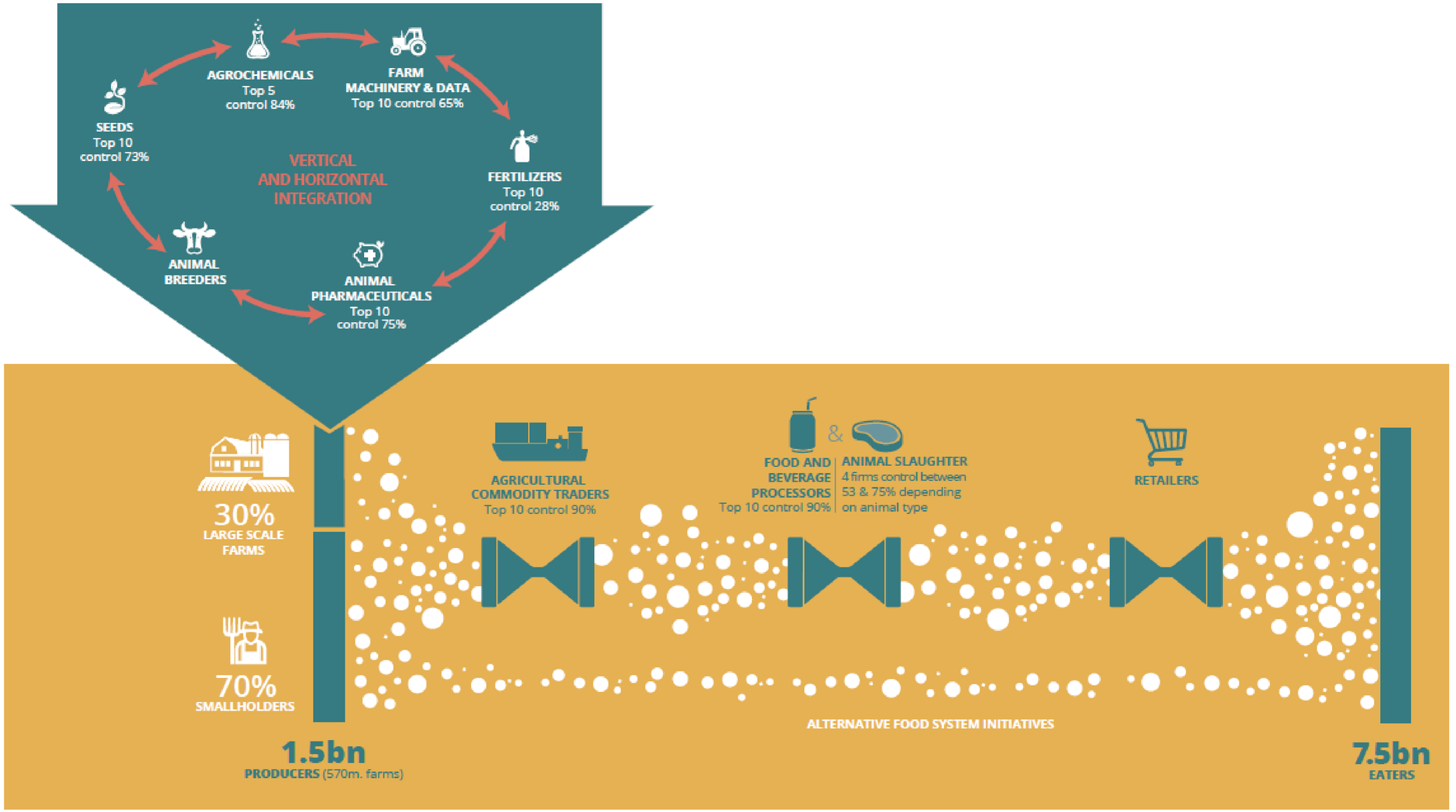


Source: FAO 2023



Source: Derived from NZ Stat data in Vatsa and Renwick (under review)

Who decides what we get to eat?



Source IPES 2017

The Brands

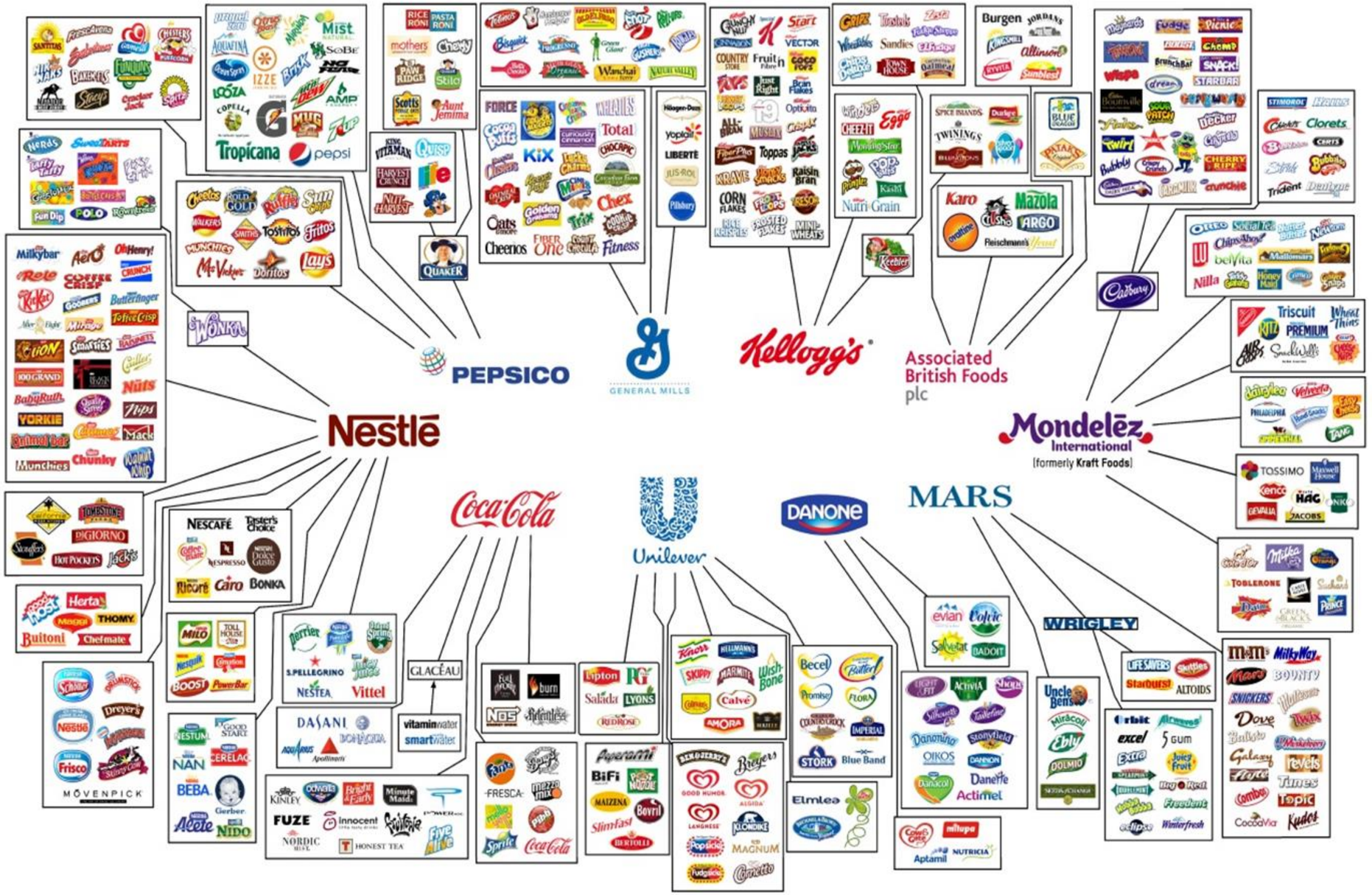
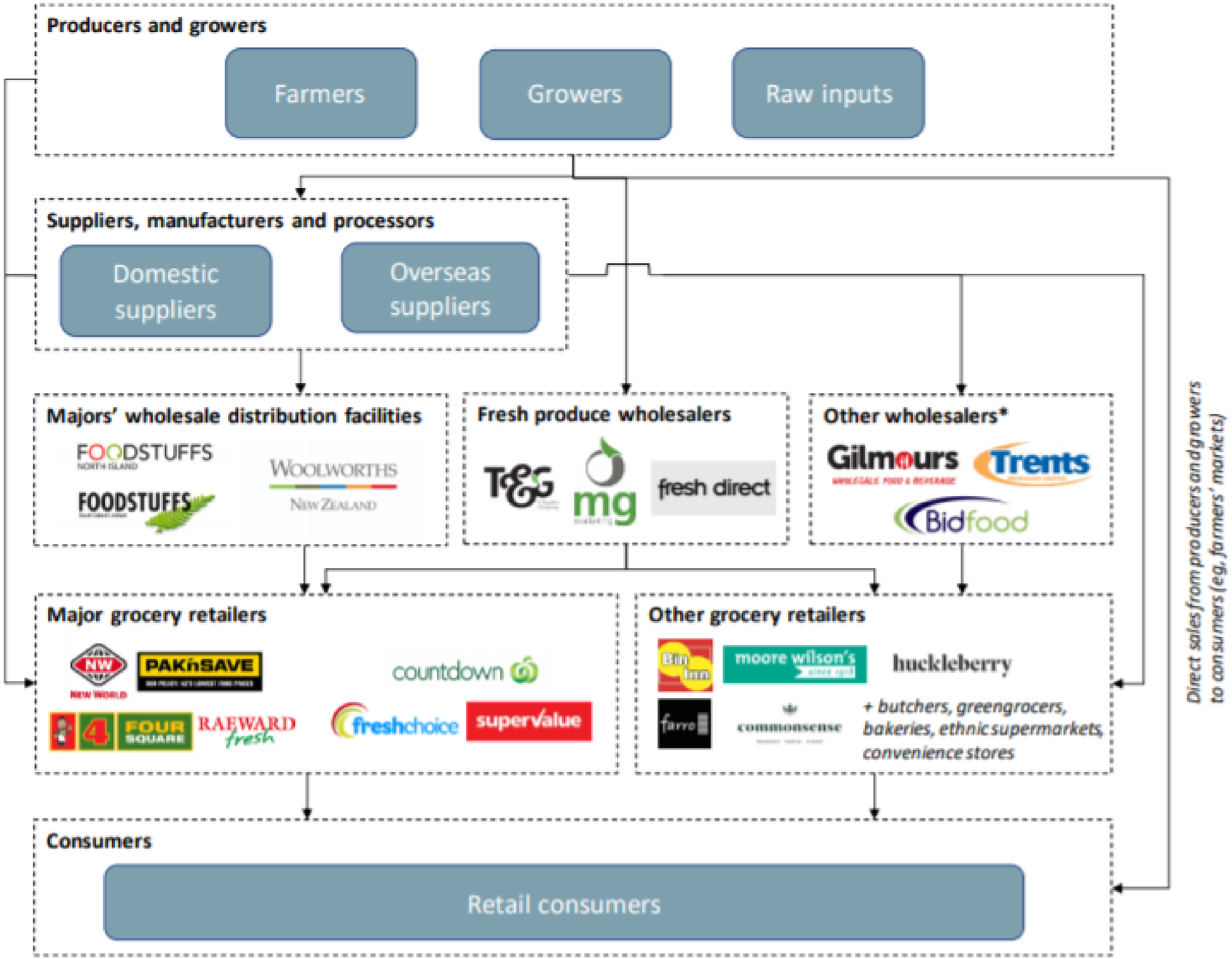
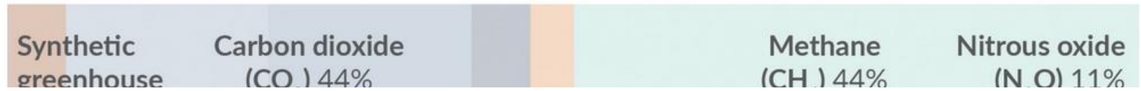

PEPSICO
GENERAL MILLS
Kellogg's
Associated British Foods plc
Nestlé
Mondelēz International (formerly Kraft Foods)
Coca-Cola
Unilever
DANONE
MARS
WRIGLEY
MÖVENPICK

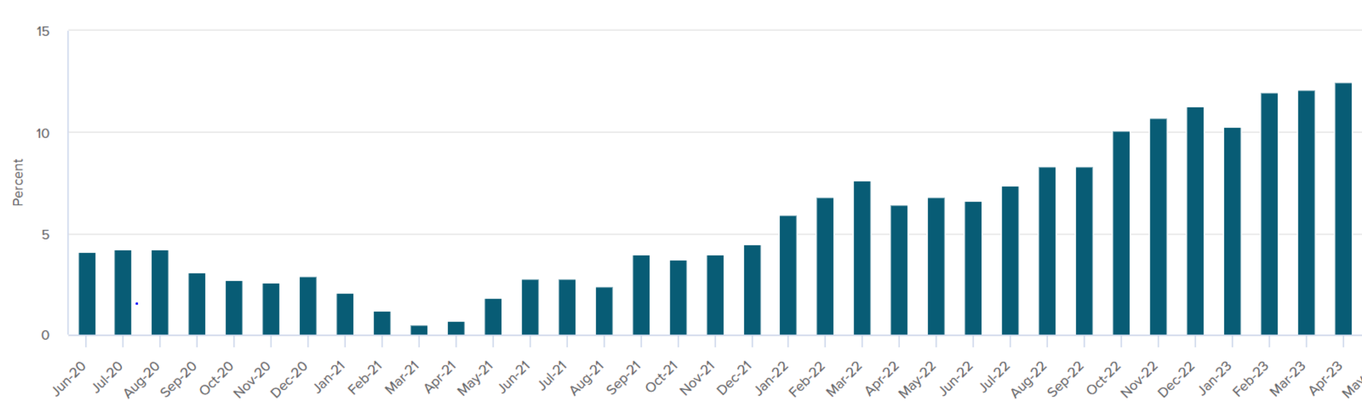
Figure 3 High-level summary of the supply chain for the NZ grocery sector



Food System in Disarray?

- Food Insecurity – Nearly 1 in 5 Children in New Zealand
- Obesity - 1 in 3 in New Zealand
- Climate Change – 50 per cent of emissions
- Imbalance of power and lack of ‘fairness’ in food system
- High levels of food price inflation
- Food Loss and Waste – 1/3 of what is produced
- Biodiversity – 1/3 of species listed as threatened





And things may become worse!
The Fourth dimension is Stability

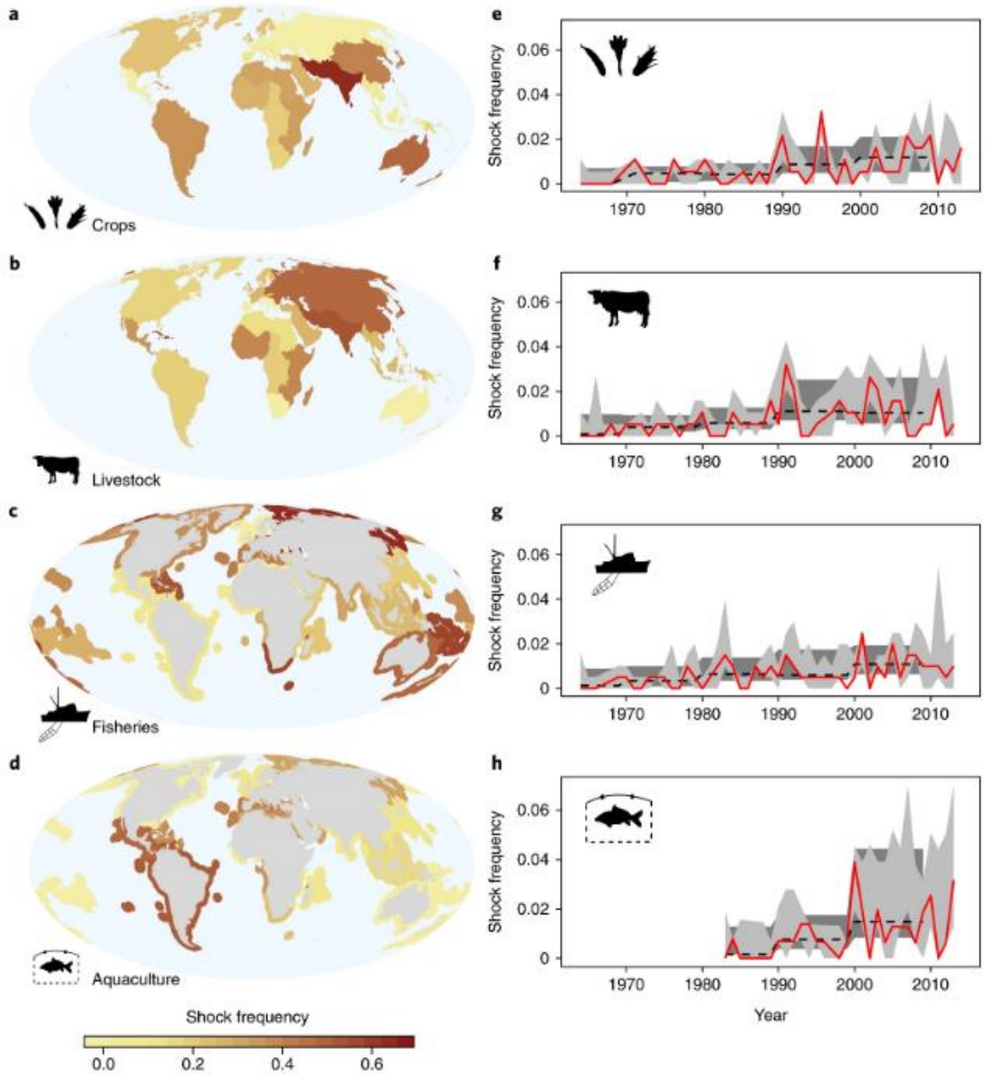
Shock frequency does appear to be increasing

‘Critically, shock frequency has increased through time on land and sea at a global scale. Geopolitical and extreme-weather events were the main shock drivers identified, but with considerable differences across sectors’

Cottrell *et al* 2019 *Nature*

Fig. 1: Trends in food production shock frequency in crop, livestock, fisheries and aquaculture sectors from 1961–2013.

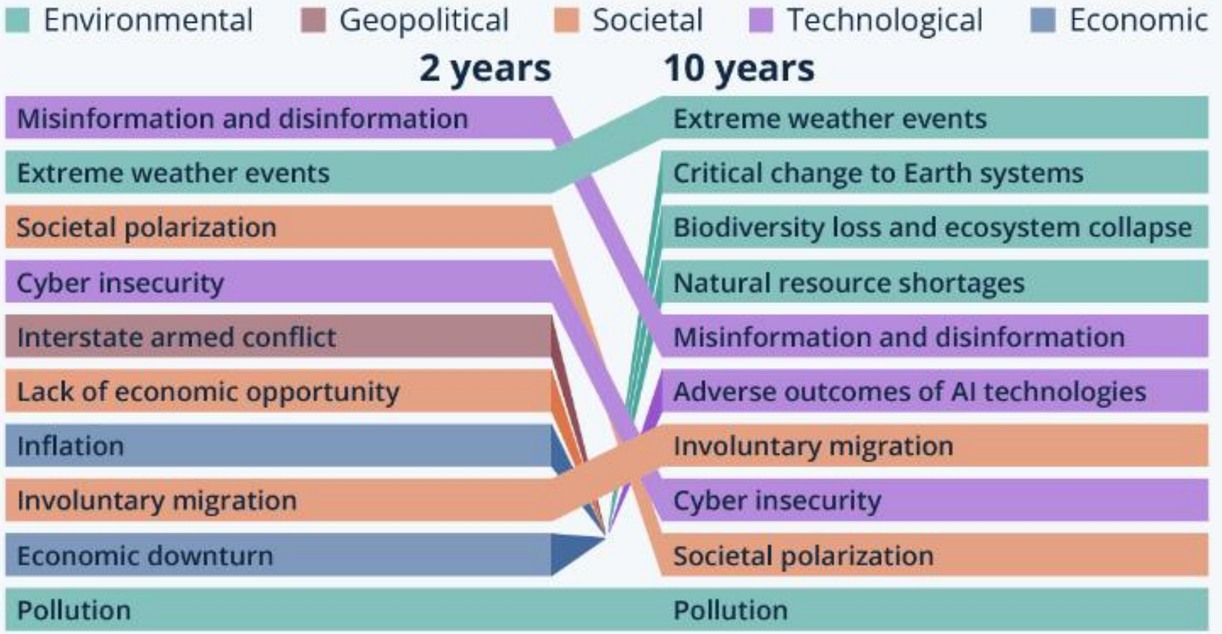
From: Food production shocks across land and sea



a–**h**, Spatial (**a**–**d**) and temporal (**e**–**h**) trends for crops (**a** and **e**), livestock (**b** and **f**), fisheries (**c** and **g**) and aquaculture (**d** and **h**). Regions include North America, Central America, the Caribbean, South America, Northern Europe, Western Europe, Southern Europe, Eastern Europe, North Africa, West Africa, Central Africa, Southern Africa, East Africa, Western Asia, South Asia, East Asia, Southeast Asia, Melanesia, Micronesia, Australia and New Zealand, and Polynesia. The red lines in the time series indicate the annual shock frequency from the shocks identified in this study. The light grey confidence interval describes the plausible range of frequencies under different combinations of LOESS model span (0.2–0.8), production baseline durations (3, 5, 7 or 9 years)

The Largest Risks Faced by the World

Experts' view on the most severe global risks over the next 2 and 10 years*

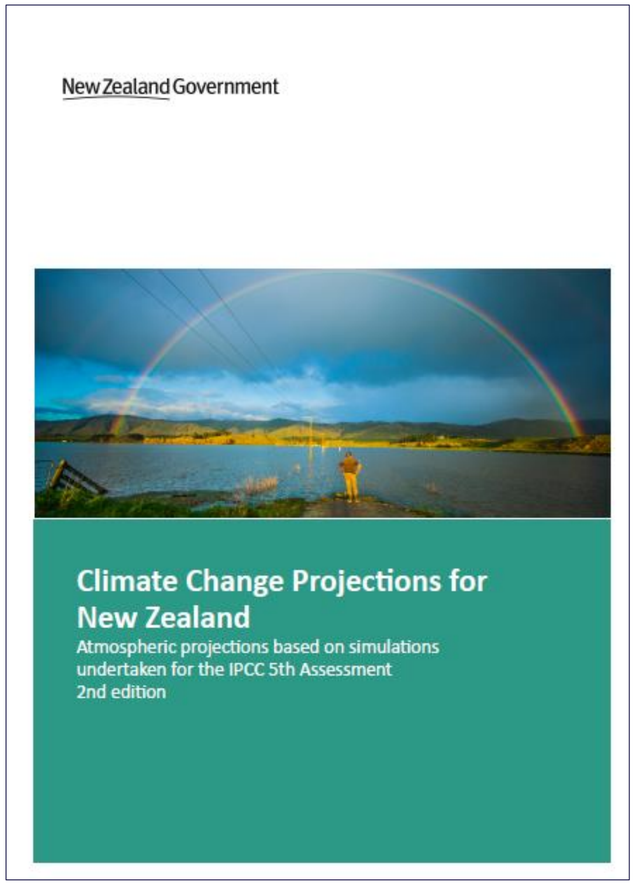


* Based on risk assessments by 1,490 experts across academia, business, government, the international community and civil society collected Sep.-Oct. 2023

Source: World Economic Forum

statista

Diversification for Adaptation



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old days and

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It's official - So
record-breaker

Rachael Kelly · 18:05, Mar 30

Some vegetable prices double since Cyclone Gabrielle hit crops

From **Checkpoint**, 5:46 pm on 1 March 2023

Share this

Tom Taylor, Checkpoint Reporter
Tom.Taylor@rnz.co.nz

Anita Erskine, of Papatotara, has been feeding baleage out to her cows for about a month to keep condition on them, because there is not enough grass for them to eat during Southland's dry season.

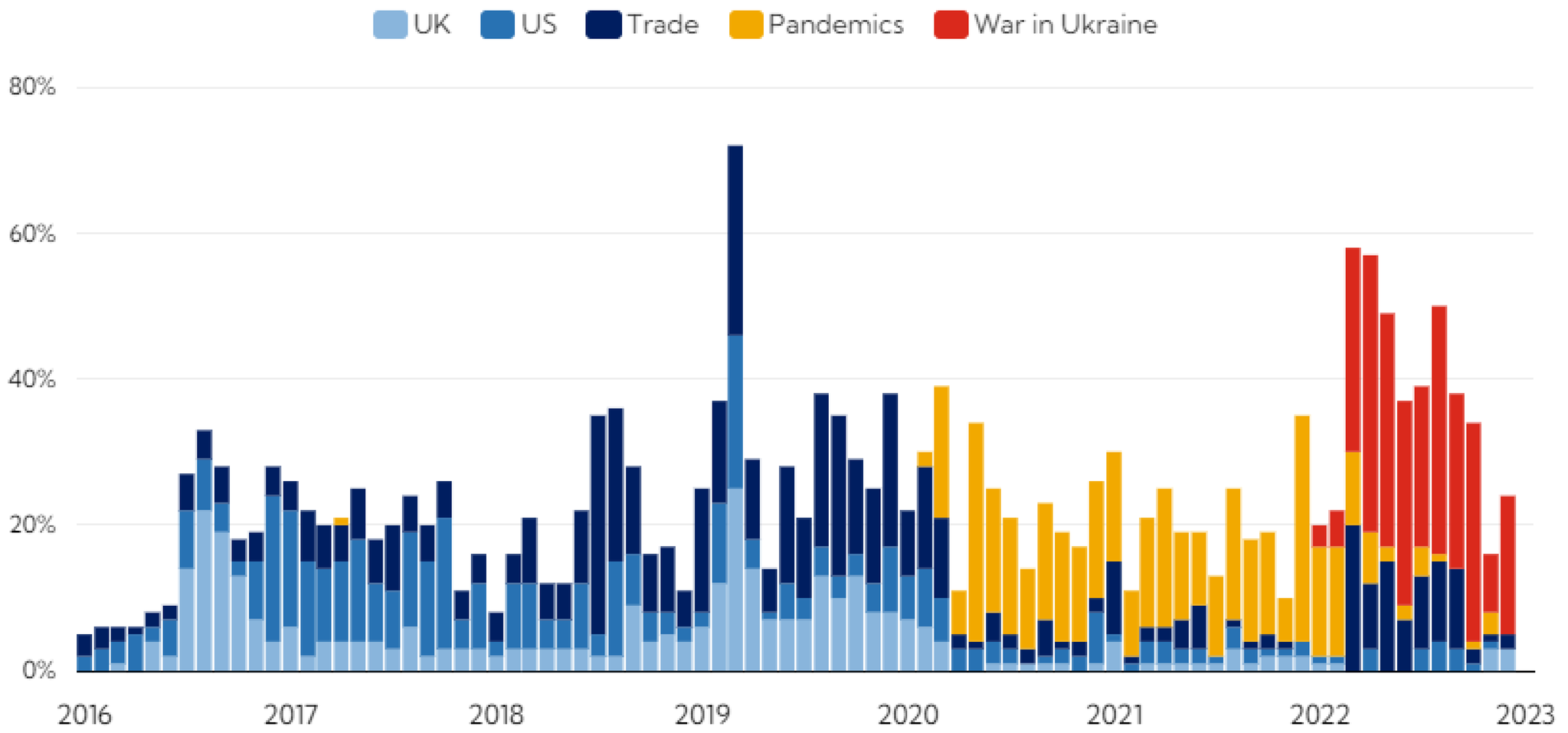
Aquifers in some parts of Southland have hit record lows as the sunshine keeps belting down, and an MP is calling on the Government to officially declare a drought.

Parts of Southland are experiencing a "green drought" where pastures look green, but soil moisture deficits are down by as much as 50 per cent in some areas.

Uncertainty drivers

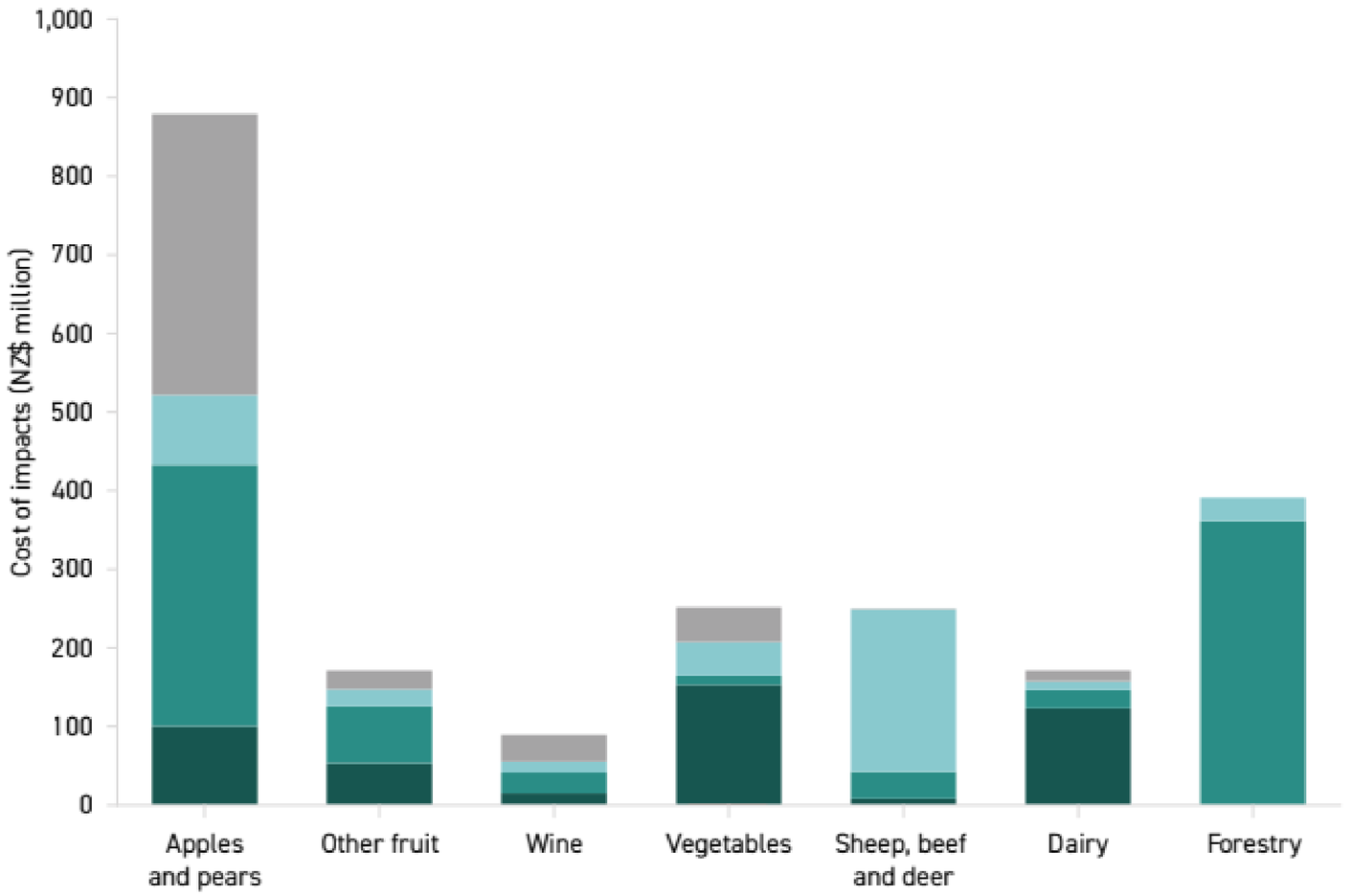
The War in Ukraine continues to be the dominant force of global uncertainty.

(uncertainty related to listed factor as a share of overall uncertainty)



Source: Ahir, Bloom, and Furceri (2022a), see VoxEU blog for details on key words included for each category.

Graph 1: Estimated on-farm impacts from Cyclone Gabrielle
Cost of impacts, NZ$ million



Source: MPI estimates.

Cyclone Gabrielle the biggest natural disaster to hit primary industries; may be 'last straw' for some

Tina Morrison · 05:00, Mar 26 2023

PIERS FULLER/STUFF

The apple industry in Hawke's Bay was hard hit by the cyclone.

U.S.-China Trade War: A Timeline

Cumulative tariffs between the U.S. in China in 2018-2020

US tariff action Chinese tariff action Tariff rate

September/ October 1, 2019	$300b	15%
	$110b	20-25%
	$75b	5-10%
February 14, 2020 (Phase One deal)*	$250b	30%
	$300b	7.5-15%
	$110b	20-25%
	$75b	2.5-5%

* China/the U.S. have also been accepting tariff exemption applications for a range of products

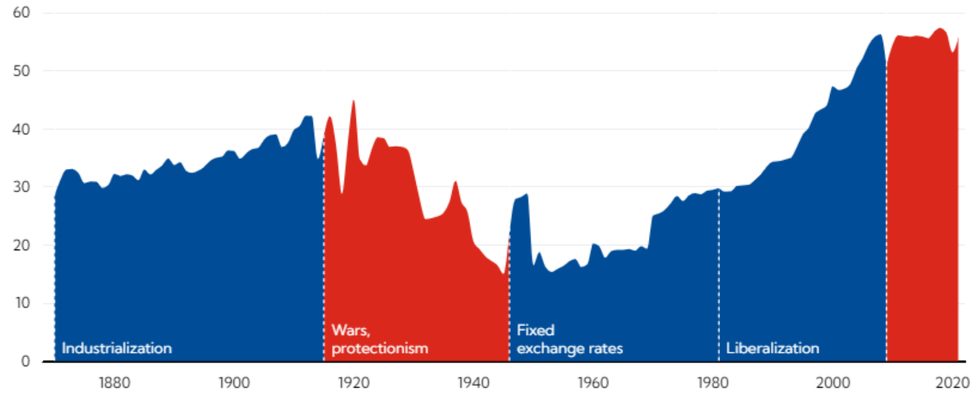
Source: Media reports

statista

Eras of globalization

Trade openness slowed following the global financial crisis.

(sum of exports and imports as a percent of GDP)

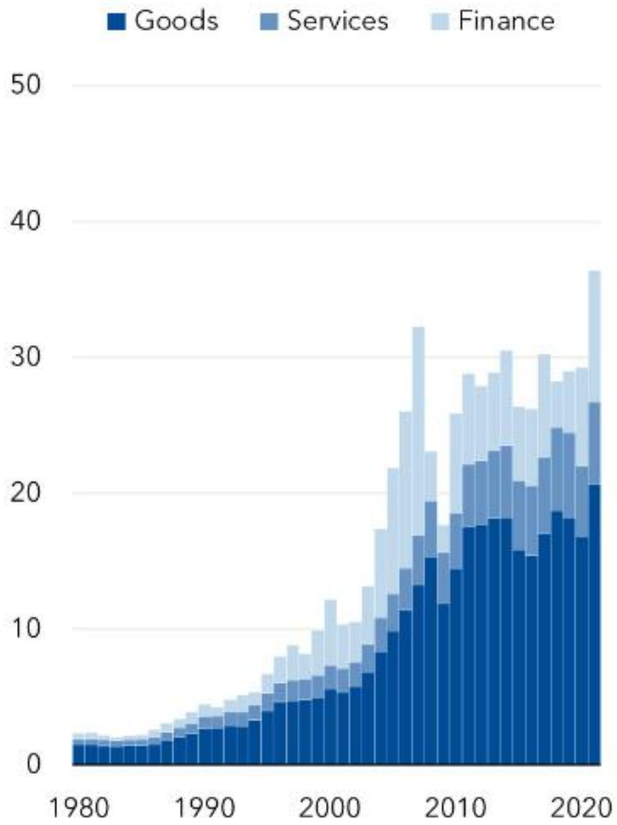


Sources: PIIE, Jorda–Schularick–Taylor Macrohistory Database, Penn World Data (10.0), World Bank, and IMF staff calculations. · Note: Sample's composition changes over time.

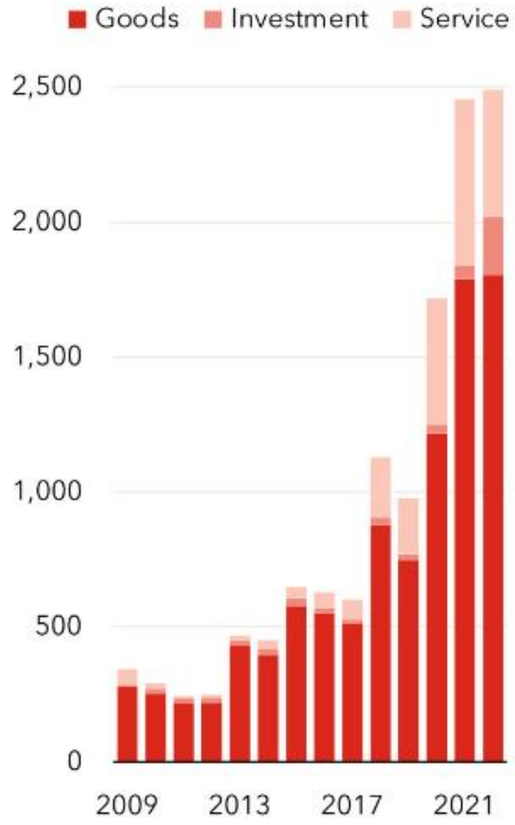
Rising restrictions

Global economic integration slowed over the past decade, while trade restrictions rose rapidly.

Global flows of goods, services, and finance
(trillions of US dollars)



Trade restrictions imposed
(number)



Sources: IMF Balance of Payments, World Bank, global trade alert (2022), and IMF staff calculations. Note: The figure shows exports only.

IMF

Where does Food Security start

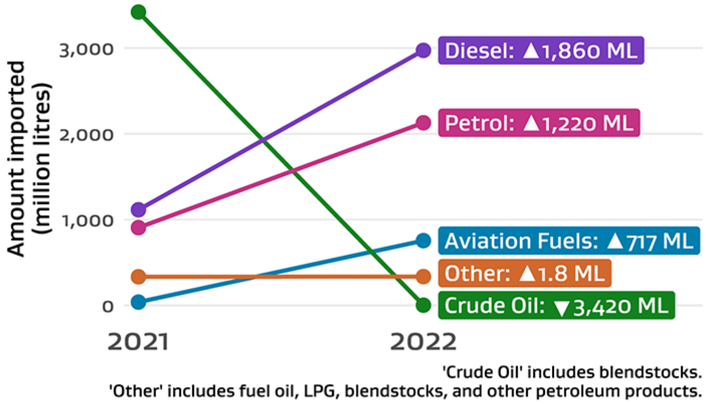


Figure F.1 Amount of oil imported during the final three quarters in 2021 versus the final three quarters in 2022, by product

'Crude Oil' includes blendstocks.
'Other' includes fuel oil, LPG, blendstocks, and other petroleum products.

RESEARCH NOTE

NEW ZEALAND GEOGRAPHER WILEY

How many seasonal workers from the Pacific have been employed in New Zealand since the RSE scheme began?

Richard Bedford[1] | **Charlotte Bedford**[2]

[1]Te Ngira Institute of Population Research, University of Waikato and Auckland University of Technology, Hamilton and Auckland, New Zealand
[2]Development Policy Centre, Crawford School of Public Policy, The Australian National University, Canberra, Australia

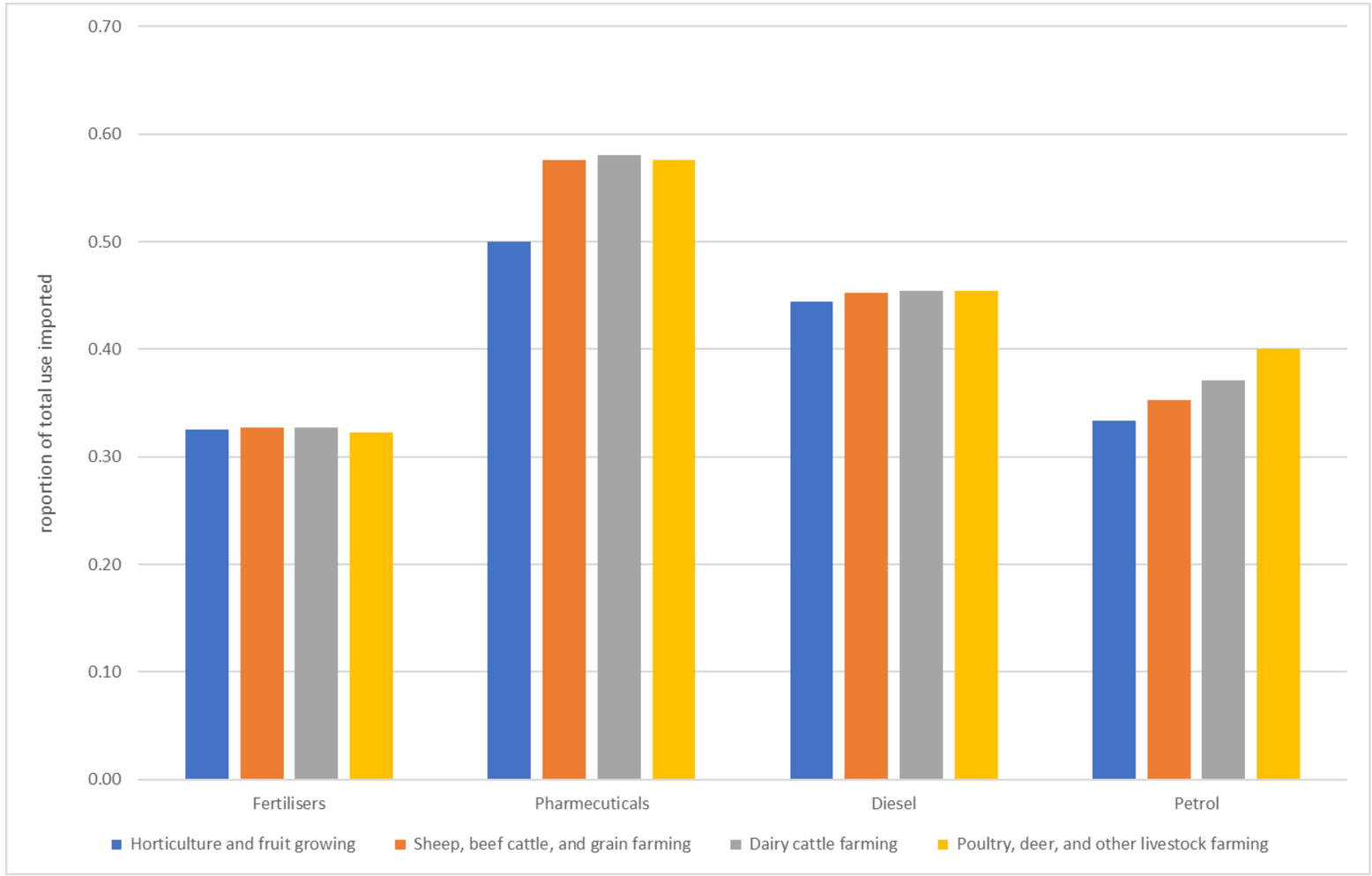
Correspondence
Richard Bedford, University of Waikato and Auckland University of Technology, Te Ngira Institute of Population Research, Knighton Road Hillcrest, Hamilton 3105, New Zealand.
Email: richard.bedford@waikato.ac.nz

Abstract

This Research Note provides the first reliable figures on the numbers of seasonal workers from the Pacific Islands who participated in the Recognised Seasonal Employer (RSE) scheme between July 2007 and June 2022. The method for deriving these figures is explained briefly before examining the frequency of return by men and women for employment in subsequent seasons from the nine participating Pacific states. Clarification of the numbers of seasonal workers involved in the scheme, as distinct from work visas issued each year for RSE employment, is timely for two reasons. Firstly, the RSE scheme is under review in March 2023 by Immigration New Zealand. Secondly, the three major sources of Pacific seasonal labour are raising questions in 2023 about the impact of the scheme on their domestic labour markets and economies. Robust data on numbers of Pacific seasonal workers during the scheme's first 15 years contributes important information in both these contexts.

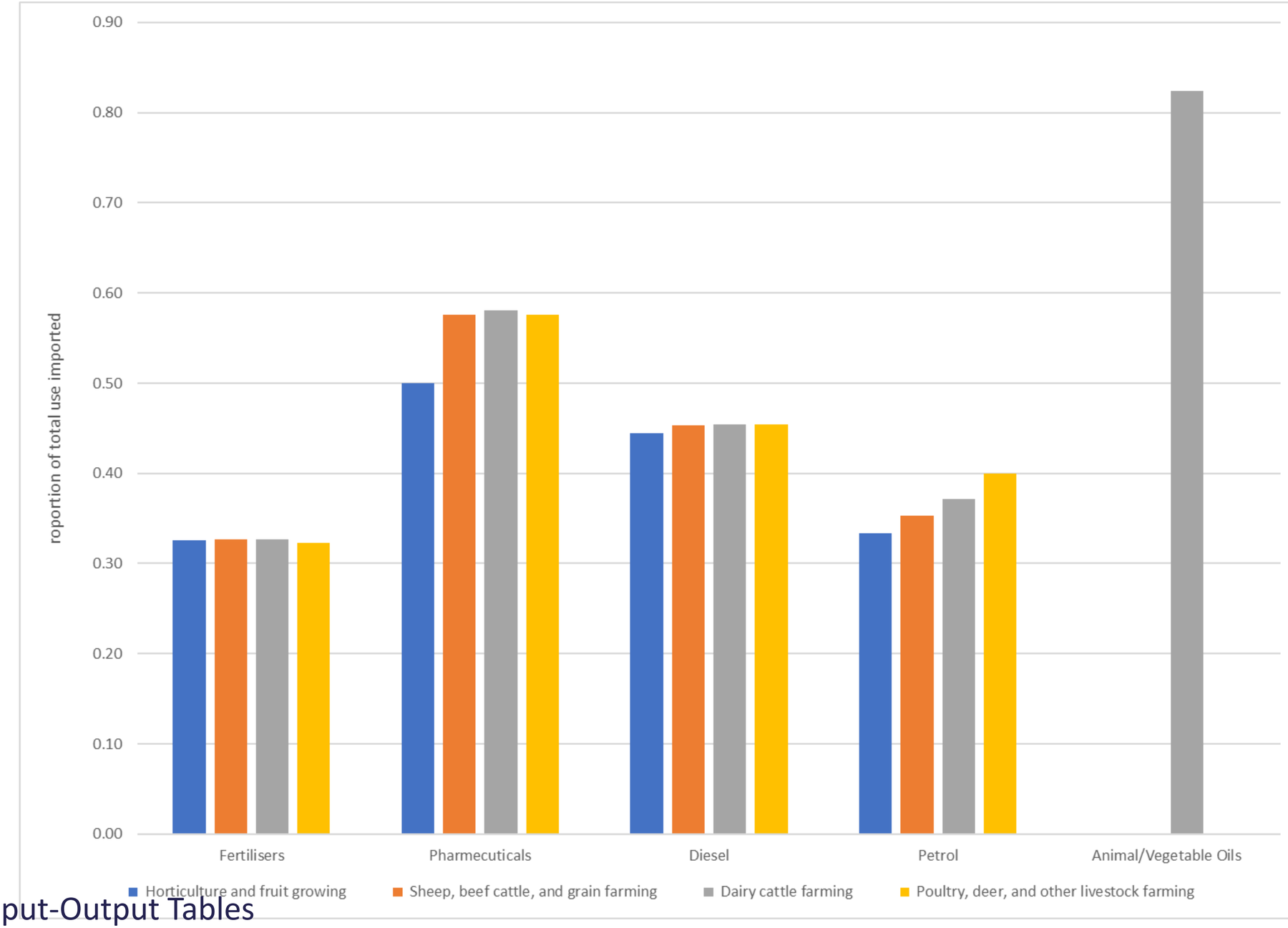
KEYWORDS
gender, Pacific source countries, RSE scheme, seasonal labour migration

Our primary sectors are reliant on imports for key inputs



Source: Derived from New Zealand Input-Output Tables

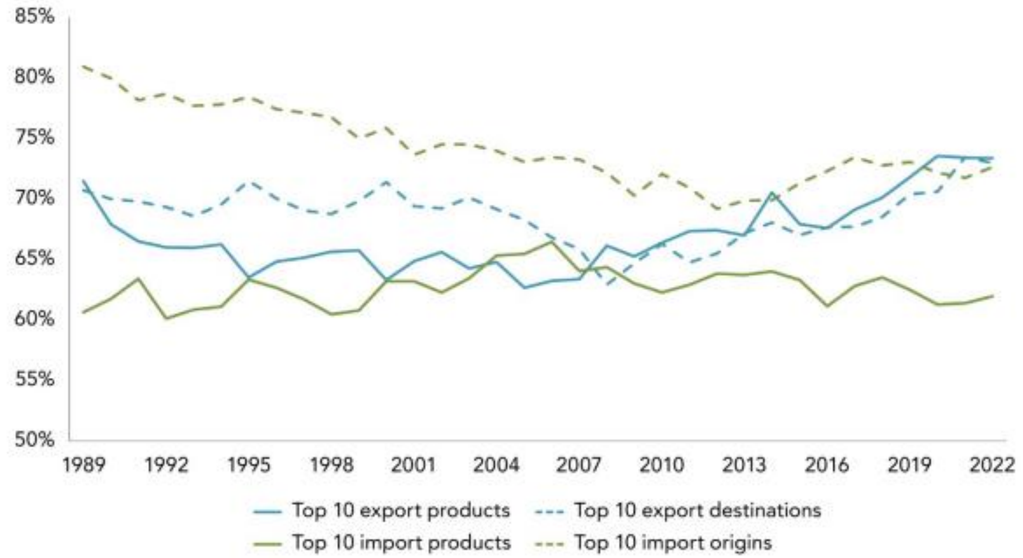
Import reliance



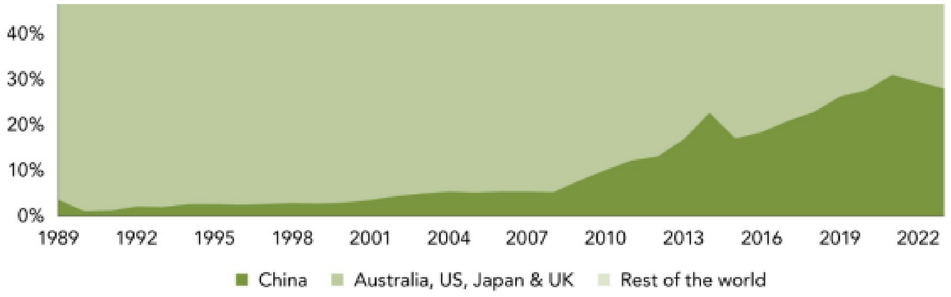
Source: Derived from New Zealand Input-Output Tables

Import and Export Trade is becoming more concentrated

Figure 12: Aotearoa New Zealand's top 10 exports and imports (% of total by value)



Source: (Stats NZ, n.d.)

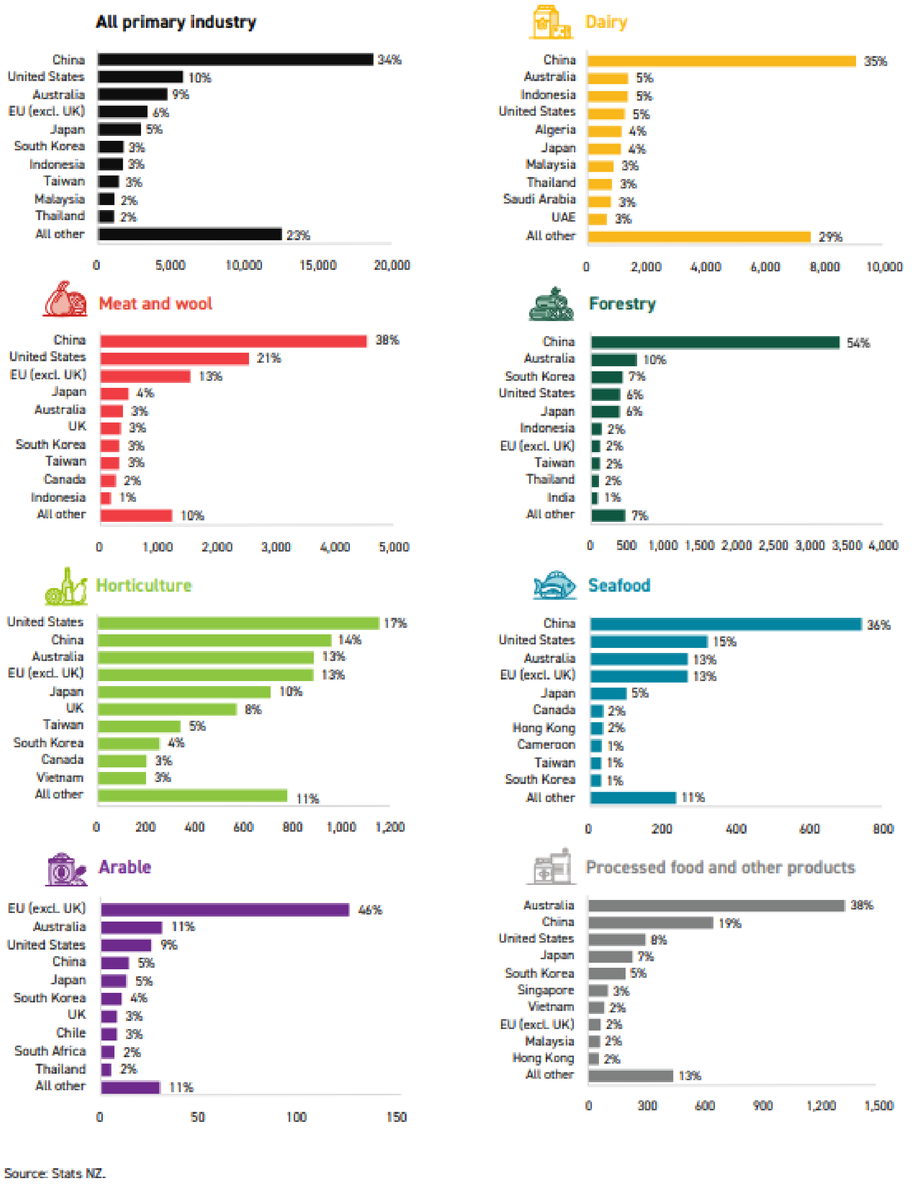


Source: (Stats NZ, n.d.)

Source Productivity Commission

Top export markets

Year to 30 June 2023, NZ$ million and percent



Source: Stats NZ.

Productivity Commission: Vulnerability Analysis

Table 3: Top three imported and exported intermittently vulnerable products

	Imports	Value ($m)	Exports	Value ($m)
2017	Data-processing machines	$660	Methyl alcohol	$665
	Aeroplanes and other aircraft	$520	Unwrought silver	$112
	Fertilisers (phosphate)	$131	Lambskins	$52
2018	Data-processing machines	$716	Live lobsters	$293
	Fertilisers (phosphate)	$187	Wood rough (coniferous)	$44
	Oil-cake and soya-bean residues	$137	Wood for fuel (non-coniferous)	$31
2019	Data-processing machines	$741	Frozen meat cuts (excl. lamb)	$259
	Aeroplanes and other aircraft	$608	Wood rough (coniferous)	$50
	Aluminium oxide	$383	Wood for fuel (non-coniferous)	$37

Note: We refined trade data filters in response to stakeholder feedback, and the ranking of items for 2019 is not the same as reported in the issues paper (NZPC, 2023b, p. 19). Changes are documented in the *Trade data analysis 2.0* (Legge & Temple, forthcoming).

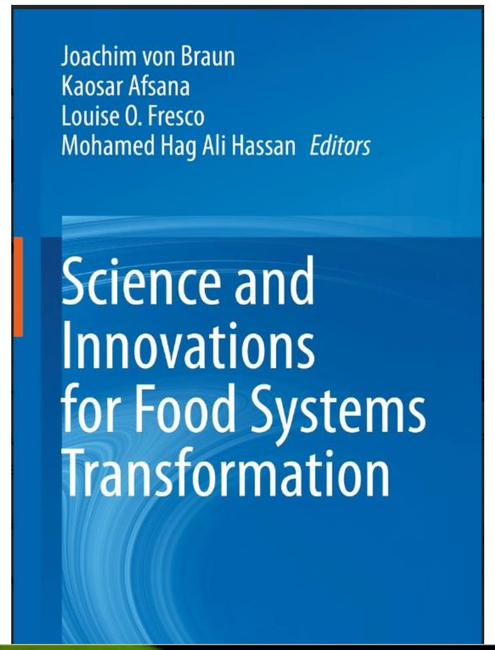
Specification	Oil shock	Tech shock	Trade shock
Type	Supply	Demand	Trade
Shock event	Oil price increase to US$250 per barrel	Synthetic dairy produced at 50% costs	Asia imposes barriers (25% tariff equivalent)
Employment friction	Full reemployment	Full reemployment	Full reemployment
Government response scenarios	-	50% reemployment	50% reemployment
	-	No response	No response
	-	Labour subsidy	Labour subsidy
	-	-	Output subsidy
Land-use scenarios	-	Land held in dairy	-
	-	Alternative uses of land	-

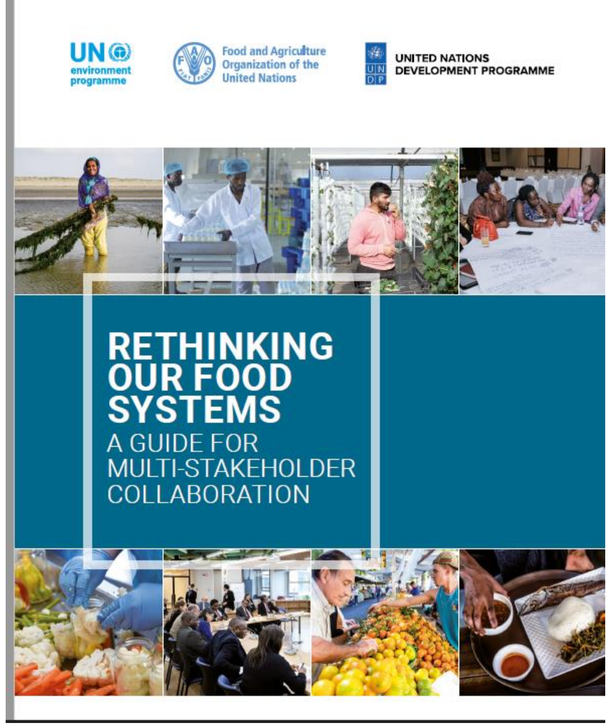
Table 1: Combined direct and indirect exposures to intermediate goods (%)

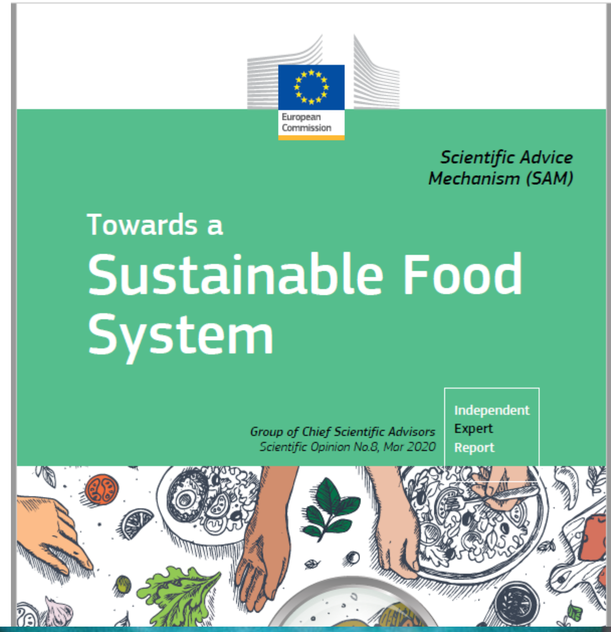
	Intermediate inputs (imports)				Intermediate outputs (exports)			
	Foreign	China	USA	Australia	Foreign	China	USA	Australia
Food	10.2	2.6	0.8	1.0	23.8	9.4	2.2	1.9
Clothes	19.5	9.1	1.0	0.9	16.0	5.0	2.1	0.9
Wood	11.6	3.2	0.9	0.8	39.0	7.2	7.0	6.0
Paper	13.2	3.7	1.1	1.1	27.0	8.7	3.9	1.8
Petrol	7.8	1.7	0.4	0.4	13.9	2.8	2.6	1.0
Chemicals	18.7	5.0	1.8	1.4	24.3	9.1	2.6	2.1
Pharma	19.9	5.3	1.9	1.8	15.6	5.0	1.6	1.6
Plastics	19.9	5.8	1.8	1.6	23.4	5.3	5.5	2.2
Non-metals	11.3	3.3	0.7	1.1	12.5	2.5	1.9	1.3
Basic metals	12.3	4.1	0.8	0.9	32.6	3.9	5.8	3.7
Fabricated metals	17.1	5.2	1.0	2.2	16.8	2.8	3.9	2.2
Electronics	21.6	8.7	1.5	1.4	10.7	1.4	2.0	1.9
Electrical equipment	20.0	7.9	1.2	1.4	17.8	2.5	4.3	2.8
Machinery	19.0	5.7	1.3	1.9	16.2	2.2	2.7	3.3
Vehicles	25.5	6.6	2.6	1.0	26.5	5.7	5.0	2.4
Transport	23.5	4.3	5.9	0.7	26.3	5.4	5.2	2.4
Manufacturing, other	15.5	5.2	1.0	1.1	26.4	5.3	5.4	2.2
Agriculture	49.3	12.4	4.2	4.0	29.6	11.7	2.0	2.1
Fishing	41.4	7.7	2.5	3.3	24.9	7.7	2.0	6.2
Average	19.9	5.7	1.7	1.5	22.3	5.5	3.6	2.5

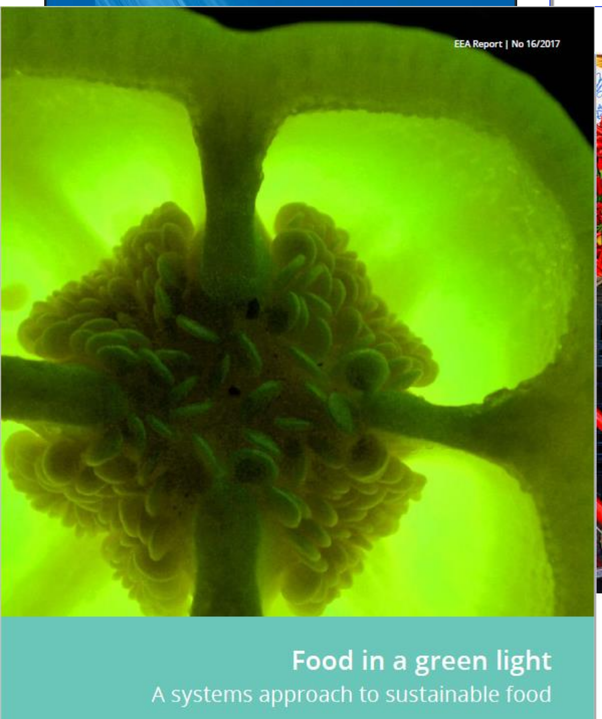
Source: NZPC and Motu calculations using Inter-Country Input-Output data for the 2018 year (OECD, 2021c).

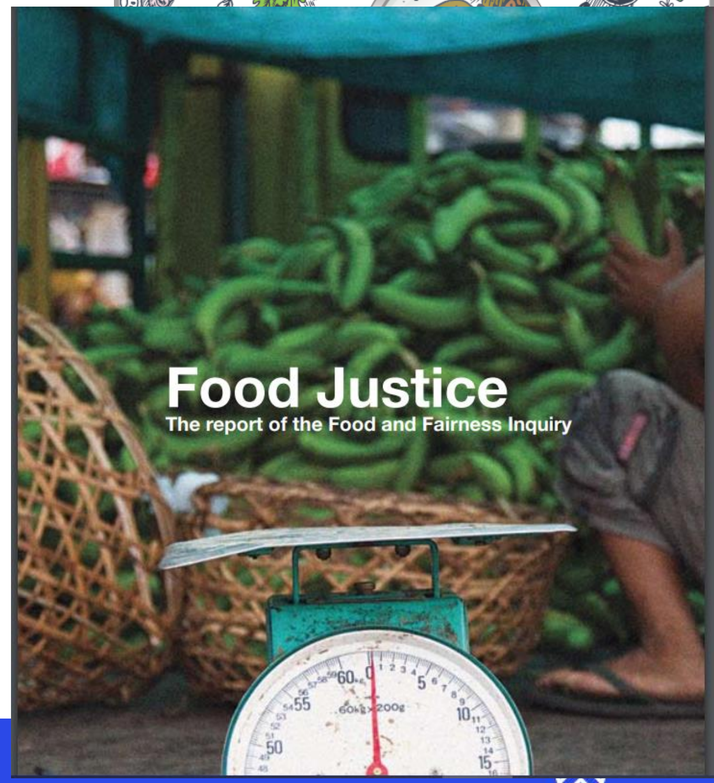
We are not alone











Climate extremes make NZ's supply chains highly vulnerable – it's time to rethink how we grow and ship food

Published: July 26, 2023 6.59am NZST

Getty Images

Supermarket customers around New Zealand are noticing gaps in the grocery aisles that have nothing to do with the global pandemic or Ukraine war. It's clear domestic food supply chains have been increasingly challenged by natural disasters and the

Author

Alan Renwick
Professor of Agricultural Economics, Lincoln University, New Zealand

Resilience

‘There are broadly two models of resilience. The equilibrium model closely follows the materials science concept, with a focus on absorbing and bouncing back from shocks. In contrast, the evolutionary model emphasises adaptability and transformation for the long-run health and performance of the system (Pells, 2023). The inquiry uses the evolutionary model, which makes resilience conceptually distinct from other related economic objectives, including robustness and security.’

‘In contrast, resilient systems adapt their structures, functions, and behaviours – not only to survive, but also to learn, grow and improve. Over time, genuinely resilient systems continuously evolve towards whatever is better suited to changing circumstances.’

Source Productivity Commission (2024)

Feeding local population vs food exports

30 Jan, 2020

AUT study shows that food insecurity may be linked to nutritional disparity in global food trade, with high-quality exports and nutrient-poor imports.

Directors call for National Food Strategy

July 12, 2023 by Federated Farmers

The directors of six National Science Challenges call on the government to develop a National Food Strategy for Aotearoa New Zealand.

"Food is essential to our health and wellbeing but it can be a major cause of ill-health and disease," said Professor Sir Jim Mann, director of the Healthier Lives challenge. "The food we produce also has profound effects on the environment and on climate change, and is vitally important to our economy. A healthy and environmentally sustainable food supply is essential for human and planetary health."

Niki Bezzant facilitates the Feeding Aotearoa panel discussion at the New Zealand International Science Festival on Friday 7 July, with (left to right) Professor Cliona Ni Mhurchu, deputy director of Healthier Lives; Joanne Todd, director of High-Value Nutrition; Dr Jenny Webster-Brown, director of Our Land and Water; Dr Julie Hall, director of Sustainable Seas; and Dr Phil Wiles, director of Deep South.

We don't know what we don't know about food security

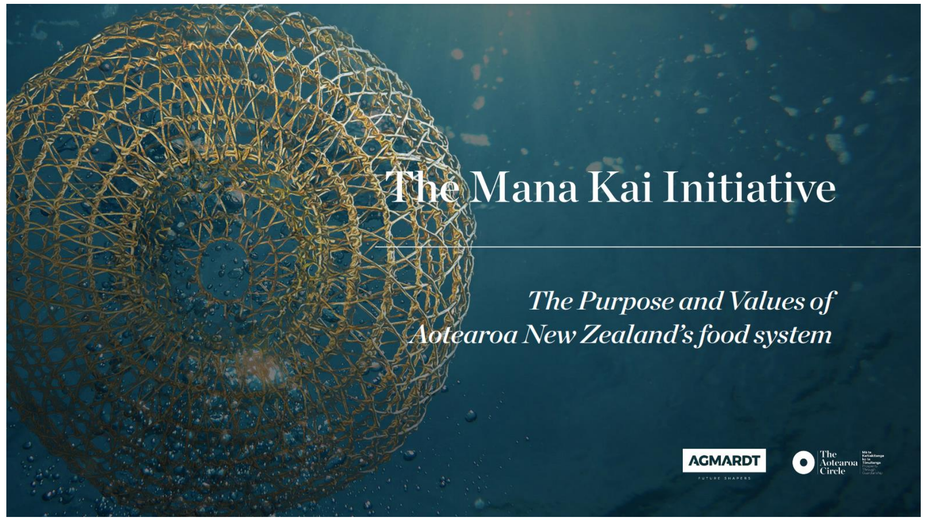
If shipments of food suddenly stop reaching our shores would we have enough food to feed ourselves? A good place to start would be a national food security assessment.

by **Dr Catherine Knight** 11/02/2024 Share

'A big tick for NZ on meat and dairy, and a wide variety of fruit and veg. We don't do so well on the carbohydrate or non-animal protein front – such as wheat, rice, or legumes. And for sugar, cocoa and coffee

Rethinking New Zealand's food security in times of disruption

Tarek Soliman and Suzie Greenhalgh from Manaaki Whenua – Landcare Research, New Zealand

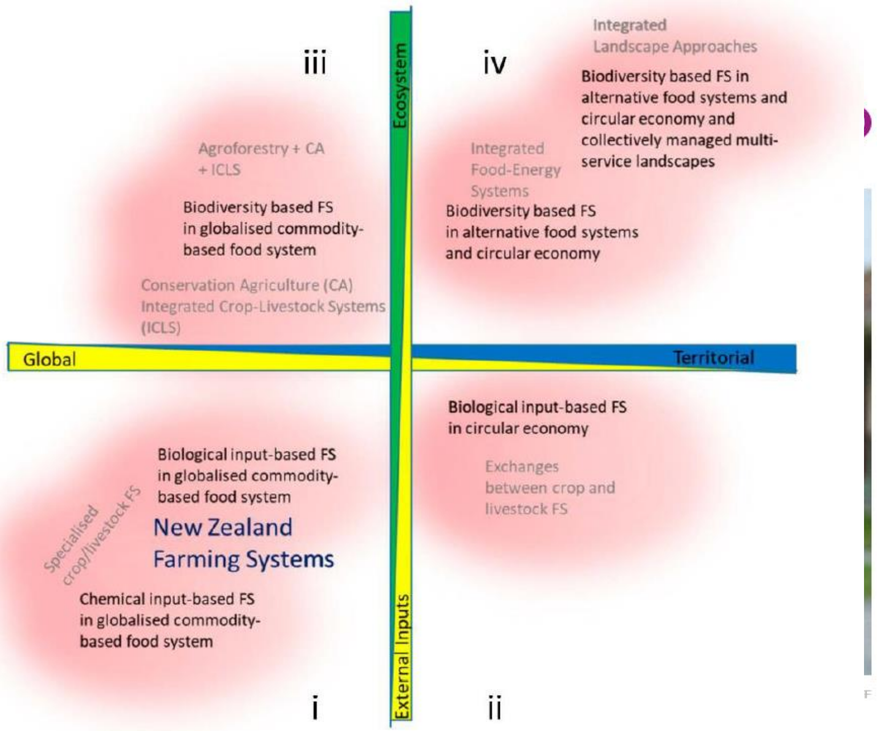


Rethinking Production and Distribution?

Diversification

Local Food Resilience

Circular Bioeconomy



Local Food Networks: Becoming more possible

- Vertical Farming
- Cultured proteins
- Circular Approaches
- Distributed manufacturing – 3D printing
- Distributed energy sources

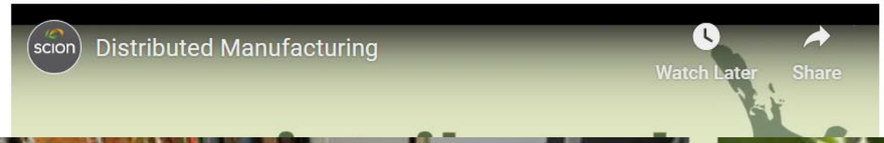
With only three hours of human labour per week, new Ashburton indoor vertical farm mimics nature

Gerhard Uys · 05:00, Jul 11 2023

Distributed manufacturing

Home . Science . Bio-based products & technologies . Distributed manufacturing

Mini factories that use residues from production forests, or horticultural, crop and natural fibres to create new wood products, biochemicals and biomaterials.



Why firms are racing to produce green ammonia

6 days ago

It would be impossible to feed the world's population without fertiliser

By Chris Baraniuk
Technology of Business reporter

In the 19th Century, Europeans realised what the Inca had known long before. Bird droppings, or guano, made a fantastic fertiliser.

And so sprang up a gigantic industry dedicated to the harvesting of guano from Latin American bird colonies, where there were huge piles of the stuff.

… many, including Starfire Energy, hope to package the required tech in a space as small as a shipping container, so that it can be made near to the point of use

Once started, the system can cycle on and off in a matter of minutes, following the vagaries of renewables. Starfire Energy aims to deliver its first commercial-scale devices, which could produce a tonne of ammonia per day, in 2025 [!!!]

Many potential ways to get there – Diversified Businesses or Landscapes

Source: Bain and Renwick (2021)

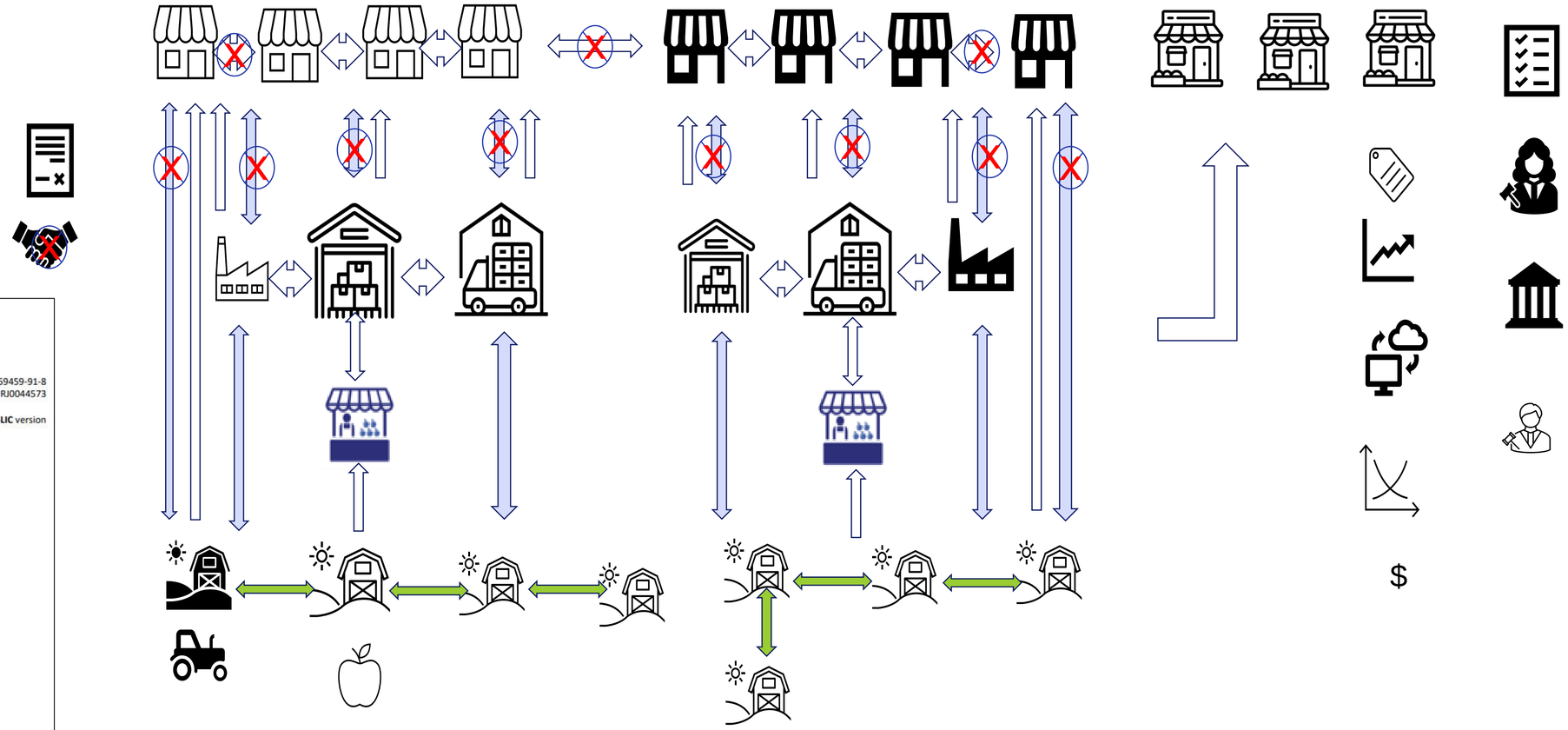
Beware the Local Trap

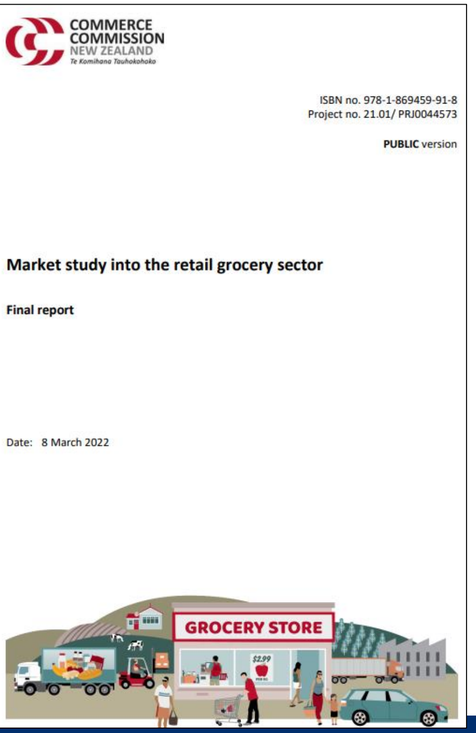
- ‘Many assume that eating local food is more ecologically sustainable and socially just. We term this *the local trap* and argue strongly against it. We draw on current scale theory in political and economic geography to argue that local food systems are no more likely to be sustainable or just than systems at other scales.’

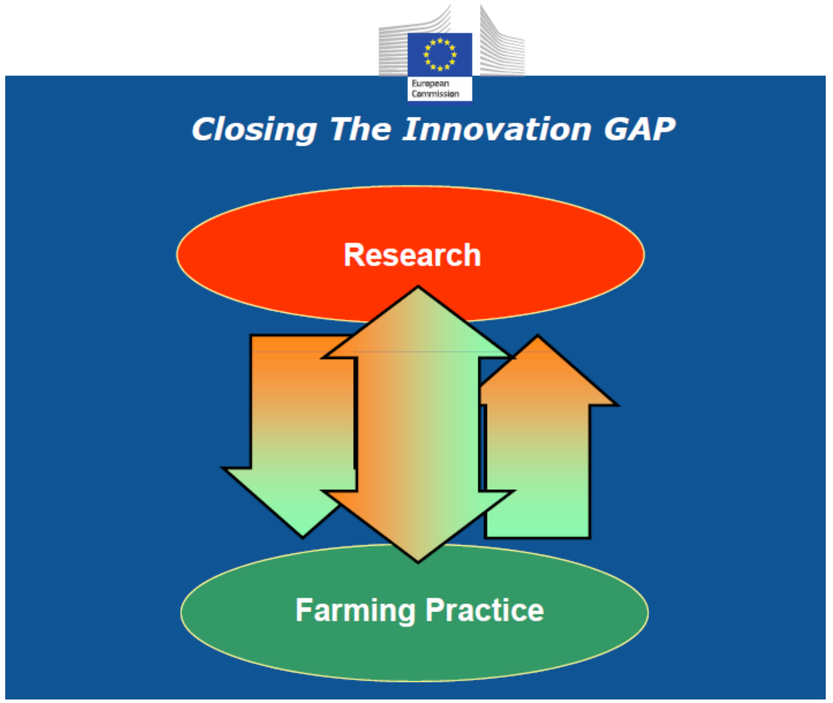
- Born, B., & Purcell, M. (2006).

- Many questions
- What is the extent of the trade-off between efficiency and resilience?
- What would be the costs (including hidden costs) of production in other types of systems?
- Would food be cheaper or more expensive?
- Does it really give us greater resilience?
  - Would we have been better or worse off during the Covid-19 Pandemic for example

We can tackle the individual parts….

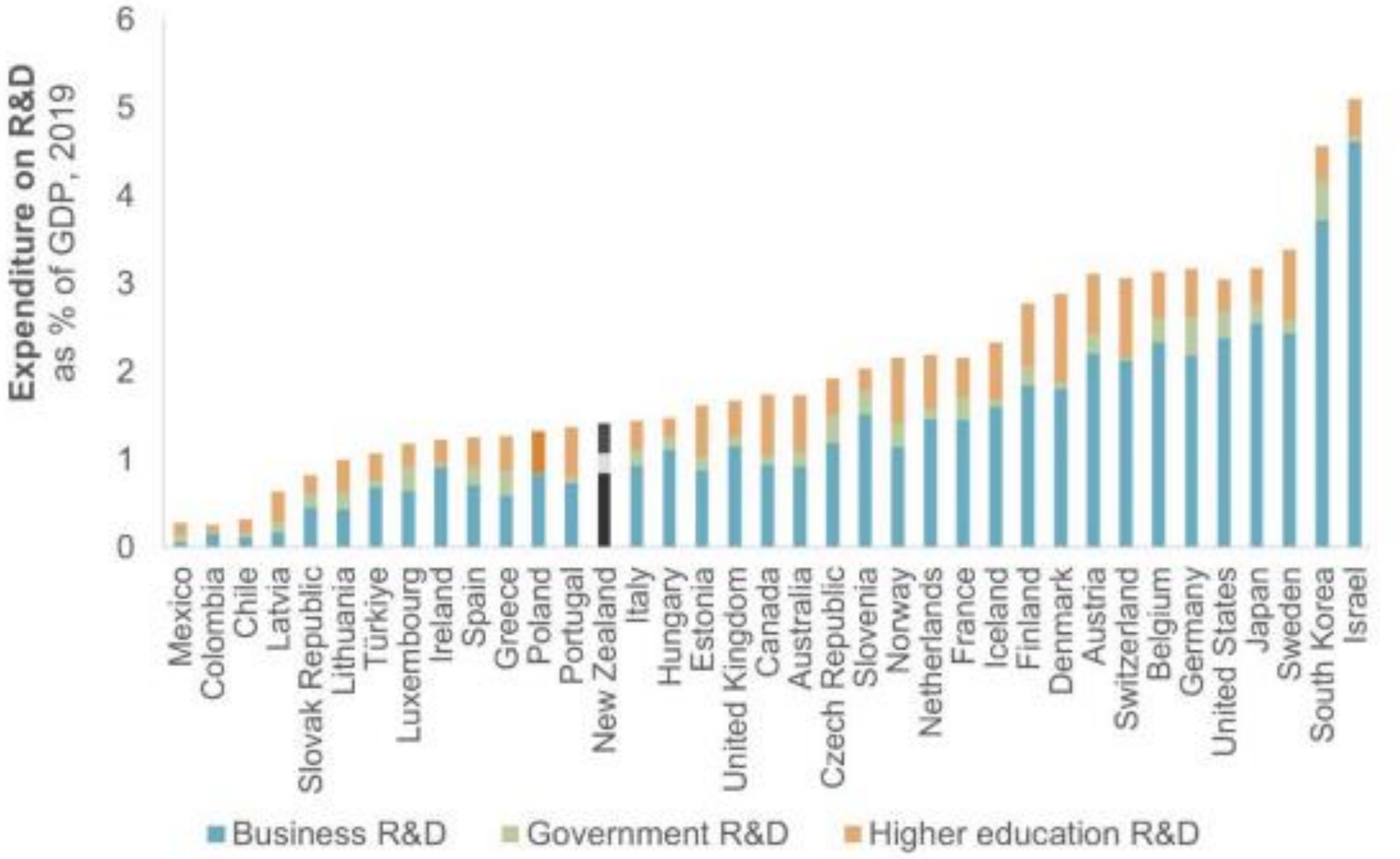




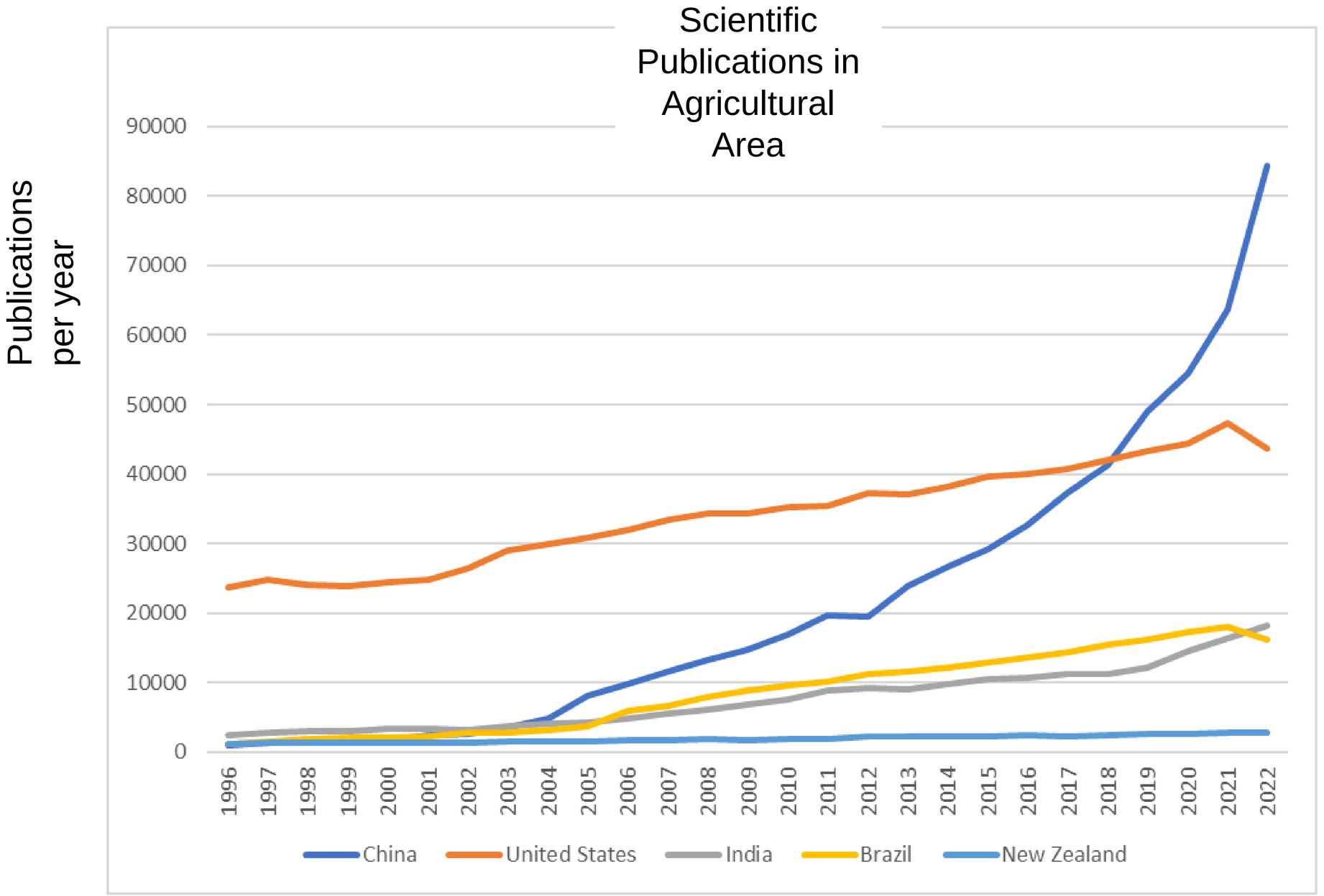


More investment in Research needed into our food system and how we make it resilient

Figure 25: Low levels of investment in research and development

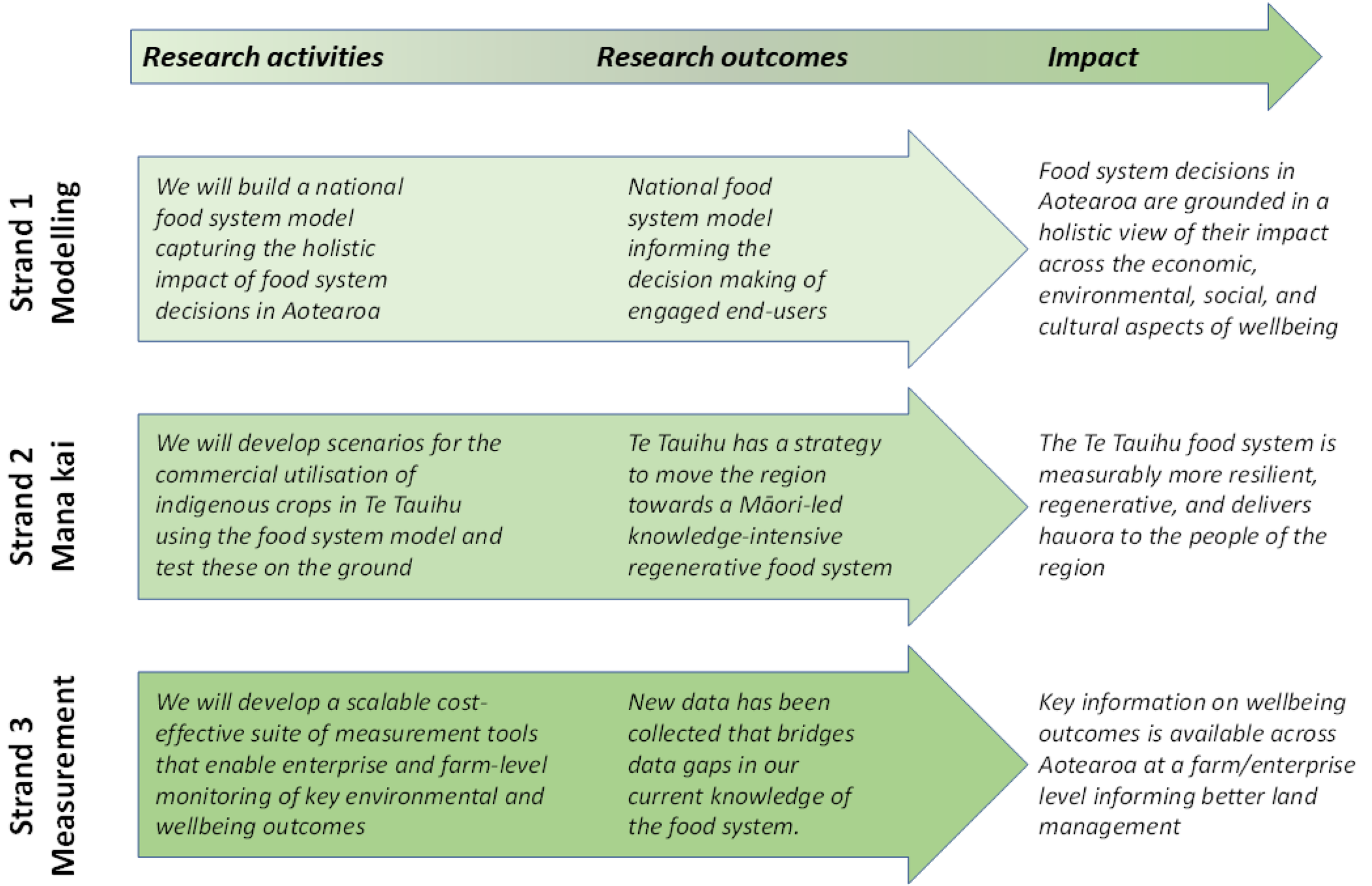


Source: New Zealand Productivity Commission calculations based on OECD. Stats, Main Science and Technology Indicators database (NZPC, 2023c).



Source: Derived from Scimago

Kai anamata mō Aotearoa – exploring future food system scenarios and impacts


Research activities
Research outcomes
Impact
Strand 1 Modelling
We will build a national food system model capturing the holistic impact of food system decisions in Aotearoa
National food system model informing the decision making of engaged end-users
Food system decisions in Aotearoa are grounded in a holistic view of their impact across the economic, environmental, social, and cultural aspects of wellbeing
Strand 2 Mana kai
We will develop scenarios for the commercial utilisation of indigenous crops in Te Tauihu using the food system model and test these on the ground
Te Tauihu has a strategy to move the region towards a Māori-led knowledge-intensive regenerative food system
The Te Tauihu food system is measurably more resilient, regenerative, and delivers hauora to the people of the region
Strand 3 Measurement
We will develop a scalable cost-effective suite of measurement tools that enable enterprise and farm-level monitoring of key environmental and wellbeing outcomes
New data has been collected that bridges data gaps in our current knowledge of the food system.
Key information on wellbeing outcomes is available across Aotearoa at a farm/enterprise level informing better land management

How resilient are we to shocks?

What would a change to production patterns mean?

How do we meet our emissions targets?

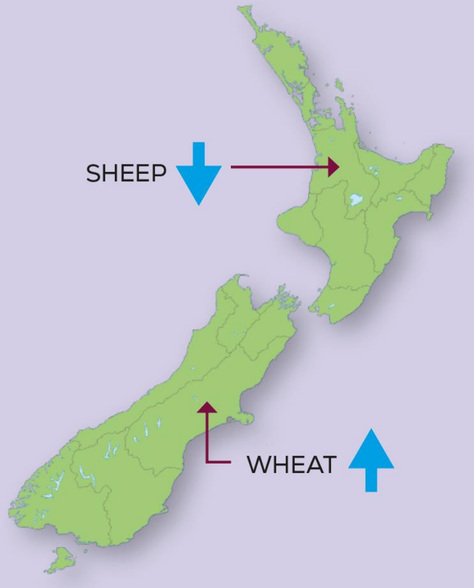
FOOD SYSTEM STAKEHOLDERS

USER SCENARIO

CEREALS ↓

FRUIT ↑

DAIRY ↓



Emissions per kg lamb

FTE per tonne wheat

Export $ per tonne milk

SCENARIO OUTPUTS

TOP LEVEL

Total emissions:	↓ 12%	H
Primary employment:	↑ 5%	L
Export $:	↑ 3%	M

...

DETAILED OUTPUTS

Total sheep CH4:	↓ 23%	H
Seasonal kiwifruit jobs:	↑ 5%	M
Export $ milk powder:	↑ 3%	M

...

HIGH

MEDIUM

LOW

Strength of evidence ratings on all outputs

Food Security and The Food System

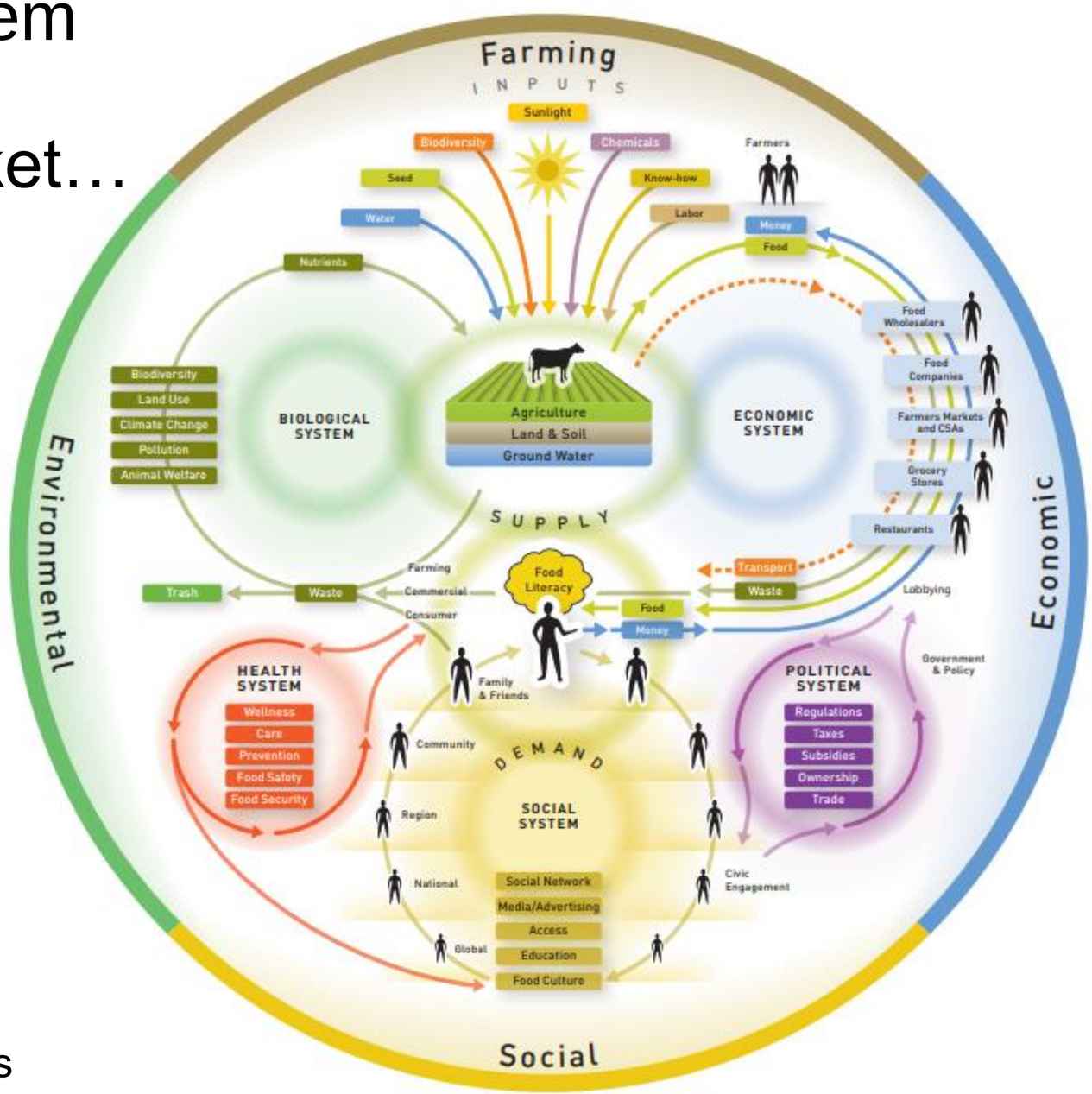
Too important to leave to the market…

“Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and. healthy life” FAO

Four Dimensions

- Availability
- Access
- Nutrition
- Stability

‘The fundamental role of New Zealand’s food system is to ensure Food Security for New Zealanders’ Discuss



Source: Nourish