UNIVERSITY OF AUCKLAND
Waipapa Taumata Rau
NEW ZEALAND

ENGINEERING

SYSTEMS PROJECT 2024

Cost of Living Crisis NZ - Food

The Challenge

ENGGEN 403
SYSTEMS
PROJECT
BRIEF 2024

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Please refer to the Systems week page and Systems assignment page on Canvas for more details.

1.0 Background

Food is a basic necessity for life for people in a wide range of circumstances. However, the supply and availability of food in Aotearoa New Zealand is complex, with a lengthy supply chain and various influences on access and affordability. It comprises both domestic production and imported goods. Food products often move through complicated supply chains, from producers to consumers. The elaborate and extensive nature of the food supply chain means many opportunities exist to better understand, analyse, re-imagine, and innovate food provision to society. Further, there may be ways to reduce costs and improve efficiency throughout the supply chain, potentially capturing some of these savings or synergies for the benefit of the end customer.

There are a several key segments in the food supply chain. These are:

- **Production**: This stage entails the production of raw products. Key actors during production are growers and farmers (King, 2023). Aotearoa New Zealand is a major food producer – in 2021, its food production was enough to feed 40 million people (New Zealand Trade and Enterprise, n.d.), well above our own population.

- **Processing**: Processing is highly diverse, mainly because raw materials are processed to different extents (Deloitte, 2013). For instance, there is a big difference in the levels of processing of cleaning vegetables and preparing ready meals – the latter requires significantly more processing. However, this stage can generally be thought of as factories and processors turning raw materials into something people can safely consume.

- **Distribution/Logistics**: Distribution/logistics is the link between processors and retailers. It involves collecting, transporting (via air, land, or sea) (King, 2023), and distributing foods to various retailers.

- **Retail:** Retailers include supermarkets but also food service industry actors like restaurants and cafes (King, 2023).
  It should be recognised that the current food retailer system in New Zealand is dominated by a few players. Any changes to this system are likely to be complex in terms or regulation and legal structures, perhaps with significant challenges to feasibility, as well as difficult and protracted to implement. Therefore, solutions, improvements, or other novel approaches to this problem space would likely need to be very well thought out and heavily supported. Thus, innovating in this area may well be a high-risk endeavour. Teams should carefully research, understand, and consider innovations in any aspect of the system, but particularly the retail level. Some references are provided that may assist in better understanding the forces and implications of concentrated oligopolies in smaller countries across a range of goods.

An overview of the Aotearoa New Zealand supply chain is presented below, along with some possible innovation opportunities for consideration in the different segments. Of course, your team may identify further opportunities for innovation well beyond these and you are urged to think outside the square, particularly in the early stages of the solution ideation process.

Through this project, teams may be able to identify how to develop these innovation opportunities. Teams should consider the Systems Thinking tools and innovation ideation methodologies used throughout the ENGGEN courses to recognise, consider, and analyse innovation opportunities that may help yield benefits to the overall system, as well as costs and savings inherent in reconsidering the existing approaches.

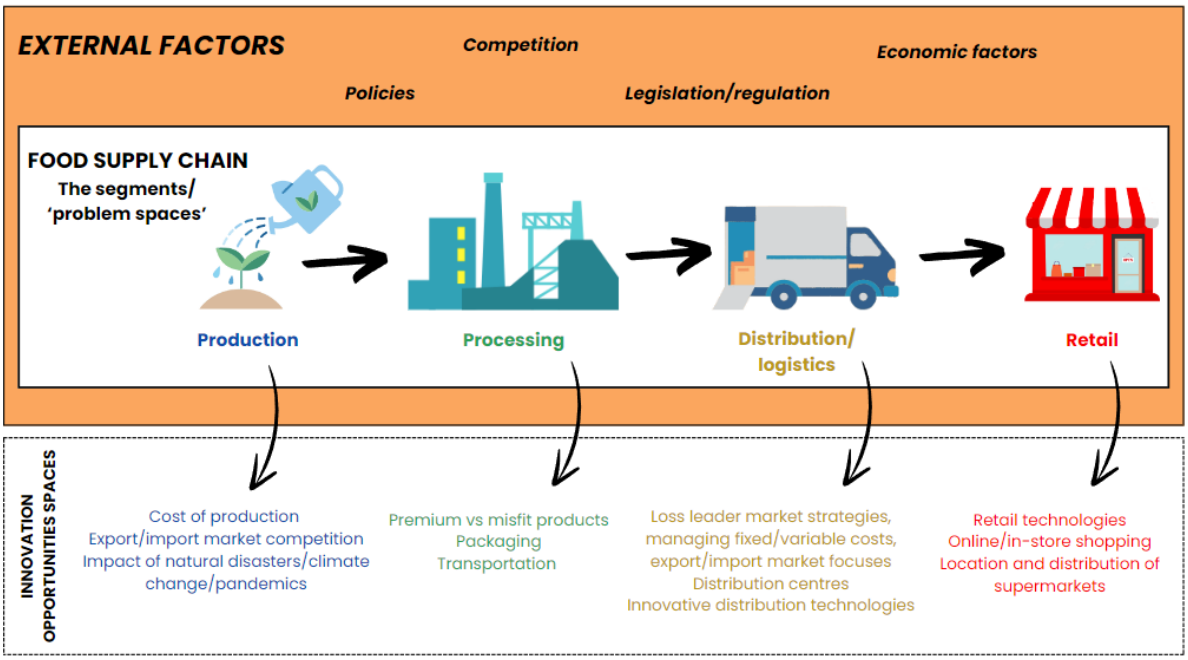

Figure 1 – The food supply chain in New Zealand

The middle section of Figure 1 depicts the four primary segments of the food supply chain (Production, Processing, Distribution and Retail). Consider these your problem spaces. The bottom section of the figure describes examples of opportunity spaces you may consider for innovation within each problem space (again, you should ideate beyond what is here). The top side describes examples of external factors, such as competition, government regulations/policies, and economic factors, which may impact the supply chain, and should be considered in your discussion. It is clear this is a system-level problem with many intertwined problems.

2.0 The Problem Space

Aotearoa, New Zealand, has been dealing with a cost-of-living crisis arising after the COVID - 19 health emergency. The escalating cost of living is particularly evident in, and closely linked to the high cost of food. 2023 was an especially rough year on this front. A recent World Vision Report (2024) found that a food basket containing common foods like eggs and rice increased by 56% in Aotearoa New Zealand from 2022 to 2023. Stats NZ (2023) also reported a 12.5% increase in food prices between 2022 and 2023 – the largest recorded increase since 1986. Certain foods increased even more, such as fruit and vegetables, which spiked in price by approximately 22.5% (Stats NZ, 2023). Interestingly, restaurant and 'ready-to-eat' foods only

increased by 9% (Stats NZ, 2023). Although food prices have finally dropped for the first time in the last six years, the current price level is still the third highest the country has experienced since 1961 (Stats NZ, 2024).

High food prices represent a wicked problem faced by everyone, but most significantly by medium to low-income households for whom the increases translate to higher proportions of household income. A lack of sufficient good quality food at affordable prices across the population means that there is a direct impact on vulnerable groups such as the elderly and children. For instance, the elderly may have specific dietary requirements but may not be able to afford them, which could lead to further health issues (Woodruff et al., 2023). On this note, the health impacts, both physical and mental (Woodruff et al., 2023), of rising food costs and associated food insecurity are also significant. The price increase discrepancies between processed foods and fresh foods serve to exacerbate poor health outcomes, such as obesity and associated issues (Vatsa & Renwick, 2024). For instance, the Ministry of Health's 2022/2023 Health Survey found that just 5.4% of children in the age range 2-14 years old consumed the recommended daily serving of vegetables. Instead, highly processed diets are prevalent and are likely to lead to health – including dental – issues (University of Auckland, 2024). It does not stop there. These children may also be unable to move around as much, which impacts how they socialise with others (University of Auckland, 2024).

As mentioned previously, high food prices have an inequitable impact across Aotearoa, New Zealand, meaning that these associated impacts are felt disproportionately. If a country cannot provide good quality and nutritious food to its younger generation, it is as problematic as not providing the best possible education. The future economic power and potential of a country and how it is perceived by the rest of the world (politically and economically) relies on the overall well-being of its population (mental, emotional and physical). Therefore, high food costs have far-reaching impacts on the four capitals and thus, demand our attention.

So why are food costs so high in New Zealand? There are several key drivers, which include: geographic location and isolation, our relatively small market size, high labour costs, export-focused agriculture, and stringent regulations to name a few. It is also worth noting that, in terms of domestic production, the country has quite a centralised food system (Renwick, 2023). A lot of food production is localised in one region, such as apples in Hawkes Bay, and there are few large distribution centres (Renwick, 2023). This centralisation means that local disruptions can significantly impact domestic food production and supply, think about Cyclone Gabriel's impact on the East Coast.

Addressing these challenges requires a multidisciplinary approach, integrating engineering, economics and policy-making. Your project is focused on the development of innovations around this problem space. You should especially focus on where the supply chain can be innovatively disrupted or made resilient in the face of potential natural disasters and climate fluctuations. The aim is that these innovations will keep Aotearoa New Zealand's food crops safe, production costs low/stable, and avoid continuous or intermittent spikes in food prices that affect the general population.

3.0 The Challenge

The challenge for Systems Week 2024 is to develop a detailed business case report that addresses the broader problem introduced above – the high food costs faced by Aotearoa New Zealand consumers. Specifically, select **two segments (problem spaces)** of the food supply chain in New Zealand and craft **one problem statement for each** of your chosen **two supply chain segments (craft two independent problem statements, one per segment**). You must consider the societal costs and benefits as well as the economic costs and benefits. Your final recommended innovation should include an extensive discussion on how it addresses the overall problem of high food prices in New Zealand, as well as consider how to make the system more resilient and less susceptible to weather, health emergencies, transportation bottlenecks, and other disruptions.

For example, you can choose a problem from the 'Distribution' segment and another problem from the 'Retail' segment. These are your two selected problem spaces. For each problem space, develop one problem statement (so you will have two problem statements in total). You may weight them as you wish, according to the depth of the problem space uncovered by your comprehensive research. You should include a brief reasoning as to your weighting of the problem statement. Then you should create a solution/improvement (or package of solutions/improvement) that addresses both of your problem statements.

Therefore, **your aim for Systems Week 2024 is to create a detailed business case regarding innovations to alleviate the high cost of food for New Zealanders.** In your innovations, be sure to consider the vulnerable and disadvantaged groups, the resilience of the food supply chain to unforeseen events, and the deeper issues related to this problem in terms of social, cultural, and economic aspects.

What new innovations can be developed to tackle the high cost of food in Aotearoa New Zealand over the next 10 years?

4.0 Solution Space

The aim of this section is to aid you in starting to explore your solution space. Teams should consider this a starting point only and not an exhaustive list. There is an expectation that your ideation goes beyond simply that which is listed here.

4.1 Innovation Opportunity Spaces

Some examples of opportunities for innovations within the food sector could include the below. Keep in mind that you should innovate for solutions that create the 'biggest bang for your buck', consider how your total package of solutions will impact different stakeholders. Will you plan for a large benefit of a select few or a more marginal benefit to everyone. Who needs change the most? Or does everyone need some relief? You must think critically and

conduct serious analysis, synthesis, and recycling/iteration to arrive at something meaningful to policy making and of lasting benefit to all New Zealanders.

Production

- Costs of production (fuel, energy, water, raw materials, labour)
- Export/import market competition
- Export/Import of raw materials
- Resilience to natural disasters/climate change/pandemics
- Grow your own or grower's hubs
- The impact of regulations on the cost of production (climate, ethical etc.)
- Labour force shortages (domestic and migrant)

Processing

- Premium vs misfit products
- Packaging
- Transportation
- Novel food technologies (lab cultivated meats, GMO's)

Distribution

- Loss leader market strategies
- Managing fixed/variable costs
- Export/import markets
- Distribution centres
- Innovative distribution technologies (drones, robots)
- Farm to table initiatives

Retail

- Government intervention/oversight
- Regulating competition
- Retail technologies
- Online/instore shopping
- Impact of the speculation of food and energy prices on retail (supply and demand in the free market)
- Location and distribution of supermarkets
- Decentralisation of food retail/ smaller local supply

4.2 What other countries are doing

Rising food costs have not been limited to Aotearoa New Zealand. As such, when investigating innovative solutions, it can be helpful to consider what other countries have done or are doing. For instance, the Greek government requested supermarkets' supplier price lists, offered contributions to low-income households (Reuters, 2023), and imposed price cuts on certain basic items (Dimitropoulos & Katanich, 2024). France "secured a pledge from 75 top food companies to cut prices on hundreds of products" (De La Hamaide, 2023, para. 1), and Spain lowered or eliminated the tax on basic foods (Backholer & Zorbas, 2024).

According to the 2022 Global Food Security Index, the top three most food-secure countries are, in order, Finland, Ireland, and Norway (Economist Impact, 2022a). The report considers food security in terms of affordability, availability, sustainability, and quality and safety. Finland scored 100 (out of 100) in six out of 11 affordability indicators – one related to

poverty, and the other five related to food safety net programmes (Economist Impact, 2022b). The country also scored well in terms of the change in average food costs (Economist Impact, 2022b).

5.0 Context and Advice

This section contains some context and advice based on the teaching team's combined experiences running systems week and the way we've interpreted the brief. Consider these recommendations by the teaching team.

5.1 Use of artificial intelligence (AI) in Systems Week

5.1.1 Use of AI in stakeholder analysis

This year, the teaching team has decided to allow the use of Microsoft's generative AI - Co-Pilot to be used in your stakeholder analysis. This is to be used to generate stakeholder feedback and potential requirements that can be used to inform your innovations. This is further explained in the *Deliverables* document.

5.1.2 Use of AI in general

The general use of generative AI, even as a spell check and editor will be strictly forbidden. We recommend you have some form of editing team within your team structure to complete any editing tasks. Do NOT run your assignments through any AI software as this will breach the use terms as outlined in this report. Use of tools such as Grammarly ***is*** allowed. Note the University's policy on generative AI and restriction to use for that which is outlined and directed by the Course Director here:
https://www.auckland.ac.nz/en/students/forms-policies-and-guidelines/student-policies-and-guidelines/academic-integrity-copyright/advice-for-student-on-using-generative-ai.html

5.2 Starting assumptions

Before you start your work, groups may want to carefully consider, **list and justify their starting assumptions.** These may include:

- The proposed innovations are based on the current environment in Aotearoa New Zealand – i.e., they are not developed for a 'blank slate' context.
- Cost of food, while related, is a separate issue from cost of living. The focus of this report is on the cost of food.
- The Government does not change during this consultation period (assume there is no change of govt. in the immediate term) However, you should consider how your plan could be affected by changes in Government in the longer term.

These are just a few examples, so consider which others should be included.

5.3 Justifications for recommendations

Justification on improvements should consider the cost, consequence and potential probability of such events, along with the Living Standards Framework (LSF) and the Four Capitals. Any new Government expenditure considered should be balanced against other important expenditure priorities: for example, Covid/Health, Climate change, Natural disaster response, housing, education and other social programmes.

Any proposed Government expenditure should be considered in the context of the NZ Government budget (Budget 2024, 2024) considering how any proposal would be reallocated from other sectors or funding. All spending (Government or proposed impacts on sector actors) must be justified with a business case and if funded from a government sector, social impact of changes in budget allocations should be considered. If an initiative is proposed to fund an initiative by new government debt, this should consider other initiatives competing for new funding and the impact of interest and debt repayment required. You should also consider impacts on the cost of living and whether the public is likely to support your proposals, and also consider what may be the impact if the government was to change over the course of the implementation of the proposed plan.

You **must** propose innovations to improve **two** of the segments within the food system. Taking no action (in one or both segments) may be recommended, but this should be a purposeful decision based on proper analysis of the current system, costs and consequences. Do nothing is always an option, but in doing so, the social impacts must be fully critically discussed.
Some points to consider are listed below:

- Should we reallocate budget from other sectors or create new debt and or tax to enact your plan and if so, how much should we be prepared to spend or borrow?
- How is spending on any food system initiatives affected by our commitments in other areas (healthcare, education, climate change, emergency response, long term natural disaster plans)

5.4 Other considerations for analysis

You may wish to consider the following issues to help with your analysis. These are questions that do not need to be addressed separately but may or may not be incorporated into your report.

Advice on choosing and using references

Some data and documents have been provided for you. Whatever you use, **cite your sources correctly** – so that a reader may be able to find and consult your sources if they wish. Not doing so constitutes plagiarism and will be dealt with according to the University policy

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