

THE GLOBAL FOOD SYSTEM

THE CURRENT STATE OF THE INTERNATIONAL FOOD SUPPLY AND CONSEQUENCES FOR NEW ZEALAND

Insight Report – 30th April 2022



**Te Puna
Whakaaronui**

Current global food supply impacts

In this short report we identify an increasingly complex, compounding series of events and evolving trends that describe a significant food system crisis that has been building for some time. It requires collective, global action as well as strong domestic leadership to protect our national interests and the people of New Zealand.

Affordable food is critical to the stability and security of every nation. International food security is currently threatened by the impacts of the Russia-Ukraine war at a time when the global economy is already stressed. Yet, this war is only the most recent in a series of events and evolving trends ratcheting up the pressure to change on global food production and supply systems.

The consequences of conflict, pandemic and multiple weather events are compounding the pressures of climate, technological and consumer demand changes. Global markets are increasingly likely to see shortages, delays and continued price hikes as pressures increase across multiple points in the food system and supply chain.

How this food security crisis will develop is challenging to understand and predict. How we respond as individuals, companies, industries, economic regions and as a global community will determine the shape of tomorrow's world. It will define how trade is conducted, economies are structured and even affect social structures for generations. Global food production has reached an inflection point – our response to change pressing upon us today will determine our wealth and wellbeing for decades to come.

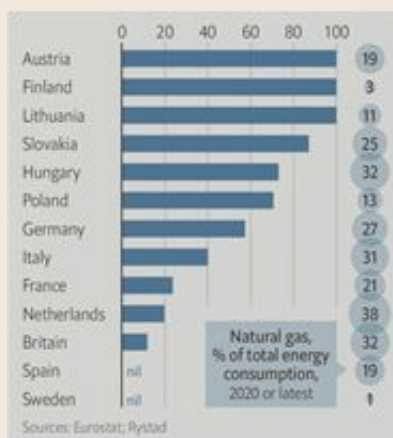
Macro Drivers of Change

Geopolitical tensions

The Russia-Ukraine war is having a profound impact on both global commodity trade and supply chains, heightening many nations' concerns about future access to calorie-dense food sources. Russia and Ukraine are responsible for producing 12% of global calorie consumption and 25% of the world's wheat trade¹. Ukraine supplies the European Union with just under 60% of its corn which forms 50% of livestock feed².

Russia provides the European Union with 40% of its natural gas needs, and is a major supplier of fertiliser, wheat, and other staples³. The supply disruption for large fertiliser and energy users will impact the ongoing production of stock feed crops.

Russian gas imports to selected European countries
(% of total)



SOURCE: The Economist

Primary Russian oil and gas pipelines to Europe



SOURCE: Wikipedia

¹ <https://www.theguardian.com>

² <https://www.footprintnetwork.org>

³ <https://www.reuters.com>

Impacts will continue, even if the war ends tomorrow, and are now being ‘baked into’ the food production sector cost structure. In addition to the exports at risk, and the inevitability of rapid price rises, the conflict is impacting international supply chain networks.

The Black Sea ordinarily sees millions of barrels of oil each day, with 25% of the world’s grain exports shipped across it. Risk from war to these shipping lanes has seen insurance refused or premiums significantly increased. Similarly, land and air trade routes between Asia and Europe are being heavily disrupted. High impact, short-term events are accelerating the search for technology solutions to affordable food security at both national and enterprise levels.

Climate Change

The ongoing impacts of green house gas emissions will continue to affect food production. Estimates show that if they continue to rise on their current trajectory, a third of global food production will be at risk by the end of the century⁴. Severe and extreme weather events through 2021 disrupted food availability; countries such as France, Canada, China, the USA and Brazil experienced significant impact. In the United States, there were twenty weather and climate disasters in 2021 alone, causing an estimated crop loss of US\$8.9 billion⁵. Climate-related disturbances to food distribution, internationally or domestically, may have significant impacts, not only on safety and quality, but also accessibility in the longer term.

California’s experience provides an insight into a grim global future if climate change is not slowed. The state remains in the grip of a dry period that has depleted the state’s reservoirs, facilitated some of the largest wildfires in state history and led to new restrictions on water use⁶. October 2020-September 2021 was the driest in a century. In 2021 drought cost agriculture about US\$1 billion, a roughly 2% reduction in crop revenues, with several thousand jobs lost, primarily affecting lower-income communities⁷.

Plans to reduce water-use to preserve underground aquifers and reservoirs include a US\$2.9 billion payment to farmers. This incentive aims to reduce

crop planting⁸. Affected produce includes: rice, tomatoes, grapes, and tree nuts (e.g. almonds, pistachios, and walnuts). California’s agricultural belt produces roughly a quarter of the nation’s food and 80% of the world’s almonds⁹.

The combination of crop losses from prolonged droughts and purposeful, reduced planting can be expected to cause rising prices and supply shortages domestically and internationally. Short-term responses to immediate problems will accelerate long-term transformations in land use as well as responses to climate change and technology solutions to food supply and security.

Technology Change

Advances in energy production, cultured meat, bio-processing, climate change and waste mitigation technologies have been accelerating simultaneously. Renewable energy technologies, bioreactor technology and food printing are enabling modern foods to compete directly with traditional products (e.g. meat, dairy and eggs). Current high food prices and pressure on the global food system are accelerating the use of the new technology to enable more locally produced food and alternative protein production.

Changes in Consumer Demand

Consumer food choices have changed in recent years moving towards sustainable, ethical and healthier options. While these changes were accompanied by a solid global trend to “buy local” the emerging global food crisis will accentuate this trend further to minimise risks and costs associated with longer supply chains. As the price of food increases, so will the demand for more low-cost, locally produced and nutrient dense food.

Global Food System Vulnerability

Disruptions and the economic impacts of COVID-19 have driven up staple commodity prices. Global agricultural commodity prices are now 40% higher than in January 2020¹⁰. The number of people facing “acute food insecurity” is poised to double to 272 million people according to the United Nations World Food Programme¹¹.

⁴ <https://www.theguardian.com>

⁵ <https://www.washingtonpost.com>

⁶ <https://www.latimes.com>

⁷ [2021 drought cost California ag industry more than \\$1B | The Packer](https://www.thepacker.com)

⁸ <https://www.bloomberg.com>

⁹ <https://blog.aghires.com/80-worlds-almonds-come-california>

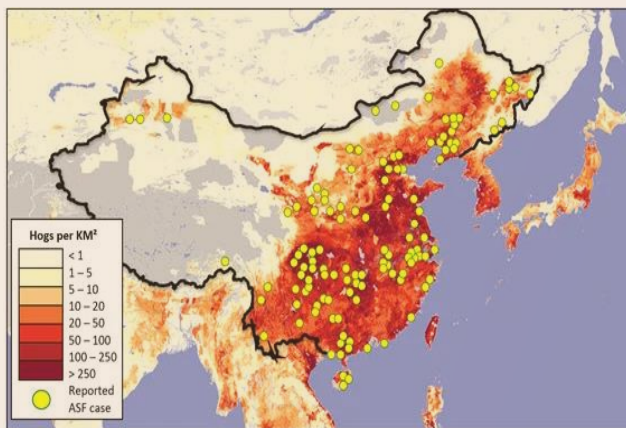
¹⁰ <https://www.ft.com>

¹¹ [Brief: Food Security and COVID-19 - World | ReliefWeb](https://www.reliefweb.org)

Since 2018, global food systems have been suffering cumulative stress and the supply of many key commodities has been disrupted:

- In 2018/19 a devastating outbreak of African swine fever swept across China, wiping out half of the breeding farms. China's GDP fell 1% in 2019, following the culling of millions of pigs, resulting in a loss of US\$111.2 billion¹². Rebuilding the system has been prioritised, but wholesale pork prices have dropped significantly (US\$2.86 per kilogram - half the level a year ago), leading to further decreases in sow herd sizes due to poor hog margins.

China Hog Distribution and reported African swine fever cases



SOURCE: Steiner Consulting

barley, and oat production decreased by 38.5%, 35.4%, 35.3% and 43%, respectively in 2020 compared to 2018¹⁵.

- Through 2021 South American droughts impacted 50% of the world's soybean supply. Parts of Brazil fluctuated between flooding and drought reducing the production of many crops. Soybean production is estimated to have declined by 7.7% from the end of January 2022¹⁶. Brazilian coffee producers are predicting a decline in Arabica bean production of 20-30% in 2022/23.
- In July 2021 China saw heavy rainfall and flooding affect 2.4 million acres of crop fields in the Henan province. This area is known as China's 'granary', it produces a third of the country's wheat and accounts for a tenth of its corn, vegetable, and pork supply¹⁷.
- Through 2021 and 2022, food supply shortages across North America have been exacerbated by a string of fires, plane crashes and explosions at nearly two dozen food processing facilities. Food producers have also had to contend with ransomware attacks on their operating systems. Ransomware attacks have targeted critical supply chain points, creating bottlenecks and further exacerbating food shortages¹⁸. These events have affected facilities that process a wide range of important ingredients, including meat, potatoes, onions, oil, vinegar, soybean, and fresh fruit.
- From February 2022 a highly pathogenic bird flu virus outbreak began tearing its way through US farms, spreading to at least 24 states within two months from the first reported case. To date, nearly 23 million birds have died; this is the worst US outbreak of avian flu since 2015, when more than 50 million birds died¹⁹. The outbreak is driving up consumer prices for eggs and chicken meat, which had already been rising due to inflation. Chicken breast tenders now cost a full US dollar more than they did at the same time last year, a 58% increase, according to the USDA²⁰.
- During February 2022 European and UK food production has been disrupted by soaring

- 2021 proved to be a year of droughts and heatwaves for Europe¹³. Yields dropped 7-9% on average. The severity of crop losses resulting from heat waves, droughts and floods has more than tripled over the last fifty years. Cereals have been the most severely affected, occupying nearly 65% of Europe's cultivated land they are mainly used for animal feed. Record rainfall in Europe has also inundated fields, destroyed crops, and caused major disruption to production sites. Spain has experienced 41% below average rainfall since October 2020, irrigation water supplies were exhausted.
- 2021 droughts reduced Canadian lentil production by 31%¹⁴. Usually producing 40% of the world's supply, this year it harvested only 1.98 million tonnes. Additionally, wheat, canola,

¹² <https://www.nature.com>

¹³ <https://www.theguardian.com>

¹⁴ <https://gro-intelligence.com>

¹⁵ <https://www.ctvnews.ca>

¹⁶ <https://www.thepigsite.com>

¹⁷ <https://www.scmp.com>

¹⁸ <https://www.cnbc.com>

¹⁹ [What we know about the bird flu outbreak : NPR](https://www.npr.org)

²⁰ <https://www.npr.org>

energy costs²¹. Vast glasshouses are standing empty as energy costs make crop production uneconomical. Energy costs will continue to push food prices even higher at a time of historic inflation.

- April 2022 has brought France an unusual cold snap that is ravaging crops from sugar beet to fruit. Frost damaged 80% of France's vineyards, resulting in the smallest grape harvest since 1957²². Wine growers have resorted to lighting fires under individual grape vines to preserve them from frosts.
- Also in April 2022, at least 373 million people (in cities that create 40% of China's GDP) have been affected by the most recent wave of COVID-19 lockdowns across China²³. Shanghai, home to the world's largest port, is experiencing significantly reduced volume, with seven-day throughput down 33% compared to 12 March 2022, as 26 million people locked down.

The largest global container ports 2021 (throughput in millions of twenty-foot equivalent units)



SOURCE: Statista

A lockdown in Shenzhen last month caused a 32% reduction in ocean shipment volume in Guangdong Province. Cumulatively, ocean container traffic out of China to the United States alone has dropped 31% since 6 April 2022. Trucking services in and out of Shanghai are reduced by an estimated 30%, resulting in longer delivery times, and an inevitable rise in transport costs from detour and highway fees.

- On April 28th Indonesia placed a ban on exports of refined, bleached and deodorised (RBD) palm olein to improve availability and reduce prices of cooking oil in the local market. An estimated 40% of Indonesia's palm oil export products will be affected, reducing earnings by over US\$1 billion per month²⁴, a significant impact on Southeast Asia's largest economy²⁵. Palm oil is the most widely consumed vegetable oil globally, it is a key ingredient in products including biodiesel, soap, cosmetics, bread and chocolate²⁶.

What can we expect next?

Current global food system difficulties are unlikely to resolve themselves anytime soon. The implications globally and for New Zealand's food industries are significant. The inability to access sufficient food is most often associated with third world countries. However, food insecurity will - and already is - increasing in relatively well off, first world countries.

Adverse climate events are certain to continue and to increase in severity if effective mitigations are not implemented. As climate change continues, production is projected to decline in tropical regions, while temperate regions will see some gains. Warming beyond crop thresholds will induce yield declines even in temperate regions. Countries bearing the brunt of land degradation and production losses are also home to some of the poorest and most food insecure.

Increased risk of civil unrest

The International Monetary Fund has expressed their belief that steeper price increases for food and fuel may spark civil unrest in some regions, from Sub-Saharan Africa and Latin America to the Caucasus and Central Asia. Food insecurity is likely to increase in parts of Africa and the Middle East.

Even before the pandemic in 2019, the United Nations estimated that 690 million people, or 9% of the world's population, were facing food insecurity and going hungry. The combination of steeply rising food prices, poor weather, and the climate crisis impacting agricultural production were already generating a wave of political instability in several countries around the world.

²¹ <https://www.bbc.com>

²² <https://www.foodandwine.com>

²³ <https://www.reuters.com>

²⁴ <https://www.aljazeera.com>

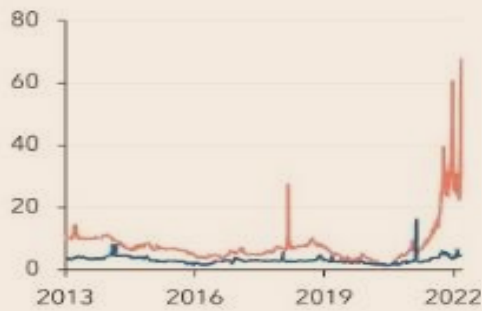
²⁵ <https://www.aljazeera.com>

²⁶ <https://www.theguardian.com>

Inflation rates accelerating

Prices for energy, grains and metal soared since the invasion of Ukraine

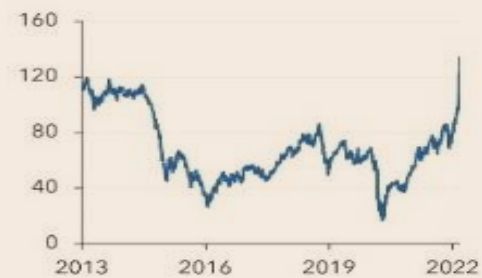
European & US Natural Gas*
(\$US/MMBtu)



Metals Index**
(2016=100)



Brent Crude Oil
(\$US/barrel)



Corn, Wheat
(\$US/bushel)



SOURCE: Bloomberg USDA, Datastream and IMF calculations

*European and US natural gas prices use Dutch TTF and Henry Hub as proxies respectively.

**Base Metals Price Index includes aluminum, cobalt, copper, iron ore, lead, molybdenum, nickel, tin, uranium and zinc.

Unrest in Sri Lanka, Pakistan, and Peru over the last month highlights the national risk countries can expect to face from the effects of acute food insecurity in the future²⁷.

Understanding the Impact for New Zealand

New Zealand will not be immune to direct food price rises or ongoing system level changes.

Immediate impacts

Ministry of Foreign Affairs and Trade analysis has postulated that, for New Zealand, the Limited Bilateral Trade Relationship between New Zealand and Russia will insulate us to some degree from direct impacts in the short-term²⁸. New Zealand's exports to Russia totaled NZ\$293 million in the year to June 2021, these could be shifted to other trading partners. New Zealand imports from Russia, totaling NZ\$95 million in 2021, have dropped to close to zero in recent months. Alternative sources for these imported products are being investigated.

This scenario contrasts with the results of the 2014 Russian invasion of Ukraine, when European sanctions resulted in a glut of dairy products on the global market and a subsequent drop in dairy prices. This time the European dairy market is far less exposed to Russia, and by extension, New Zealand is also less exposed – for now.

Mid-to-long-term impacts

New Zealand's geographic isolation predetermines a degree of supply chain vulnerability. Logistics and transportation costs are rising due to massive disruptions at the distribution end of the supply chain. Reduced airline capacity and cargo re-routing, coupled with lockdowns and isolation requirements, have led to delays at ports.

The cost of raw materials and other inputs continue to rise throughout the supply chain with the impact worsened due to factories closing and re-opening due to fluctuating COVID-19 protocols. Energy costs are also rising, partly due to recovery of global demand in 2021, combined with supply shortages, and now due the Ukraine-Russia war. Collectively these factors create disruption at every stage of the supply chain – production, transportation, and distribution – forcing New

²⁷ <https://edition.cnn.com>

²⁸ <https://www.mfat.govt.nz>

Zealand to “import” more inflation on top of that being generated within the domestic economy²⁹.

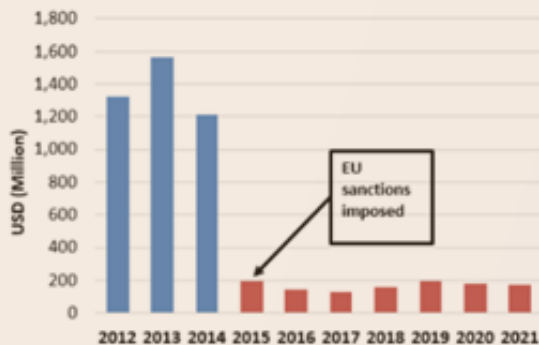
The effects of cost increases and scarcity will have a disproportionate impact on New Zealand’s most vulnerable people. Almost 40% of New Zealand households experience food insecurity, and this number is increasing despite New Zealand

Fonterra Milk Price Payout



EU dairy export trade to Russia

SOURCE: Global Trade Atlas



producing enough food to feed 40 million. This situation has spurred calls for the country to “feed the five million first”³⁰. Numbers experiencing food insecurity will continue to rise unless we acknowledge the situation and take action for change.

New Zealand’s food dichotomy

High international food prices have two key impacts domestically:

- increasing food insecurity; and
- higher short-term revenues for primary sector exports.

Market pressures will accelerate broader medium and longer-term changes in the global food system

which will, in turn, increase New Zealand’s vulnerability. Locally based, lower-cost food products and production systems, alternative proteins and precision fermentation, will compete with traditional export goods.

Within the current global food system dynamics, New Zealand must simultaneously manage affordable access to nutritious foods domestically, while sustaining demand in key international export markets.

Domestic considerations

Solutions for domestic food insecurity will need to consider societal and cultural variables as well as production, price and availability to be successful. Empowering communities to produce and distribute food is a low cost, culturally inclusive approach to food security.

Groups such as Hauora Kai Co-Op³¹ and WELLfed³², amongst others, are already achieving this as at a relatively small-scale. By providing food resources and teaching communities how to produce and prepare food, maintain balanced diets and reduce waste, these locally driven, community-based models empower groups and individuals to implement practical solutions that feed families and make a real difference.

Replicating and scaling-up these models via community partnerships, and local and central government support, can create enduring social networks that alleviate food insecurity.

Influencing the short-term

International trade will always be critical to New Zealand’s economic wellbeing. For this reason, it is more important than ever to continue to advocate for open trading relationships and the removal of both export and import restrictions.

As the world faces increasing food hardship, reducing import restrictions to promote the movement of food at the lowest possible price, and seeking food solutions from alternative local sources, will become a matter of survival for both import and export dependent countries.

Increasing targeted investment into the Research, Science and Technology system (including universities and the innovation infrastructure) will be critical for New Zealand. Producing goods that

²⁹ <https://www.rnz.co.nz>

³⁰ <https://www.rnz.co.nz>

³¹ <https://www.wesleyca.org.nz>

³² <https://www.wellfed.kiwi>

meet changing consumer demands will continue to grow in importance. Developing new commercial models that protect New Zealand's commercial interests will be key to delivering long-term national benefits.

Positioning for the medium-term

Pressure for New Zealand's food production inputs and practices to become planet positive are increasing. This will increase sensitivity to prices, further highlighting the need to build the capability to produce high value exports into high-income markets. Additional effort applied to realising the potential of new foods that are low-cost and scalable, environmentally positive, and nutrient dense, is key to remaining competitive.

There are opportunities to build food system resilience for long-term success, such as through investment in climate change adaptation:

- methane mitigation;
- water availability;
- flood resilience;
- energy security (e.g. renewable, distributed networks as the relative costs of wind, solar and battery storage decrease); and
- targeted research and development investment.

Identifying and focusing on a number of national 'missions' such as high value extracts, low carbon building materials/products, and redesigned value chains will create new industries.

Summary

Global pressures for change have been building for some time. More people are becoming aware of the need to develop new knowledge and technology. We have now reached an inflection point - global food system change is upon us - and we must consider our options and act now.

Creating future success means we must be open to new thinking and taking action beyond New Zealand's traditional way of doing things. It's time to challenge the knowledge and behaviours we once thought incontestable. Our economy rests on the strength of our food system – relying solely on what worked in the past risks New Zealand being left behind.

New Zealand must create a full suite of benefits from its food system – social, environmental,

cultural and economic, to achieve long-term success.

Maintaining global food security will become more problematic, New Zealand will benefit from an effective plan to ensure the wellbeing of its people and economy. It is possible to achieve economic prosperity, as well as collective and individual wellbeing for our people.

Awareness of the need to act is the first step, articulating our food system options and taking action are the next. Time is not on our side – the longer we wait to confront change, the more difficult the inevitable steps forward will become.

Te Puna Whakaaronui, New Zealand's first Food and Fibre Sector think tank, will continue to monitor the global food production situation and report back with further insights as events unfold.

Te Puna Whakaaronui's inaugural report :WELL_NZ – reframing New Zealand's Food Sector opportunities will be released in May 2022. This publication considers New Zealand's current and future food production landscape. For regular food system related information please subscribe to our newsletter, email us at: tepunawhakaaronui@mpi.govt.nz

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