Solutions for sustainable futures

Ahikā Consulting

Rooms 6 & 7, Level 3,
2 Dowling St, Dunedin 9016

PO Box 1320, Dunedin 9054

info@ahika.co.nz

www.ahika.co.nz

An Overview of the Regional Food System

for Wellington Region and Horowhenua District

Te Whatu Ora National Public Health Service

Date: 15 February 2024

BIODIVERSITY AND RESTORATION

FRESHWATER, FOOD, FARMS, AND FOREST

COMMUNITY AND CLIMATE

ENERGY, CARBON, AND WASTE

Report prepared for client by Niki Bould

Report reviewed by Rhys Millar

Report identifier: 240215 An Overview of the Regional Food System

2 Dowling Street
Ōtepoti Dunedin 9016
Aotearoa New Zealand

Reliance and Disclaimer

The professional analysis and advice in this report has been prepared by Ahikā Consulting Limited for the use of the party or parties to whom it is addressed (the addressee) and for the purposes specified in it. This report is supplied in good faith and reflects the knowledge, expertise and experience of the consultants involved. Ahikā Consulting Limited accepts no responsibility whatsoever for any loss occasioned by any person acting or refraining from action as a result of reliance on the report, other than the addressee.

In preparing this report Ahikā Consulting Limited has endeavoured to use what it considers as the best information available at the date of publication, including information supplied by the addressee. Unless stated otherwise, Ahikā Consulting Limited does not guarantee the accuracy of any forecast or prediction in this report.

Document Version History

Version	Date	Author/Reviewer	Change Status
231030- 1	30 October 2023	Niki Bould / Rhys Millar	Draft
231107 - 2	7 November 2023	Niki Bould / Rhys Millar	Final
231206 - 3	6 December 2023	Niki Bould	Combined Stage 1, 2 and 3
231213 - 4	13 December 2023	Niki Bould / Suse McHugh	Client reviewed
240117 - 5	17 January 2024	Niki Bould / Suse McHugh / Tessa Ackerson	Client changes confirmed
240215 - 6	15 February 2024	Niki Bould	Improving readability of graphs (and updating food demand to food consumption, and food supply to food production)

1 Executive Summary

The Wellington Regional Leadership Committee is a union of councils, iwi, and central government in the Wellington-Wairarapa-Horowhenua region, formed to work together to positively shape the future of the region. The committee has launched a Regional Food System Strategy Project to determine a sustainable, equitable, and local approach to food. The Overview of the Regional Food System for Wellington Region and Horowhenua District provides an understanding of the foodshed and food system for phase one of the Regional Food System Strategy.

The Overview of the Regional Food System has created an understanding of the capacity for the Wellington Region and Horowhenua District to supply its own food needs with the purpose to promote more resilient food economies that have a stronger focus on localisation. The project was delivered in three stages: firstly, the food production potential of the region's productive land relative to the food needs of its population was evaluated. Secondly, an understanding of the systems that food must travel from production to plate were explored including a snapshot of stakeholders involved in that food system. Thirdly, the project identified further research and opportunities for achieving the goal of increasing the localisation of food.

Stage one of the project is based on a methodology developed through the Otago Food Economy Report (Millar, et al., 2016), and using data from AgriBase® (a product of AsureQuality Limited[1]), a baseline foodshed analysis[2] was completed. The high amount of productive agricultural land, on a per capita basis, is demonstrated. For example, the Wellington Regional foodshed area (as defined by the project) is 296,656 hectares, amounting to 60% of the defined current productive land area for food as recorded in the AgriBase® dataset for the Wellington Region and Horowhenua District (497,428 ha). The remaining 40% of the Wellington Region and Horowhenua District's existing food producing land is beyond the community's needs for self-sufficiency and is classed as 'surplus'.

With an estimated population growth of 200,000 people by 2052, the Wellington Regional foodshed area extends to 398,856 hectares, which is 80% of the existing food productive area. By 2052, only 20% of the existing food productive area will be surplus to the community's self-sufficiency requirements.

In summary, the foodshed analysis for the Wellington Region and Horowhenua District shows the production of significant volumes of dairy products and red meat, which reflects the export-focussed nature of Aotearoa New Zealand's primary production. Moreover, only 26% of the existing dairy production is needed to meet local community needs. The amount of red meat is also beyond the

[1] AgriBase® spatially maps almost every farm in the country. Providing each with its own traceable ID, it holds information on approximately 144,500 live (current) New Zealand rural properties. These include properties involved in livestock farming, arable cropping, horticulture, viticulture, or forestry. Lifestyle blocks and conservation estate are also included in AgriBase®. However, there are limitations with the dataset, see Appendix two for more details.

[2] A baseline foodshed analysis is a report that provides information on the current estimated amount of food needed to feed the population residing within the study area and compares it to the estimated amount of food produced within the study area.

current needs of the community. The methodology used for this calculation (Lawton, 2013) shows that the production of meat formed 85% of the ecological footprint of the average (2013) Aotearoa New Zealander's diet. Concurrently, in the Wellington Regional foodshed, it is the red meat production that accounts for most of the land use (85% including beef cattle, deer, goats, and sheep but not dairy cattle culls).

Horticultural production is predominantly found in the Horowhenua and the Wairarapa Districts, with some large-scale commercial vegetable production supplying both local and national markets. Fruit production is distributed across the region, ranging from small producers supplying local markets to extra-large-scale producers supplying the export market. Some food items, such as tropical fruits (bananas, pineapples, and mangoes) or grains (rice and quinoa), are unsuited to the climate and may never be produced locally. Overall, a wide range of food types are grown within the Wellington Regional foodshed.

Stage two of the project produced a baseline food system analysis which identified the key aspects of the food system and how the current food system functions. The bulk of the second part of the project was conducted through quantitative surveys and interviews. Due to time and budget constraints, only a small percentage of food producers/growers and food retailers were surveyed. The data gathered provides a snapshot of the stakeholders and current food system within the Wellington Region and Horowhenua District.

Stakeholders of a food system are businesses, organisations, groups, and individuals that are involved with food anywhere along the supply chain, from paddock to plate and potentially stand to lose or gain from changes to it. Including, those involved in:

- The production of food, such as the producers of primary produce (e.g. fresh fruit and vegetables, meat, fish, eggs, and milk). This includes farmers (arable, livestock and poultry), growers of fruit and vegetables, egg producers, and game and fisheries workers.
- The packing and processing of food, such as abattoirs, butchers, milk processing, cheese making, fruit packhouses, honey packers, flour millers, and makers of baked goods and lightly processed food (e.g. cheese, sausages, pies, jams, and baked goods).
- The distribution of food (such as meat traders, and distributers for local, regional, national, or overseas export).
- The retail of food including through food outlets (café's, bars, restaurants, convenience stores, organic stores, butchers, bakers, fish mongers, takeaway food stores, supermarkets, and global fast-food outlets).
- The direct sellers of food, primarily primary produce such as farm shops, market stalls, vegetable box schemes, food cooperatives, grocers, supermarkets, and other food delivery schemes (however, mobile shops and online shopping/ delivery companies were excluded from the research due to incomplete data).
- The consumption of food (consumers).

Key findings of the current food system show the predominance of a large-scale high export-focused commercial food system. Gaps in the data mean it was impossible to determine which food producers sell locally, nationally, regionally or for export, meaning the quantities of food produced in the region identified from the foodshed analysis could not be determined as staying within the region or leaving the region. A snapshot of food producers showed a wide variety of business operations, with some just selling to one market (local, national or export) others supply two types of markets and some selling to all three. A key comment indicates, *"although we supply both locally (to local retailers and our own shop), we need to supply nation-wide to make it work financially, ideally we need to export*

to make our business sustainable". This comment affirms the belief for some growers that only supplying to the local market was not possible if they wanted to ensure their business could be profitable.

Pricing competition poses a potential hurdle for growers, especially when compared to the lower prices available in the conventional food economy. Imported products can often be sold at similar or even more affordable prices than their local counterparts. Large-scale purchasing can also influence prices, meaning supermarkets can often sell cheaper than a grower selling direct-to-consumer. The pricing challenge can also be exacerbated as some growers emphasise ethical production, incorporating sustainable practices and fair wages for workers, which are factors that contribute to elevated production costs. Additionally, some food producers indicate they find it challenging to achieve satisfactory returns from market participation due to consumers' expectations of lower prices for locally produced items.

Understanding whether there is an appetite from local producers to supply into the local market, challenges and benefits were explored. A lack of demand (as well as a lack of consumer education) and outdated or unusable regulations (specifically food safety compliance regulation) and limited growth potential (including lack of population) are common reasons stated as to why it is challenging to supply the local market. The key drivers for growers selling locally are predominantly due to community values, and building or keeping local relationships, with supporting the local economy as being third most important.

Suggested changes required to improve the local food system were varied, however some responses suggest that engaging in direct-to-consumer sales is labour-intensive and demands additional costly resource. Similar comments indicate that consumer education is required alongside more streamlined regulations to get food from farm to table.

Key findings from within the food processing sector shows that despite there being a large amount of milk produced in the region, most of the milk is transported out of the region to be processed. The two closest large-scale processing plants are in Longburn and Pahiatua. Four small-scale cheese factories are within the region but only work with a very small percentage of the overall annual tonnage of milk.

A wide variety of horticulture processing exists within the Wellington regional foodshed, from being sold off-farm for processing and distribution (whether local, national or export), sold to existing distributers (such as supermarket) or sold direct-to-consumer via farm gate sales (or pick your own), farmers' markets or CSA models (Consumer Supported Agriculture), or online sales (such as vegetable box delivery).

For meat processing, it is hard to track which animals stay within the region and which travel outside for national or export supply. However, an important revelation showed that a major meat processor acquires 8% of its pork supply from local pig farms, with the remaining 92% being sourced as frozen imports from Europe or North America. Consequently, the annual procurement stands at 950 tonnes of locally sourced pork, whereas a substantial 11,000 tonnes are imported from overseas each year.

Of the approximately 2,548 food premises across the foodshed, 30 were surveyed, providing a snapshot of information. Half of those surveyed indicate they source their food for sale as local as

possible, and a quarter specify purchasing direct from the grower. For these consumers of local food, they need a supply chain that is reliable, trusted, and simple. For those not already sourcing food locally, barriers included comments that local produce was not available, or there was a lack of consistent supply or that logistics were too complicated to pursue it. Over a third of respondents indicate that the price of local food was too high.

Stage three of the project included recommendations for the future specifically after the stakeholders and partners of the Regional Food System Strategy came together for an end-of-year wānanga to review the findings of Stage One and Stage Two and to collectively identifying opportunities for regional collaboration within the strategy. The recommendations are structured around five areas.

Firstly, directly from the wānanga, areas of further research were identified to strengthen the work to date. Secondly, different methods for localising food are discussed. Thirdly, best approaches to support the food producers and growers are considered, with the fourth recommendation focusing on the best approaches to encourage consumer support of local food producers and growers. Finally, a summary of potential opportunities to enhance the local food economy in the Wellington Regional foodshed is explored.

In short, research shows that local food economies globally are flourishing and becoming more prevalent. The Wellington Regional food economy is no different. For example, there are strong opportunities to diversify production away from the core export commodity products (red meat and milk) to vegetables and fruit, enabling stronger self-sufficiency. The opportunity cost associated with changing land use to less profitable food production, however, is the biggest and most obvious impediment to such a transition.

To support food producers selling locally, consumers may need to recognise that local food does not always mean cheaper food, that they will need to make the effort to support local distribution, which may mean choosing local over price and convenience.

Finally, potential opportunities for change to grow the localisation of food pivots around strong collaboration, building a brand, working with mid-scale producers, and creating local food hubs. Local food hubs are inherently collaborative, as is the aggregation of products from multiple farms to support larger-scale distribution of local foods into a variety of markets. The hub facilities would need to provide a physical site, aggregation, marketing, and distribution. Due to the geographical size of the Wellington Regional foodshed, satellite hubs could be developed to distribute food across the foodshed. Synergistic ventures, such as kitchen or processing facilities, present an opportunity to leverage surplus produce, seconds, or seasonal gluts for the creation of nutritious fast foods, prepared meals, or high-quality processed food items. The incorporation of health-conscious "fast-food" outlets not only addresses challenges related to food accessibility but also contributes to dismantling barriers associated with community perceptions of local food. Collaborating with educational institutions specialising in food training offers the prospect of creating enterprises and employment opportunities while potentially generating additional income for the Hub.

The Overview of the Regional Food System has provided a snapshot of the Wellington Regional foodshed today, and what may be required to feed the population in the future. The Wellington Regional Leadership Committee continues to work on the Regional Food System Strategy.

1.1 Origins of the Report

In mid 2023, Ahikā Consulting Ltd was contracted by Te Whatu Ora National Public Health Service (NPHS) Capital Coast, Hutt Valley, Wairarapa to undertake research into the Wellington Region and Horowhenua District's foodshed and food system. NPHS contracted Ahikā Consulting's Niki Bould as the researcher to undertake this research with support from NPHS staff. Enquiries about the research report can be directed to nikibould@ahika.co.nz.

1.2 Glossary of Terms

Food Group: A food group comprises foods with similar nutritional properties or biological classifications. Nutrition guides commonly categorise foods into distinct groups, for example, Aotearoa New Zealand Ministry of Health (MOH) discusses five key food groups (vegetables, fruits, proteins, grains, and milk products).

Food Type: For the purposes of the research, a food type is a way to describe specific foods categorised within a food group. For example, meat or red meat, poultry meat, pork meat and fish are all food types that are part of the protein food group.

Foodshed: A 'foodshed' is a definitive geographic area (within this Overview of the Regional Food System the "Wellington Regional foodshed" is referred to). However, foodshed is also used to describe the food that is produced and consumed within that specific geographic area and to indicate what potential that specific geographic area has in order to meet the food needs of its population.

Food System: A food system includes all processes and infrastructure involved in feeding a population: growing, harvesting, processing, packaging, transporting, marketing, retailing, and disposal of food and food-related items. A dominant food system could be described as the existing large-scale high export-focused commercial food system that currently operates predominantly across Aotearoa. An informal food system could be described as that operating outside of the commercial food system that includes hunting and gathering of food with the aim of eating, processing, or trading food, where money doesn't change hands and instead people are fed by the kindness of whanau and neighbours.

Local Food: Raw food (fruit, vegetables, meat, eggs, milk, fish) that is produced or grown close to the place where it is sold and lightly processed food (sausages, pies, drinks, jams, chutneys, dairy produce, and baked goods) where the main ingredient is supplied from nearby. The definition of close, nearby, and local can vary according to who you ask. Some people say local means Aotearoa New Zealand, others say it means regional. Within this Overview of the Regional Food System, local food means raw food and lightly processed food grown and processed within Wellington Region and Horowhenua District.

Local Food Economy: A food system operates within and is influenced by social, political, economic, and environmental contexts. The term food system is used frequently in discussions about nutrition, food, health, community economic development and agriculture. Local food economies encompass the economic and social systems involved in growing, processing, distributing, and consuming food within a specific locality. They aim to enhance social capital and bolster resilience in farming communities by fostering increased economic activity locally. By fostering collaboration, local food

economies contribute to building community cohesion and enhancing consumer awareness of food and farming systems.

Producers: Producers of primary produce (e.g. fresh fruit and vegetables, meat, fish, eggs and milk) and lightly processed food (e.g. cheese, sausages, pies, drinks, jams and baked goods). This includes farmers (arable, livestock and poultry); growers of fruit and vegetables; game and fisheries workers and processors; dairy producers; egg producers; flour millers, and makers of baked goods, jams and chutneys, and drinks (although for this study, drinks have not been included).

Retailers: Food outlets or sellers of food through shops, farm shops, market stalls, box schemes, food cooperatives, supermarkets, and other food delivery schemes (such as mobile shops and online shopping/ delivery companies).

Stakeholders: The businesses, organisations, groups, and individuals that influence the local food economy and potentially stand to lose or gain from changes to it.

Contents

1 EXECUTIVE SUMMARY III
1.1 ORIGINS OF THE REPORT VII
1.2 GLOSSARY OF TERMS VII
2 INTRODUCTION 1
3 STAGE ONE: BASELINE FOODSHED ANALYSIS 2
3.1 DETERMINING THE FOODSHED 2
3.1.1 Land area of Wellington Region and Horowhenua District 2
3.1.2 Population of Wellington Region and Horowhenua District 3
3.1.3 Ecological Footprint calculations 4
3.1.4 Calculating the foodshed 5
3.1.5 The foodshed by 2052 6
3.2 DETERMINING THE MASS BALANCE USING A DETAILED FOODSHED ANALYSIS 7
3.3 TOTAL ESTIMATED CONSUMPTION 8
3.3.1 Factor I: Population 8
3.3.2 Factor II: Average food consumption 9
3.3.3 Factor I x Factor II = Total Estimated Consumption 22
3.4 TOTAL ESTIMATED PRODUCTION 22
3.4.1 Factor III: Land use analysis 23
3.4.2 Factor IV: Volume of food production 26
3.4.3 Factor III x Factor IV = Total Estimated Production 29
3.5 MASS BALANCE: THE WELLINGTON REGIONAL FOODSHED 30
3.6 ESTIMATING THE FOODSHED IN THE FUTURE 32
3.7 FINDINGS 32
4 STAGE TWO: BASELINE FOOD SYSTEM ANALYSIS 33
4.1 DEFINING THE 'LOCAL' IN LOCAL FOOD? 33
4.2 KEY STAKEHOLDERS IN THE EXISTING FOOD SYSTEM 34
4.2.1 A snapshot of food producers 34
4.2.2 A snapshot of food processing, distribution, and supply chain 42
4.2.3 A snapshot of food retailers 47
4.2.4 A snapshot of farmers' markets 62
4.2.5 A snapshot of consumers 65
4.2.6 A snapshot of the informal local food system 65
4.3 FINDINGS 68
5 STAGE THREE: RECOMMENDATIONS 69
5.1 REGIONAL FOOD SYSTEM STRATEGY WĀNANGA 69
5.2 AREAS FOR FURTHER RESEARCH 69
5.2.1 Opportunities for Māori and Pasifika communities 70
5.2.2 Income demographic overlay 70
5.2.3 Identify food deserts and food swamps 70
5.2.4 The role of supermarkets 71
5.2.5 Requirements for encouraging dairy conversion 71
5.3 LOCALISING FOOD 72
5.3.1 Direct-to-consumer marketing and sales 73
5.3.2 Pricing can play a role in stimulating local food economies 75
5.4 BEST APPROACHES TO SUPPORT FOOD PRODUCERS/GROWERS 75
5.4.1 Local food does not always mean cheaper food 75

5.4.2 Reliable distribution options *76*
5.4.3 Products are safe and legal for consumers *76*
5.4.4 Capturing value *76*
5.5 BEST APPROACHES TO ENCOURAGE CONSUMER SUPPORT OF LOCAL FOOD 76
5.5.1 Consumers need consistency of supply *76*
5.5.2 Consumers want convenience *77*
5.5.3 Consumer education *77*
5.6 POTENTIAL OPPORTUNITIES FOR FURTHER DEVELOPMENT 77
5.6.1 Encourage collaboration and networks *78*
5.6.2 Build a brand – build trust *79*
5.6.3 Work with mid-scale producers *80*
5.6.4 Create local food hubs – with satellites *81*
6 APPENDIX ONE: METHODOLOGY OF THE BASELINE FOODSHED ANALYSIS 84
6.1 FACTOR I: THE SIZE OF A FOODSHED'S POPULATION 84
6.2 FACTOR II: WORKING OUT AVERAGE FOOD CONSUMPTION 84
6.2.1 Explaining the MOH data *84*
6.3 FACTOR III: EVALUATION OF THE DIFFERENT LAND USE TYPES 86
6.4 FACTOR IV: FOOD PRODUCTION ESTIMATES 86
6.4.1 Farming systems analysed *86*
6.4.2 Fish harvest *89*
7 APPENDIX TWO: GIS SPATIAL EVALUATION OF LAND USE 91
7.1 DATA SUPPLY SPECIFICATIONS 91
7.1.1 Farm identification *91*
7.1.2 Farm type descriptions *91*
7.2 DATASET LIMITATIONS 92
8 APPENDIX THREE: METHODOLOGY OF THE BASELINE FOOD SYSTEM ANALYSIS 93
8.1 FOOD GROWER INTERVIEW DESIGN AND COLLECTION 93
8.1.1 Interview selection *93*
8.1.2 Data analysis *93*
8.1.3 Interview limitations *93*
8.2 FOOD PREMISE SURVEY DESIGN AND DISTRIBUTION 93
8.2.1 Survey/interview selection *93*
8.2.2 Data analysis *94*
8.2.3 Survey limitations *94*
9 APPENDIX FOUR: FURTHER RESEARCH IDEAS FROM WĀNANGA 95
9.1 OPPORTUNITIES TO REDUCE RETAILER AND HOUSEHOLD FOOD WASTE 95
9.2 PERCENTAGE OF FOOD PRODUCED WITHIN THE REGION THAT LEAVES THE REGION 95
9.3 OWNERSHIP OF FOOD PRODUCING LAND 95
REFERENCES 96

2 Introduction

Local Food Economies are the economic and social systems for growing, processing, distributing and consuming food within a local area, building social capital and increasing resilience in farming communities by increasing activity within the local economy. Through collaborative processes, a local food economy can build community cohesion and greater consumer understanding of food and farming systems which in turn further breaks down social barriers between Aotearoa New Zealand's rural and urban communities.

In 2016, Ahikā Consulting Ltd (Millar, et al.) produced a Local Food Economy Report for Otago and a Toolkit to assist community organisations, government organisations or local councils to understand their own local food economy. Localising a food economy helps communities to work towards protecting and strengthening their own food systems. Mapping key elements, including the built, social, physical, financial, natural, political, and human capital already available in a community, can help identify crucial threads to enabling a resilient food economy. These threads are often woven together to create a food economy and must be unwoven to identify where food comes from and how it is produced, distributed, and sold. Mapping this information can be used to establish new links between different components of the food economy.

The Wellington Regional Leadership Committee is a union of councils, iwi, and central government in the Wellington-Wairarapa-Horowhenua region, formed to work together to positively shape the future of the region. The committee has launched a Regional Food System Strategy Project to determine a sustainable, equitable, and local approach to food. Figure 1 shows the plan for achieving Phase 1: Preliminary Priorities and Actions of the Strategy, including proposed responsibilities.

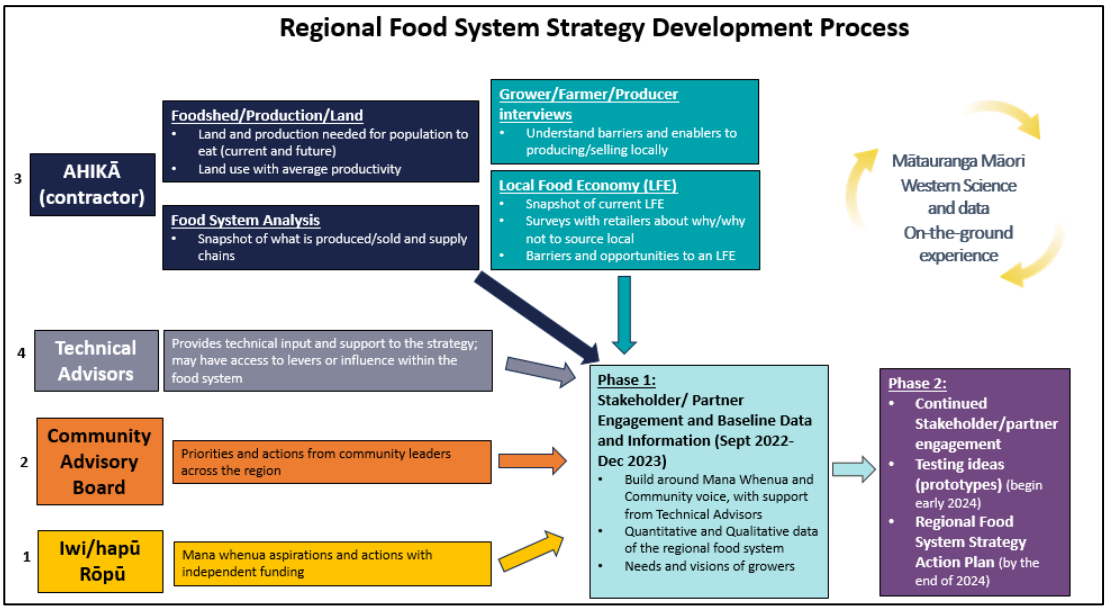

Figure 1: Regional Food System Strategy diagram of responsibilities

Ahikā has committed to producing an Overview of the Regional Food System for the Wellington Region and Horowhenua District, which will be produced in three stages:

- Stage 1: Provide a Wellington Region and Horowhenua District foodshed analysis.
- Stage 2: Provide a Wellington Region and Horowhenua District food system analysis.
- Stage 3: Provide recommendations to identify gaps in existing food system, and commonalities and opportunities for change in Wellington Region and Horowhenua District.

3 Stage One: Baseline Foodshed Analysis

A foodshed is a geographic area or region that encompasses all the sources of food that supply a particular population or community. It is a concept used to understand and map the flow of food from its production, distribution, and consumption within a specific geographic area. Similar to the concept of a watershed, which defines the boundaries of water drainage, a foodshed defines the boundaries of where a community or region obtains its food resources.

The idea behind a foodshed is to promote and support local (including regional) food systems by emphasizing the importance of sourcing food from nearby producers and reducing the reliance on distant or global sources. This concept aligns with principles of sustainability, reducing food miles (the distance food travels from production to consumption), and fostering a closer connection between consumers and local food producers. It can also be a valuable tool for discussions around food security, agricultural planning, promoting local agriculture, and food production.

3.1 Determining the Foodshed

There are four parts to determining what the foodshed is for the Wellington Region and Horowhenua District:

1. Understanding the land area of Wellington Region and Horowhenua District.
2. Understanding the population within Wellington Region and Horowhenua District.
3. Understanding the Ecological Footprint calculations per person.
4. Calculating the Foodshed.

These parts are explained in detail below.

3.1.1 Land area of Wellington Region and Horowhenua District

Figure 2 (page 3) shows a map of the land area of the Wellington Region and Horowhenua District. Table 1 shows the total land area of **911,976** hectares and the land area by Territorial Authority (TA).

Table 1: Land area by Territorial Authority within the Wellington Region and Horowhenua District (StatsNZ)

Territorial Authority	**Total area in hectares** (ha) from largest to smallest
South Wairarapa District	245,737
Masterton District	229,868
Carterton District	117,950
Horowhenua District	106,380
Kāpiti Coast District	73,148
Upper Hutt City	53,988
Lower Hutt City	37,658
Wellington City	28,999
Porirua City	18,248
Total area	**911,976 ha**

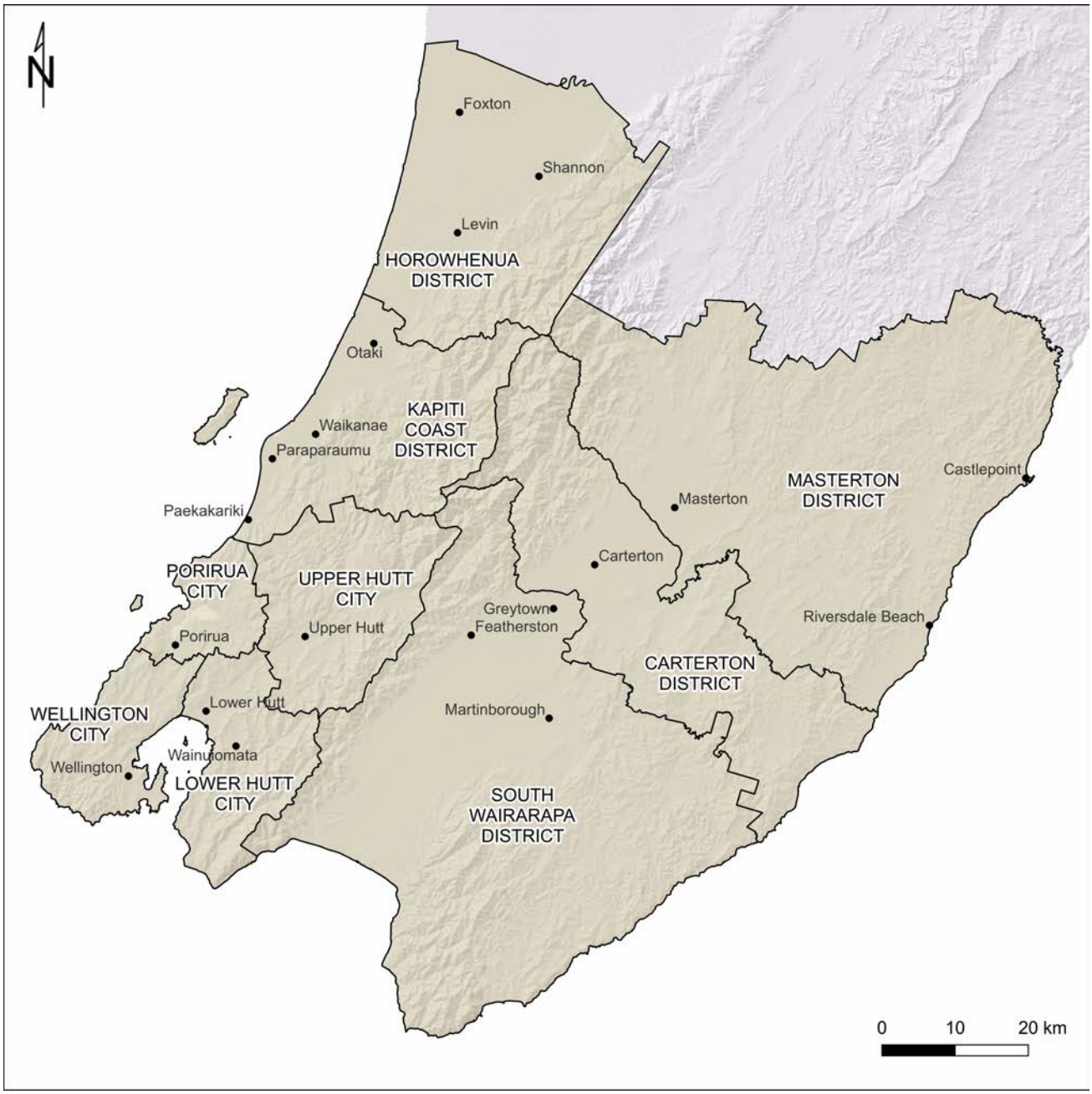

Figure 2: Map showing the Wellington Region and Horowhenua District by Territorial Authority

The map in Figure 2, shows the whole of the Greater Wellington Region (GWR) plus the only district outside of the GWR, Horowhenua District.

Horowhenua District sits within the Horizons Regional Council which is the regional council of the Manawatū-Whanganui region. However, Horowhenua District is part of the Regional Food System Strategy project, and as such, for the purposes of this report, the name 'Wellington Region and Horowhenua District' will be used to discuss the area of land within the project boundaries.

3.1.2 Population of Wellington Region and Horowhenua District

According to New Zealand Statistics (2022) across the nine Territorial Authorities, there are an estimated 580,540 residents within the Wellington Region and Horowhenua District (Table 2, shown on page 4).

Table 2: Population estimate data from Territorial Authorities in the Wellington Region and Horowhenua District (StatsNZ)

Territorial Authority	Population estimates at 30 June 2022
Wellington City	213,110
Lower Hutt City	112,520
Porirua City	61,610
Kāpiti Coast District	57,610
Upper Hutt City	47,730
Horowhenua District	36,980
Masterton District	28,950
South Wairarapa District	11,760
Carterton District	10,270
TOTAL population	580,540

The estimated resident population is based on the census resident population count. This is updated for residents missed or counted more than once by the census (net census undercount); residents temporarily overseas on census night; and births, deaths, and net migration between census night and the date of the estimate.

3.1.3 Ecological Footprint calculations

The Ecological Footprint represents the quantity of resources necessary to sustain a population's food needs, encompassing a multifaceted array of factors. It extends beyond the mere land required for food cultivation and encompasses inputs such as chemicals and energy in agricultural processes, energy for transportation, food processing, refrigeration, and the infrastructure supporting these activities.

In cases where populations consume more processed or imported foods, the complexity of the system intensifies. The Ecological Footprint (Figure 3) serves as a valuable metric for gauging this complexity. It operates on the principle that all consumables can be traced back to the natural resources used in their production, including the associated land requirements. The Ecological Footprint of a population quantifies the land needed to meet all its consumption demands and manage the waste it generates.

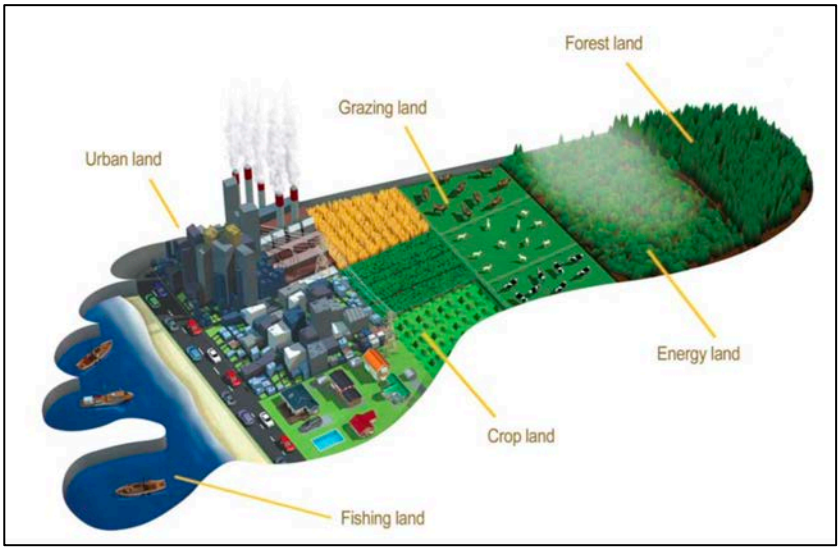

Figure 3: Image based on Composition of Ecological Footprint (MfE, 2007, p.73)

There are six categories of land considered in Ecological Footprint calculations (although fishing occurs in the Ocean, for the purposes of this research it is referred to as 'land'), as illustrated in Figure 3 (page 4). For instance, the production of an apple necessitates physical land for the apple tree, potentially forested land for trees used in paper packaging, and energy land, which accounts for forested areas responsible for offsetting the carbon emissions generated throughout the apple's lifecycle, including chemical usage, transportation, and refrigeration (Lawton, 2013).

The annual food footprint for an Aotearoa New Zealander is estimated at 0.511 hectares (Lawton, 2013). This calculation results from dividing the total food consumption of Aotearoa New Zealanders by the population. It's important to note that this figure represents the Ecological Footprint of an omnivorous diet and is not an exact science. For this project, 0.511 hectares per person is used to determine the necessary foodshed area for feeding the population of Wellington Region and Horowhenua District, allocating this land per individual.

3.1.4 Calculating the foodshed

Using Lawton's Ecological Footprint calculation of 0.511 ha/person the "Foodshed" for Wellington Region and Horowhenua District is **296,656** hectares (Table 3). Meaning, for the 580,540 people living within the total project area, 296,656 hectares of land would be required to sustain them.

Table 3: Calculating the foodshed based on each Territorial Authority within the Wellington Region and Horowhenua District

Territorial Authority (TA)	Population estimates at 30 June 2022 (StatsNZ)	x Ecological Footprint 0.511ha / person (Lawton, 2013)	Land area for each TA (StatsNZ)	Deviation
Wellington City	213,110	108,899	28,999	-79,900
Lower Hutt City	112,520	57,498	37,658	-19,839
Porirua City	61,610	31,483	18,248	-13,235
Upper Hutt City	47,730	24,390	53,988	29,598
Kāpiti Coast District	57,610	29,439	73,148	43,709
Horowhenua District	36,980	18,897	106,380	87,483
Carterton District	10,270	5,248	117,950	112,702
Masterton District	28,950	14,793	229,868	215,074
South Wairarapa District	11,760	6,009	245,737	239,728
TOTALS	**580,540 ppl**	**296,656 ha**	**911,976 ha**	**615,320 ha**

Table 3 shows the land required according to the Ecological Footprint calculations, while the column on the right represents the deviation between the Ecological Footprint requirements and the actual land area. For example, Wellington City has a population of 213,110 people and an Ecological Footprint of 108,899 hectares. This is significantly more than the actual land availability of 28,999 hectares, resulting in a substantial deficit of 79,900 hectares. Conversely, some areas like the Masterton District have an Ecological Footprint far less than actual land availability, with a surplus of 215,074 hectares.

Therefore, in total the combined population of these areas is 580,540 people, requiring 296,656 hectares based on the Ecological Footprint calculation. Overall, there is a significant surplus of 615,320 hectares of land available. Therefore, just under 33% of the total land area of the Wellington Region and Horowhenua District is required to feed the population. It is important to note that the

land area recorded by StatsNZ includes all types of land use including bush, urban areas, road reserves, waterways, etc.

To calculate the surplus or deficit of land required to feed the current population based on land used for food production rather than the total land area, a different total land area size is used and shown in Table 4 (based on AgriBase® dataset, which is described in detail in Section 3.4.1 on page 23).

Table 4: Calculating the foodshed based on food producing land within the Wellington Region and Horowhenua District

	Population estimates at 30 June 2022 (StatsNZ)	x Ecological Footprint 0.511ha / person (Lawton, 2013)	Food producing land (AgriBase® dataset)	Deviation
Total current food producing area	580,540 ppl	296,656 ha	497,428 ha	**200,772 ha**

Table 4 shows that once bush, urban areas, waterways, road reserves, etc., are removed, a total of 497,428 hectares across the whole region remains. Using the land area of 497,428 hectares equates to 60% of the current food producing land being required to feed the current population, meaning 40% (over 200,000 hectares) of the current food producing land is surplus to current requirements.

3.1.5 The foodshed by 2052

It is estimated that over the next 30 years the population of the foodshed will expand by 200,000[3] people to 780,540 people, increasing the total foodshed requirements to **398,856** ha.

Table 5: Calculating the foodshed based on each Territorial Authority within the Wellington Region and Horowhenua District over the next 30 years

Territorial Authority (TA)	Population increases by 200,000 over 30 years (by 2052)	x Ecological Footprint 0.511ha / person (Lawton, 2013)	Land area for each TA (StatsNZ)	Deviation
Wellington City	286,528	146,416	28,999	-117,417
Lower Hutt City	151,284	77,306	37,658	-39,648
Porirua City	82,835	42,329	18,248	-24,081
Upper Hutt City	64,173	32,793	53,988	21,195
Kāpiti Coast District	77,457	39,581	73,148	33,568
Horowhenua District	49,720	25,407	106,380	80,973
Carterton District	13,808	7,056	117,950	110,894
Masterton District	38,923	19,890	229,868	209,978
South Wairarapa District	15,811	8,080	245,737	237,658
TOTALS	**780,540 ppl**	**398,856 ha**	**911,976 ha**	**513,120 ha**

Table 5 provides a comprehensive overview of projected population growth in the territorial authorities within the Wellington Region and Horowhenua District, spanning a 30-year period up to the year 2052. This growth is expected to bring an additional 200,000 people into these areas.

[3] Sense Partners 2022 Population Projections as used in the Future Development Strategy.

Using current population statistics as a baseline and extrapolating based on existing demographic percentages per territorial authority, it is anticipated that Wellington City will experience the most substantial increase, adding 73,418 people to its population. This represents 37% of the total projected population growth. Consequently, using the Ecological Footprint calculations it is estimated that Wellington City will require 146,416 hectares to accommodate this growth within the foodshed. However, the available land area within Wellington City is limited to just 28,999 hectares, resulting in a significant shortfall of 117,417 hectares.

Collectively, the projected population across all territorial authorities is expected to reach 780,540 people by 2052, necessitating a foodshed of 398,856 hectares according to the Ecological Footprint calculation. The total available land area stands at 911,976 hectares (StatsNZ), resulting in a surplus of 513,120 hectares.

When the figure is compared to AgriBase® dataset's food producing land of 497,428 hectares, 80% of existing food productive area in the Wellington Region and Horowhenua District is required to feed the population by 2052, meaning only one-fifth of the current food producing land will be surplus to the community's self-sufficiency requirements.

3.2 Determining the Mass Balance using a Detailed Foodshed Analysis

Further analysis of the foodshed requires an understanding of the mass balance of each food type consumed within the Wellington Region and Horowhenua District. Determining the mass balance shows whether there is surplus, or deficit of specific food types currently grown within the region. There are four factors to the mass balance equation, shown in Figure 4.

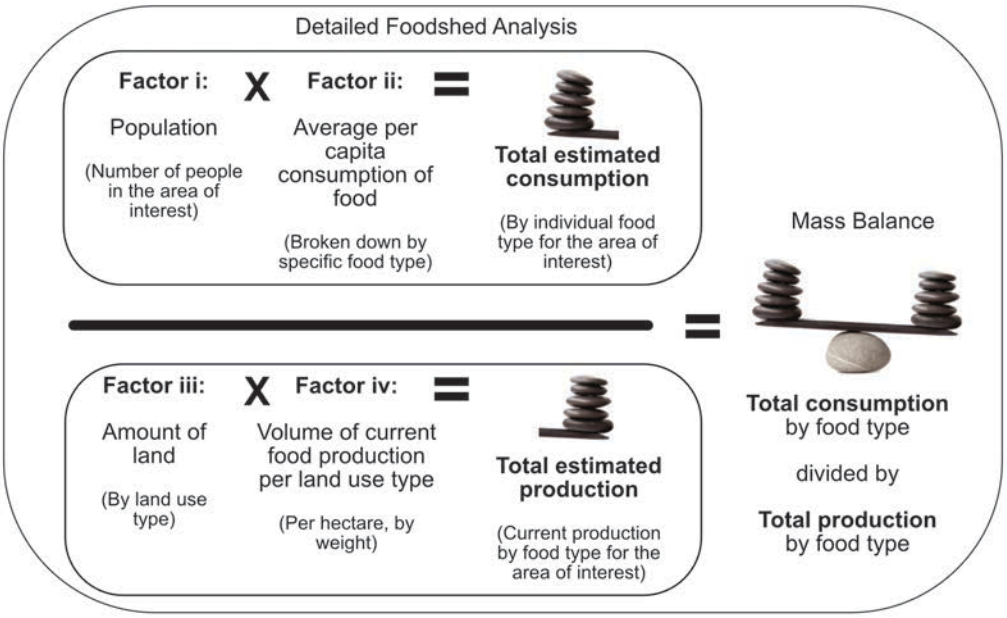

Figure 4: Diagram showing detailed foodshed analysis calculation

A detailed analysis of the average per capita consumption of food, existing land use and food production that is occurring within the foodshed provides a clear understanding of what food is being produced in the area. Subsequent data provides a robust analysis on the types and quantities of surplus and deficit food production. More details regarding the methodology for the baseline foodshed analysis can be found in appendices one and two. The following sections explore the four main factors, in two parts: "Total Estimated Consumption" and "Total Estimated Production".

3.3 Total Estimated Consumption

The first two factors to address when considering the likely total estimated consumption within the Wellington Region and Horowhenua District are the size of the population, and the population's average food consumption (see Appendix one for full details of how average food consumption is calculated).

3.3.1 Factor I: Population

The estimated population in the foodshed area, as of 30 June 2022, stands at 580,540 residents (StatsNZ). Figure 5 reveals a substantial concentration of individuals aged between 20-49 living across the foodshed area.

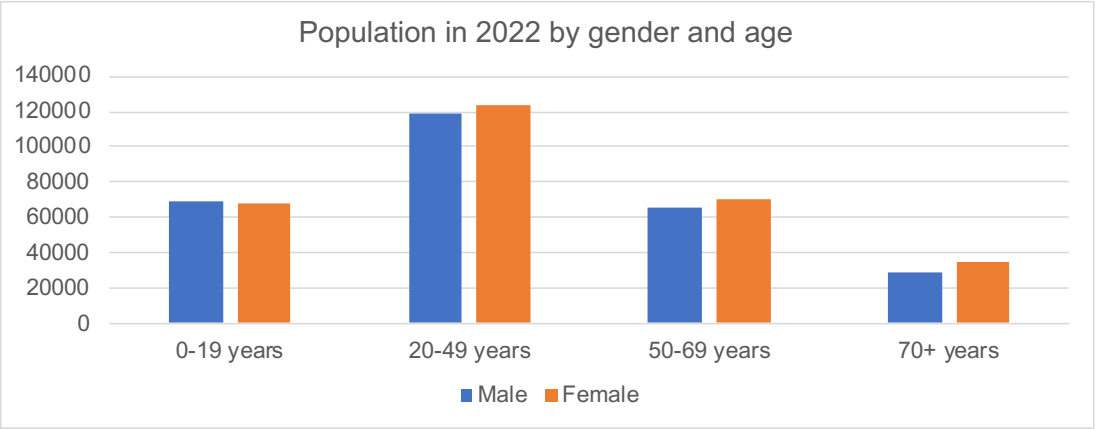

Figure 5: StatsNZ 30 June 2022 population data breakdown of gender and age

The population data can be broken down further to show gender and age across each of the nine Territorial Authorities, Figure 6.

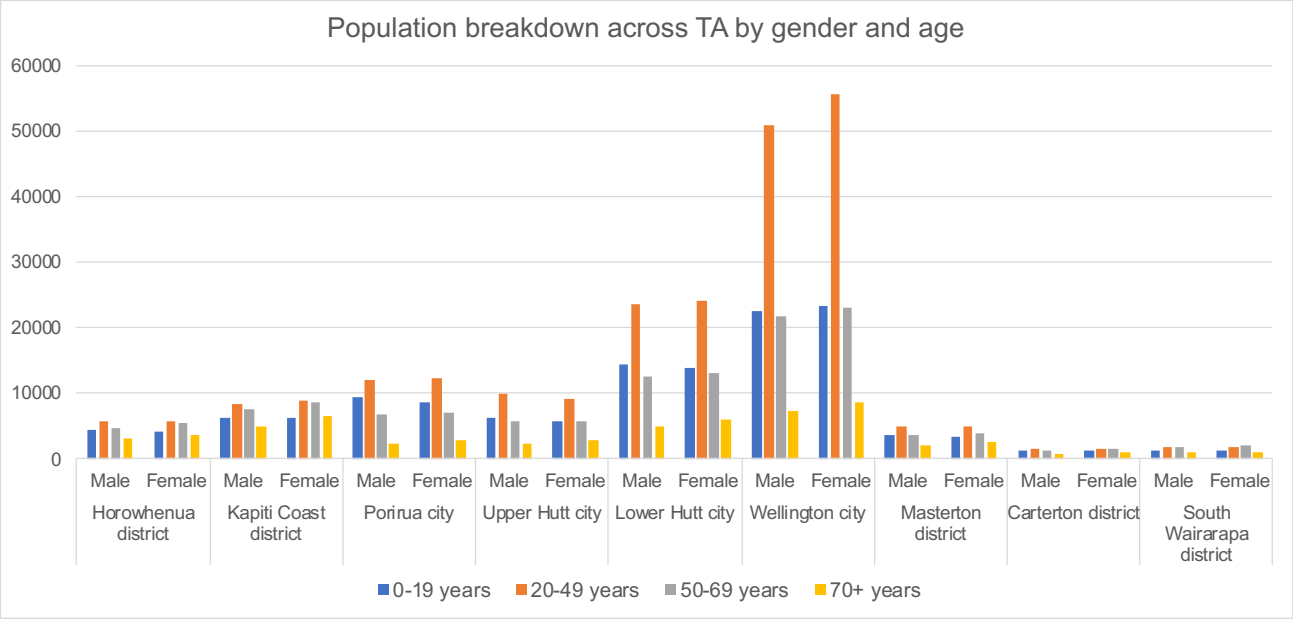

Figure 6: StatsNZ 30 June 2022 population data breakdown of gender and age across the nine Territorial Authorities

Notably, Figure 6 shows Wellington city and Lower Hutt city have larger populations compared to the other seven districts, and highlights where the majority of the 20-49 year-olds reside.

3.3.2 Factor II: Average food consumption

Determining average food consumption considered several different sources of information:

- Recent food trends including
  - Kantar Better Futures Report (2020 and 2022).
  - Beef and Lamb statistics on meat consumption (2020).
  - New Zealand Adult Nutrition Survey data (2008/09).
- FAOSTAT estimated national food consumption figures for Aotearoa New Zealand (2020).
- Our World in Data food consumption figures Aotearoa New Zealand (2019).
- Ministry of Health's recommended average food consumption (2020).

These are explained in more detail below.

3.3.2.1 Recent food trends

Kantar Better Futures Report

Recent food trends show an increase in vegetarianism and veganism. Kantar (previously Colmar Brunton) have been producing *Better Futures Reports* since 2017. These are freely available reports that provide key insights into consumer perspectives on sustainability and social and environmental issues that are important to the people of Aotearoa, and how these change over time. The average number of participants in the surveys is 1,000 (n=1000).

In the 2020 report, Kantar states that since 2015 the trend towards meat free eating is increasing, growing from 5% to 15% of respondents by 2019 (see Figure 7).

Figure 7: Colmar Brunton (now Kantar) Better Future Report 2020, p.9

It is important to note that there is a lack of data that proves vegetarian or vegan diets are on the increase.

In the 2022 Kantar report, they documented an increase in a "flexitarian" approach to food with 19% of respondents stating they maintain a vegetarian or vegan diet (Figure 8, page10).

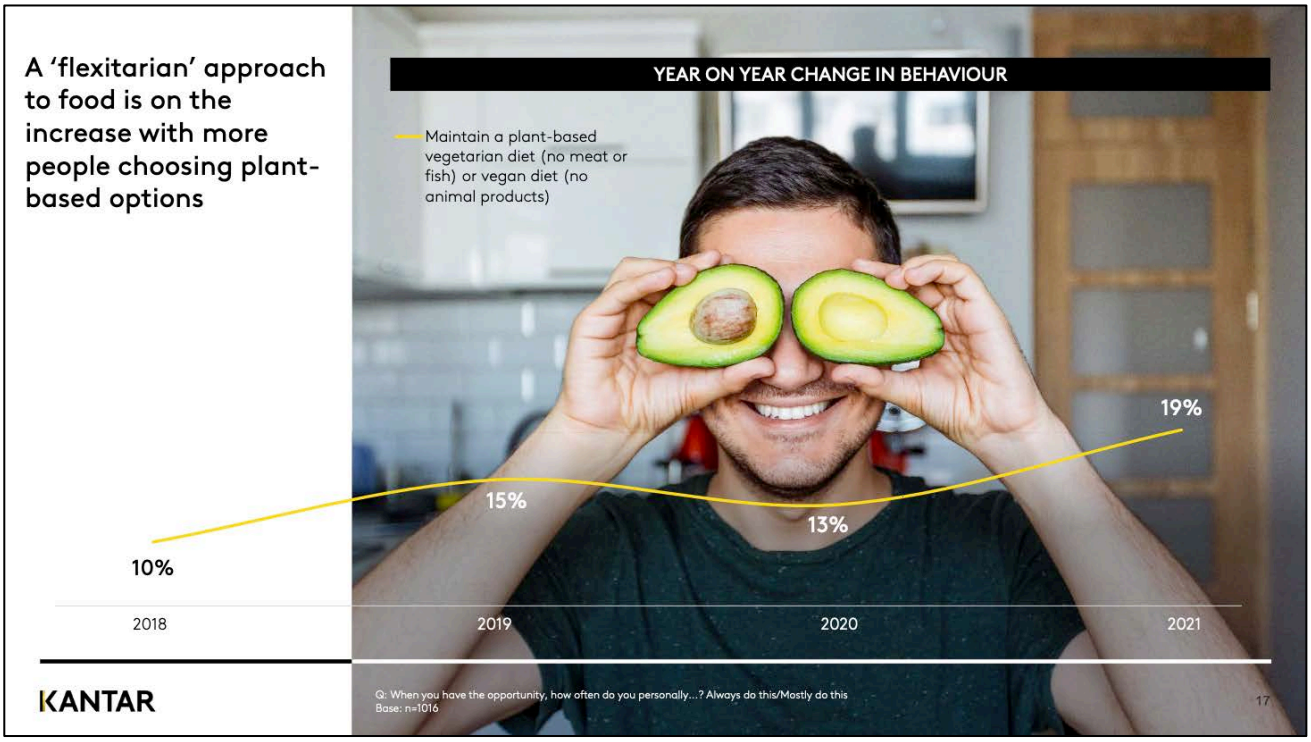

Figure 8: Kantar Better Future Report 2022, p.17

However, these results are significantly different to the latest analysis of data from the New Zealand Health Survey published in *Public Health Nutrition* (Greenwell, et al. 2023), which has stricter definitions of vegetarianism. The research shows 93% percent of Aotearoa New Zealanders eat red meat, 2.9% do not eat red meat, but do eat seafood and poultry, 1.4% are pescatarians (no red meat or poultry, but do eat fish), 2% are true vegetarians (no meat or seafood at all) and 0.7% are true vegans (no meat, seafood, or animal-derived products such as dairy). The research team found that for surveys where people label themselves vegetarian, they may not actually count as vegetarian with the new strict parameters. For example, when one of the research team was interviewed about the new findings, they stated, "*You really can't ask people how they identify… I've had people tell me, when they find out what I'm interested in and what I research… they say, 'Oh, yeah, I'm vegetarian.' And I said, 'Isn't that bacon you're eating in your sandwich?' They said, 'Oh, yeah. I mean, I eat bacon but, you know*"[4].

Beef and lamb statistics on red meat consumption

According to Beef + Lamb NZ (2020, p.30), historical data indicates that in the last national nutrition survey conducted in 2008/9, the average consumption of beef and lamb in Aotearoa New Zealand is reported to be around 400 grams per week. More recent data from the 2020 Organisation for Economic Co-operation Development (OECD) and the Food and Agriculture Organization (FAO) Agricultural Outlook[5] reveals that the average Aotearoa New Zealander now consumes approximately

[4] https://www.rnz.co.nz/news/national/504179/vegans-in-aotearoa-rarer-than-you-might-think-study-finds

[5] *The OECD-FAO Agricultural Outlook 2020-2029* is a collaborative effort of the Organisation for Economic Co-operation Development (OECD) and the Food and Agriculture Organization (FAO) of the United Nations, incorporating expertise from collaborating member countries and international commodity organisations. It provides market projections for national, regional, and global supply and demand of major agricultural commodities, biofuel and fish.

3.4 kilograms of sheep meat and 11.5 kilograms of beef per capita annually (OECD/FAO, 2020). This translates to roughly 63 grams per week for sheep meat and 221 grams per week for beef, 284 grams total. 116 grams less than reported in 2008/9.

This trend aligns with findings from the Kantar survey (2022), which indicates an increase in vegetarian diets and a reduction in overall meat consumption, but conflicts with the latest research from New Zealand Health Survey (Greenwell, et al. 2023).

New Zealand Adult Nutrition Survey data from 2008/09 on red meat consumption

The New Zealand Adult Nutrition Survey provides a comprehensive insight into the dietary habits, nutritional status, and health outcomes of adults in Aotearoa New Zealand. The survey underscores the significance of meat consumption in the Aotearoa New Zealand diet, particularly the consumption of beef and lamb, which serve as important sources of protein, vitamins, and minerals for most adults. However, it's worth noting that there is an emerging trend towards the adoption of alternative protein sources such as poultry and fish and the Kantar study indicates a move towards plant-based proteins.

Although the available datasets, including the New Zealand Adult Nutrition Survey, do not explicitly specify the weight of a single serving of red meat, an analysis of the data suggests that to align with Beef and Lamb's (2020) reported figure of 400 grams per week for beef and lamb consumption, a serving size of approximately 135 grams of raw meat is required. Based on this serving size, the New Zealand Adult Nutrition Survey data indicates an estimated annual consumption of approximately 20.65 kilograms per capita (equivalent to 397 grams per week) of red meat. These insights provide valuable information about meat consumption trends and dietary habits in Aotearoa New Zealand.

3.3.2.2 FAOSTAT national food consumption figures

About United Nations FAOSTAT

The Otago Food Economy report completed in 2016 (Millar, et al. 2016), estimated the volume of foods consumed by the foodshed residents (those living in Dunedin and Wānaka, Otago) using the United Nations FAOSTAT[6] data (2011). The dataset provided estimated national food consumption figures. The food supply quantity (kg/capita/yr) is a measurement used to represent the average amount of food available for consumption per person in a given country or region over the course of one year. This figure is typically expressed in kilograms per capita per year.

The FAOSTAT (2007) dataset had been used previously by Lawton in her PhD research on the Ecological Footprint (2013) when calculating food ecological footprints. Lawton (2013) considered FAOSTAT the most reliable dataset available, although she states that because it is a top-down reporting method it has limitations of accuracy (explained in more detail in Section 3.3.2.6 Limitations of the data, page 20). Lawton indicates that there might be inaccuracies in the national data submitted

[6] FAO food and agriculture statistics collects and disseminates timely and reliable food and agricultural statistics globally. They develop statistical methodologies and standards, and support member countries develop statistical systems through technical assistance and capacity development activities. They disseminate statistics through their dissemination platforms (FAOSTAT and RuLIS) and produce publications, working papers and statistical yearbooks that cover food security and nutrition, crop and livestock, economic, social and environmental statistics.

to the FAOSTAT because food that is not purchased is excluded and because FAOSTAT reports the total food consumed within the country for a given year, including by tourists (2013).

Also, it is not clear whether the FAOSTAT data includes food that is commercially grown or all food including home-grown. There is some suggestion that household food production is on the increase, however the most recent quantitative data for food grown by NZ households is from the 1957 census (Statistics New Zealand, 1957) so they are not helpful for current production. This type of reporting does not capture any food caught, hunted, or traded or through any mahinga kai practices[7].

As a result, the FAOSTAT food figures could be an underestimate depending on the amount of non-commercial food is consumed by Aotearoa New Zealanders. Furthermore, Lawton concluded that while there are several gaps in the FAOSTAT data which created uncertainties in the Ecological Footprint calculation it remained the dataset of choice because the food data are presented as raw (loss-adjusted primary weights) rather than processed food. Using raw foods are the clearest way to calculate footprints. As a result, the FAOSTAT data is included in this report for the total food consumed by Aotearoa New Zealanders.

To determine which year's data set to use, the years from 2011 to the latest available (2020) are compared in Figure 9.

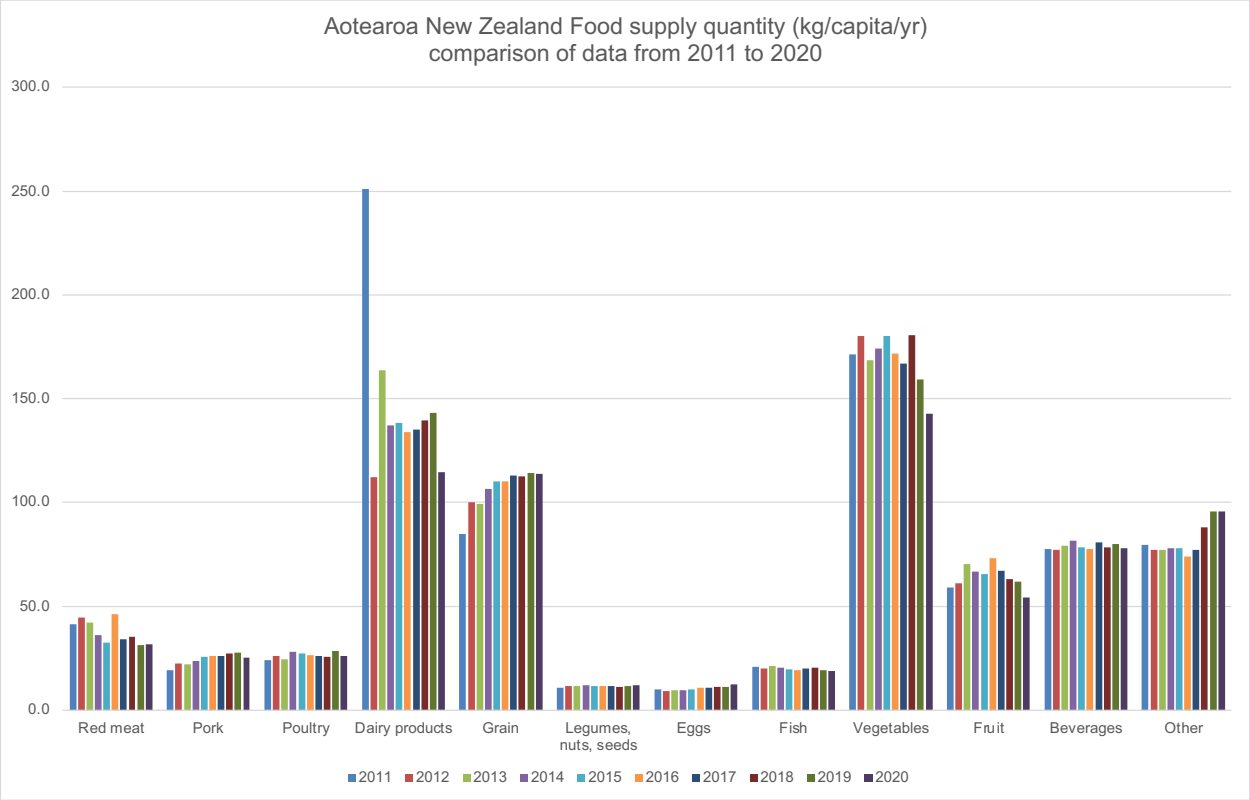

Figure 9: FAOSTAT data from 2011 to 2020

Figure 9 shows a pattern across the food supply data from FAOSTAT across the years 2011 to 2020. There is one obvious outlier, which is the dairy products for 2011 (251 kg/capita/yr), which is nearly

[7] Mahinga kai/mahika kai literally means 'to work the food' and relates to the traditional value of food resources and their ecosystems, as well as the practices involved in producing, procuring, and protecting these resources.

double the amount of dairy supplied for the following years (for example 2012 is 112 kg/capita/yr). There is no way of knowing what caused this anomaly. Therefore, two sets of data are used below, one that averaged data between 2012 and 2020, and the other in the year 2019 (due to 2020 being the COVID year).

Meat consumption analysis

Over the span of nine years, data from the United Nations FAOSTAT reveals a decline in red meat consumption, dropping from 45 kg per person per year in 2012 to 32 kg per person per year in 2020, with a notable exception in 2016 (see Figure 10). A trend seemingly in line with the Kantar reports and the Beef + Lamb NZ findings.

It is interesting to note that fish consumption also experienced a slight decrease during this period. However, pork consumption displayed a noteworthy trend, increasing from 22 kg per person per year in 2012 to 28 kg per person per year in 2019, marking a 27% rise, only to dip by 10% in 2020 to 25 kg per person per year.

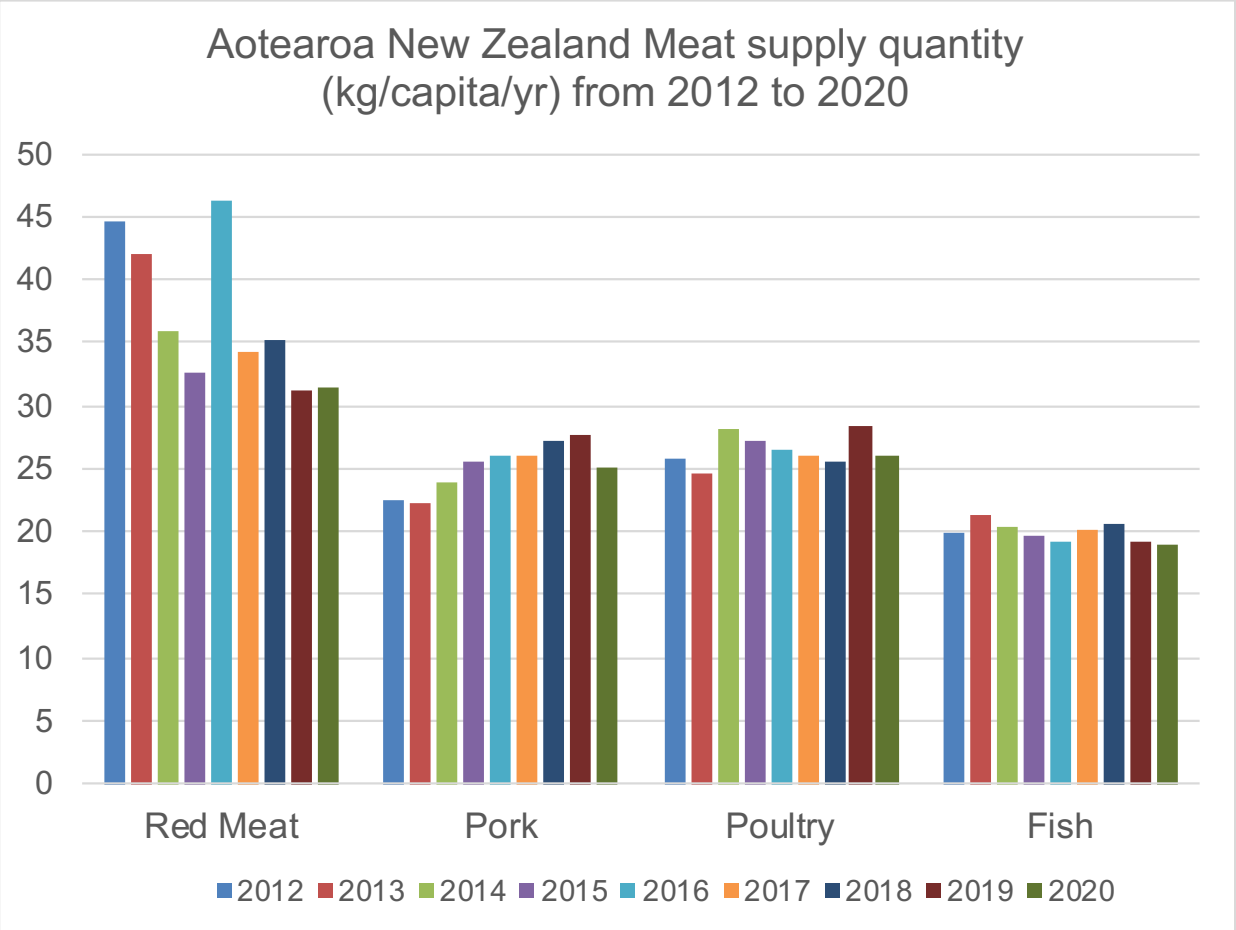

Figure 10: FAOSTAT shows estimate supply quantity of red meat, pork, poultry and fish

The consumption of poultry presents a challenge in terms of clear trends, as it appears to fluctuate throughout the nine-year duration. When the collective meat figures are examined together (refer to Figure 11, page 14), an overarching pattern emerges – overall meat consumption has been on a decline, starting from 113 kg per person per year in 2012 and reaching 102 kg per person per year in 2020, representing a decrease of 9.73%. However, it's worth noting the anomaly in 2016 when there is a notable surge in red meat consumption.

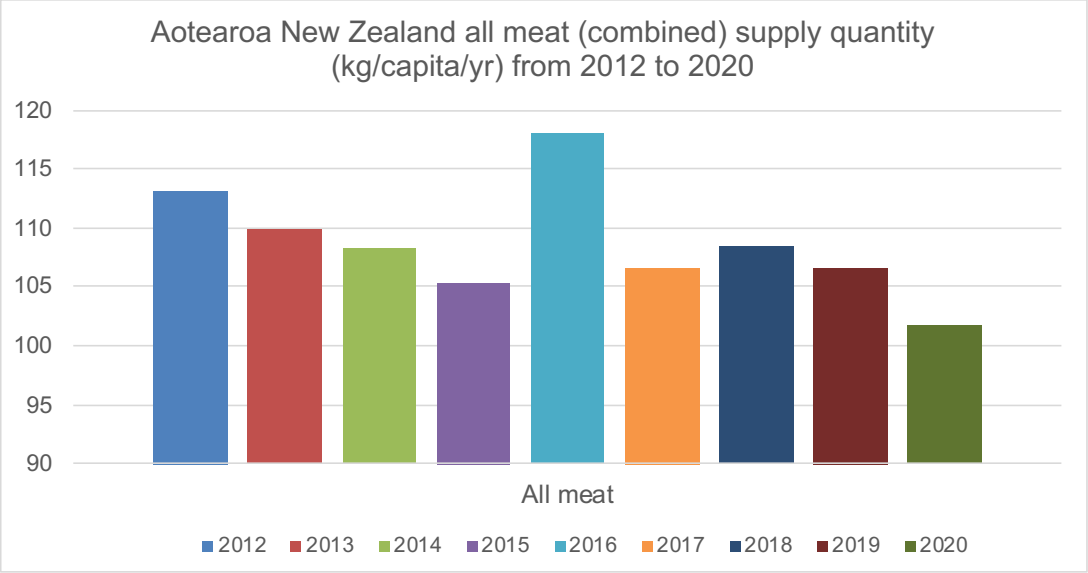

Figure 11: FAOSTAT shows an estimated overall decline in meat consumption between 2012 and 2020

FAOSTAT shows a considerable increase in egg consumption from 2012-2020 (9 kg per person per year to 12 kg per person per year; a 33% increase), however dairy consumption fluctuates somewhat (Figure 12), increasing in 2019 to 143 kg per person per year then decreasing in 2020 to 115 kg per person per year.

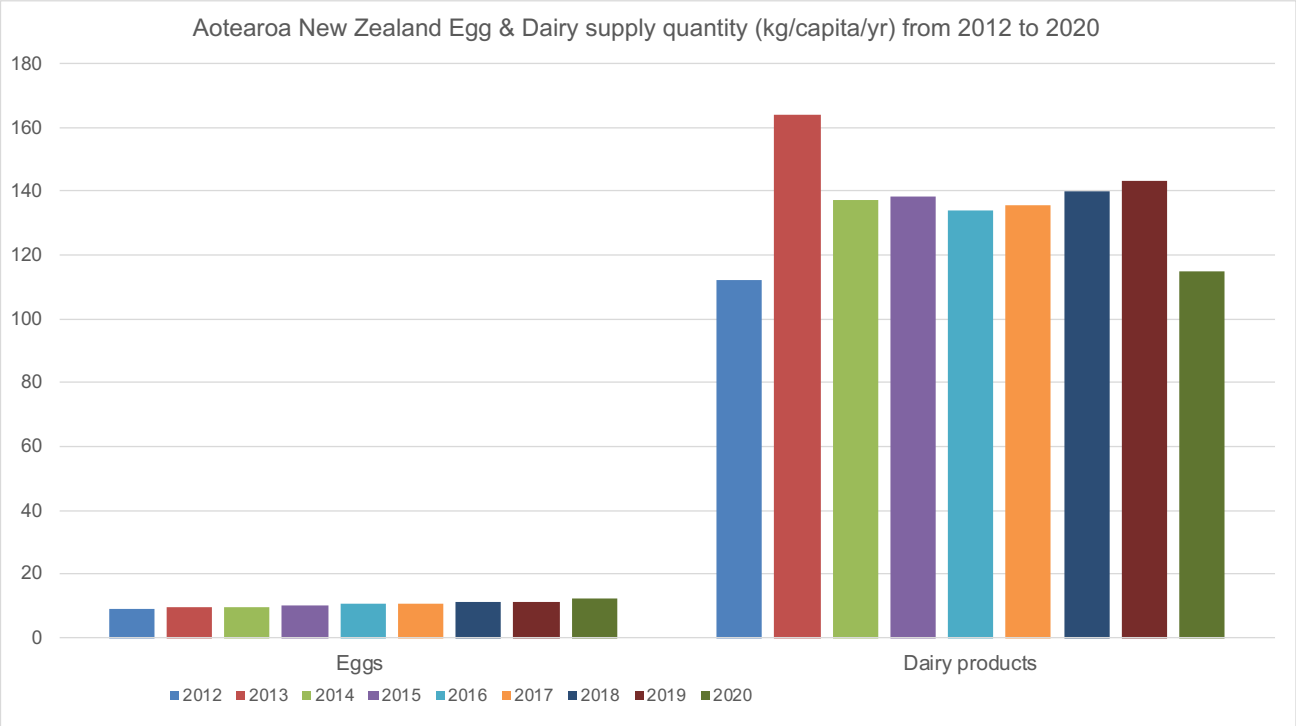

Figure 12: FAOSTAT showing an estimated minor increase in egg consumption, and some fluctuation in dairy consumption

Interestingly, FAOSTAT shows there has also been a reduction in vegetable and fruit consumption over the nine-year period (Figure 13, page 15). This seems at odds with the decreasing meat consumption and stated national food consumption trends.

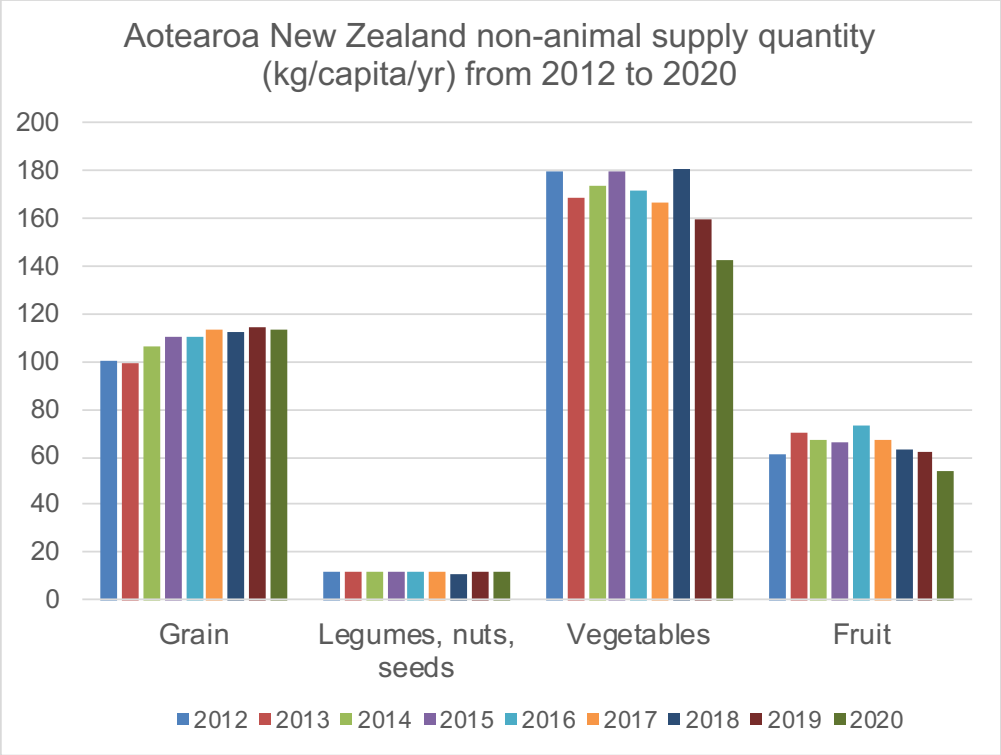

Figure 13: FAOSTAT showing grain, legumes/nuts/seeds, vegetables and fruit consumption

FAOSTAT average food consumption

According to FAOSTAT 2019 data, the estimated food supply quantity per person is **784 kg**, (including beverages and other) comprising the food types shown in Figure 14.

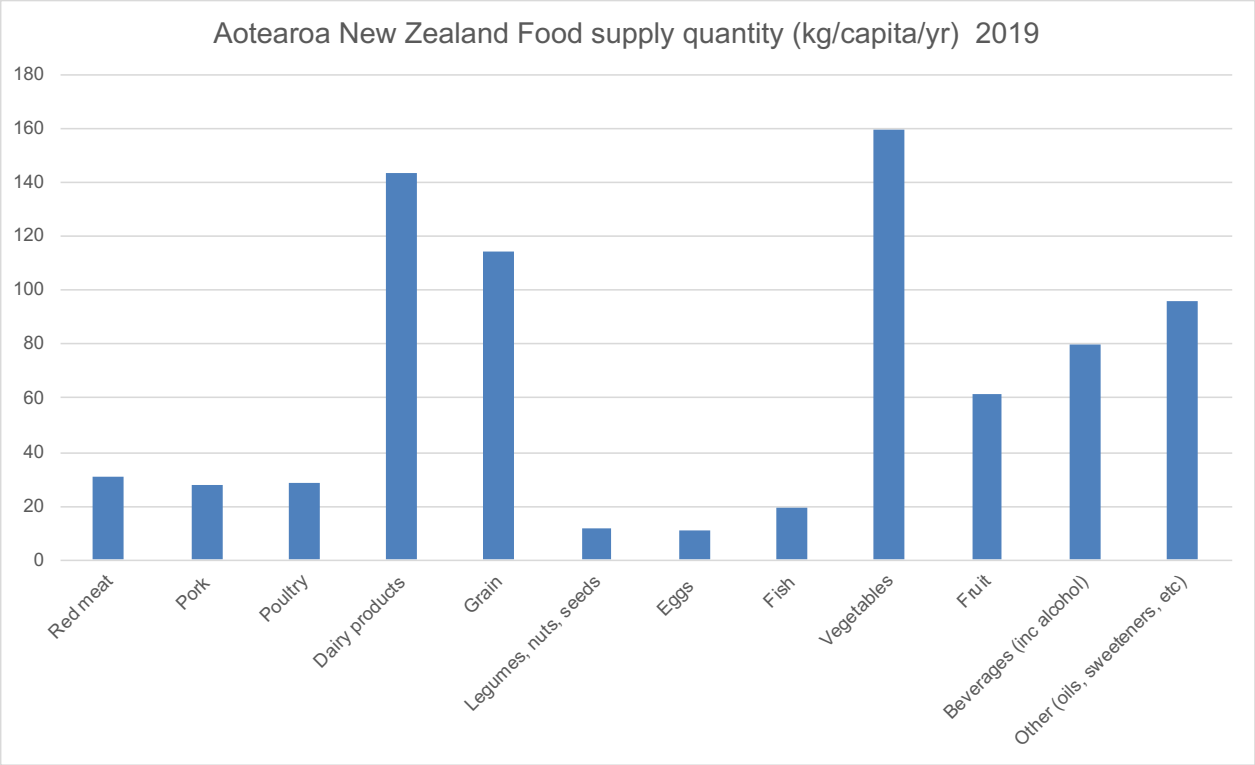

Figure 14: FAOSTAT for 2019, showing estimated food supply quantity for Aotearoa New Zealand

The FAOSTAT data includes 'Beverages' (such as tea, coffee, cocoa, wine, beer, and other fermented drinks) as well as 'Other' (which include foods hard to incorporate into the other food types, such as oils, fats, offal meat, sweeteners, and crustaceans).

3.3.2.3 Ministry of Health recommended average food consumption

Aotearoa New Zealand Ministry of Health (MOH) provides "Eating and Activity Guidelines for New Zealand Adults" (Ministry of Health, 2020b), with "New serving size advice" that explains serving sizes from each food group for different age ranges and gender (Ministry of Health, 2020a).

Calculations based on MOH advice regarding the serving size and number of servings per person show the approximate percentage of different food groups required for all people across different ages and genders, as shown in Figure 15 (see Appendix one for further details).

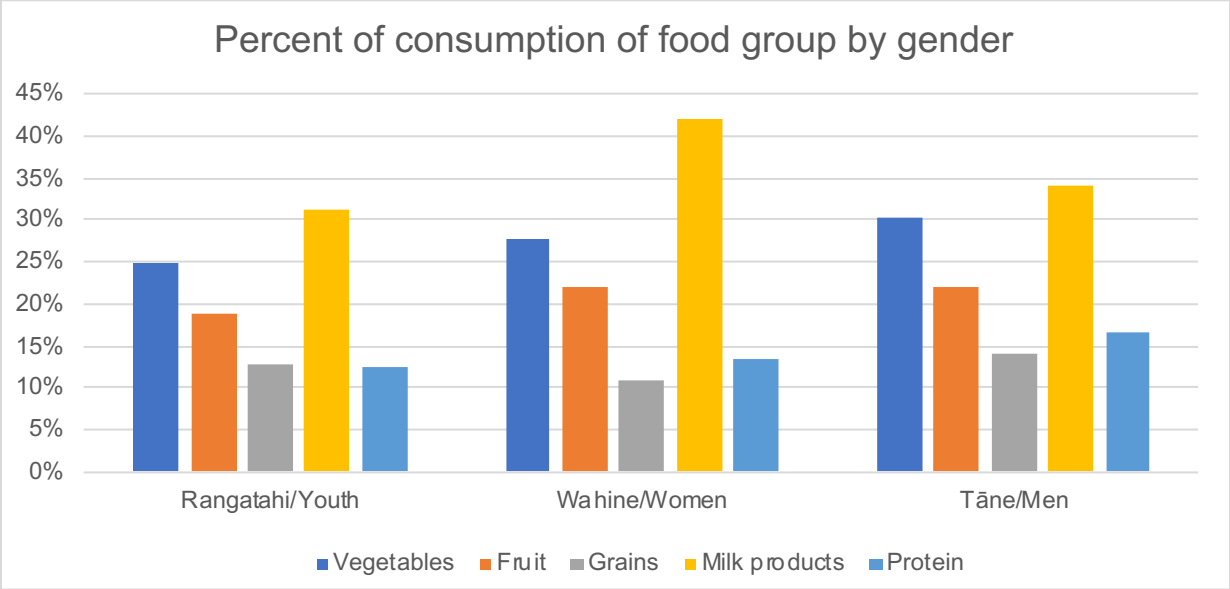

Figure 15: Data based on serving size and number of serving averaged across age ranges and genders

Figure 15 shows that the patterns of consumption for the five different food groups are relatively similar. An exception is the amount of milk products recommended for over 50-year-old women, which is nearly double the recommended amount compared to women under 50 (2.5 servings for under 50 and 4 servings for over 50). "Increased consumption of milk and milk products is recommended for women over the age of 50 to help maintain bone density and reduce the risk of osteoporosis after menopause" (Ministry of Health, 2020a). Milk products are described as low or reduced fat fresh milk, UHT long-life milk, reconstituted powdered milk or buttermilk, low- or reduced-fat yogurt and cheese, or calcium-fortified plant-based milk alternatives. The milk product group does not include foods made from milk that have little calcium and a high fat content, such as cream cheese, sour cream, cream, and butter.

The protein group includes nuts and seeds (including nut butters), legumes (such as beans, lentils, chickpeas, split peas), fish, eggs, chicken and red meat and pork and is shown in Figure 16, page 17.

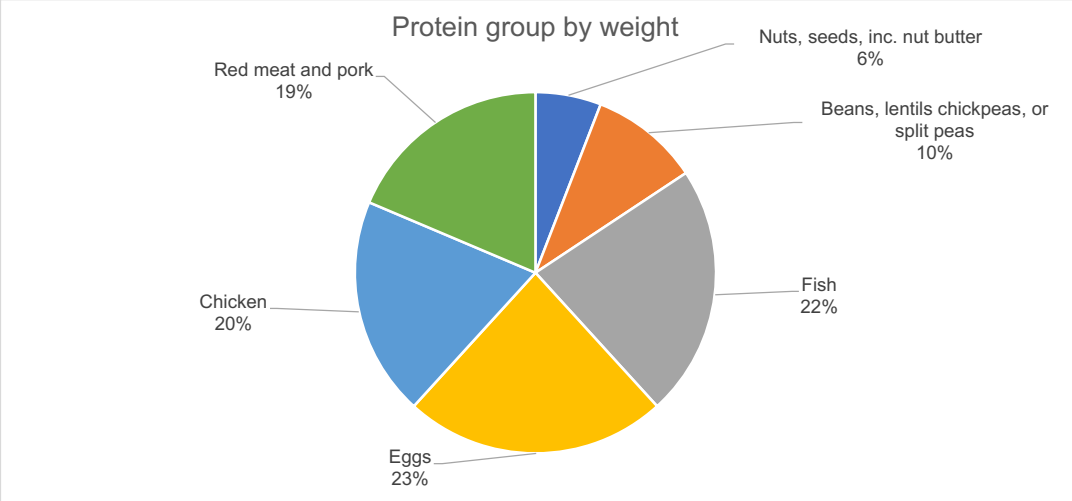

Figure 16: Different weighted amounts of each of the six types of food that makes up the protein group

Presented in Figure 17 is a graph based on MOH's recommended serving size x number of servings for different ages /genders (per person per year) from the five food groups, showing minimum and maximum quantities.

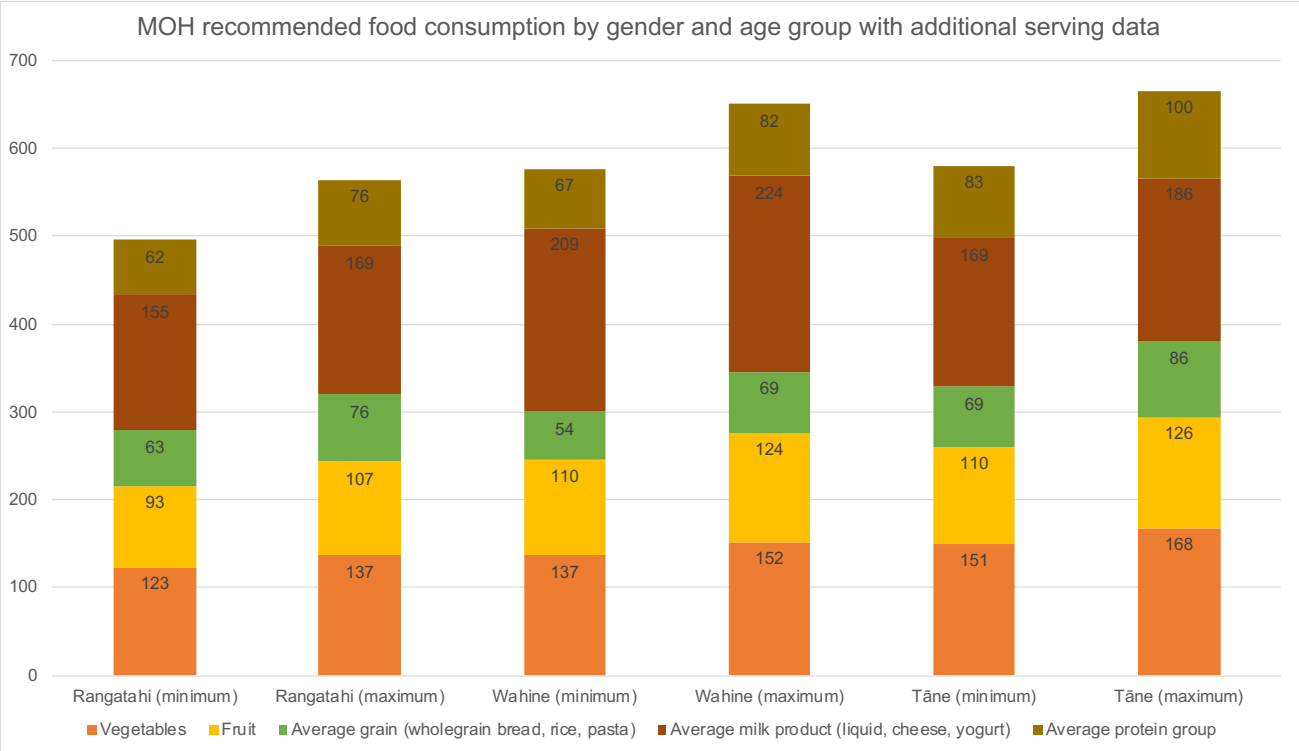

Figure 17: MOH: Data calculated from minimum and maximum serving sizes (in kg per person per year)

Within the serving sizes, MOH has an additional column referring to the "approximate number of additional servings from the food groups", the data includes fats and ranges from zero additional servings to five in the case of teenage boys. With the additional servings added, the total amounts for each average Rangatahi/Youth, Wahine/Woman or Tāne/Men can vary by 13-15%. This additional data makes up the "maximum" amounts in the graph, as follows:

- Rangatahi/Youth = 496-565 kg/yr.
- Wahine/Woman = 577-651 kg/yr.
- Tāne/Men = 581-666 kg/yr.

In summary, MOH average food consumption ranges from 496 kg per year to 666 kg per year.

3.3.2.4 Working out Wellington Region and Horowhenua District's food consumption

To calculate the food requirements for the Wellington Region and Horowhenua District's populations, the MOH's model of recommended average food consumption for an average person is used as a base. This model is chosen because it represents a set of healthy food consumption recommendations for the population.

Data from FAOSTAT and other datasets provide the breakdowns of percentages of consumption of different types of milk products and different types of protein products. Based on these datasets, assumptions can be extrapolated to other food categories, including red meat, poultry, legumes (which are grouped with nuts and seeds), eggs, and fish, therefore aligning with food types reported in the FAOSTAT data (Figure 14, page 15).

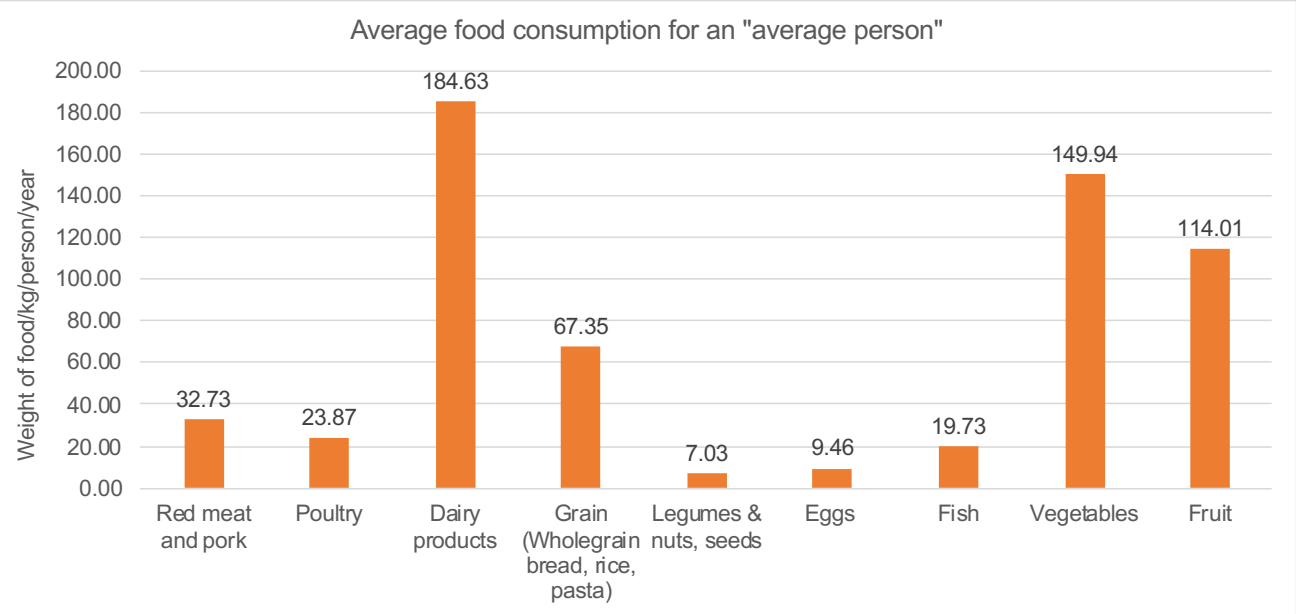

Figure 18: Wellington Region and Horowhenua District average estimated food consumption across food types (in kg/yr)

Figure 18 shows a graph of the data, which summarises the estimated amount of food consumed by an average person in the Wellington Regional foodshed. The Wellington Region and Horowhenua District's average food consumption model incorporates meat in the protein food group, so is more in line with average omnivore food consumption (as opposed to only plant-based proteins). Using this approach considers variations in dietary preferences, acknowledging that some individuals may not consume meat while others may consume more than the recommend amounts.

Figure 18 shows the assumed Wellington Regional foodshed's average food consumption for a year for an average person, is an estimated as **609 kg.** It is important to note, the accurate figure is 608.75 kg and is rounded here for ease of use. Also, this figure excludes "beverages" and "other" that are included in the FAOSTAT estimate.

The following section compares average food consumption for the Wellington Regional foodshed with data collated from within Aotearoa.

3.3.2.5 Comparison across data sets

Data has been gathered and analysed from the following datasets:

- OECD-FAO Agricultural Outlook - Meat consumption 2019 (meat data only).
- New Zealand Adult Nutrition Survey 2008/2009 (meat data only).
- FAOSTAT: NZ food supply quantity 2011 (with the spike in dairy consumption, as shown in Figure 9).
- FAOSTAT: NZ food supply quantity 2019.
- Otago foodshed study (created by Ahikā Consulting), 2016.
- MOH 2020 data for recommended serving size x number of servings for adults and children, which has been averaged over genders and ages (minimum consumption).
- MOH 2020 data for recommended serving size x number of servings for adults and children, which has been averaged over genders and ages (maximum consumption).

Data from both the New Zealand Adult Nutrition Survey 2008/2009 and the OECD-FAO (2019 data) only show meat consumption in the country. These two datasets serve as a guide to understanding average food consumption for an average person in the Wellington Regional Foodshed. As explained above (and in data limitation below), FAOSTAT may not capture data on all the food that is grown at home (on farm or in the back garden) or hunted, caught, or traded for home consumption (such as mahinga kai), so it is expected to be lower than the recommended food consumption by MOH. The FAOSTAT data from 2011 had a spike in the supply of dairy products, nearly double other years. Data used for the 2016 Otago foodshed from the Otago Food Economy report was used as the starter for creating the food consumption data, but the dataset it was based on had altered, so it is here as a reference but not as a guide. Two datasets from MOH are used to illustrate the minimum and the maximum amounts of food that make up recommended average food consumption.

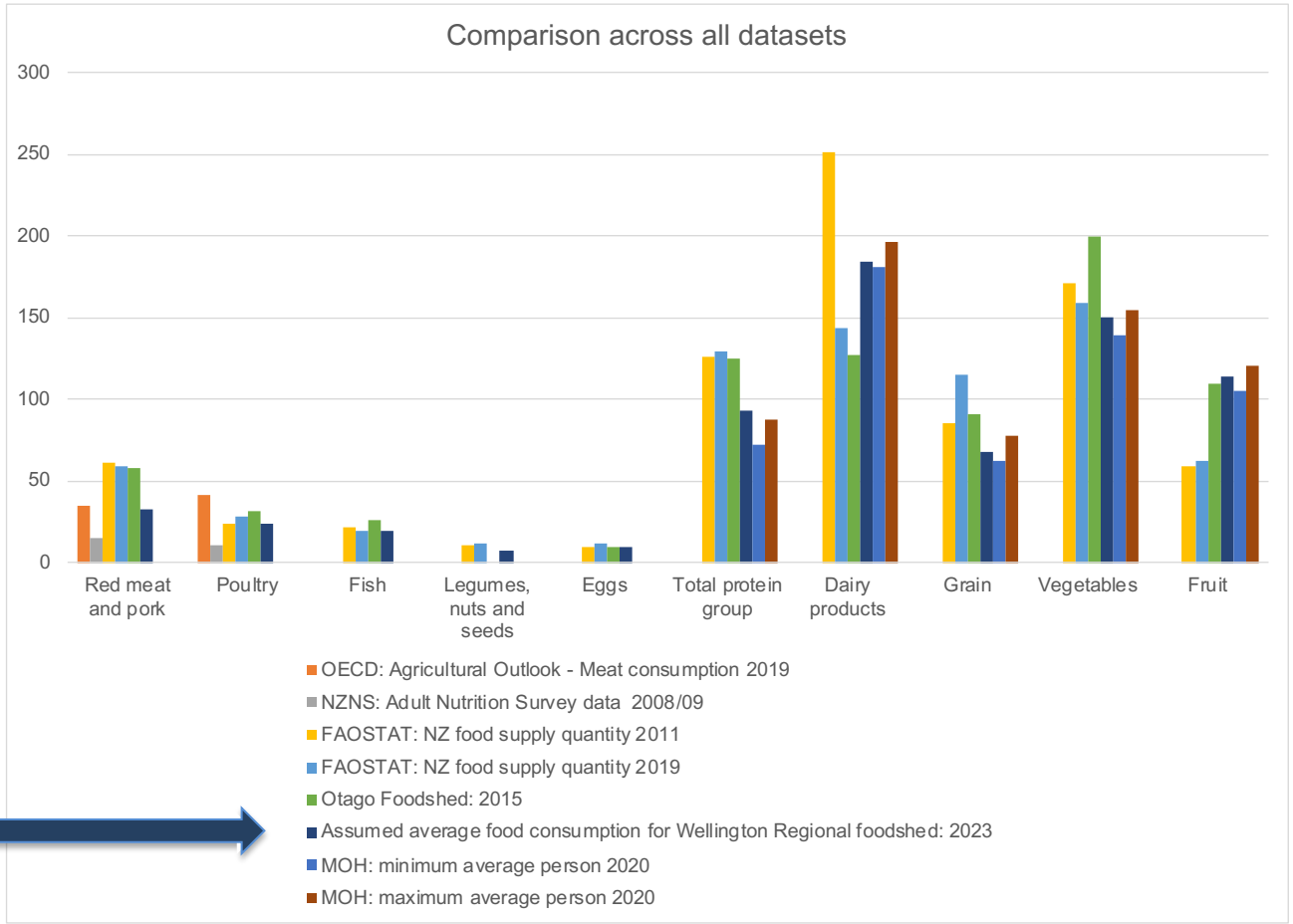

Figure 19: Comparison between multiple datasets

Figure 19, page 19 compares the results of these seven datasets across as many food types as possible, they are all calculated in kg per capita per year. Included in the graph is the "Assumed average food consumption for Wellington Regional foodshed: 2023" described in the section above and illustrated in Figure 18 (page 18). An arrow is used to serve as a pointer, for ease of reading the graph.

The aim of the comparison is to see how the "Assumed average food consumption for Wellington Regional foodshed: 2023" compares to the other datasets. Despite the huge variations across each dataset, the "Assumed average food consumption for Wellington Regional foodshed: 2023" sits comfortably in the middle and is well averaged.

3.3.2.6 Limitations of the data

It is important to note, that data of this nature has limitations, some are listed here:

- **Inaccuracies in data sources:** National data submitted to the FAOSTAT, for example, could be inaccurate because food that is not purchased (home grown or traded for example) is excluded from submitted data and because FAOSTAT reports the total food consumed within the country for a given year, including by tourists.

- **Data sources:** Different data sources, methodologies, and assumptions are used to compile 'Total Estimated Consumption' data. The MOH's dietary recommendations are based on nutritional guidelines but do not separate out all the different food types required to create a comprehensive 'Total Estimated Consumption' dataset. The FAOSTAT dataset has a few anomalies (such as the 2011 double amount of dairy consumed) which also makes it unreliable as the sole 'Total Estimated Consumption' dataset. When a different global data site called "Our World in Data"[8] (in Figure 20) is analysed, it provides quite a different picture in terms of consumption of dairy, fish, and vegetables in Aotearoa New Zealand.

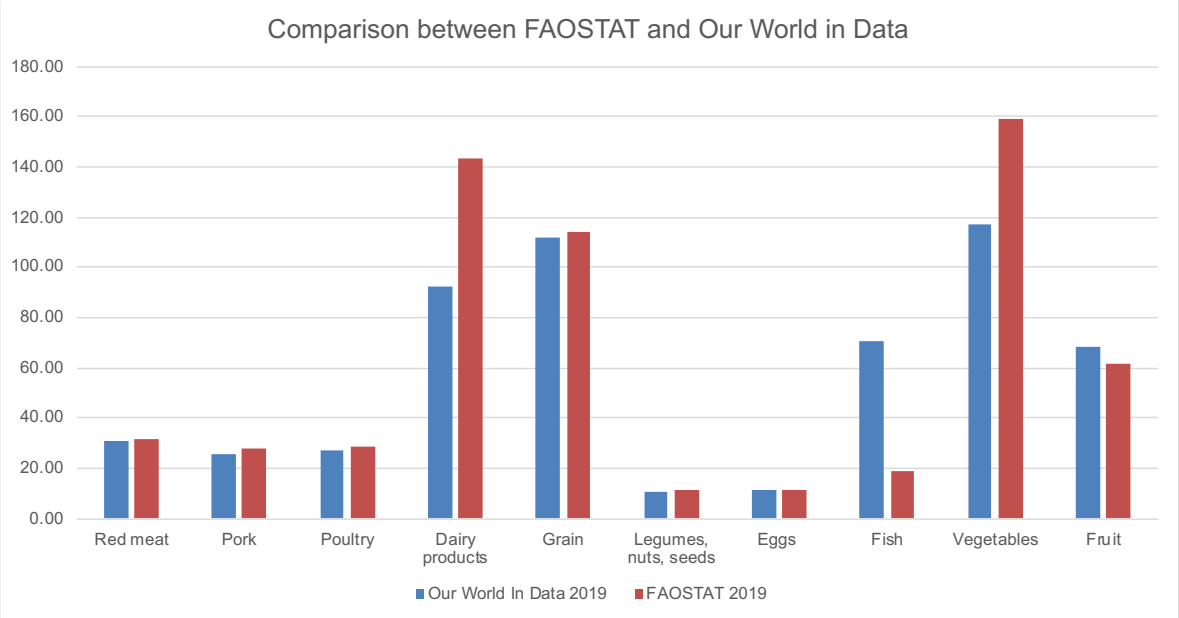

Figure 20: Data interpreted from Our World in Data website for Aotearoa New Zealand in 2019 (in kg/person/yr)

[8] https://ourworldindata.org/grapher

However, the Our World in Data shows dairy products are reported as 92 kg (and are only milk products). FAOSTAT reports on milk, butter and cream as shown in the graph in Figure 20 (page 20) as 143 kg/person/year (135 kg/person/year is milk products), meaning there is a significant difference of 43kg per person per year. Fish is reportedly 70 kg/person/year in 2019 by the Our World in Data compared to 19 kg/person/year by FAOSTAT. Vegetable consumption is reported as 117 kg/person/year in 2019 by the Our World in Data compared to 159 kg/person/year by FAOSTAT.

Red meat, pork, poultry, grain, legumes, eggs, and fruit are very similar between datasets.

- **Difference between milk products and dairy products:** FAOSTAT includes all products within the dairy family, such as milk, cream, and butter. MOH and Our World in Data excludes high fat dairy products, such as cream and butter. The process of analysing the data could have resulted in errors whilst trying to match dairy or milk products.

- **Inclusion of "beverages" and "other":** The exclusion of "beverages" and "other" categories in the MOH data can contribute to inaccuracies in the data, oils are included in the "additional servings", but have not been separated out in the comparisons presented in this report. These categories may also include items like tea, coffee, cocoa, wine, beer and fermented drinks, oils, fats, offal meat, sweeteners, and crustaceans, that are part of the FAOSTAT total food supply but are not included in the 'Total Estimated Consumption' dataset, due to them being too difficult to calculate.

- **Exclusion of processed foods:** MOH and FAOSTAT do not include processed food, which is included in the Adult Nutrition Survey data. Processed foods must be made from raw ingredients, both the MOH and FAOSTAT data present results of raw food only.

- **Differences in years:** Data from the Adult Nutrition Survey is from 2008/2009, which is ten years difference to the FAOSTAT data (2019) and 12 years different to the MOH 2020 recommendations, this can result in variations due to changing consumption patterns over time.

- **Types of meat:** Data from OECD-FAO and the Adult Nutrition Survey highlight variations in meat consumption patterns among different types of meat, such as beef, sheep (lamb and mutton), pork, and poultry, whilst MOH group all protein products together. The process of analysing the data could have resulted in errors whilst trying to match types of meat across datasets.

- **New research supersedes old:** Data on vegan, vegetarian and meat-eating diets has recently (5th December 2023) been published in *Public Health Nutrition* (Greenwell, et al. 2023). According to the latest analysis of data from the New Zealand Health Survey, 93% of Aotearoa New Zealanders eat red meat, 2.9% do not eat red meat, but do eat seafood and poultry, 1.4% are pescatarians (no red meat or poultry, but do eat fish), 2% are true vegetarians (no meat or seafood at all) and 0.7% are true vegans (no meat, seafood or animal-derived products such as dairy). These figures are significantly different to the Kantar reports (2020 and 2022).

- **Mahinga kai, hunted, gathered and homegrown food:** As indicated above, FAOSTAT data may not fully capture food grown at home, whether on farms or in back gardens, nor does it capture any information on the amount of mahinga kai or food hunted or gathered from land or ocean. Mahinga kai and homegrown produce often falls outside the scope of official statistics, which could lead to an underestimation of the FAOSTAT total food supply.

3.3.2.7 Household food waste figures

Research by Love Food Hate Waste (2018) revealed that household food waste is a significant issue, with each household discarding 79 kilograms of avoidable food (food fit for consumption, e.g. not banana peels) annually, amounting to an average cost of $563 per household. This figure is 13% of

the estimated "Assumed average food consumption for Wellington Regional foodshed: 2023" of 609 kg per person per year.

If this amount of assumed waste was added to the food consumption figures, the total amount of food consumed would increase to 688 kg per person per year (to accommodate for the waste). However, it cannot be assumed that all households are equal in how they discard waste food, therefore, food waste has not been added to the total food consumption figures.

3.3.3 Factor I x Factor II = Total Estimated Consumption

Based on an estimated 580,540 people living in the Wellington Region and Horowhenua District (Factor i), it is estimated that **353,401** tonnes of food are consumed every year (calculated from Factor ii). This number represents the estimated total amount of food that needs to be produced to feed the 2022 population every year.

The expected population in 2052 increases by 200,000 people to 780,540 residents, the amount of food required to feed these people is estimated to be **475,150** tonnes of food each year.

Table 6: Wellington Regional foodshed consumption estimates, by food type

Food Type	Per capita annual consumption (kg)	Total estimated foodshed consumption for 2022 population data (tonne)	Total estimated foodshed consumption prediction for 2052 population data (tonne)
Red meat and pork	32.73	19,001	25,547
Poultry	23.87	13,855	18,628
Fish	19.73	11,452	15,398
Legumes, nuts, and seeds	7.03	4,082	5,488
Eggs	9.46	5,491	7,382
Dairy products	184.63	107,185	144,110
Grain	67.35	39,100	52,570
Vegetables	149.94	87,047	117,035
Fruit	114.01	66,189	88,991
Total	**608.75**	**353,401**	**475,150**

Table 6 shows the total estimated consumption by food type per capita per annum and total food needs for the foodshed population in 2022 and for 2052. Due to rounding, some figures may not add up precisely.

3.4 Total Estimated Production

The second two factors to address when considering the mass balance of food within the Wellington Region and Horowhenua District foodshed is the current use of the land, and the food produced in the region (see appendices one and two for full workings).

3.4.1 Factor III: Land use analysis

Using the AgriBase® dataset (AgriBase® data is a product of AsureQuality Limited), the foodshed is mapped and classified into main land use types of food production. Non-productive uses or unconfirmed and urban area are also classified. This is further explained in appendices one and two.

3.4.1.1 Determining land use

Table 7 provides further detail about the number of farms associated with each land use, the net area of each land use, and its contribution to the total land area of the Wellington Region and Horowhenua District.

Table 7: Land use in nine Territorial Authorities in the Wellington Region and Horowhenua District from AgriBase® dataset

Land use types	Farm count	Total area (ha)
Assumed "food producing land":		
Extensive pastoral (beef cattle only)	770	58,513
Extensive pastoral (sheep and beef cattle)	747	294,358
Extensive pastoral (sheep only)	381	54,872
Dairy	365	67,883
Extensive pastoral (grazing)	186	7,395
Fruit production	104	820
Viticulture	72	1,605
Deer and goat and other livestock	66	6,040
Vegetable farming	60	1,353
Cropland	51	3,645
Poultry (meat and eggs)	48	483
Pig farming	7	134
Other food production uses (food processing plants, etc)	6	84
Bird rearing	5	39
Honey production	3	193
Fish hatcheries, etc.	2	12
Total assumed "food producing land"	**2,873 farms**	**497,429**
Other land use types:		
Lifestyle use	4,226	15,987
Not farmed (idle)	54	24,592
Unconfirmed area	135	10,398
Non-productive animals (alpaca, dogs, horses)	132	1,716
Forestry	416	86,847
Native bush	77	173,275
Non-food production uses (flowers, plant nursery, tourism, etc.)	152	2,060
Urban areas, waterbodies, road reserves, etc.		99,673
Total land		**911,976**

These results are a high-level analysis of the land identified through the AgriBase® dataset. Due to the data collection methods, this dataset needs to be treated as high-level and indicative.

At 911,976 hectares, the land area of the nine territorial authorities represents approximately 3.4% of the area of Aotearoa. Of this, 497,428 hectares (55%) is used for food production while urban areas, waterbodies, road reserves, native bush, plantation forestry, and non-food production uses account

for 40%. 2% is lifestyle blocks (which could be small scale sheep and beef production, but also various other uses, such as horses or native forest restoration or unused). The remaining 4% is idle farmland, or of unknown use (unconfirmed area).

Figure 21 provides a graphical breakdown of ***all the land use*** (listed in Table 7 on page 23) across the Wellington Region and Horowhenua District. 55% of the overall land is currently used for food production. The food producing land is referred to as the "Wellington Regional foodshed".

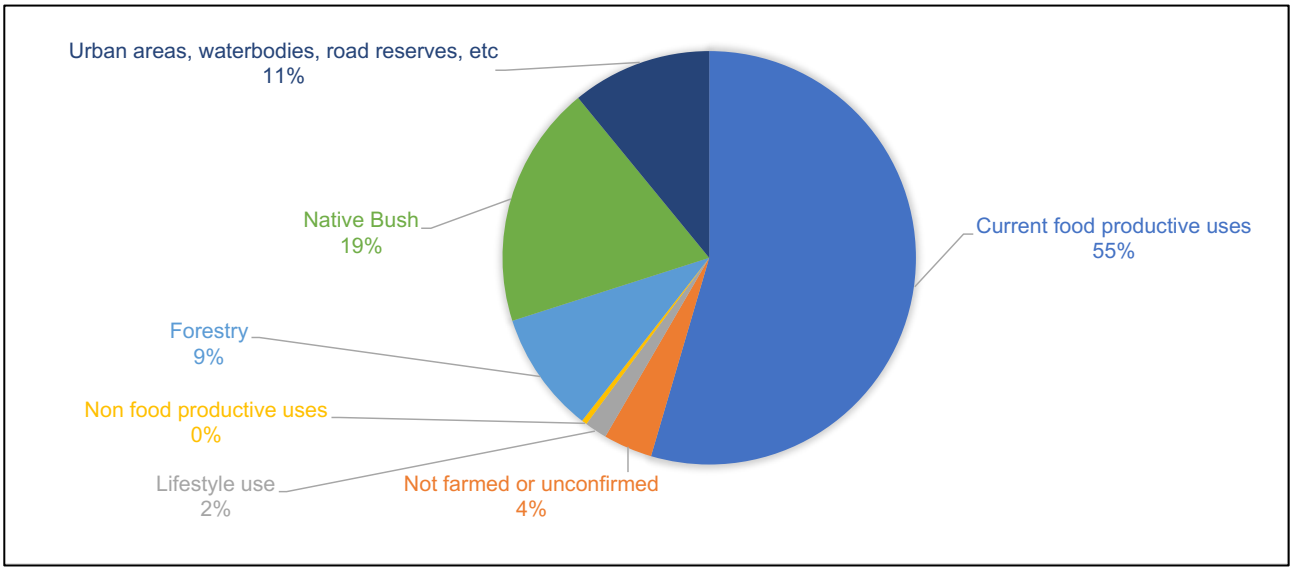

Figure 21: All land use type and area (ha) in the Wellington Region and Horowhenua District

Figure 22 provides a graphical breakdown of the ***food production land*** only in hectares (listed in Table 7 on page 23). 84% of the land is extensive pastoral land, used for sheep and beef farming. 14% is dairy farming for milk production, 1% is cropland (land used for growing crops, such as grains), 1% is deer, goat and other livestock, everything else is less than 1%.

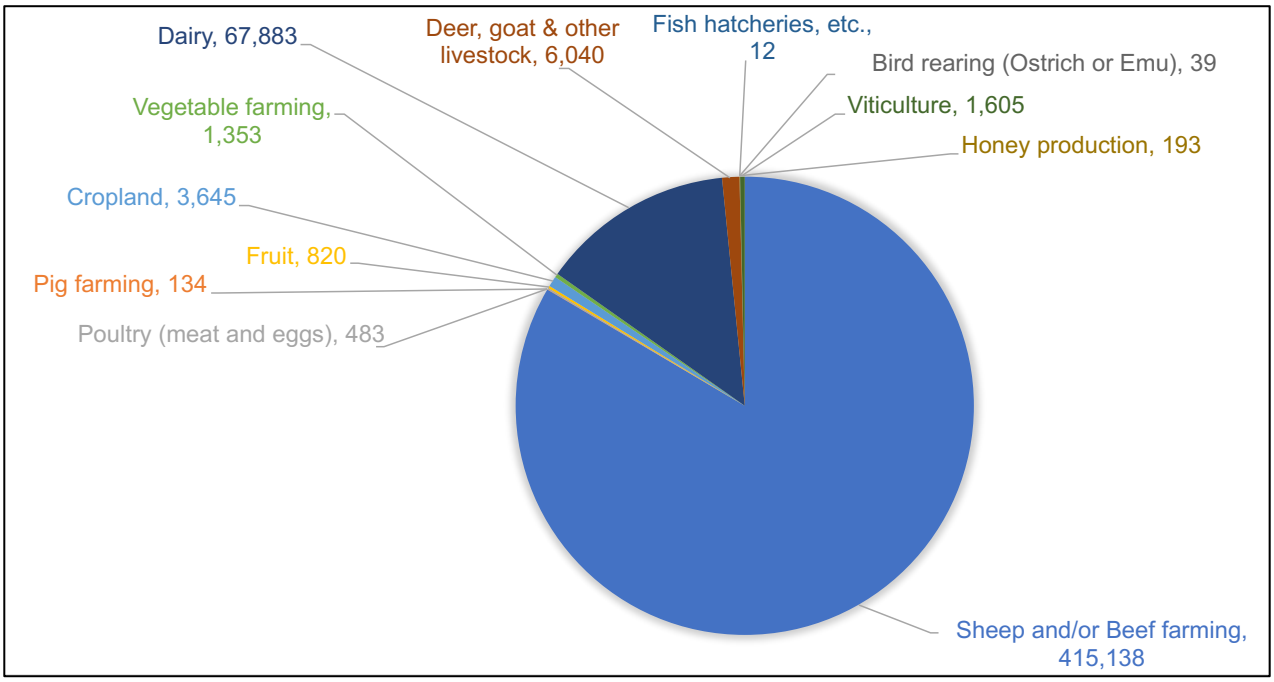

Figure 22: Only food production land use type and area (ha) in the Wellington Region and Horowhenua District

The AgriBase® data map, Figure 23 (page 25), shows the overall land use across the Wellington Region and Horowhenua District.

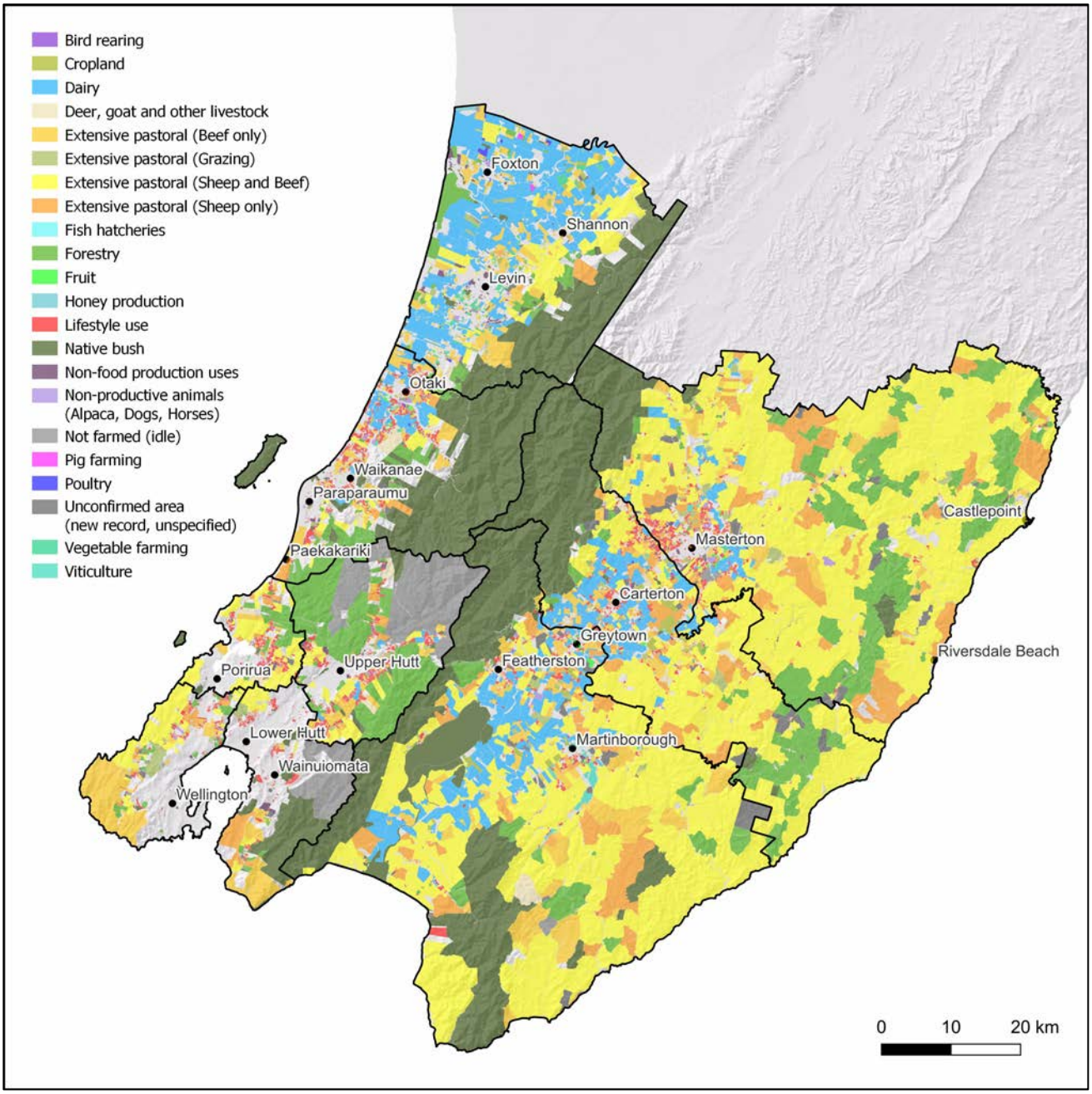

Figure 23: Map showing the overall land use across Wellington Region and Horowhenua District (data from AgriBase®)

3.4.1.2 The foodshed compared to land use

The foodshed theoretically required to feed the Wellington Region and Horowhenua District's community today, as described in Table 3 (page 5), is 296,656 hectares of food producing (or potentially food producing) land. The AgriBase® data shows that 497,428 hectares are food producing land, meaning nearly 60% of the currently mapped food productive land area of the Wellington Region and Horowhenua District is required to feed the population.

The foodshed theoretically required to feed the Wellington Region and Horowhenua District's community by 2052 (with an assumed population growth of 200,000 people), as described in Table 5 (page 6), is 398,856 hectares of food producing (or potentially food producing) land. Meaning, 80% of the currently mapped food productive land area of the Wellington Region and Horowhenua District is required to feed the population by 2052. Note, these calculations do not include potential other

food productive land (not currently mapped as food productive land) such as that found within Lifestyle use.

3.4.2 Factor IV: Volume of food production

The goal of the volume of food production component of this study is to determine the types and amount of primary food production that occurs within this foodshed. For the land use types that produce food, the food types produced are quantified by hectare and yield (weight). This data does not distinguish between what is exported or what is consumed nationally or locally.

Table 8: Food production modelling data for the Wellington Region and Horowhenua District by food type in kg per hectare per year

Beef and lamb	Beef from dairy culls	Venison and goat meat	Pork	Poultry meat	Eggs
232	133	47	11,441	12,425	31,014

Milk	Vegetables	Orchard fruit	Grain crops	Fish	Honey
23,868	41,500	20,801	5,500	4	182

Table 8 shows that on a per hectare per year calculation, vegetable growing is significantly more productive with a substantial 41,500 kg compared with free ranging animals such as sheep and beef cattle, dairy cows for meat (culls), deer and goat which all produce less than 250 kg. Non-free-ranging animals such as chickens and pigs produce more kg per hectare of food than the free ranging ones.

The following sections describe how food production modelling data for the Wellington Region and Horowhenua District is calculated.

3.4.2.1 Meat production

Predominately a sheep and beef cattle farming area, the Wellington Regional foodshed produces a considerable amount of beef and lamb meat, however a significant amount of beef (133 kg/ha/yr) comes from dairy culls[9] and 47 kg/ha/yr from venison and goat meat. Meat production calculations are based on model farm scenarios that are common for the Wairarapa, Kāpiti, and Horowhenua. See Appendix one for a description of the farming systems analysed.

Meat production weights are calculated as carcass weights, loss-adjusted primary weights. They represent the amount of meat that is produced given current Aotearoa New Zealand industry food handling, storage, and processing practices. It is the meat weight that results from an animal that is processed within the existing meat processing systems.

The following functions are used when calculating meat yields:

[9] Dairy cows can be culled for several reasons, including to maintain herd size, to generate profit from the sale of surplus cows or heifers, or when a cow's milk production reduces.

- The average carcass weight of cattle and cull dairy cows killed.
- The average carcass weight of lambs and cull sheep killed.
- The proportions of cattle and lambs supplied by typical farms and finishing farms.
- The total area of the sheep and beef farming enterprises and the density of animals on that area.
- The average carcass weight of deer grown for venison.
- The average carcass weight of goats grown for goat meat.
- The average carcass weight of pigs grown for pork.
- The average carcass weight of broiler chickens.

Red meat includes meat from sheep, beef, deer, and dairy farms. Pork production information is sourced from Pork New Zealand and provided number of farms, number of sows on these farms, reproductive performance of sows, and liveweight and dress out percentage of progeny at slaughter.

Poultry production information is sourced by phone call from the New Zealand Poultry Association to estimate the number of layer chickens and broilers in the study area and egg production information.

3.4.2.2 Milk production

The milk production calculations are made in litres of milk. Total annual milk production is the actual quantity of liquid milk that is produced, whereas milk solids refer to the solid components (milkfat and milk protein) that are left after all the water is removed from liquid milk. In Aotearoa New Zealand conventional dairy farmers are paid on the amount of milk solid produced, and as such it is a recognised unit for dairy commodities. For the purposes of this foodshed analysis the kilograms of raw milk (liquid) unit is used.

3.4.2.3 Orchard fruit production

As data is limited on precisely what is grown in the Wellington Regional foodshed, estimates have been used. For orchard fruit, yields of apples and pears are taken from New Zealand Apples and Pears information and the yield for other orchard fruit is estimated in tray-of-apple equivalents based on tray carton equivalents for apples. Apples, pears, and other orchard fruit are calculated on an average yield rate based on kilograms per hectare multiplied by the percentage of the area each crop covers. Grapes have also been included in the calculations at a yield rate based on kilograms per hectare multiplied by the percentage of the crop that becomes juice[10] (it is not known what percentage of grapes become wine and what remains as a saleable fruit product).

3.4.2.4 Honey production

Honey production is calculated on an average of 6.5 hives per hectare (data shows hives can range from three to ten per ha) with approximately 28 kg of honey per hive for the North Island (MPI, 2022).

[10] Data from www.weaverswines.com states 70% of the weight of the grapes becomes juice.

3.4.2.5 Egg production

Egg production is calculated on the number of layer chickens in the Wellington Regional foodshed, and the average amount of eggs one bird can produce a week, multiplied by the average weight of an egg provides a weight in kilograms per year.

3.4.2.6 Grain crop production

Crop production is estimated based on yields of peas, barley, wheat, and maize in the four years to 2011. It is hard to know whether grain crops are grown for human or animal consumption. Assumptions are made that maize crops are for animal feed, others such as peas, wheat, barley, and oats are for human consumption and amounts are calculated on average yields.

3.4.2.7 Vegetable production

Again, data is lacking on exactly what types of horticulture crops are grown. Production from horticultural land is estimated based on production information for lettuces, potatoes, pumpkins, and broccoli. It assumed these types of products each occupied a quarter of the total horticultural land area and that two crops of lettuces are produced per year, while for the other vegetables there is a single crop per year.

3.4.2.8 Fish production

Fish harvest data is an estimation based on the assumption that all the fish caught are caught within 12 nautical miles off the Wellington Region coastline in-shore fishing delimitations (in-shore fishing delimitations are approximately 500km off the coastline). This is a total fished area of 1,100,000 hectares (Figure 24).

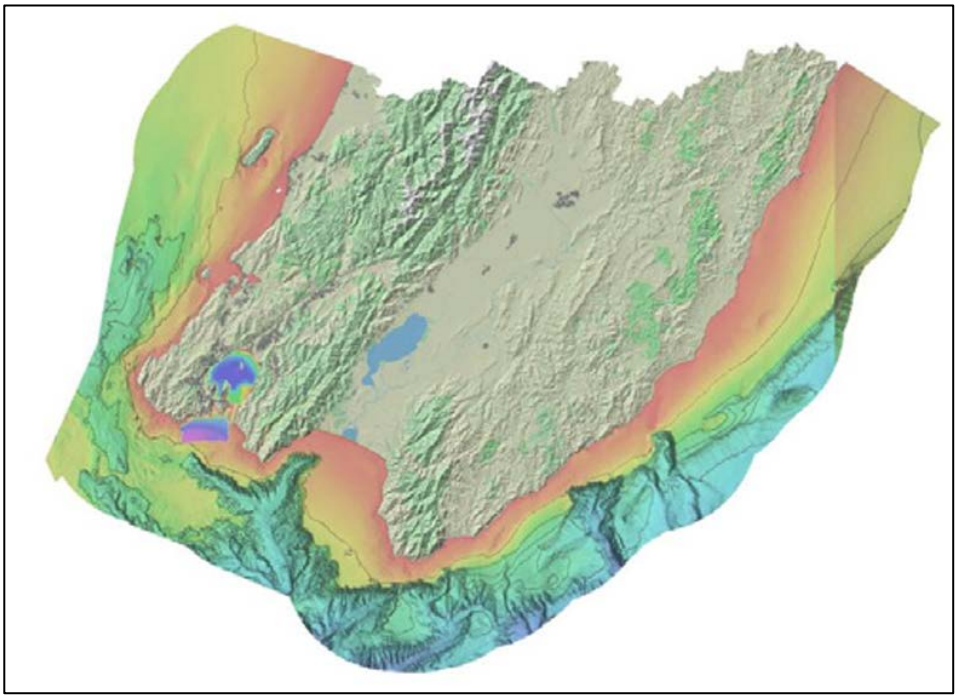

Figure 24: In-shore fishing area, for the Wellington Region and Horowhenua District (NIWA, 2012)

Data was then calculated based on average annual fish harvest (2016-2020), retrieved from the Ministry for Primary Industries[11]. Based on these calculations, fish harvest from the in-shore area of the Wellington Regional foodshed could be estimated.

3.4.3 Factor III x Factor IV = Total Estimated Production

To estimate the total estimated production, the area of each type of land use within the Wellington Region and Horowhenua District was determined (Factor iii) and multiplied by the volume of food produced (Factor iv).

Table 9: Annual estimated food production from the Wellington Region and Horowhenua District

Food produced from the Wellington Regional foodshed	Tonnes per year
Red meat	94,021
Pork	1,537
Poultry meat	6,000
Milk	1,620,255
Grain crops	20,046
Egg production	14,976
Fish caught	4,801
Vegetables	56,166
Fruit	17,061
Honey	35
TOTAL	1,834,897

Figure 25 provides a graphical breakdown of the estimated food production (described in Table 9) across the Wellington Region and Horowhenua District.

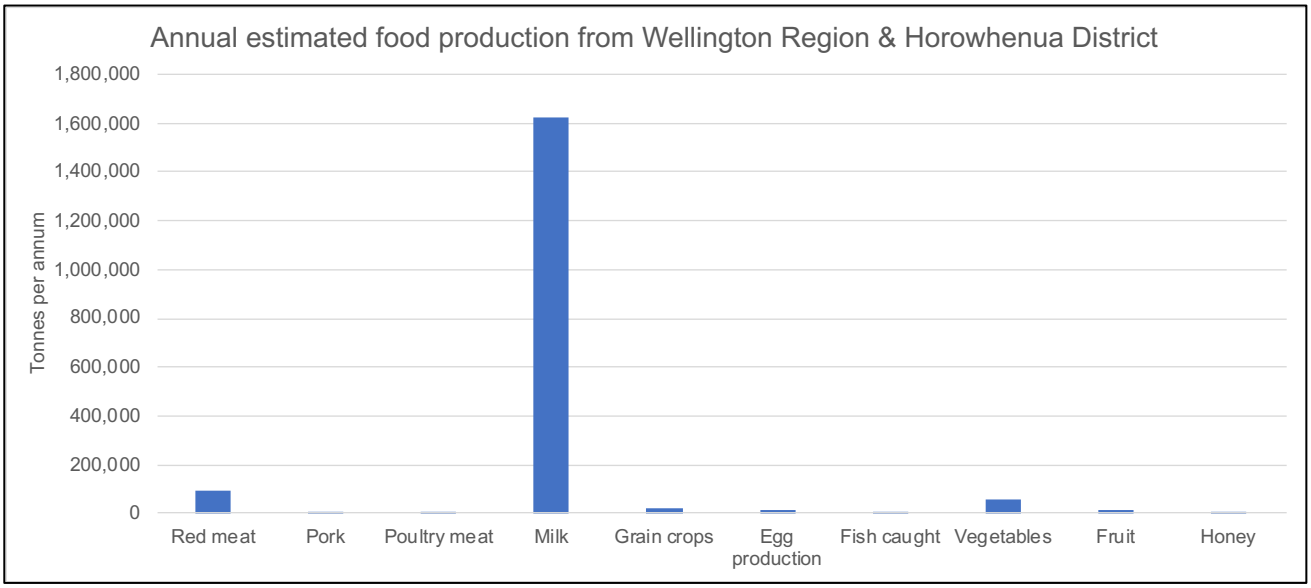

Figure 25: Total estimated production within the Wellington Regional foodshed in tonnes per annum

[11] https://fs.fish.govt.nz/Page.aspx?pk=41&fyk=37

Overall, milk is the most productive food product produced from the foodshed, despite sheep and/or beef cattle farming utilising 84% of the food producing land. Dairy sector utilises 14% of food producing land, which is 67,883 hectares.

Due to the high level of milk production, the graph in Figure 25 (page 29) is reproduced in Figure 26 without the milk production. The reproduced graph provides a better understanding of the other food types estimated to be grown in the Wellington Regional foodshed.

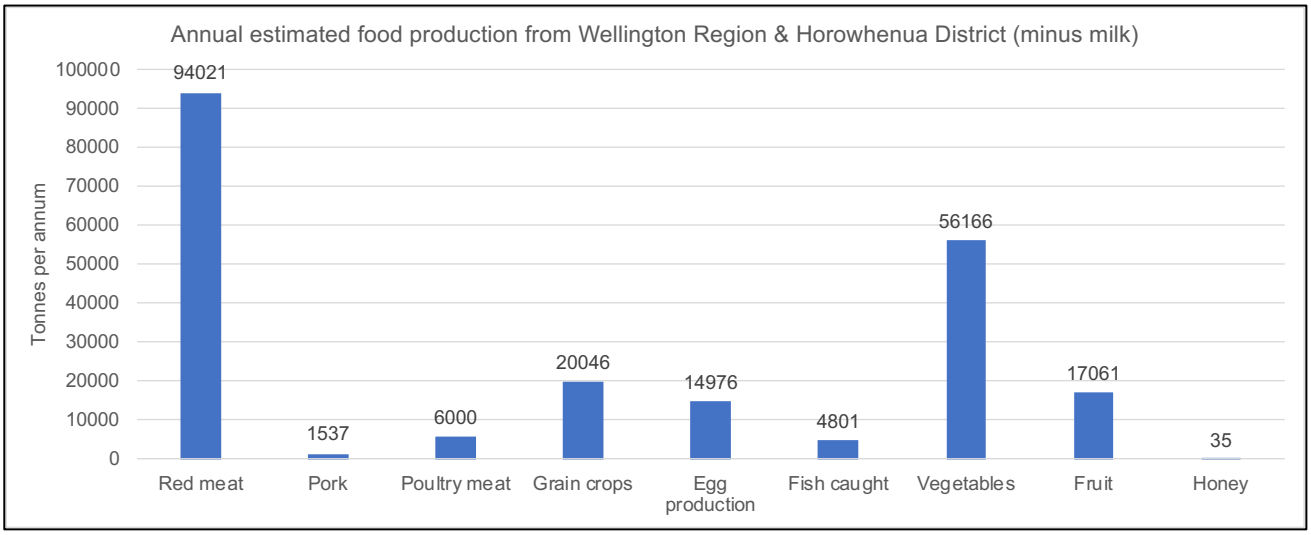

Figure 26: Total estimated production within the Wellington Regional foodshed in tonnes per annum without milk production

In the reproduced graph, the other food types produced in the foodshed can be interpreted clearer. Red meat is estimated as the second largest food type produced in the foodshed at 94,021 tonnes per year.

Vegetable production is estimated to be the third largest food produced at approximately 56,166 tonnes per year. Grain crop production is estimated at 20,046 tonnes per year, with orchard fruit production estimated at 17,061 tonnes.

Honey is the smallest of the food produced within the foodshed at an estimated 35 tonnes per annum.

3.5 Mass Balance: The Wellington Regional Foodshed

Based on the total estimated consumption and total estimated production data available, assumptions have been made to complete the mass balance (explained in detail in appendices one and two). The 'mass balance' is a way of comparing total production to total consumption for those items produced in the foodshed. As a result, it does not account for items such as bananas, which are frequently consumed but not grown in this region.

Figure 27 (page 31) and Table 10 (also page 31) shows the estimated current food production and the estimated food consumed by the 2022 population of the Wellington Regional foodshed within the Wellington Regional foodshed.

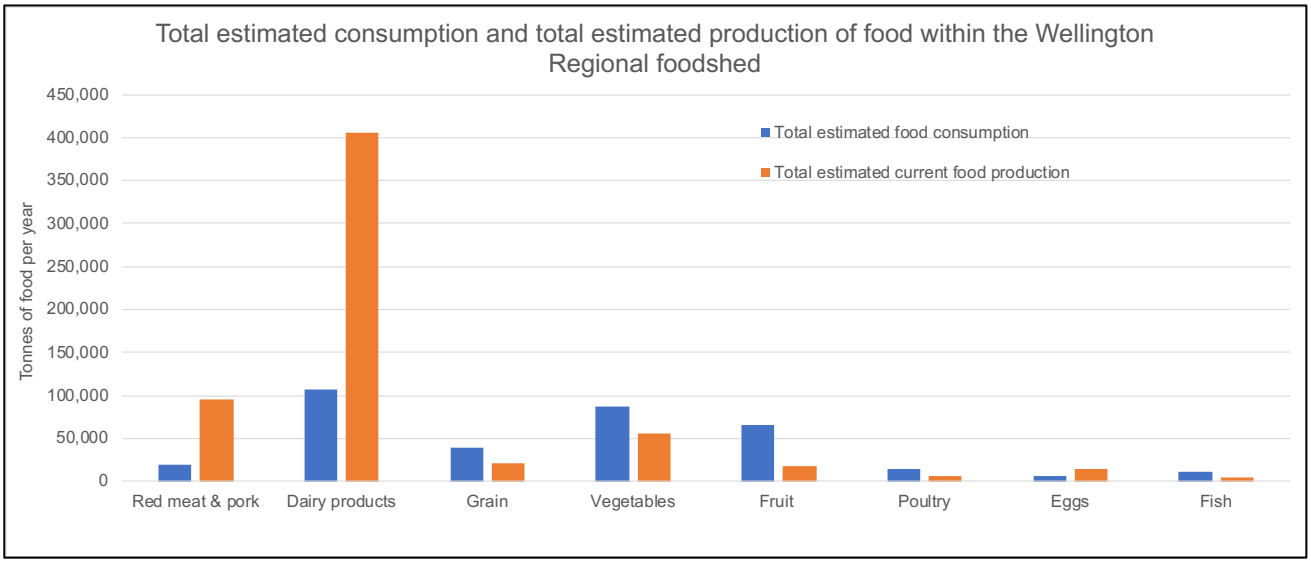

Figure 27: Total estimated consumption and total estimated production of food within the Wellington Regional foodshed

*Note about dairy: Previous figures showed the production of milk (approximately 1.6 million tonnes per annum), however for a more realistic measure when comparing to consumption, the milk production has been re-calculated to allow for processing into other products, such as cheese (which condenses the milk and is approximately 10 times lighter). Therefore, to reflect that milk is consumed both in liquid and diary product form the milk data total dairy products is now supplied at 405,064 tonnes per annum, as shown in Table 10.

Table 10: Wellington Regional Foodshed Mass Balance

Food type	kg/person/yr	Consumption (t/yr)	Production (t/yr)	Deficit / Surplus
Red meat and pork	33	19,001	95,557	76,556
Poultry meat	24	13,855	6,000	-7,855
Dairy products	185	107,185	405,064	297,879
Grain	67	39,100	20,046	-19,054
Other (legumes, nuts, etc)	7	4,082		-4,082
Eggs	9	5,491	14,976	9,485
Fish	20	11,452	4,801	-6,652
Vegetables	150	87,047	56,166	-30,881
Fruit	114	66,189	17,061	-49,128
Total	**609**	**353,401**	**619,671**	

For all the other main dietary food components consumption is greater in the region than production. Production relative to consumption in the foodshed is illustrated in the graph above in Figure 27.

The amount of food production within the informal food economy, such as backyard production, where residents grow some fruits and vegetables for their own consumption without selling it commercially, is unknown. The amount of mahinga kai (traditional way of gathering and processing food) is unknown, as is the amount of hunted meat caught and consumed. Backyard production, mahinga kai and hunted meat all contribute to the foodshed's food production, but at non-commercial levels.

3.6 Estimating the Foodshed in the Future

Foodshed values are predicted for the year 2052 (30 years from the 2022 StatsNZ data). To do this both the population and food consumption and production are adjusted. The population of the Wellington Region and Horowhenua District is increased by 200,000 people to 780,540 population.

The graph in Figure 28, shows what the total estimated consumption and total estimated production could look like over the course of the next 30 years.

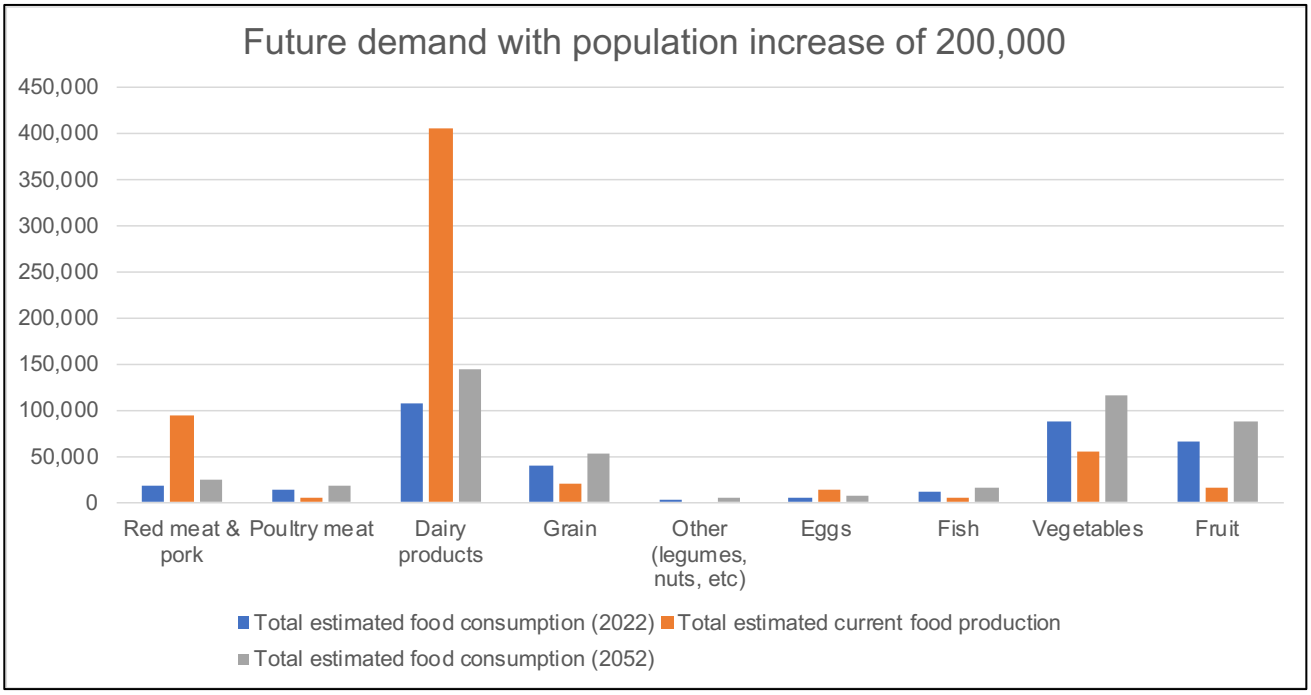

Figure 28: Future food systems within the Wellington Regional foodshed

The production of 'other' food sources is left unchanged from current to 2052. The current estimated consumption and the future estimated consumption for food within the foodshed have also been shown.

3.7 Findings

The foodshed analysis for Wellington Region and Horowhenua District provides similar findings to the Otago Food Economy report (Millar, et al., 2016). The Wellington Regional foodshed produces significant volumes of dairy products and red meat. There are significantly more dairy products and red meat products being produced than are required to meet the needs of the local community. Red meat production accounts for most of the land use.

The high amount of productive agricultural land is discussed in Section 3.4.1 (page 23). In summary, the Wellington Regional foodshed is 296,656 hectares (amount of land required to feed the current population), amounting to approximately one-third of the total Wellington Region and Horowhenua District land area. The productive land within the Wellington Regional foodshed is 497,428 hectares, which is 40% more than the ecological footprint requirements. Even when the population increases by 200,000 in approximately 2052, the Wellington Regional foodshed requirement will be 398,856 ha, which is still 100,000 hectares less than the existing productive land. These calculations do not

consider that the productive land may reduce over time due to a changing climate or land degradation, as well as the additional pressures from urban development or housing intensification.

4 Stage Two: Baseline Food System Analysis

Stage two of the report provides an overview of the existing Wellington Region and Horowhenua District Food System.

4.1 Defining the 'Local' in Local Food?

Amongst the literature there is a lack of clarity regarding the definition of the term 'local food'. The definitions that exist tend to relate to physical distance between production and sales and can vary by countries, regions, companies, consumers, and local food markets (Martinez et al. 2010). In the United States (US) the overall distance that produce can be transported and still considered local food is less than 400 miles (644km) from the source (Martinez et al. 2010). In Canada the 100-mile diet has become a popular trend (Wittman et al. 2012). So just between these two large countries the physical distance is hugely different. Clearly defining local only as a physical distance will never have consistency across countries. However, in the US and in Canada both countries are very supportive of their own state boundaries, in the US for example local food is also considered to be food consumed within the state in which it is produced (Larsen et al. 2008; Martinez et al. 2010; Wittman et al. 2012). This type of regional definition seems to correspond across countries, in Aotearoa New Zealand the Otago Farmers' Market, for example, prides itself on selling local food produced within the region.

When local food growers were asked what they understood by "Local", the answers are varied. It could be same district, same region, or same country for some. Figure 29 shows the responses.

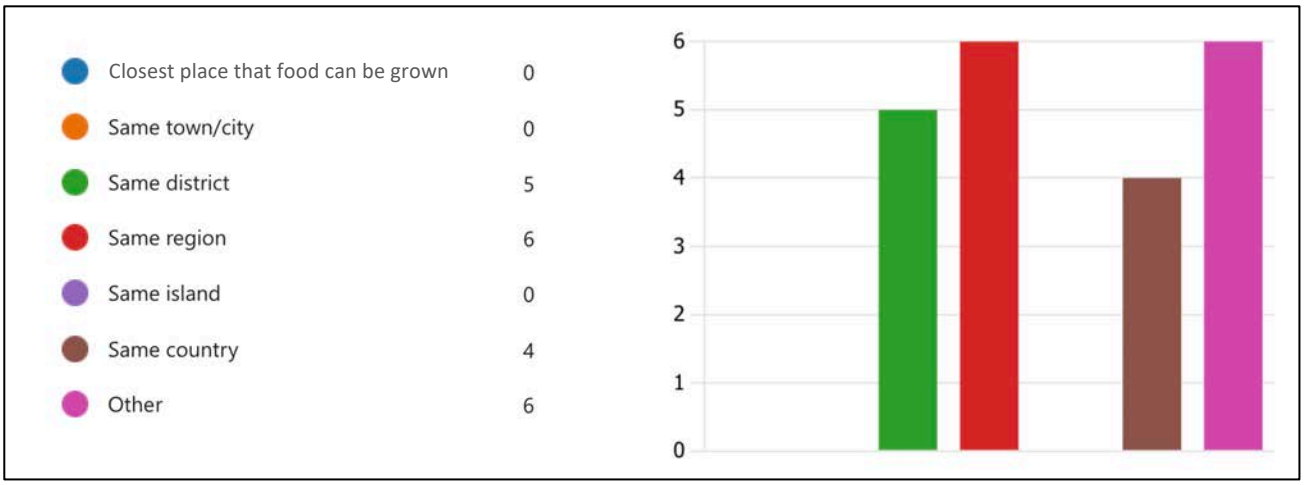

Figure 29: Defining local by the food producers/food growers (n=17)

Others add, "*we always have to include Wellington as they don't grow food*", "*needs to be grown and produced in NZ*", "*Masterton south*", "*anywhere I can drive to within the hour*" and "*lower North Island*".

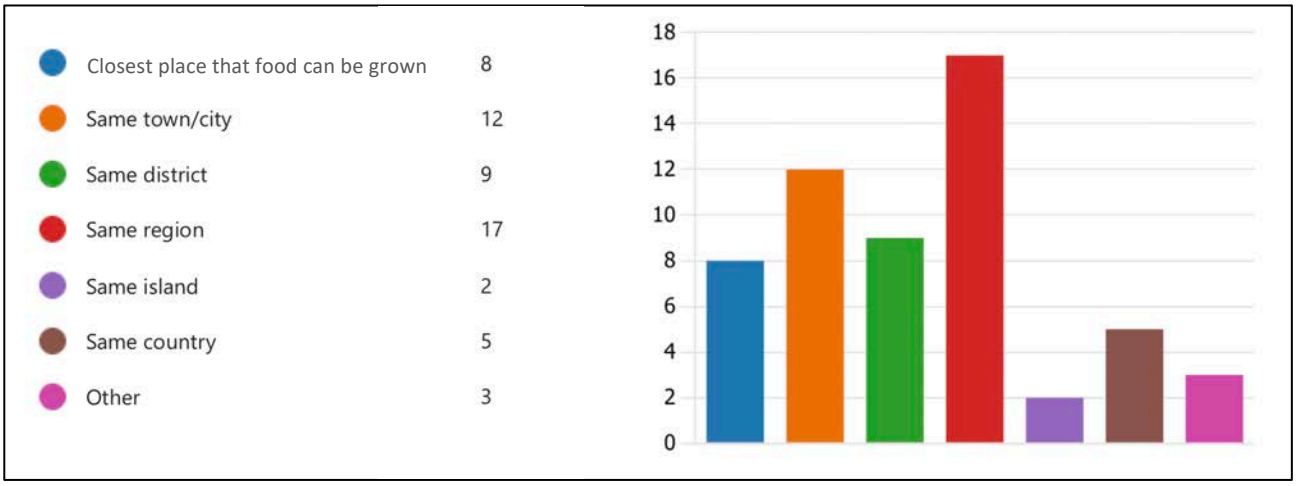

Figure 30: Defining local by the food retailers (n=30)

The three "other" comments were, "*less travel and less handled*", "*150km radius*" and "*New Zealand grown/produced"*.

For the purposes of this research, the word "local" means within the Wellington Regional foodshed.

4.2 Key Stakeholders in the Existing Food System

Delving into further detail regarding what is happening in terms of food within the foodshed provides a bigger picture and better understanding of the food economy. To do this the key stakeholders in the existing food system are identified, and a snapshot of the roles they play are explored.

4.2.1 A snapshot of food producers

The food producers have a key role to play in any food system. Food producers can specialise on one food type (such as dairy or beef cattle farming) or can diversify across several different products (beef or dairy cattle, chickens for meat and eggs, and vegetables). The estimated number and locations of different types of farming systems across the Wellington Regional foodshed is explored in the previous Stage (Section 3.4.1). To understand more about the existing food system, interviews with growers were conducted. The following sections explore a snapshot of food producing within the existing food system. 17 food growers were asked a series of questions regarding growing food in the region.

4.2.1.1 Types of food grown

A mix of different food producers were interviewed, as shown in the graph in Figure 31 (page 35).

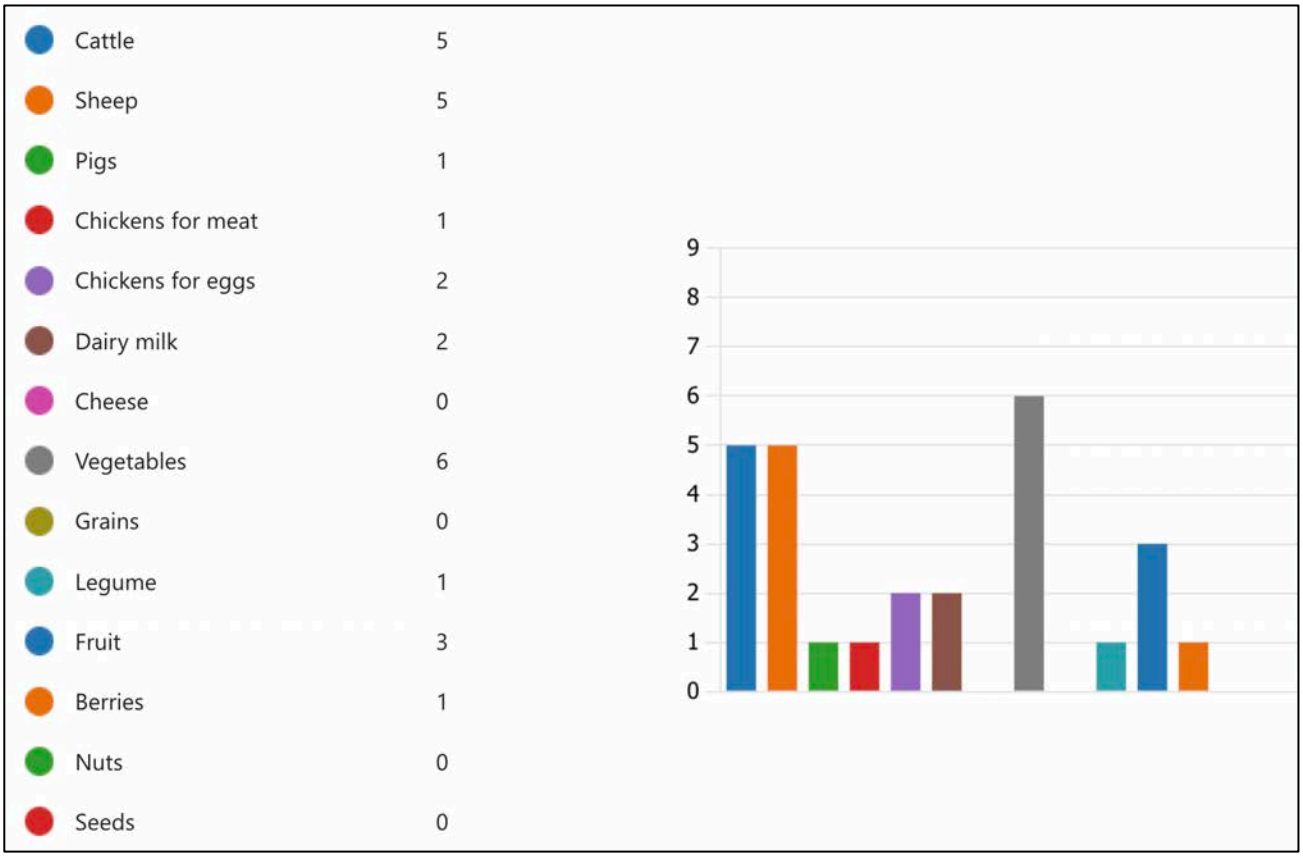

Figure 31: Graph showing the range of food grown by the 17 food growers (n=17)

Figure 31 shows the different types of food grown by the 17 growers. Many of the growers are vegetable growers, five farm sheep and/ or beef cattle, three have orchards and two produce eggs or milk.

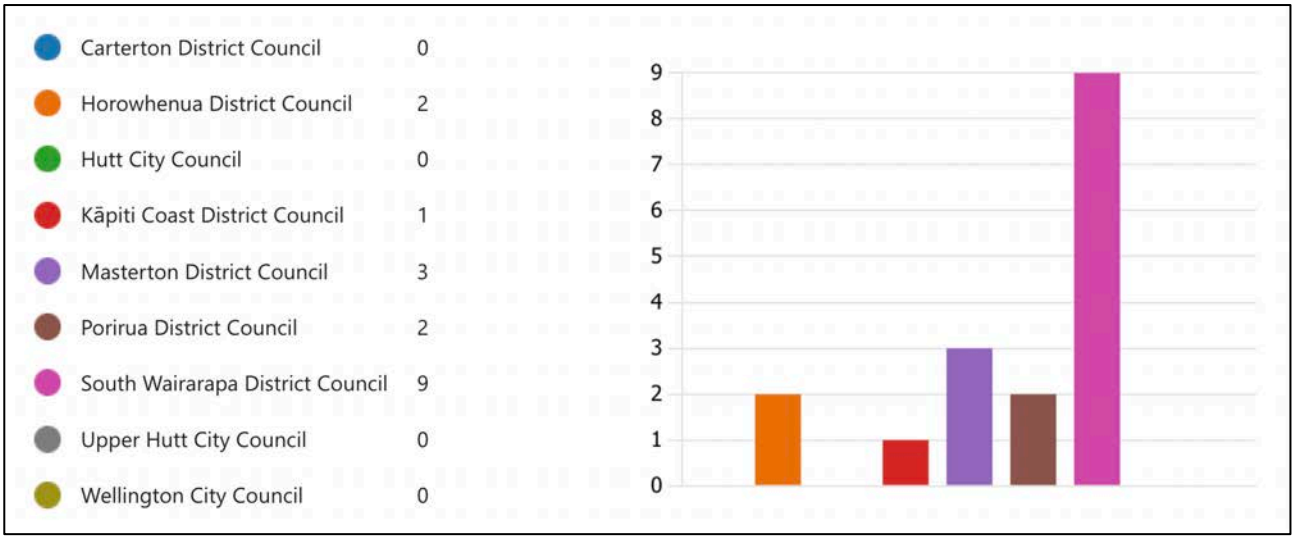

Figure 32: 17 interviews conducted over 5 districts within Wellington Region and Horowhenua District (n=17)

Of the 17, the majority are growers from the South Wairarapa District. No growers were interviewed from Carterton, Lower Hutt City, Upper Hutt City or Wellington City (Figure 32).

4.2.1.2 Existing challenges for growers

When asked what the key challenges are for growing food in this area, the responses are varied.

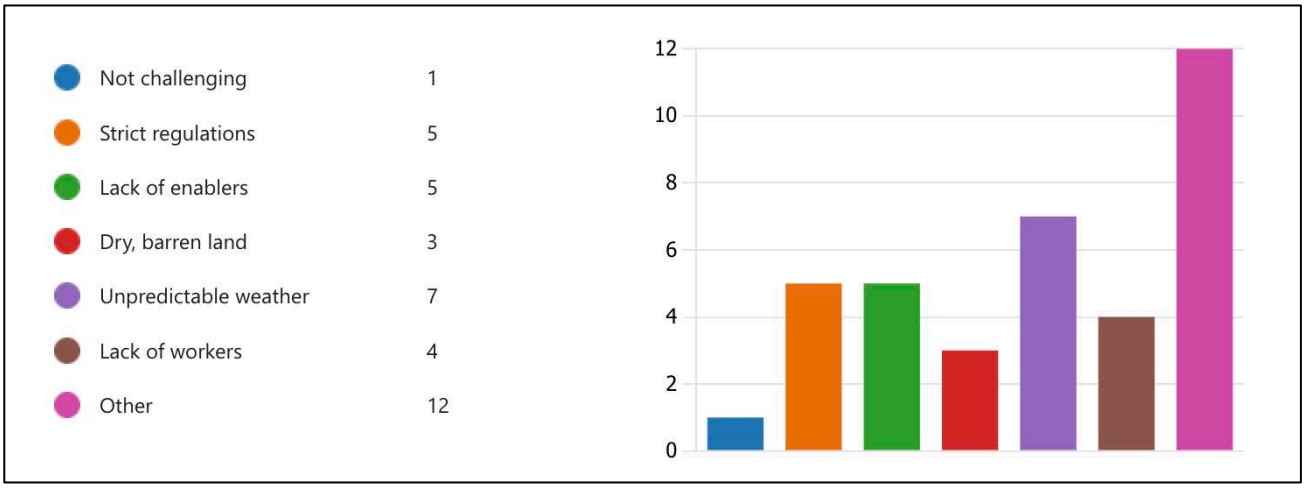

Figure 33: Key challenges for growers in the Wellington Region and Horowhenua District (n=17)

Figure 33 shows, for growers, the key issues include unpredictable weather, strict regulations, a lack of enablers and lack of workers. Other comments about the land or weather include "*changing climate, makes it hard to manage,*" and "*poorly drained soil (eastern side of mountain) it is dry in spring and summer, and wet in winter*", a vegetable grower states, "*climate is challenging, in comparison to Horowhenua, we are colder for longer*", which makes the growing period very limiting.

One grower indicates the current financial situation brings the biggest challenge, "*pricing fluctuations during current economic situation in NZ",* another indicates a lack of access to the right equipment *"access to tools for this scale of farmer* [is challenging]*, without the right tools, we are not as efficient as we could be.*"

Others find unfair competition is their biggest challenge, "*the* [lack of] *country of origin labelling is an issue as other distributers can import and sell under NZ label with no requirement to disclose where* [the original food item] *comes from.*"

One grower finds competing with supermarkets very challenging, "*we often produce more than we can sell, because we don't sell in a supermarket, we find it hard to find customers, the convenience of the supermarket trumps all and we can't beat that*".

4.2.1.3 Scale of food growers

From those growers interviewed, the graph in Figure 34 (page 37) shows how they categorise themselves in terms of the scale of their business.

Of the 17 interviewed, 10 define themselves as small-scale, two as medium-scale, two as medium-large-scale, one large-scale and two extra-large-scale. Small-scale ranges from 4 hectares growing a range of food (sheep, chickens for eggs, vegetables) to two blueberry orchards on 0.6 hectares.

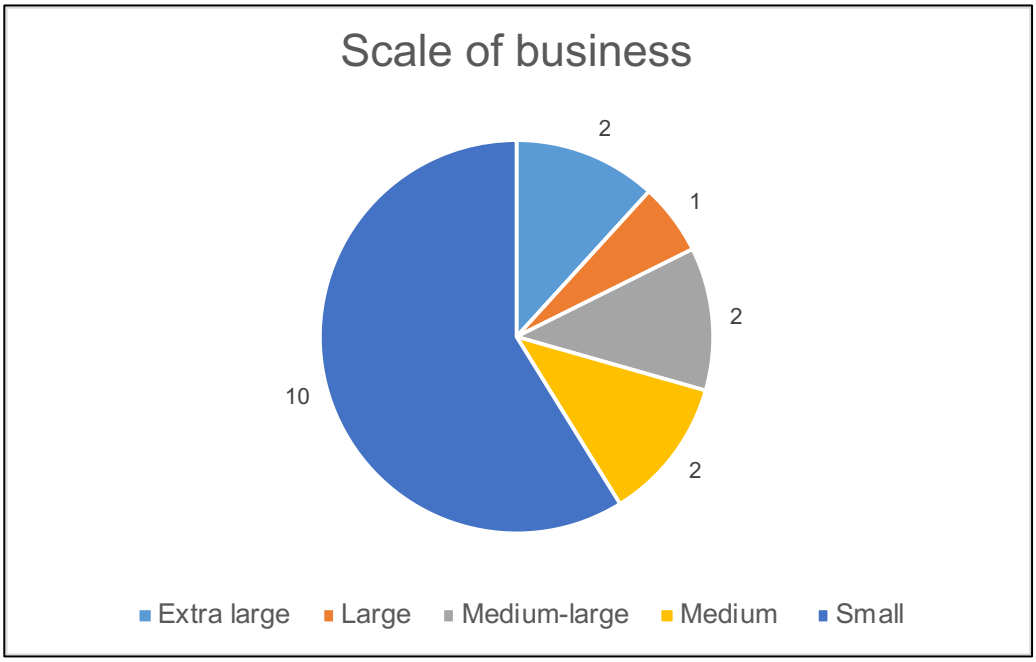

Figure 34: Pie chart showing the scale of the 17 food growing businesses (n=17)

Extra-large-scale includes orchardist growing 3,600 tonnes of apples and pears per year on 127 hectares for export and a vegetable grower growing 24 types of products on 800 hectares for national consumption.

4.2.1.4 Current business model

Understanding what food is produced in the Wellington Region and Horowhenua District is sold domestically and/ or internationally is shown in the graph in Figure 35.

Figure 35: Current operation for business (n=17)

One grower who supplies local and national, states, "*although we supply both locally (to local retailers and our own shop), we need to supply nation-wide to make it work financially, ideally we need to export to make our business sustainable*".

To further understand where food produced within the Wellington Region and Horowhenua District goes, the data is analysed further, as shown in Table 11 (page 38).

Table 11: Food produced within Wellington Region and Horowhenua District showing scale and operation

Food types grown	Scale	Current operation
Eggs	Small	Local, national, export
Fruit (olive)	Small	Local, national, export
Beef Cattle, Sheep, Dairy	Large	Local, national, export
Beef Cattle, Sheep, Pigs, Chickens for meat	Medium	Local, national, export
Dairy Cattle	Medium-Large	Local, export
Sheep	Small	National, export
Beef Cattle, Dairy Cattle, Vegetables, Berries	Medium-Large	National, export
Mushrooms	Small	Local, national
Berries	Small	Local
Vegetables	Small	Local
Vegetables	Small	Local
Vegetables	Small	Local
Sheep and Beef Cattle	Medium	Local
Fruit (olive)	Small	National
Vegetables	Extra-large	National
Sheep and Beef Cattle	Small	Export
Fruit	Extra-large	Export

Of the responses, only three are the same 'small-scale vegetable grower for local supply'. Everything else ranges from supplying for local consumption to only supplying for export. Some extra-large-scale farmers grow only for export (orchardist, as mentioned above, growing 3,600 tonnes of apples and pears per year on 127 hectares for export only) as do some small-scale farmers (sheep and beef cattle farmer). Some extra-large scale farmers grow for national supply, as do some small farms.

4.2.1.5 Benefits of supplying outside the region

When asked why they supply outside of the region, and the benefits of doing so, the response is clearly economic (Figure 36).

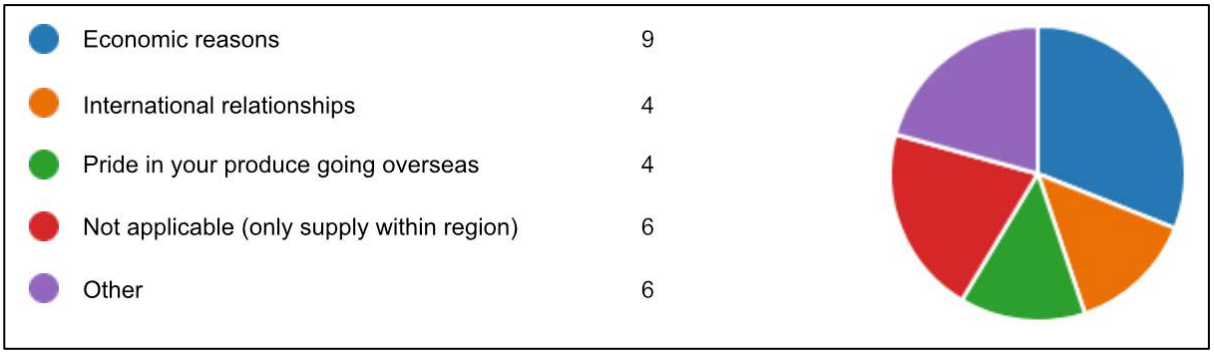

Figure 36: Pie chart showing motivation for supplying outside of the region (n=17)

Additional comments include, "*practical need to get the* [product] *out of the oversupplied market",* and a sheep and beef cattle farmer states, "[we can get better] *premiums overseas, where voluntary accreditations are valued*".

4.2.1.6 Challenges of supplying locally

When asked to describe what makes it challenging to supplying the local market, the answers are varied, Figure 37.

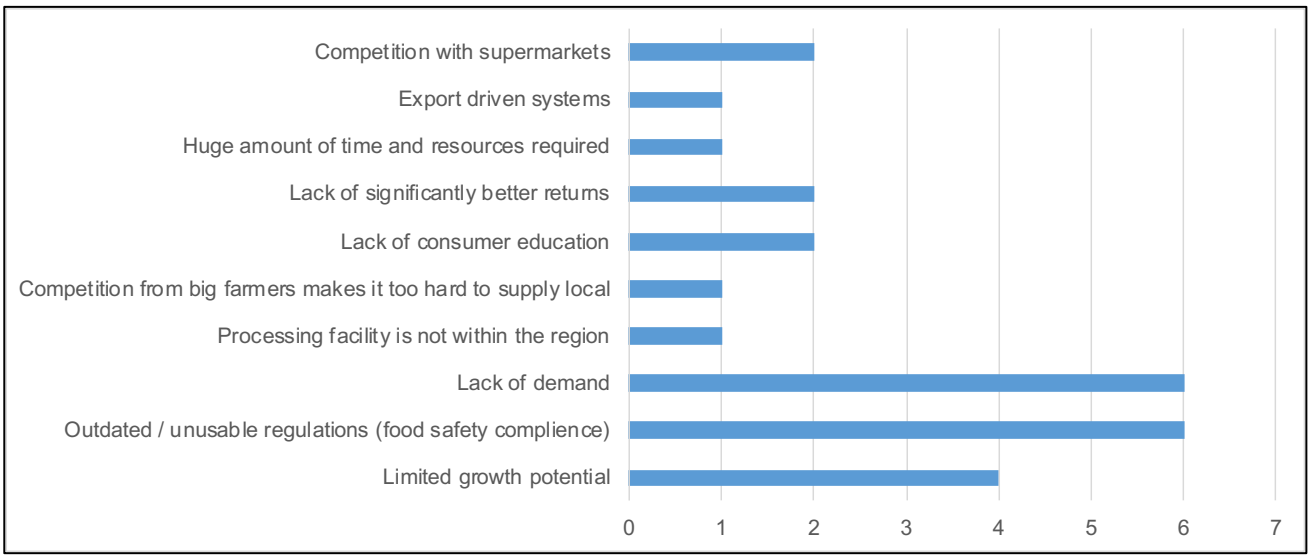

Figure 37: Various answers to what makes it challenging (n=17)

A lack of demand and outdated or unusable regulations (specifically food safety compliance regulation) are the most common reasons why it is challenging to supply the local market. Four growers indicate there is 'limited growth potential'. 'A lack of demand' ties in with the three claims that there is a 'lack of consumer education', this is explained as consumers not understanding the seasonality or growing methods of some types of food to consumers choosing the convenience and relative cheapness of a supermarket rather than supporting local growers directly.

Another grower states, "*there just isn't the population here to support our business*", as their business is for export only and grows too much fruit for the local population to consume.

4.2.1.7 Benefits of supplying locally

The growers were asked to explain what opportunities there are for them to sell their food locally, eight out of the 17 responses are the farmers' markets, meaning that farmers' market provide the biggest opportunities to sell food for these respondents, Figure 38 (page 40).

However, for the eight positive responses received about farmers' markets, four are not positive, stating:

> *"The farmers' market isn't good for us; we are seen as too big".*
> *"We used to do farmers' market before we got the brand established; then we grew out of it".*
> *"Selling at farmers' markets is not an option for us because of limited capacity".*
> *"There is a farmers' markets in the* [district name]*, but it takes a lot of energy for not much return".*

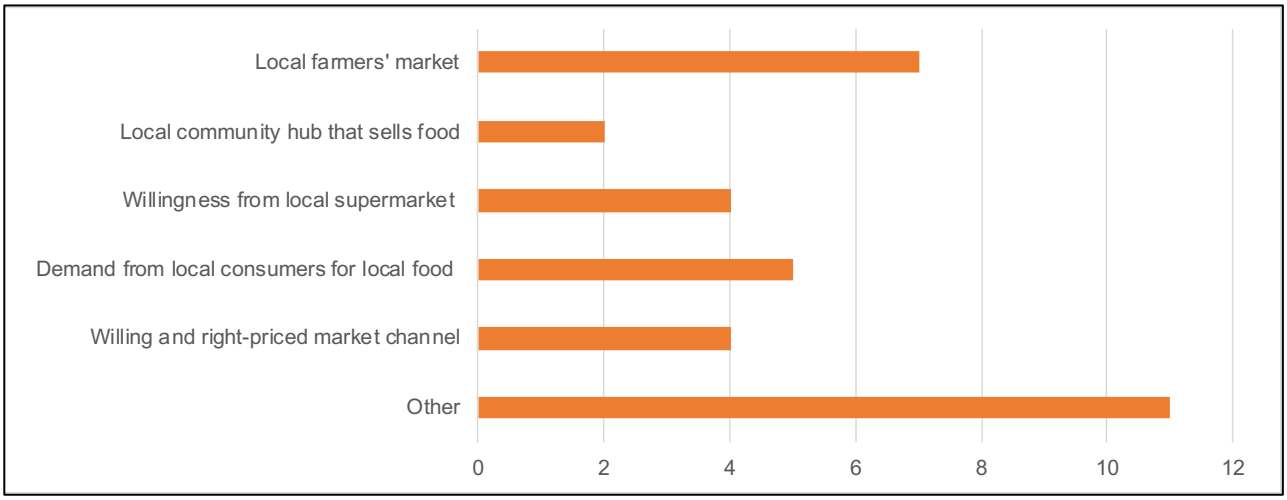

Figure 38: Responses to what opportunities there are to sell locally (n=17)

The key drivers for growers selling locally are predominantly due to community values, building or keeping local relationships, and supporting the local economy, see Figure 39.

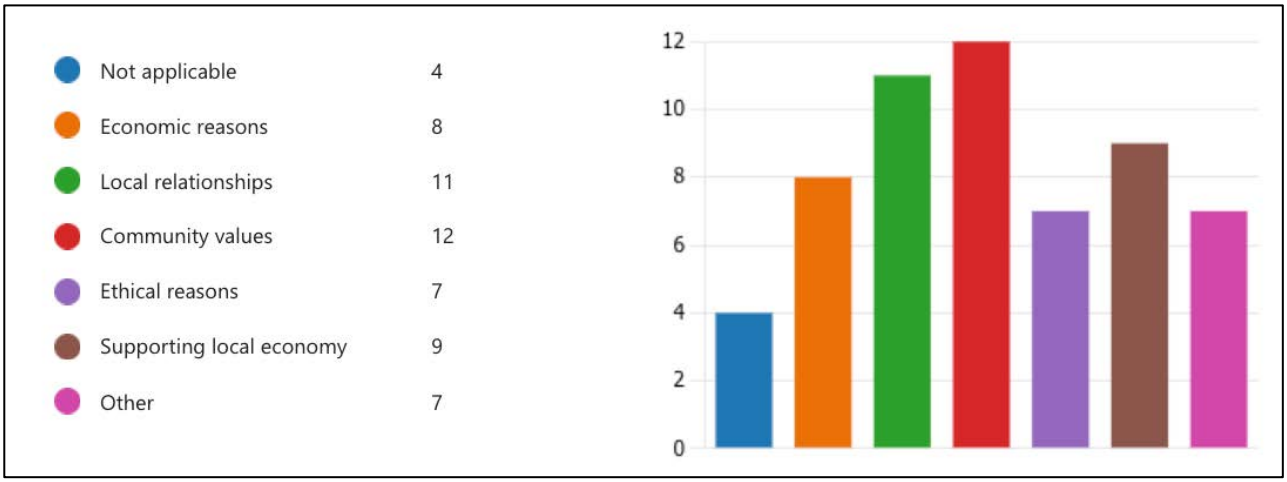

Figure 39: Motivations to supply local (n=17)

'Economic reasons' is the fourth common response for supplying local, whilst one respondent states, "*not for economic reasons, we don't get paid enough for that. We have made lots of friends through this, my wife started this* [business] *when we had kids*". Other comments include, "*this is how we eat and want other people to have access to it too*", "*we could either get really big and sell for a low price, or keep it small and go higher price*", and "*we believe we can feed our region, by local people*".

4.2.1.8 Changes that are needed to improve the local food system

When asked about the changes that are needed to make it easier to sell locally, responses are very mixed. Having 'assistance with marketing of produce' is the most common response, indicating that direct-to-consumer sales is hard work and needs resources. The second common response is 'better consumer education', reinforcing some of the challenges indicated previously. The third common response is 'easier regulations from paddock to plate' alongside 'other support (e.g. Government subsidies)', indicating that there is a role for local councils and the Ministry for Primary Industries to work alongside growers to better support small and local endeavours, Figure 40 (page 41).

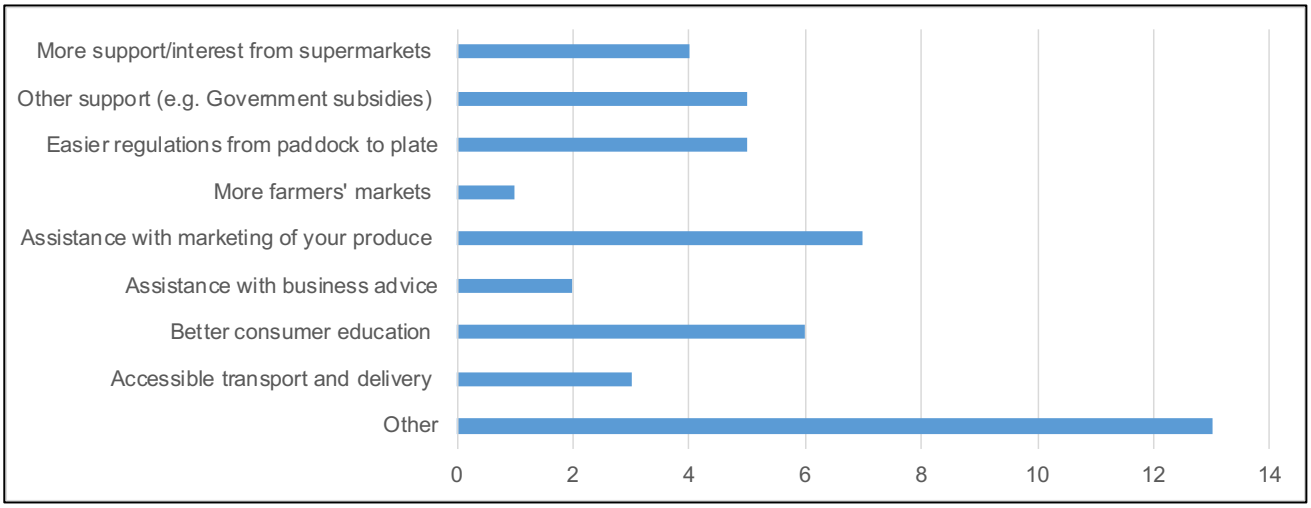

Figure 40: Q: What do you think needs to change to make it easier and more enticing for you or others to sell locally? (n=17)

Other comments include, (from one respondent), "*diversifying farming is key*", "*working together more and interlinking different concepts*", "*we need to take out the supermarkets, take out the transport, that would improve access direct-to-consumer*s" as well as "*we should be optimising what we currently have and supporting the local food*".

A different grower indicates, "*we need a certified, or at least good, marketing to show it is grown here, we need good labelling*", a reference to how some large importers of certain products can bring them into the country and sell them under a New Zealand label, because for some food types the country-of-origin labelling standards are not very clear.

Another states, "*my dream is that farmers don't have to worry about the selling*", continuing by saying, "*we need a direct-to-consumer market channel but without going through a third party, wholesale or supermarkets, so we have a guarantee that the food will be sold*". Another supports this by stating, "*some farmers might need help with marketing, to help sell their food more locally*", and a fourth states, "*Marketing is hard work, whether local scale or international*."

From a financial perspective, one respondent indicates, "*it needs to be made worthwhile for the farmer, so ensuring price consistency*" and states, "*profitability, it is about the dollars per hour worked*".

A large-scale food grower states, "*if people want to be able to sell to the established food retailers, they have to have a clear understanding of the paperwork and regulations, and how important it is to have a reliable supply*". This statement reiterates others regarding the complexity of the regulations; however, it also indicates a need for a regular supply, something that is important to the food retailers (see Section 4.2.3.4 on page 60).

4.2.1.9 Other relevant comments regarding local food

Some of the respondents added additional comments regarding the local food system. One states, "[t]*here is a local food economy, in which people are doing all the things I want to do, but it is just not legal*". This comment is specifically about red meat regulations.

Another indicates, "*formulating a framework in which the end goal doesn't just justify the means - we are not trying to get cheap food into homes - we can't bankrupt the growers*". Continuing, "*a strong economy is one with strong producers - healthy strong food systems. Supermarkets have a place,*

but they need to support the community better". Another states, "*I don't think locals should get* [food] *for cheap*."

A large food grower indicates, "*Because of the scale of our business, the only local supply we take part in is with the* [local] *Butcher, but we have had talks about supplying supermarket butcheries as well*". Another extra-large scale grower reports, "*If I was only growing for Wellington, I would only need 5 hectares, but the compliance costs and the economy of scale just doesn't make it worth it*".

And a final word on consumers and farmers' markets, "*pre covid the farmers' market was hustling and bustling, we would sell out every day. Post covid, well, it just never bounced back, every week we would come home with a truck load of food. It was such a waste. I feel like the markets in Wellington city do well, but for us to get to Wellington city markets is just not worth it*".

4.2.1.10 Food waste from food growing

Food waste from growing food seems to be minimal. There is minimal food waste from the dairy or meat growing industries, as any waste produced on farm cannot be eaten by humans. Vegetable growers and orchardists may have food waste, but primarily it is money wasted if time and resources have gone into produce that doesn't make it to the processor, distributers, or retailers. "Seconds" of fruit for example, have often been used for juicing, a trend that is also becoming popular with vegetables. Seconds of fruit and vegetables have become more normalised to eat with the help of entities such as the "ugly box by Little Farms"[12], "wonky box"[13] and the ugly food movement.[14]

4.2.2 A snapshot of food processing, distribution, and supply chain

Food can be processed on farm, such as orchard, vegetable farms or egg producers, whilst others must send their produce to a secondary facility for processing, such as milk processing or for animals, an abattoir. The following sections explore these food processing facilities and the connected supply chains.

4.2.2.1 Animal product processing

From the farm the animal goes to an abattoir for slaughter then on to a meat trader, wholesaler, or butcher. The process typically ends with the butcher, which could be within the supermarket or specialised butcher shop, as shown in Figure 41.

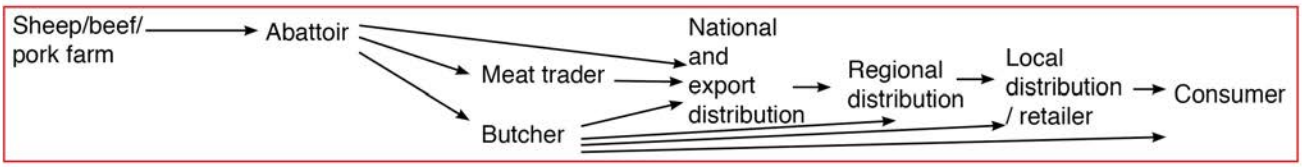

Figure 41: Supply chain for meat

[12] https://wearelittlefarms.com/products/the-mama-farm-box

[13] https://wonkybox.nz/

[14] https://www.stuff.co.nz/business/89497690/ugly-fruit-and-vege-to-be-sold-in-supermarkets-at-lower-prices

Within the Wellington Regional foodshed, eight meat processing facilities (abattoirs/meat works) are identified. Some solely process pigs or poultry and others process sheep and beef cattle, whilst others process goats, sheep, lambs, beef cattle and another process pork and lamb and debones beef but doesn't slaughter the cattle themselves. Data on amounts processed is limited; from the six spoken to, only three provided information. This information, however, shows the enormous range between them. They range from small processing facilities (e.g. processing 104 tonnes of finished product per year) to large-scale (12,000 tonnes per year) to extra-large processing facilities (processing approximately 36,500 tonnes of finished product per year). The latter takes animals from all over North Island, from as far north as Hawkes Bay and west as far as Taranaki. They also indicate that a large amount of product is sold to the Wellington Region and Horowhenua District through the meat trader whilst a larger portion is exported.

A large-scale pork processing company states, *"[t]he majority of the product [we process] is pork (95%), we do process a small amount of beef, lamb and chicken*". When asked where they source their product from, they responded, *"[t]he bulk of our product is imported from Europe and North America. This is received as frozen portioned cuts, which we defrost and process. Approx. 8% of our pork is local, all the non-pork meat used is local".*

Animal products also includes egg producers, for them the processing includes cleaning, sorting, and packing on farm. The only large-scale egg farmer engaged as part of the research within the Wellington Regional foodshed has multiple avenues, from supplying to a distributer for export and national supply, supplying direct to local supermarkets, as well as direct-to-consumer through online and delivery to the food service sector (such as cafes, bakeries, and restaurants).

4.2.2.2 Dairy processing

From the farm the raw milk is sold and collected by milk processing companies such as Fonterra who heat treat milk and either sell to wholesalers as milk or process further into cheese, yogurt, or milk powder, shown in Figure 42.

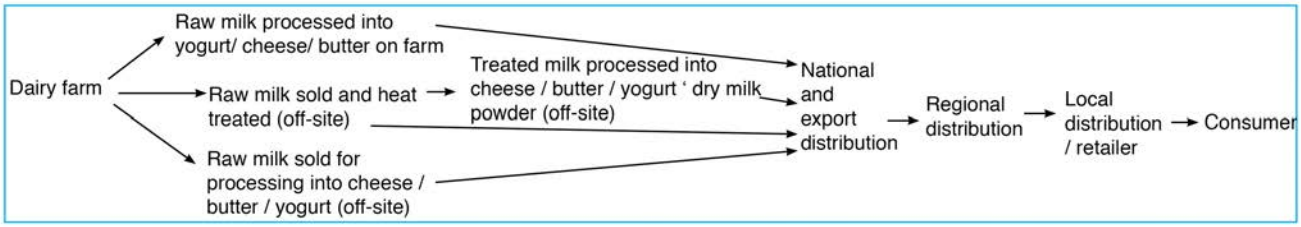

Figure 42: Supply chain for dairy

Fonterra dominates the milk processing at 84%, with other major dairy processors owning 14% of the market. These other large-scale milk processing companies include:

- Open Country Dairy Ltd (6%).
- Synlait Milk Ltd (Synlait) (3%).
- Westland Co-Operative Dairy Company Ltd (3%).
- Tatua Co-Operative Dairy Company Ltd (1%).
- Oceania Dairy Ltd (1%).[15]

[15] https://www.dairyfarms.nz/about/nz-dairy-industry/

The Dairy Companies Association of NZ states there are no significant dairy production factories in the Wellington Region or Horowhenua District. The two closest large-scale processing plants are both Fonterra plants, one is in Longburn and the other in Pahiatua, meaning most of the milk produced within the Wellington Region and Horowhenua District will be trucked in tankers outside of the region (shown in the map in Figure 47, page 46).

However, four small scale cheese factories are identified in the research. Their supply chains will be a bit different to the large-scale one above. Instead, their supply chain will be more reflective of Figure 43, where farmers sell milk to smaller scale commercial processors for pasteurization or cheese making, which then goes to a local distributor, who supplies to the retailer.

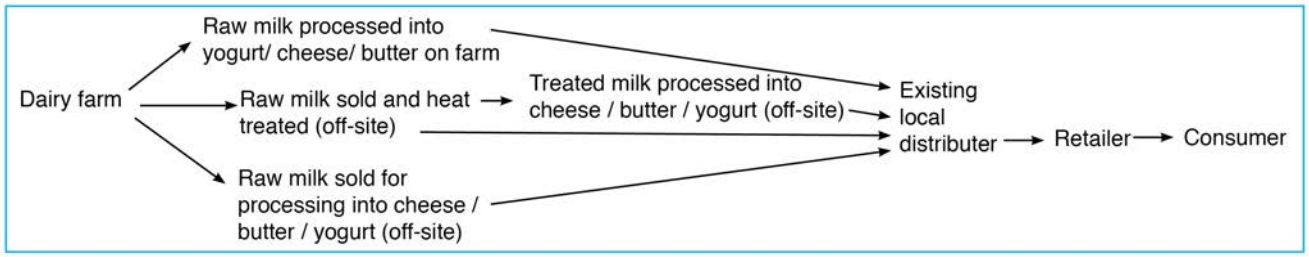

Figure 43: Alternative supply chain for small scale cheese making

Again, data from dairy production is limited, of the four cheese producers, one uses all sheep milk from their own farm and bring in cows' milk from nearby farm, whilst another just brings in cows' milk from a nearby farm. One produces 109 tonnes of curd per year, the other uses 65,000 litres of milk to produce over 9 tonnes of cheese per year.

4.2.2.3 Horticulture processing

Processing of harvested vegetables can include rinsing, trimming, shelling, sorting, packing, storing, and transport; processing of harvested fruit can include sorting, waxing, packing, storing, and transport. Often this happens onsite.

In terms of how the product reaches consumer, this can happen in different ways depending on the scale of the business. For example, large-scale horticulture farms tend to be registered with either NZ GAP (previously the New Zealand Fresh Produce Approved Supplier Programme) or with the wholesaler/ retailers' registration programme. Then, from the farm the produce typically goes to the wholesaler for processing and distribution to retailers, for some farms they have on farm stalls or 'pick your own' which is called direct-to-consumer sales (Figure 44).

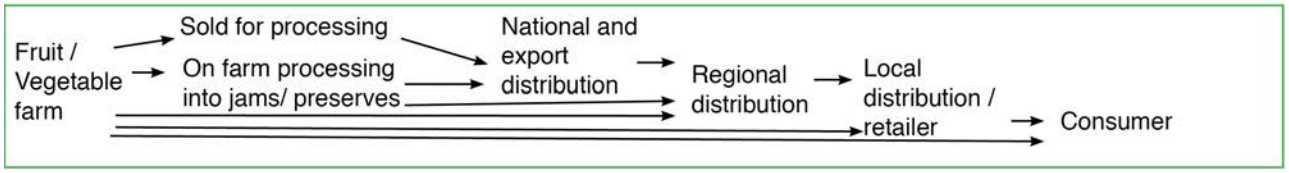

Figure 44: Typical supply chain for horticulture

In the model shown in Figure 44, there are many different options for how the grower sells their produce, some will do one or more of the options. One of the large-scale fruit growers within the Wellington Regional foodshed sells direct for export distribution and all 3,600 tonnes of fruit are exported in 175 x 40-foot containers, every year. For this large-scale grower, no fruit is sold locally or nationally.

Another option is that growers can sell their produce to existing local distributers (wholesale) who are already set up and operating, prior to the retailer, this type of supply chain is shown in Figure 45. For farmers to sell to wholesalers they must be registered as a grower; for the majority of wholesalers the NZ GAP accreditation is widely recognised. For the larger wholesalers and the supermarkets, they often have their own accreditation scheme that growers have to achieve prior to being accepted as a registered grower.

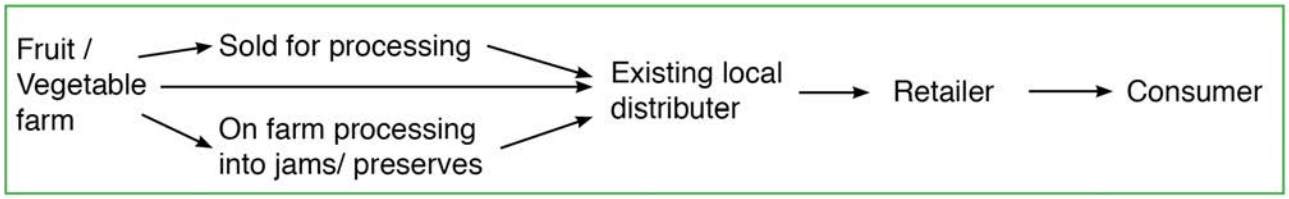

Figure 45: Grower to existing local distributer to retailer supply chain

Some existing distributers (or even sometimes a retailer, cutting out the distributer) could be more lenient with local growers. In some instances, if a local grower is practising organic or certified organic, then the likes of organic speciality stores may be the most likely retailers who would deal directly with the grower. However, stringent organic rules must be adhered to.

A third option noted within the Wellington Regional foodshed is direct-to-consumer. In this model growers sell their products directly to consumers either at the farm (farm gate sales), through farmers' markets or through CSA models (Consumer Supported Agriculture), shown in Figure 46.

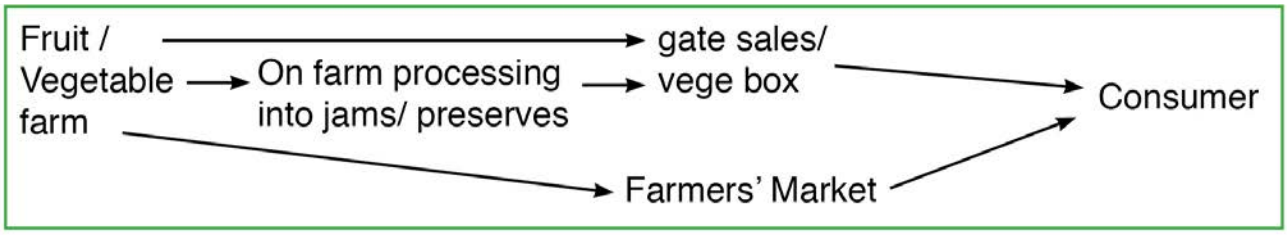

Figure 46: Grower direct-to-consumer

Farmers who grow fruit and vegetables and wish to sell direct-to-consumers can do so in several ways but only if the produce is subjected to minimal processing (for example, wash / rinse). A few small-scale vegetable growers within the Wellington Regional foodshed discussed selling produce direct-to-consumers through a CSA vegetable box scheme. CSA schemes originated in the 1960's in Switzerland and Japan and the concept is that consumers pay a local farmer a one-time payment at the beginning of the season and in return receive a weekly supply of fresh, seasonal produce from that farm. In this way, the participants of the CSA share the risk and the successes of the farmer. Moreover, the consumer has increased connection to the food (some producers take payment as hours worked on the farm) and therefore ease the financial strain on farmers by ensuring there is money at the start of the season (when needed) and not just at the end (Larsen et al. 2008).

One of the small-scale farmers in the Wellington Regional foodshed has morphed away from the traditional CSA farmer managed model. Instead of providing a weekly seasonal vegetable box, they allow consumers to tailor their orders through an online platform, which are individually packed each week. This model has developed due to complaints from seasonal box recipients that they didn't like surprises, they had no idea what to do with some vegetables and that they wanted vegetables out of season. The small-scale farmer states that consumer education is still very limited in terms of the out-of-season requests constantly received from consumers. The farmer indicates, "*the normal CSA*

model is good for farmers, but here we have made it good for consumers, but it is less good for us! We have teamed up with others [vegetable growers]*, so there are seven of us now, seven different organic farmers to fill the orders*." A downfall about the consumer self-selection is that the grower must pack multiple different orders each week, manage the online platform and market the produce, creating additional pressure to the existing workload.

4.2.2.4 Mapping the food processing

The map in Figure 47 shows the location of all the known food processing facilities, including the two large milk processing plants outside of the Wellington Region and Horowhenua District.

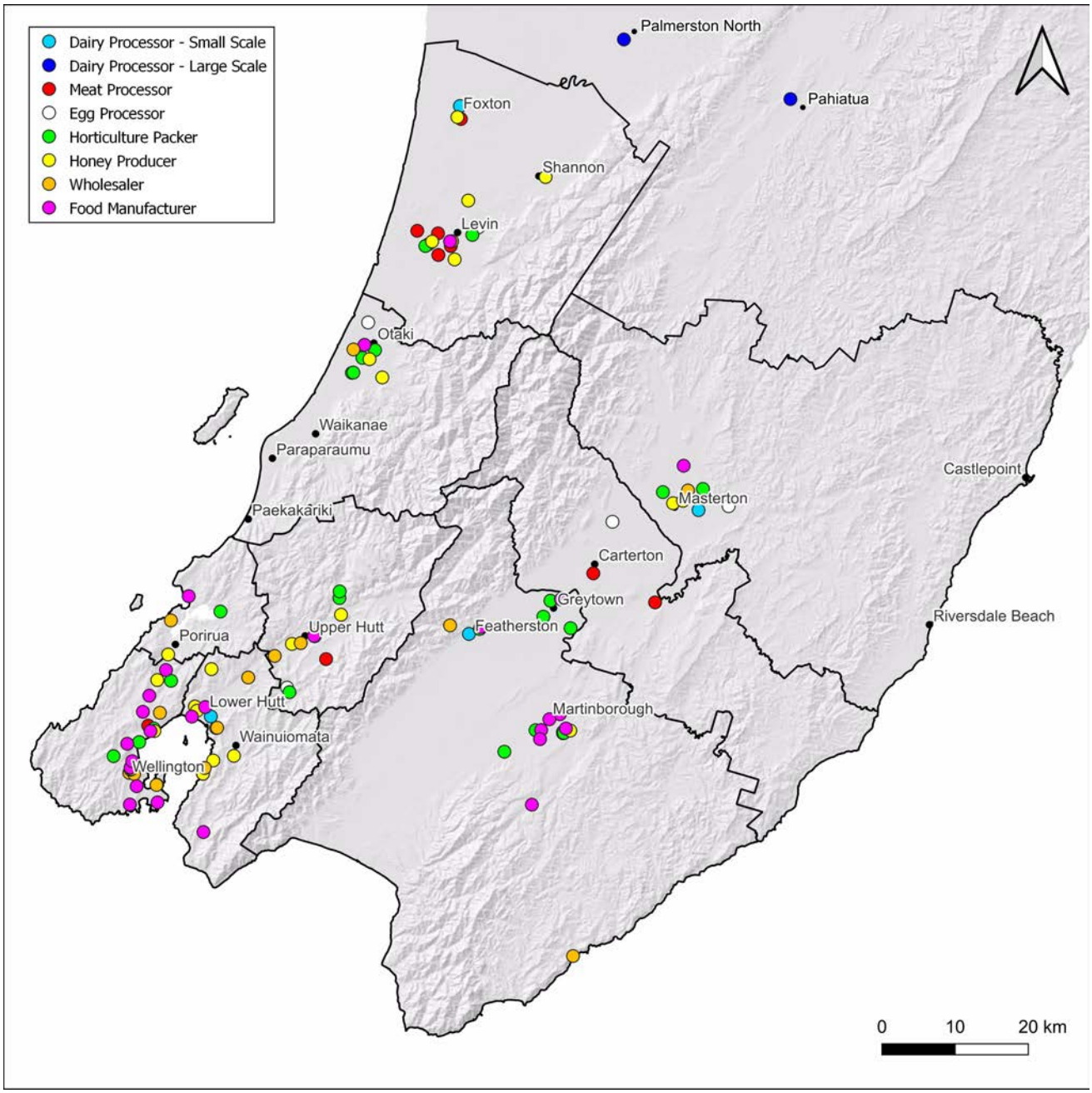

Figure 47: Map of the Wellington Region and Horowhenua District showing approximate locations of processing facilities

The map in Figure 47 shows that the large amount of dairy milk produced in Horowhenua and in the valley bed across the Wairarapa, Carterton and Masterton will predominantly be transported north for processing. Horowhenua milk will most likely go for processing close to Palmerston North, (Fonterra's

Longburn facility) and those around the Wairarapa north will most likely go to Fonterra's Pahiatua facility.

As indicated previously, one of the large-scale meat processors, only purchases 8% of their pork from local pig farms. The remaining 92% is imported frozen from Europe or North America. This means 950 tonnes per year of pork meat is purchased locally, whilst 11,000 tonnes per year comes from overseas.

4.2.2.5 Food waste from processing food

Research shows that animal processing uses most of the animal, with the exception of the hide. Offal can become food for human consumption but is not very popular, so both offal and tripe (stomach lining) tend to go into pet food. There is little to no food waste from animal processing, there is one major wasted product, which is the skin. With a decline in leather use (moving towards synthetics), the skins of animals processed for food tend to go to landfill. Tongues, and brains can also be eaten, but no abattoirs process them. These also go to landfill.

A large pork meat processor states, any "[w]*aste meat is cooked (to be compliant with Biosecurity regulations), then sent to a local rendering operation. Our DAF waste* [wastewater] *is sent for composting (all the product is firstly taken out of the DAF via the flocculation process). Brine waste (high salt content), is tankered to Hastings for processing at their wastewater facility – as this cannot go to the* [local] *district council, as the sodium is too high*."

There is minimal food waste from the dairy industry. For small cheese processors they have whey as a waste product, which is not technically food, however it often goes to local piggeries as a food source. Food waste from the vegetable or fruit growing industries tend to go back into composts and ultimately returns nutrients back to feed the land or the trees.

4.2.3 A snapshot of food retailers

Previous report sections have explored food production and wholesale distribution. This report section now considers the retailers who are the front facing, customer focused food premise. The following is an introduction to the various food premises across the different locations around Wellington Region and Horowhenua District. The descriptions include different business categories. The purpose of mapping food premises is to understand the distribution and types of food premises in the local food economy, therefore helping to evaluate how people access food. Mapping helps to visually attain how well the current Wellington Region and Horowhenua District food economies could potentially achieve the core requirements of a local food economy, such as:

- Customers having accessible and convenient access to locally produced food.
- Producers having reliable distribution options.
- Producers having growth opportunities.

Across the whole of the Wellington Region and Horowhenua District there is a total of 3,162 food premises registered with the nine Territorial Authorities (not including premises who solely trade in drinks, such as coffee roasters, coffee caravans with no food, or tea importers). There may be more than this, but due to incomplete data, this is the number of premises that could be identified that had addresses that could be mapped. There are 95 supermarkets registered with the Ministry for Primary

Industries (MPI). There are 66 global fast-food outlets (McDonald's, Kentucky Fried Chicken, Pizza Hut) registered with MPI.

Once organised into one of six categories, the number of registered outlets that fit within the constraints of the study reduces. For example, those labelled as a home, mobile or internet business have not been included as they are not a front facing, customer access food premise. Therefore, the total number of each food businesses across each of the six food categories is presented in Table 12 and then separated into each Territorial Authority in Table 13.

Table 12: Category descriptions with number of each within Wellington Region and Horowhenua District

Category	Number of food premises
Café, bar, restaurant (dine in)	1,625
Convenience store	308
Specialised food store (including organic store, butcher, baker, fish monger, and retailers that don't fit into other categories)	219
Takeaway only	235
Supermarket	95
Global fast-food outlet	66
TOTAL	**2,548**

Table 13, shows the breakdown of these food premises across the nine Territorial Authorities across the Wellington Regional foodshed.

Table 13: Food premises across nine Territorial Authorities

DISTRICT	Café, bar, restaurant	Convenience store	Specialised food store	Takeaway only	Supermarket	Global fast-food
Carterton District	19	4	0	2	2	1
Horowhenua District	61	16	7	15	7	5
Kapiti Coast District	116	10	15	14	16	4
Lower Hutt City	285	62	49	40	16	11
Masterton District	61	15	7	10	6	6
Porirua City	95	37	14	38	9	10
South Wairarapa District	59	7	7	4	2	0
Upper Hutt City	81	21	9	10	6	6
Wellington City	848	136	111	102	31	23
TOTAL	**1,625**	**308**	**219**	**235**	**95**	**66**

Wellington City has half of all the total number of known food premises and Lower Hutt City has nearly a fifth of the total number of known food premises. Carterton District has the least number of known food premises, with 1% of the total number.

4.2.3.1 Mapping the food retailers

These food premises have been mapped across the whole of the Wellington Regional foodshed. For ease of interpretation, these have been separated into their own districts in Figure 48 to Figure 56 on the following pages.

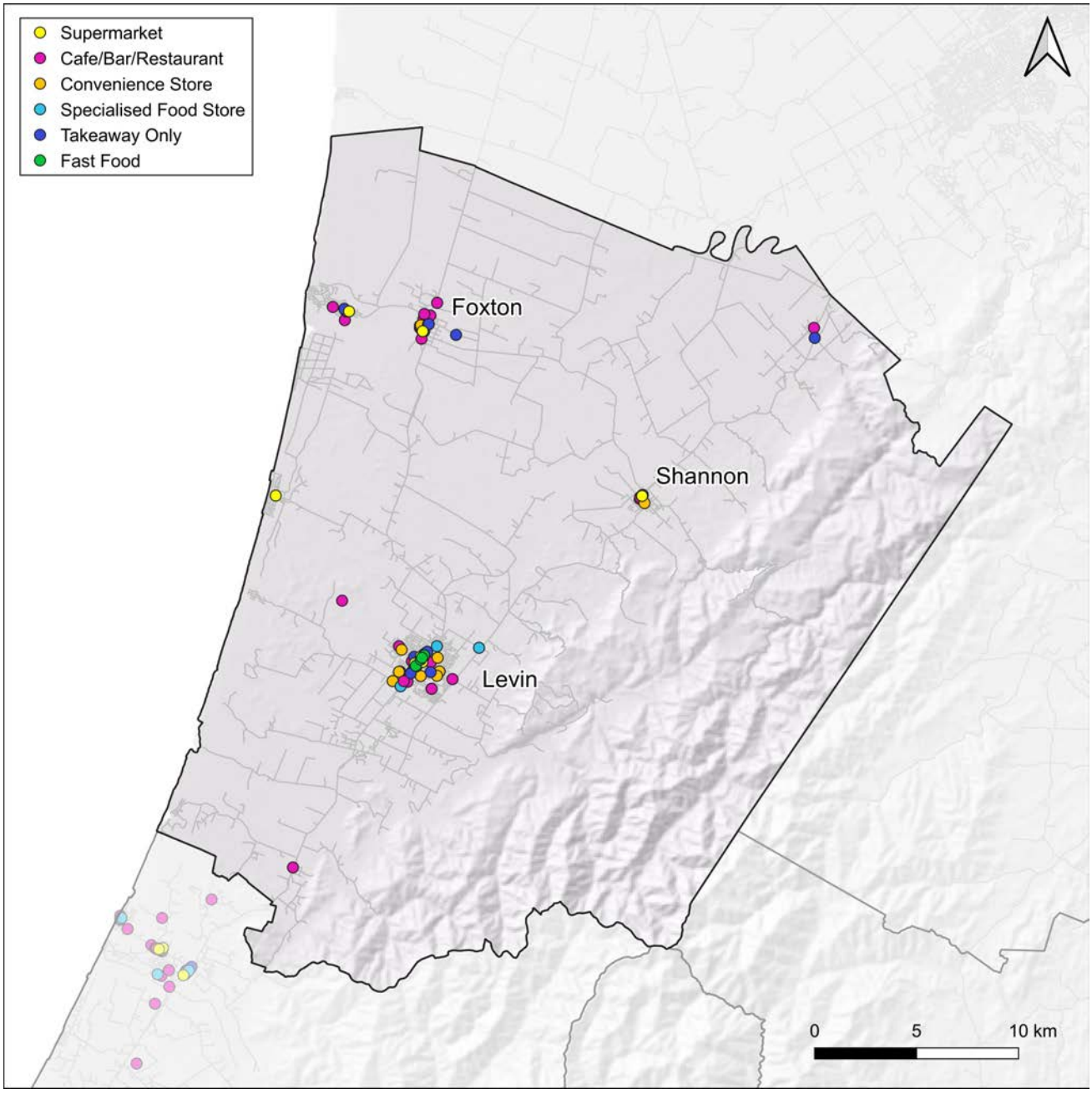

Figure 48: Food premises in Horowhenua District

The food premises in Horowhenua (Figure 48) are clustered around the towns of Levin and Foxton, with a couple of premises close to Shannon.

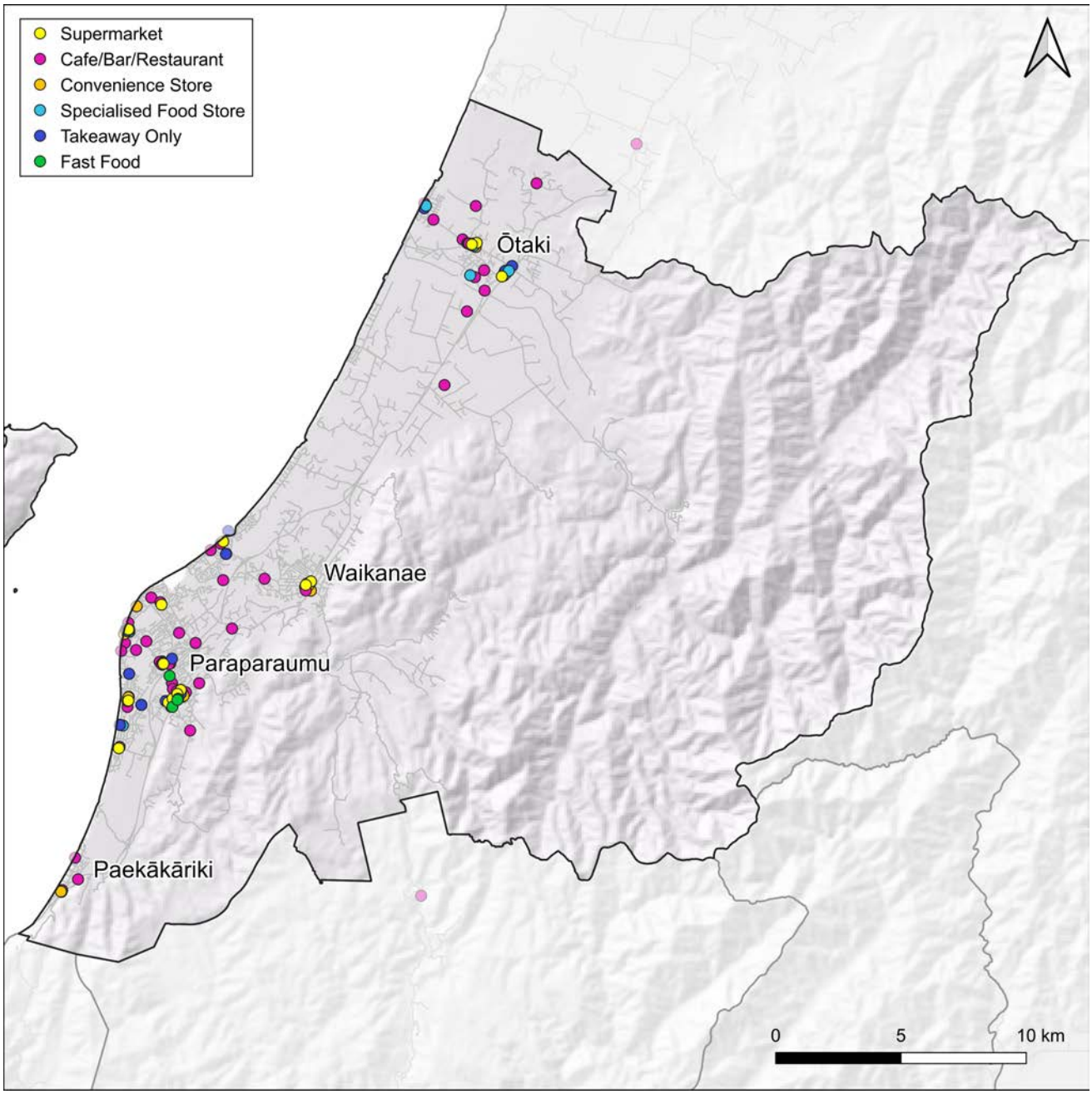

Figure 49: Food premises in Kāpiti Coast

The food premises in Kāpiti Coast are spread around the coastal settlements, especially in and around Ōtaki and Paraparaumu. Paraparaumu has global fast-food outlets, whilst Ōtaki does not.

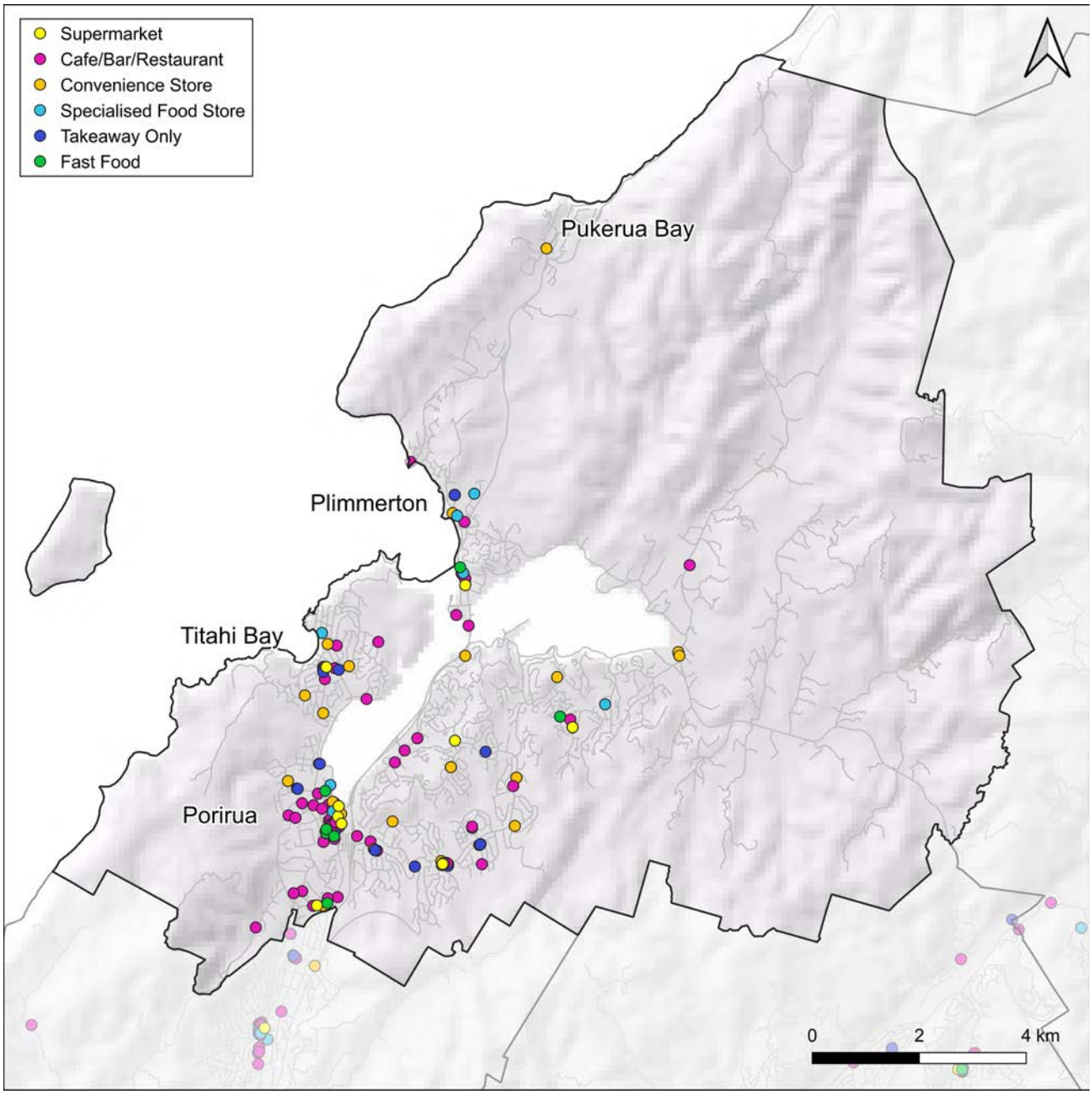

Figure 50: Food premises in Porirua

In the Porirua District, food premises are quite scattered around half of the district, with clusters being close to Porirua township and Tithai Bay and Plimmerton.

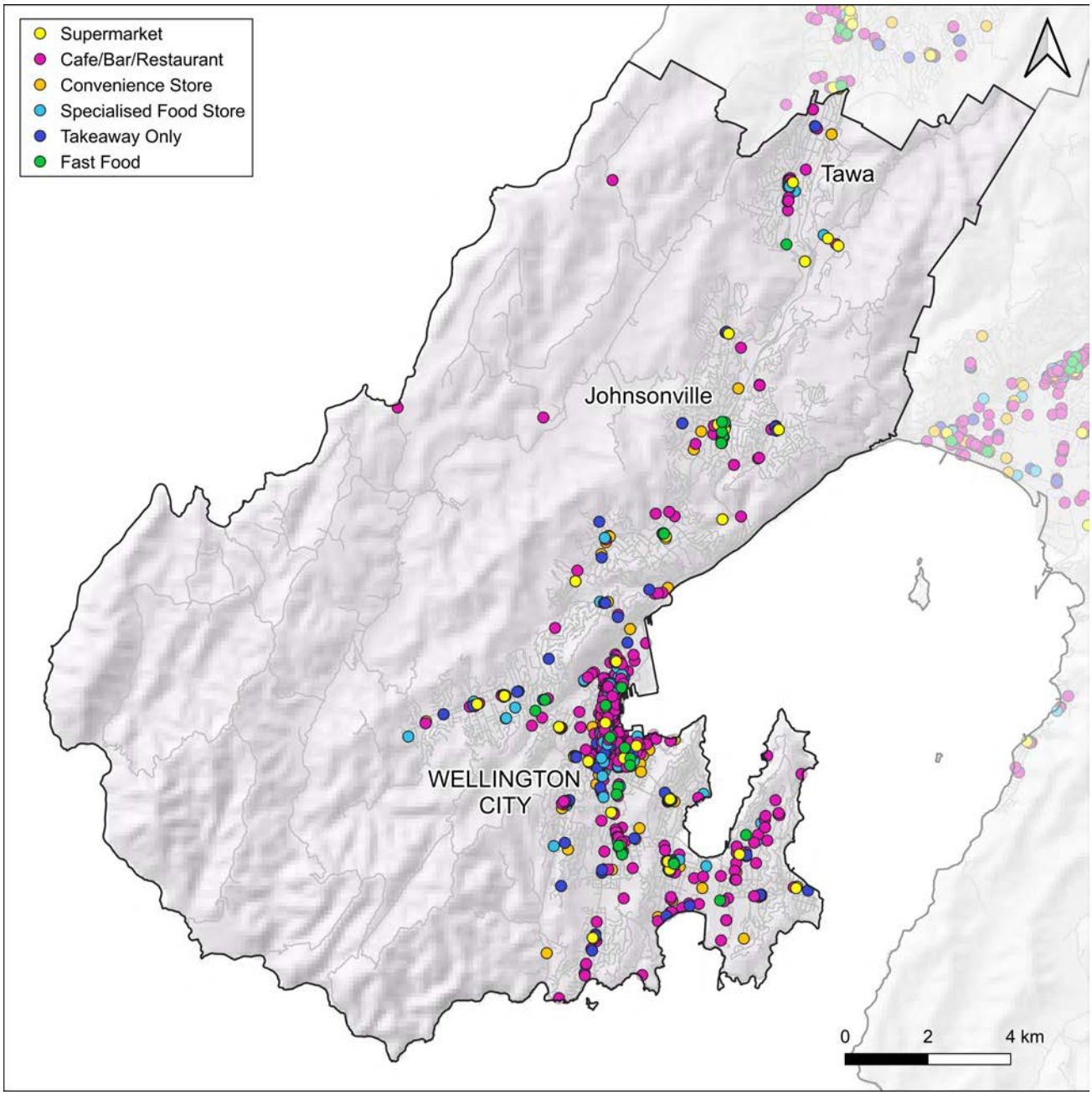

Figure 51: Food premises in Wellington City

Wellington City food premises are clustered mostly in the CBD; however, a lot are scattered are all through the urban areas up through Johnsonville and Tawa.

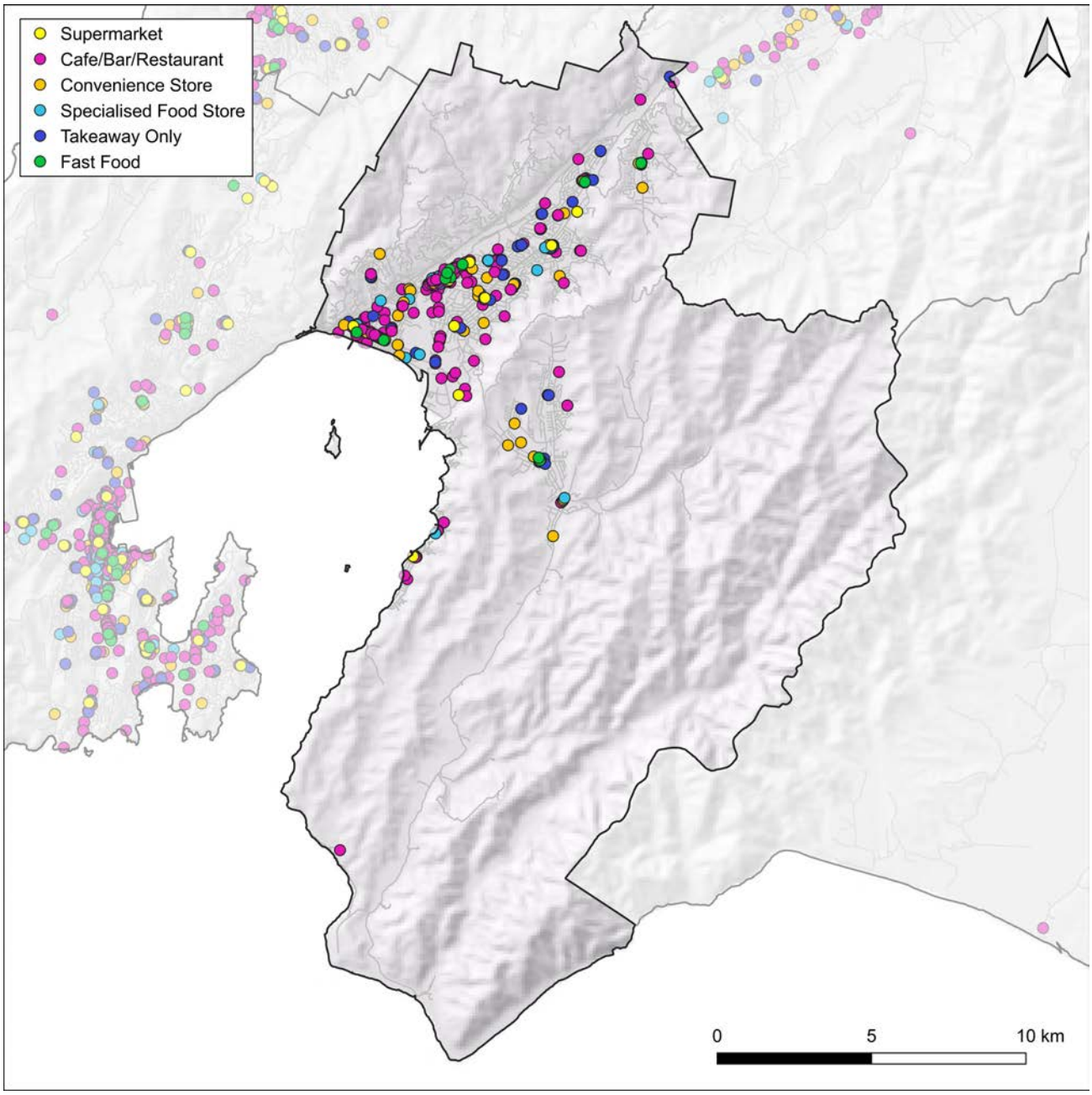

Figure 52: Food premises in Lower Hutt City

The food premises within the Lower Hutt area are predominantly clustered in the bottom of the valley.

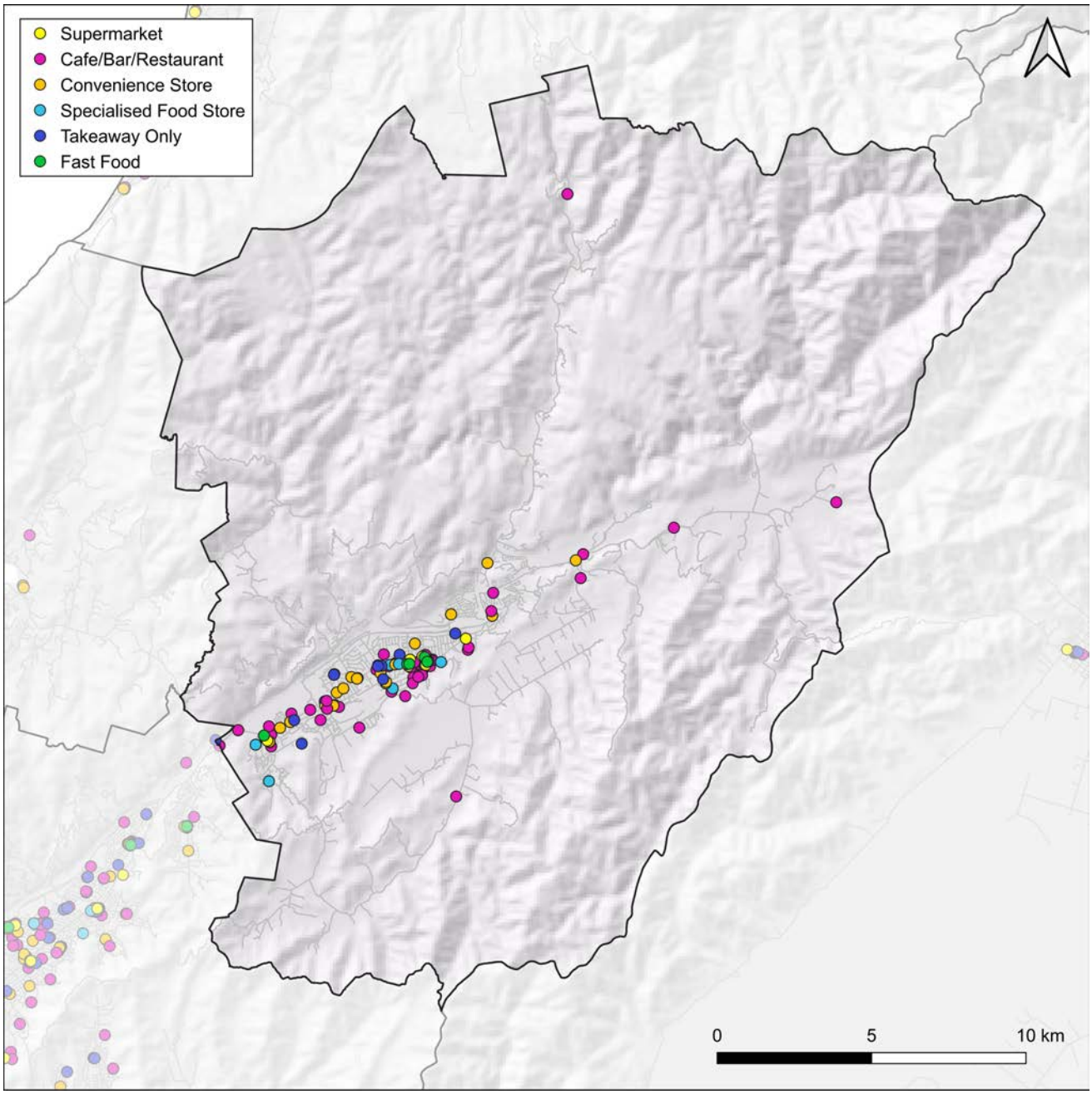

Figure 53: Food premises in Upper Hutt City

Most of the food premises are clustered in the bottom of the valley, with the dine-in premises being more distributed through the district.

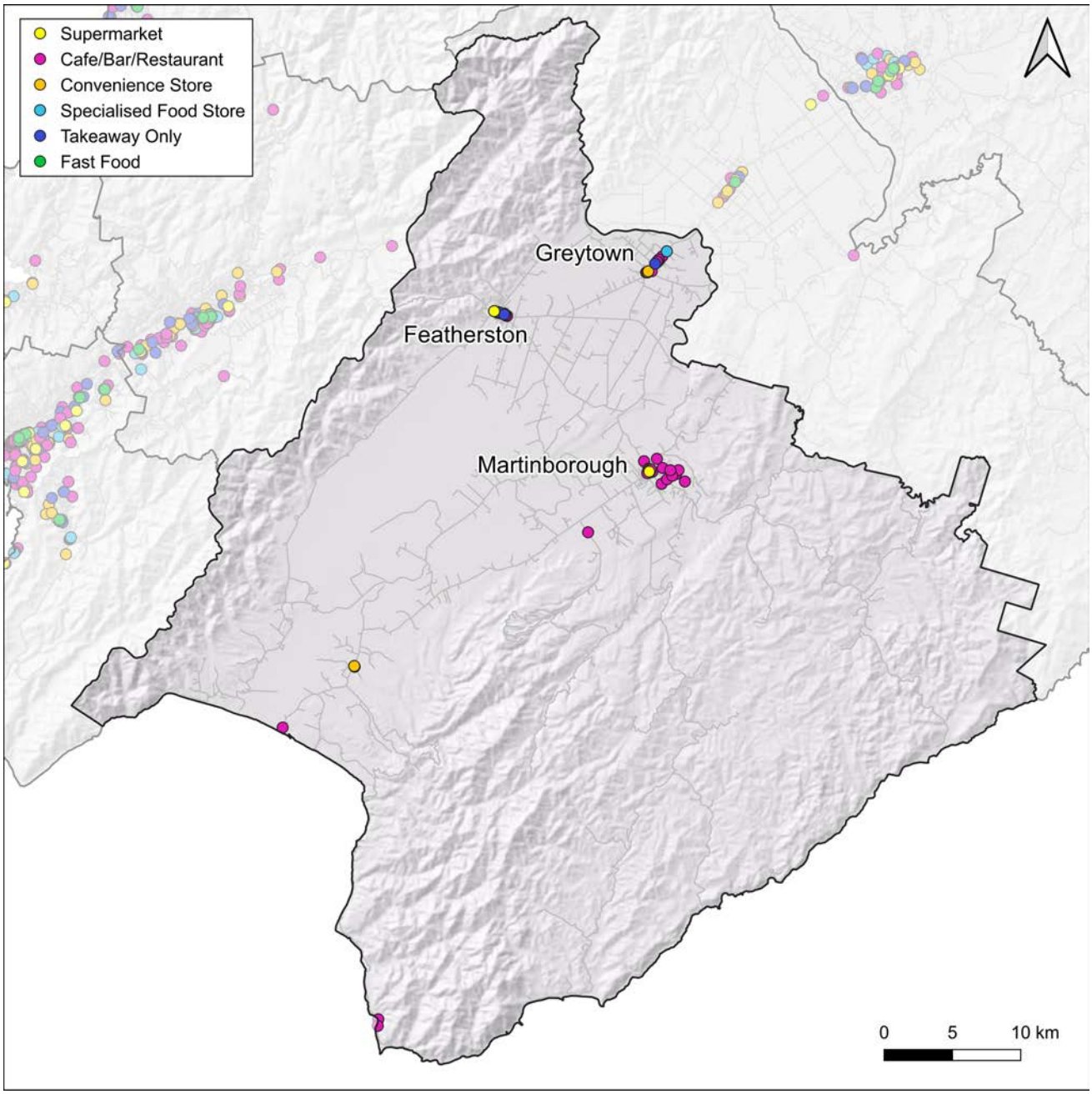

Figure 54: Food premises in South Wairarapa

The dine-in, takeaway and convenience stores are clustered mainly around the three towns of Martinborough, Featherston and Greytown. South Wairarapa does not have any global fast-food chains.

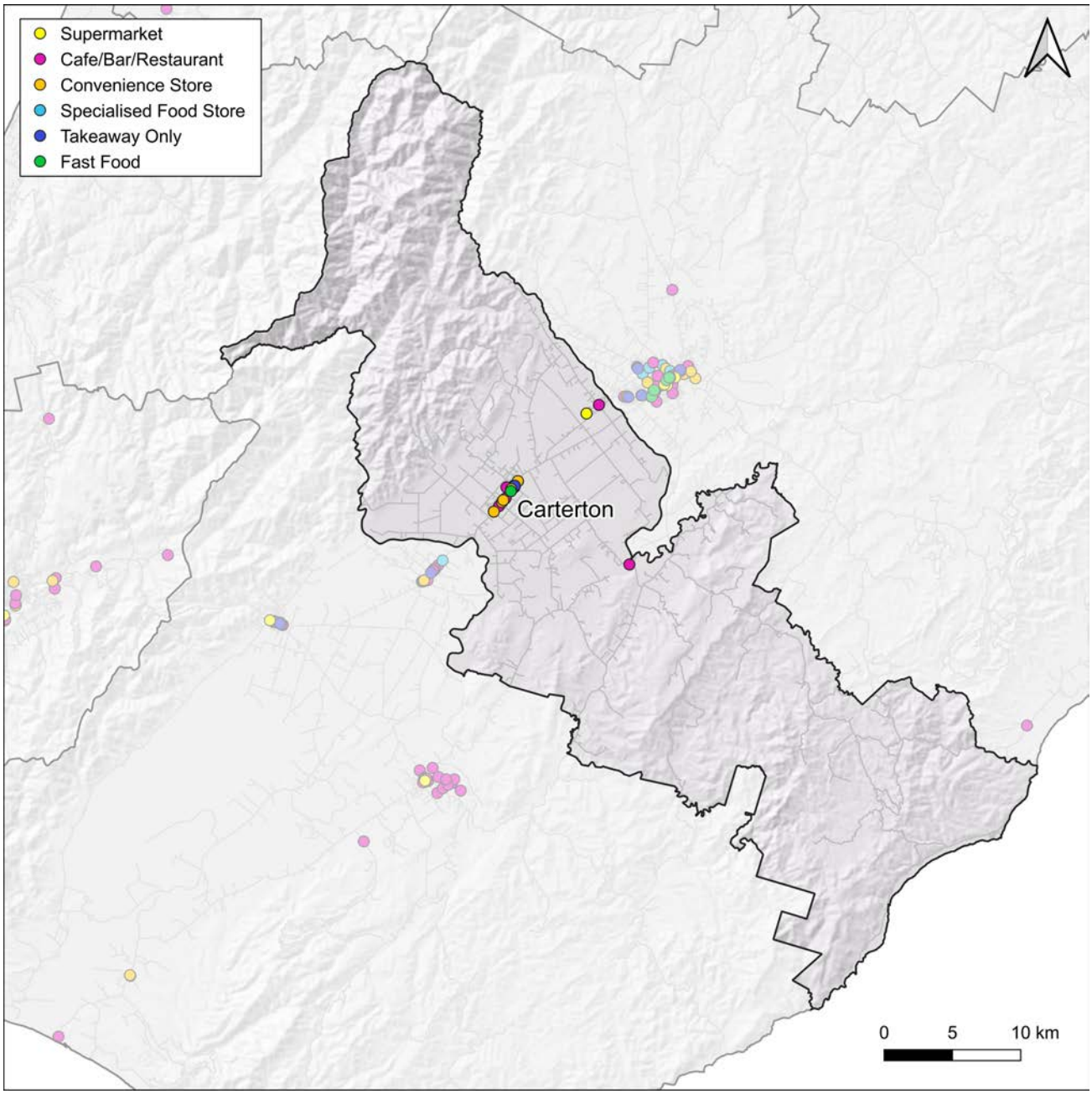

Figure 55: Food premises in Carterton District

The majority of food premises are in Carterton itself, there is only one global fast-food outlet.

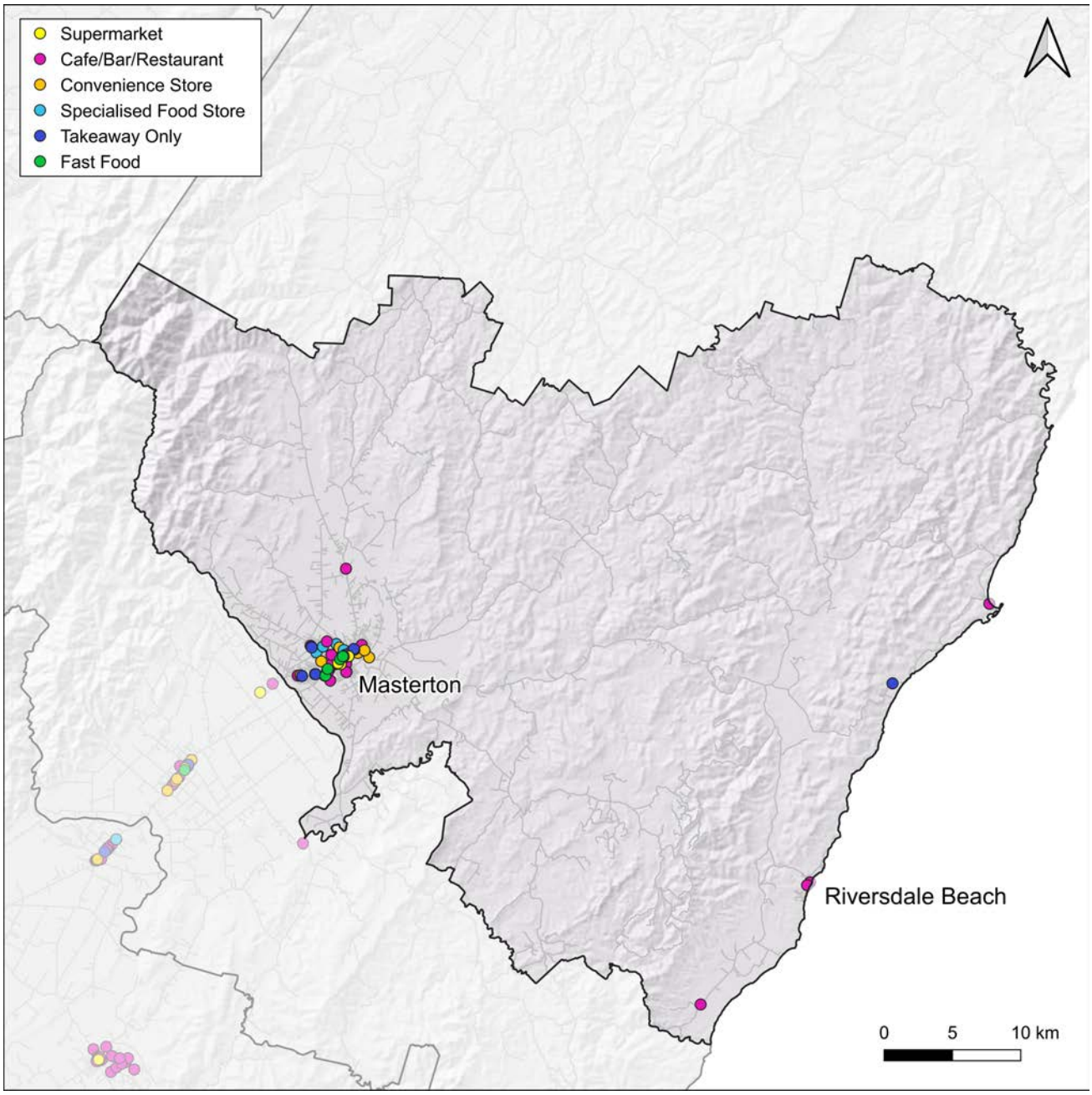

Figure 56: Food premises in Masterton

Most of the food premises are clustered around the main township of Masterton. With a couple of dine-in facilities and a takeaway on the coast.

4.2.3.2 Responses to the survey

Understanding how food retailers source food is important to the existing food system, therefore data was gathered from food premises across the Wellington Region and Horowhenua District. 30 surveys were complete, including 10 responses from cafés, six from a speciality store (butcher, bakery, smoothie/drink store), five from restaurants, six are wholesalers (which includes a mobile truck, and online stores), three indicate takeaway outlets (only one is takeaway only), two convenience store, shown in Figure 57 (page 58). See Appendix three for methodology on the streets chosen and number of premises surveyed.

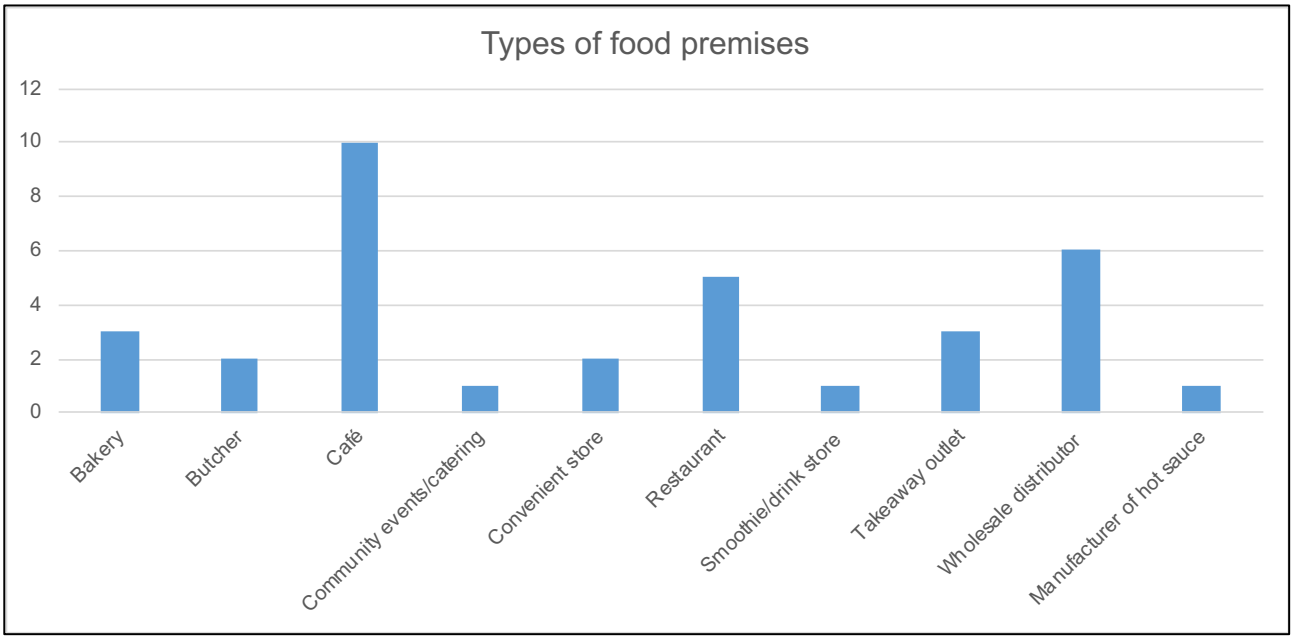

Figure 57: Types of food premises that answered the survey (n=30)

The location of these food premises is shown in Figure 58.

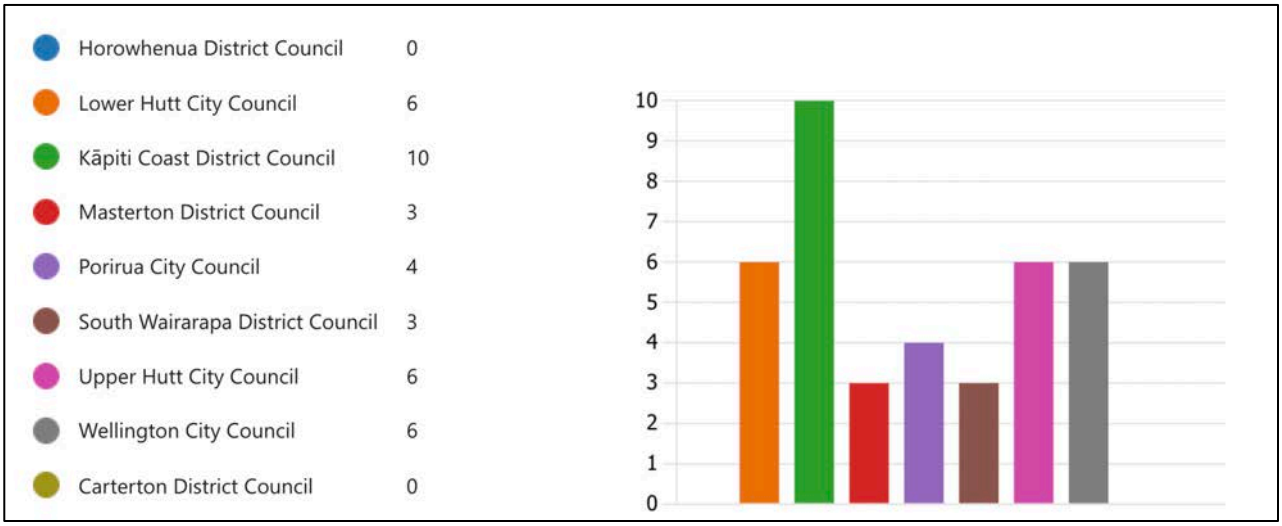

Figure 58: Location of the premises engaged in the research (n=30)

Unfortunately, no food premises were reached in the Horowhenua or Carterton Districts. The most responses came from Kāpiti Coast (10), six from three areas of Lower Hutt, Upper Hutt and Wellington central.

When asked how many paying customers food is sold to in a week, a third of responses show the businesses sell to 100-500 customers, seven are much larger selling to 1,000-5,000 customers, Figure 59 (page 59). Only one large business (over 5,000-10,000 paying customers a week) completed the survey.

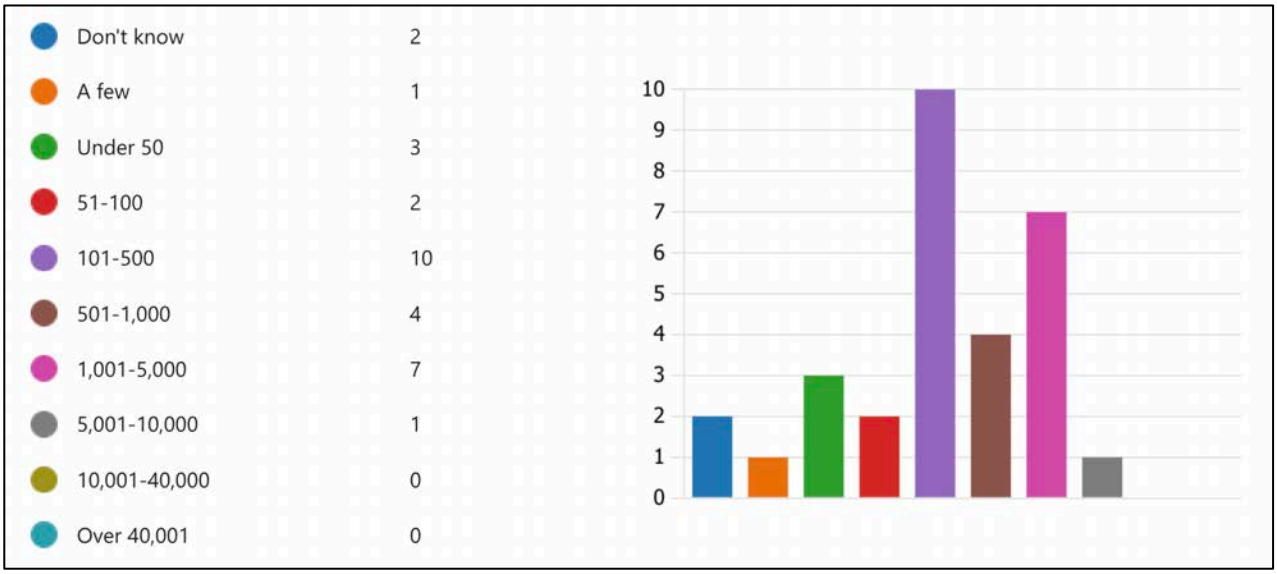

Figure 59: Size of the food retailers that participated in the online survey (n=30)

Two of the food premises do not know how many customers they sell food to, and four premises sell to under 50 customers a week.

4.2.3.3 How food retailers source their food

When asked how they source the food they sell, 23 out of the 30 stated wholesaler, Figure 60.

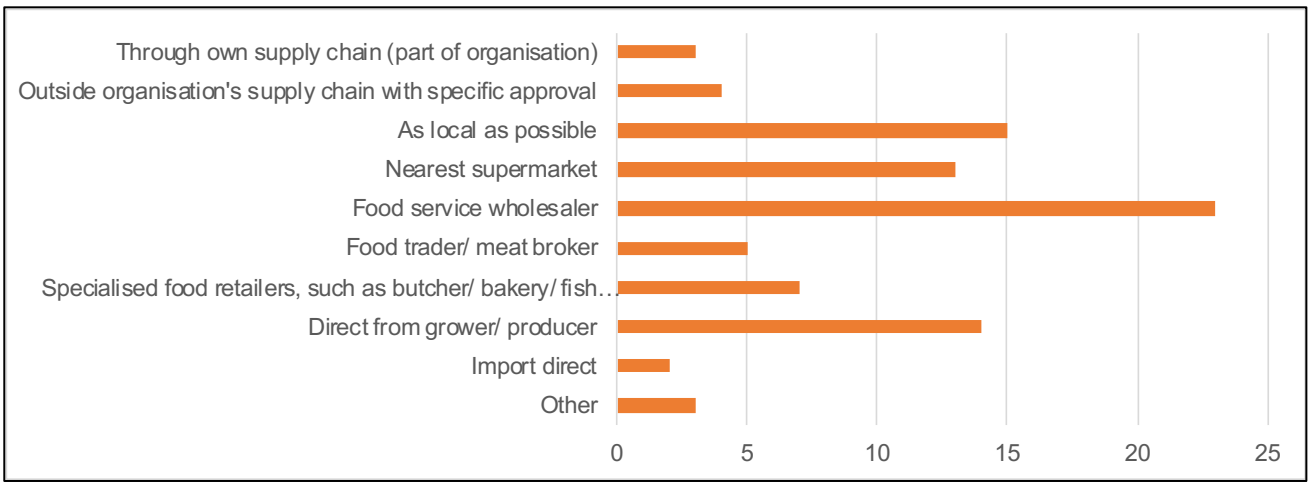

Figure 60: Question asked, "How do you source the majority of your ingredients or food products/produce?" (n=30)

The 15 that indicate 'as local as possible', six also indicate they purchase 'direct from the grower'. The cafés and restaurants are predominantly the ones to shop at the nearest supermarket for ingredients.

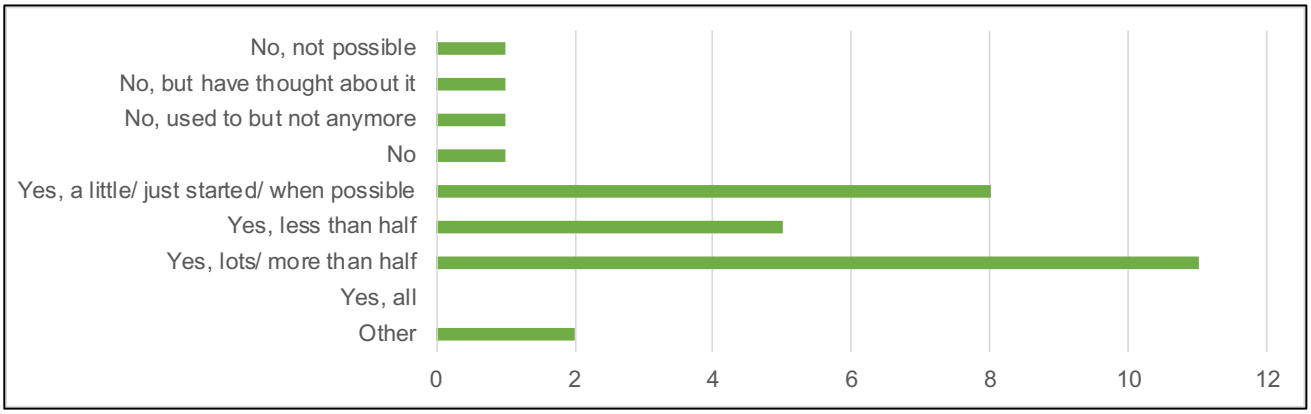

Figure 61: Question asked: Do you source local food products/produce? (n=30)

A lot of the respondents indicate they do source their food locally (Figure 61). The two 'other' comments, includes a butcher shop stating, "*yes, 100% (within 20-30km from us)*", and a wholesale/online store stating, "*some produce was sourced from the Hawkes Bay also but with destruction of some of farms we are having to now use imported food as a substitute*".

Of the four that don't source food locally, they indicate that for them, the food they required is 'not available', 'too expensive', or there is a 'lack of consistent supply / volume'. These food premises include a convenience store, a café, and a bakery/deli. When asked if they had ever been asked for local food, all four said "*no*".

For all the respondents when asked what they look for in their supply chain, 73% of responses indicates 'reliable', Figure 62.

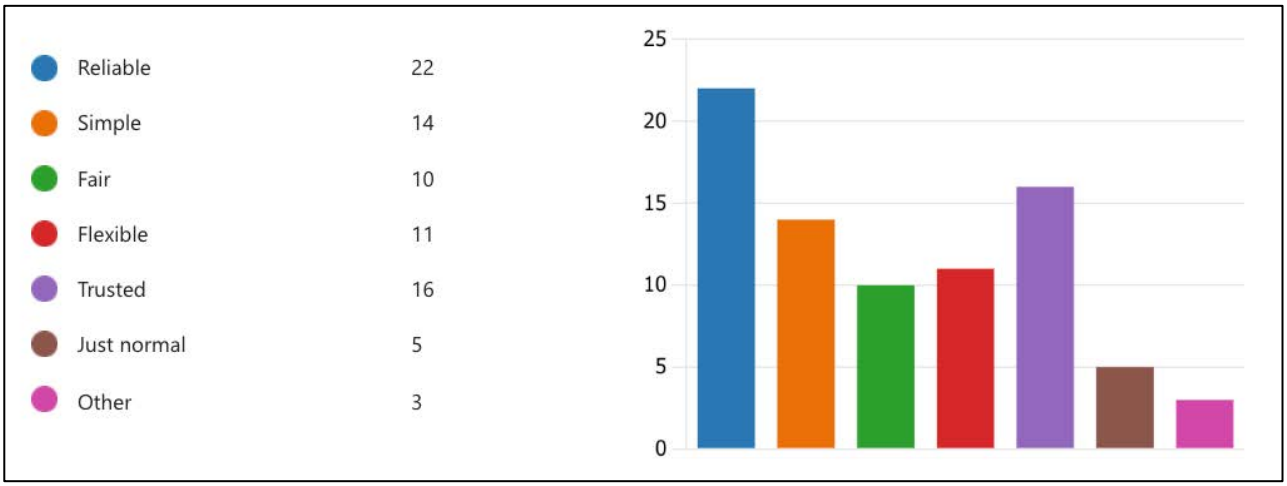

Figure 62: Positives about the supply arrangements (n=30)

More than half of the responses indicate, 'trusted' and 47% indicates, 'simple' as being positives about supply arrangements.

4.2.3.4 Barriers to sourcing local food

When asked what stops them from sourcing more products locally, 12 respondents already source locally. The next common answer was 'local produce was not available', then, 'a lack of consistent supply' and 'logistics are too complicated', Figure 63 (page 61).

Six of the respondents indicate local food is 'too expensive', and four state, 'lack of consistent quality'.

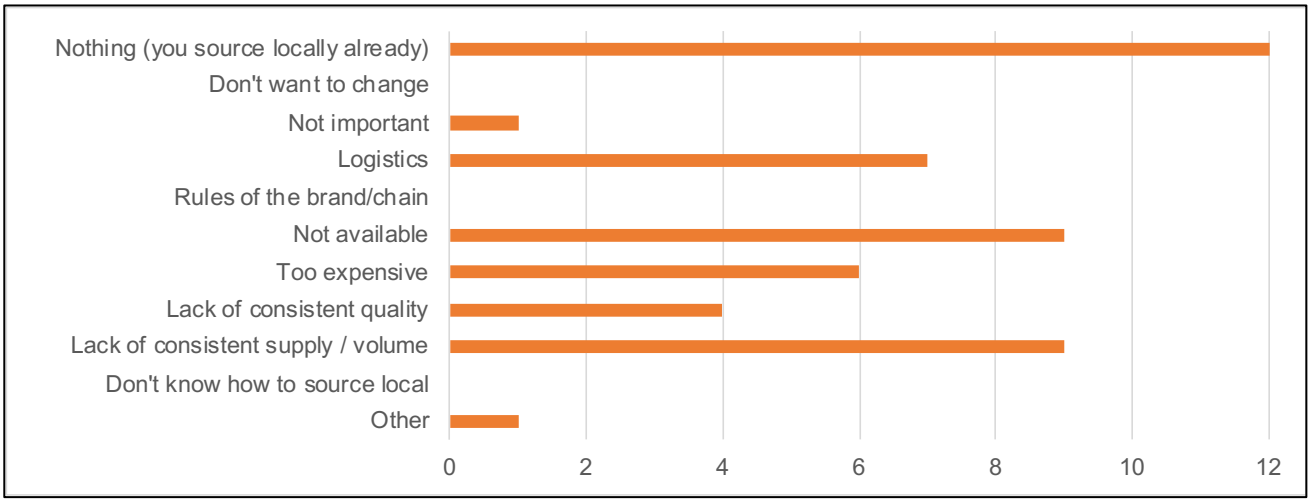

Figure 63: Responses to what stops you from sourcing more local food (n=30)

In response to a question about the barriers to sourcing local, Figure 64, the top response from nearly half of the food retails is about pricing, being 'too high', second is that 'big business controls the market'. A third of the respondents indicate that the third barrier is 'consistent supply is a problem'.

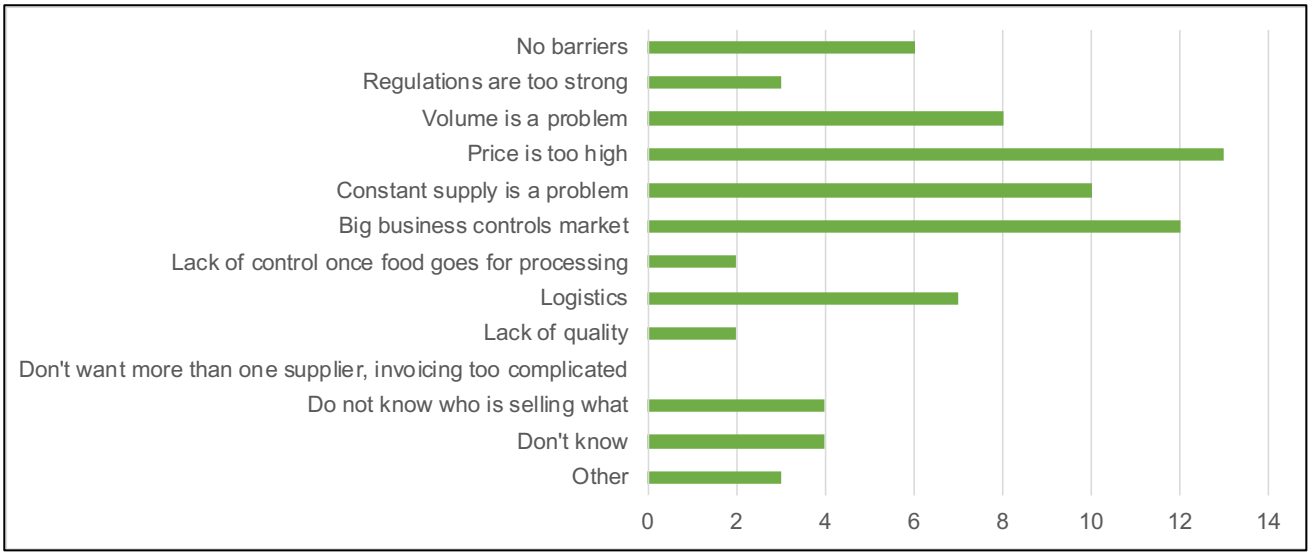

Figure 64: Barriers to sourcing local food (n=30)

Eight respondent's state that the 'volume is a problem', meaning supply of produce does not keep up with the amount of food sold.

4.2.3.5 Opportunities to sourcing local food

When asked what the positive impacts of sourcing local food are, the responses show 'supporting local people/economy' as being top (26 of the 30 food retailers indicate this in Figure 65 on page 62). Two thirds of the answers state, 'fresher produce' and more than half state, 'customers more receptive to locally sourced food' and 'know the supplier'.

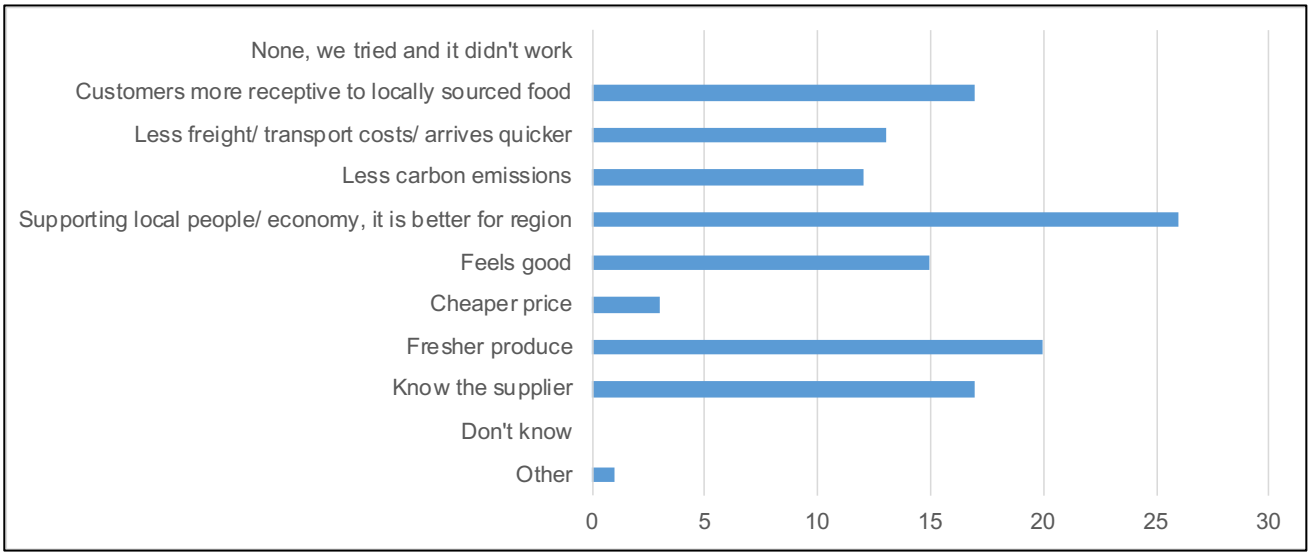

Figure 65: Positives to sourcing local food (n=30)

More than a third of responses claim, 'less freight/ transport costs/ arrives quicker' and 'less carbon emissions' are positives of sourcing local food. The one 'other' comment indicates, "*aiding smaller business rather than corporates, dealing with people who are passionate about what they are doing*".

4.2.3.6 Waste from the food retailers

Food retailers state that they do not waste much food. The exact amount of waste generated from within the foodshed is hard to estimate, as there is not enough data available. However, research shows that companies such as KiwiHarvest rescues 170,000 - 200,000 kg of good quality surplus food every month[16] in total from Invercargill, Queenstown, Dunedin, and Auckland.

Within the Wellington Regional foodshed, Kaibosh Food Rescue[17] operates. At the time of writing, they state on their website, they have currently rescued 3,518,050 kg of food in total. Kaibosh partners with a national organisation, The Aotearoa Food Rescue Alliance (AFRA), who provide national support for local food rescue organisations to reduce food waste and increase food security around the motu. Last year AFRA recorded that a total of 7,772 tonnes of food[18] was rescued from around Aotearoa.

4.2.4 A snapshot of farmers' markets

Farmers' markets are physical spaces where local farmers, growers, and producers gather regularly to sell a diverse range of fresh produce, and agricultural goods directly to consumers. These markets emphasize locally sourced and seasonal products, providing consumers with the opportunity to purchase directly from farmers and learn about the origins of their food. Operating as community hubs, farmers' markets contribute to a sense of community, fostering social interactions and cultural exchange.

[16] https://www.kiwiharvest.org.nz/about-us
[17] https://www.kaibosh.org.nz/
[18] https://afra.org.nz/

Farmers' Market New Zealand (FMNZ) offer an optional authenticity scheme for all FMNZ member markets which promotes the 'three golden rules' for farmers' markets and their stallholders:

- A farmers' market is a food market (e.g. no arts, craft, bric-a-brac) with some exceptions for plants and flowers.
- This food is produced within a defined local area (each market can define their local region).
- The vendor must be directly involved in the growing or production process of the food (e.g. no middle person, on-sellers, wholesalers, retailers, etc.).

4.2.4.1 Mapping farmers' markets

There are 17 farmers' markets identified within the Wellington Region and Horowhenua District, all of which open in the morning on one of the weekend days (see Table 14 to Table 16), which are all mapped in Figure 66 on page 64.

Table 14: Farmers' markets that open every Saturday morning

Name	Location
Thorndon Farmers' Market	Hill St carpark, Thorndon, Wellington
Newtown Fruit and Vegetable Market	Newtown School, Mein Street, Wellington
Riverbank Market	Riverbank carpark, Daly Street, Lower Hutt
Porirua Saturday Market	Waitangirua Shopping Mall carpark, Porirua
Cobham Court Farmers' Market	Cobham Court, Porirua
Wairarapa Farmers' Market	Solway Showgrounds, Masterton
Paraparaumu Beach Saturday Market	Marine Parade, Paraparaumu
Waikanae Community Market	Waikanae Park, Park Ave, Waikanae

Table 15: Farmers' markets that open every Sunday morning

Name	Location
Harbourside Market	Cnr of Cable St and Barnett St, Wellington
Victoria Street Farmers' Market	Cnr Victoria and Vivian St, Wellington
Carterton Farmers' Market	Memorial Square, High Street, Carterton
Tawa Lions Saturday Market	DressSmart carpark, 24 Main Road, Tawa, Wellington
Rotary Sunday Market	103 Chapel Street, Masterton
Brewtown Farmers' Market	23 Blenheim Street, Maidstone, Upper Hutt

Table 16: Farmers' markets that open on specific days

Name	Location	Opening
Ōtaki Market	State Highway 1, opposite New World, Ōtaki	Winter: 1st and 3rd Sunday, Summer: every Sunday
Foxton Farmers and Artisan Market	36 Bergin Road, Foxton Racecourse, Foxton	Last Sunday of each month
Greytown Country Market	Stella Bull Park, Greytown	3rd Sunday of each month

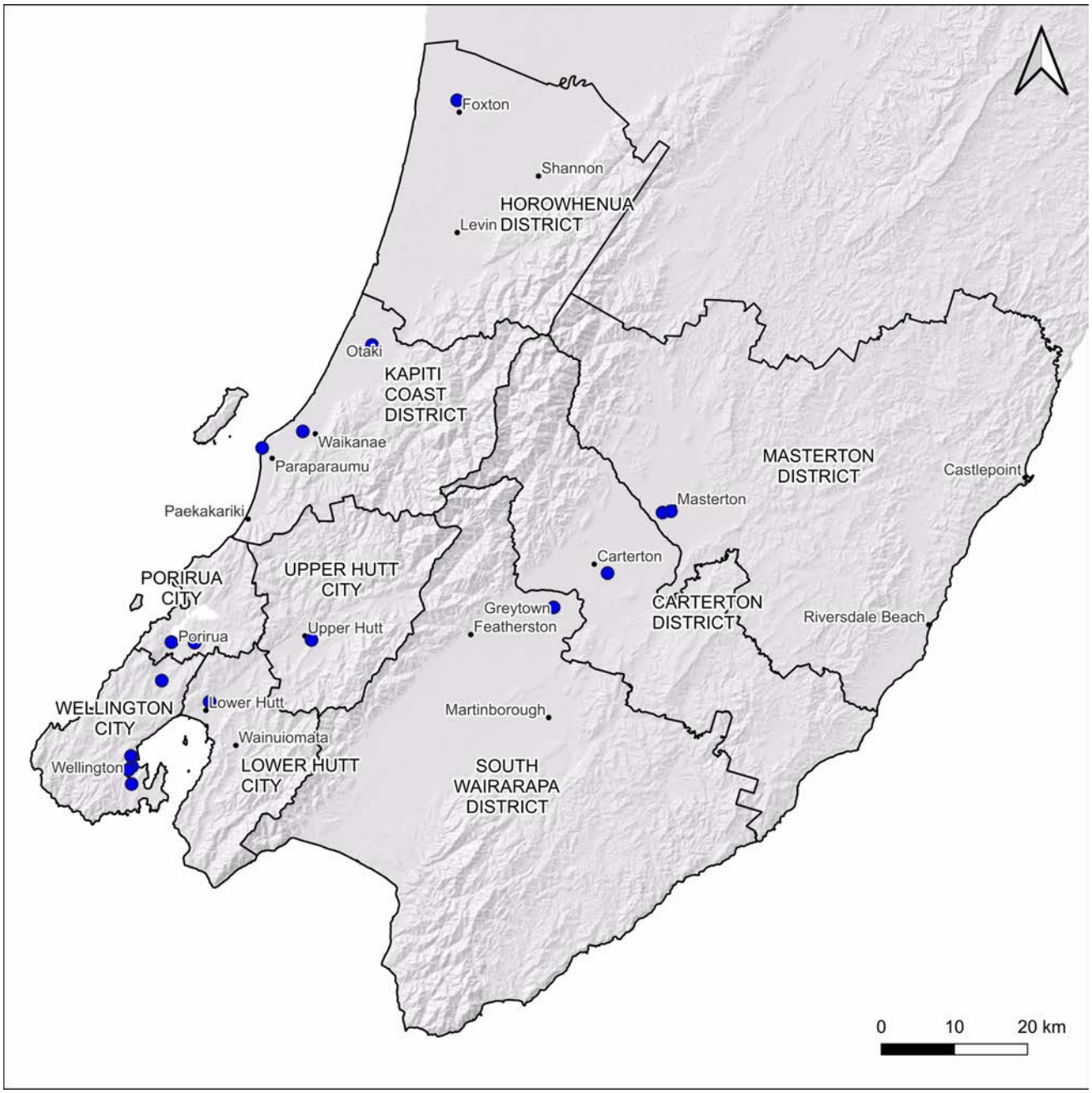

Figure 66: Farmers' Markets within Wellington Region and Horowhenua District

Every district within the Wellington Regional foodshed has at least one farmers' market.

4.2.4.2 Reliance on consumers

Research shows that the top reason that food growers participate in farmers' markets is because of the relationship they can build with their customers. Clearly, growers need consumers to attend farmers' markets for them to be able to sell their products and make a profit. The Otago Farmers' Market study (Millar, et al., 2016) showed that half of the vendors believed that half of their customers were regulars, and they gave the reason they believe they retain these regular customers is because of their quality products and that they have built 'trust' with the customer. 'Trust' from the vendors' perspective with their consumers is essential, not only does it give consistent demand, but it also enables product development, where vendors can literally experiment with their products on loyal customers; develop and test new ideas, receive instant feedback or recommendations and then make improvements.

Vendors are not alone in being motivated to build a relationship with the consumer. Of course, there are different reasons involved but research shows that some consumers want to know whom they are buying food from. Millar, et al. (2016), showed that it was not just because consumers want to directly support their local producers, but it is also because with knowledge of who is growing the food comes 'trust'. With 'trust' comes informed decisions and a firm reliance on the integrity, ability, or character of the producer, meaning whatever reason it is that drives consumers to purchase direct from the producers (environmental issues, animal welfare issues, food safety, support for the local economy, etc.) is guaranteed.

Therefore, for farmers' markets it is essential to maintain these levels of trust for both consumer and producer, producers need to know that consumers will be there to purchase their products, and for them to be able to experiment and develop their products whilst consumers need to be able to make informed decisions and have reliance on their food producer.

4.2.5 A snapshot of consumers

The food system analysis research did not specifically include consumers who purchase food to eat at dine-in or takeaway outlets or to purchase and take home. However, it did include consumers who source food, such as cafés and restaurants, to add value and on-sell to their own consumers. A snapshot of their opinions are included in Section 4.2.3.3 How food retailers source their food (on page 59).

Wider research on Aotearoa New Zealand consumers shows participation in the local food economy is not necessarily driven by price or convenience (Larsen et al. 2008), which is supported by a New Zealand study into consumer preferences regarding red meat where "*price and value for money*" were the highest scoring preference (65%) with convenience being the third highest (51%) (Millar, 2012, p.12). However, the categories of 'price and value for money', and 'convenience' were significantly more important to the consumers who preferred conventionally farmed meat as opposed to those who chose organically certified farmed meat. So, some value-driven consumers (who place importance of social, health, environmental concern) are willing to pay higher prices for some types of local food (Millar, et al. 2016).

4.2.5.1 Waste from consumers

Research by Love Food Hate Waste (2018) revealed that household food waste was a significant issue, with each household discarding 79 kilograms of avoidable food (food fit for consumption, e.g. not banana peels) annually, amounting to an average cost of $563 per household.

4.2.6 A snapshot of the informal local food system

What is happening within the informal, non-commercial food system is also important for building a fuller picture of the local food system. Data available for known marae and community gardens is used to illustrate the locations of each.

4.2.6.1 Mapping marae

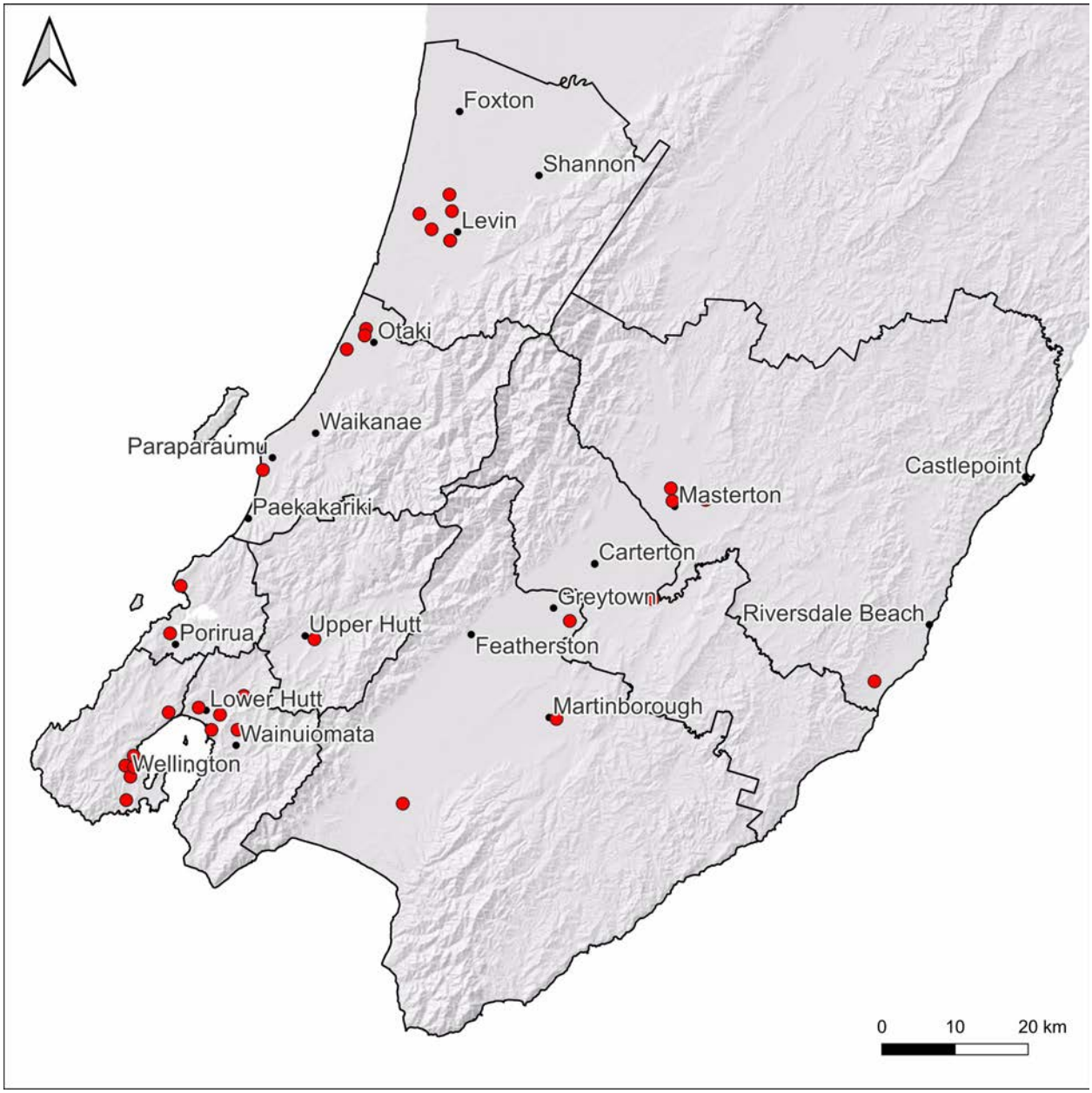

Figure 67: Known marae around the Wellington Regional foodshed

The map in Figure 67, shows the location of some marae within the foodshed. Marae are significant in that they are often places where food is provided to the community. This can be for cultural reasons such as when welcoming guests to the marae as a form of Manaakitanga or acting as food hubs in times of need, such as an emergency response.

4.2.6.2 Mapping community gardens

Community gardens are an important part of the informal food system, the map in Figure 68 (page 67), shows all known community gardens.

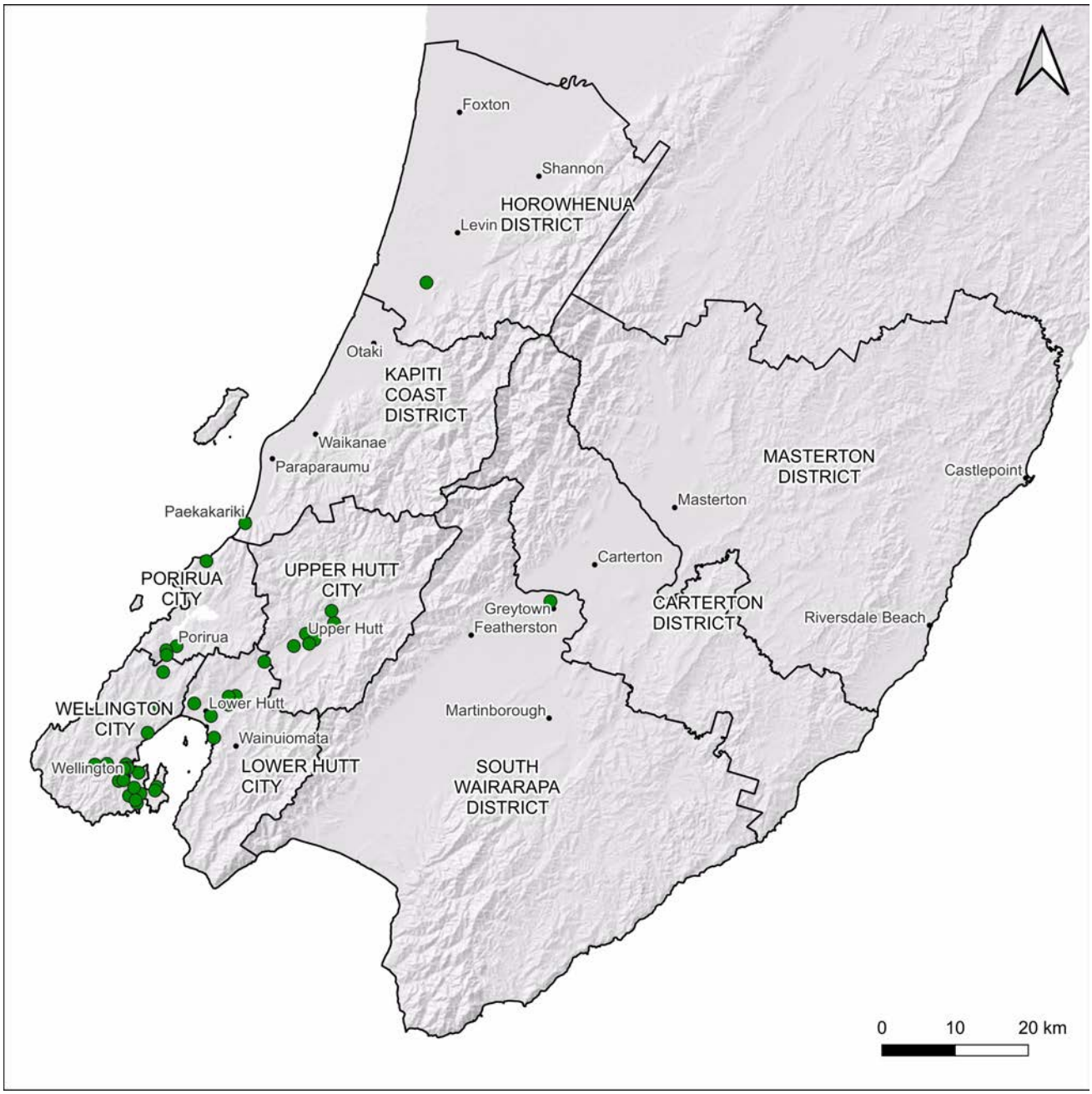

Figure 68: Known local community gardens

Community gardens serve various functions and provide numerous benefits to the communities they are a part of. Not only are they created to produce fresh, locally grown fruits and vegetables, but they provide an opportunity for community members to grow their own food, promoting self-sufficiency and healthy eating. Community gardens can address food insecurity and improve access to fresh, healthy produce in areas where nutritious food is otherwise scarce. By reducing the need to transport food long distances, community gardens can also reduce carbon emissions and help combat climate change.

They can also serve as educational spaces where people can learn about gardening, horticulture, and sustainable farming practices. They are particularly valuable for teaching children about where food comes from and environmental stewardship, as well as promote sustainable practices such as composting, organic gardening, and reduced reliance on harmful pesticides providing habitats for pollinators and other wildlife, contributing to biodiversity. They can also contribute to improved air and soil quality.

Community gardens are hubs for social interaction and community building. They bring people from diverse backgrounds together, fostering a sense of belonging and connection among neighbours. In times of crisis or emergencies, community gardens can play a crucial role in providing food security for the community.

4.3 Findings

Findings from the current food system research show a sizable focus on large-scale exports. However, due to data gaps, it remains challenging to ascertain whether food producers predominantly engage in local, national, regional, or export markets. Consequently, the foodshed analysis could not definitively determine the quantities of food produced within the region and are locally consumed or are distributed beyond regional boundaries.

A snapshot of various food producers revealed a diverse spectrum of business operations. Some exclusively cater to a single market (local, national, or export), while others supply two or all three types of markets. Notably, a significant insight emerged from a key comment, stating, *"although we supply both locally (to local retailers and our own shop), we need to supply nation-wide to make it work financially; ideally, we need to export to make our business sustainable."* This commentary underscores the perspective held by certain growers that exclusively catering to the local market may not be financially viable, necessitating broader national and international market engagement for sustainable business profitability.

The primary motivations for food producers selling within the local market are not solely economic, as indicated above, some growers and producers found the economic benefits to be marginal. Rather, many producers were motivated by a genuine belief in their activities, establishing direct relationships with customers, building community relationships, and the platform it provided for establishing successful businesses and boosting the local economy.

Half of the food retailers surveyed indicate they source their food for sale as local as possible, and a quarter specify purchasing direct from the grower. As consumers of local food (they purchase, add value and on sell), they need a supply chain that is reliable, trusted, and simple. For those not already sourcing food locally, barriers included lack of availability of local produce, a lack of consistent supply or that logistics were too complicated to pursue it. Over a third of food retail respondents indicate that the price of local food was too high.

Research shows, the top three reasons cited by consumers for supporting local food are freshness, ethical choices, and support for the local economy. To bolster the sales of locally sourced food by producers, consumers may have to acknowledge that local food does not necessarily mean lower prices. This recognition may require a conscientious effort on the part of consumers to prioritize local food choices, which may have to take precedent over considerations of price or convenience, in order to support local growers.

5 Stage Three: Recommendations

The recommendations for the third stage of the report were informed by the Regional Food System Strategy end-of-year wānanga. The context of the wānanga is described below, with the recommendations following in five topics:

1. Areas of further research.
2. Localising food.
3. Best approaches to support food producers/growers.
4. Best approaches to encourage consumer support of local food producers/growers.
5. Potential opportunities to enhance the local food economy in the Wellington Regional foodshed.

5.1 Regional Food System Strategy wānanga

As part of the ongoing mahi for the Regional Food System Strategy, an end-of-year wānanga was held over two days (2nd and 3rd November 2023). The event provided an opportunity to bring together stakeholders and partners involved in the strategy, including mana whenua, community organizations, central and local government, academia, as well as growers and food producers from across the region. Stakeholders and partners came together to review Stage 1: Baseline Foodshed Analysis and Stage 2: Baseline Food System Analysis, and to discuss how the regional and sub-regional impacts, as well as plan a path forward.

The first day of the wānanga was held online. Ahikā presented the data collected as part Stage 1: Baseline Foodshed Analysis and Stage 2: Baseline Food System Analysis. Included was an overview of the regional food system, highlighting the quantity of fresh food grown in the region compared to the required consumption, supply chain and food distribution mapping, and qualitative data on the barriers and opportunities for local food distribution and economic development.

Day two took place at the Boys and Girls Institute in Wellington and was co-facilitated by Taranaki Whanui and Kore Hiakai. The morning workshop focused on reviewing Ahikā's data, discussing its implications for local initiatives, and collectively identifying opportunities for regional collaboration within the strategy. The second workshop, led by Taranaki Whanui, was dedicated to long-term sustainability planning, which explored what the region could do to develop resilient communities in the face of climate risks and global change.

An overarching theme that emerged from the wānanga was the pressing need for regional collaboration in developing a sustainable food system, and that that no single district can address the complex challenges of a regional food system alone.

5.2 Areas for further research

Further research was identified from Regional Food System Strategy wānanga that, if complete, will provide a richness of knowledge regarding local food for the Wellington Regional foodshed that was not possible within this initial foodshed and food system analysis (see appendix four for further research ideas).

5.2.1 Opportunities for Māori and Pasifika communities

Additional research is required to understand Māori and Pasifika diets, the informal economy (mahinga kai), and opportunities in the future for local food.

Due to there being limited data available on other types of food consumption within the foodshed, food consumption was calculated based on a typical Aotearoa New Zealand diet. Determining the difference between European, Māori, Pasifika and other diets would provide an additional layer of richness to the foodshed that is currently missing.

The food system analysis identified the informal food economy that exists within marae. However, food traded, hunted, or gathered such as in a mahinga kai system, could not be mapped as limited data exists on quantities of items currently changing hands. Opportunities for Māori and Pacific communities within the local food system requires further engagement with these communities to identify a range of opportunities that are suitable for their communities.

5.2.2 Income demographic overlay

An "income demographic overlay" typically refers to a visual representation or mapping that combines information about income levels with demographic data. It involves overlaying income-related information onto demographic maps or charts to analyse and understand the income distribution within different demographic groups or geographic areas. Key components:

- Income Data: This refers to information about the earnings or financial resources of individuals or households. Income data can include details such as average income, median income, or income distribution within specific areas or demographic groups. This information is available from StatsNZ.
- Demographic Data: Demographic data encompasses information about the characteristics of a population, such as age, gender, ethnicity, education level, and other socio-economic factors. This data helps provide a comprehensive understanding of the population being studied. This information is available from StatsNZ.

An income demographic overlay would provide additional richness to the existing data. This type of analysis can be valuable for understanding socio-economic patterns, or addressing issues related to income inequality and demographic disparities within the local food economy. It provides a visual tool for interpreting complex data sets and making informed decisions based on the intersection of income and demographic factors.

5.2.3 Identify food deserts and food swamps

5.2.3.1 Food desert

A food desert refers to an area, often an urban or rural neighbourhood, where residents face limited access to affordable and nutritious food, particularly fresh fruits, vegetables, and other whole foods.

Mapping of the food retailers / premises in the Food System Analysis (Figure 48 to Figure 56 on pages 49 to 57) of the Overview of the Regional Food System, shows where different food premises are located. Where food premises are not located, these areas could be classed as food deserts.

5.2.3.2 Food swamp

A food swamp refers to an area where there is an abundance of unhealthy, energy-dense foods, often in the form of fast-food restaurants, convenience stores, and other outlets that primarily sell processed and high-calorie food and beverages. Food swamps can lead to health disparities and contribute to issues such as obesity, diabetes, and other diet-related conditions. The prevalence of easily accessible unhealthy food options can undermine efforts to maintain a balanced and nutritious diet.

Global fast-food outlets and takeaway only outlets were mapped through this research and shown in Figure 48 to Figure 56 on pages 49 to 57. However, further analysis would need to be completed on the existing data of food premises to separate out retail premises that primarily sell processed and high-calorie food and beverages. It could not be assumed that all take-away outlets (for example) sell processed and high-calorie food and beverages. More in-depth research would be needed to identify if there is an overabundance of less nutritious food options, specifically where it might make food decisions challenging for residents to make healthy food choices.

5.2.3.3 Addressing food deserts and food swamps

Addressing issues related to food deserts and food swamps involves community planning, policy interventions, and efforts to increase access to affordable, healthy food options. Initiatives may include supporting the establishment of grocery stores offering fresh produce, promoting farmers' markets, and implementing policies that encourage healthier food environments in both urban and rural settings. Combining the Income Demographic Overlay project (described above on page 70) would also be beneficial for both projects.

5.2.4 The role of supermarkets

There could be a role for supermarkets in the local food economy if some conditions are met. Supermarkets provide the most convenient outlet for consumers, but they currently don't provide the best return for food growers or producers. Further targeted research needs to happen to understand what changes each supermarket would be willing to make to support local growers in the future.

Research shows that franchise supermarkets have greater ability to support local food growers. This can happen in several ways, from purchasing local food for retail, or supporting programmes such as the food in schools programme by connecting growers directly to outfits making lunches for schools.

5.2.5 Requirements for encouraging dairy conversion

Questions were raised at the wānanga regarding the large amount of milk that is produced within the Wellington Region and Horowhenua District. The questions were:

- What would be needed to help convert dairy farms to other agriculture?
- What can be done to support farmers to reduce reliance on chemicals for dairy farmers?
- How long would it take to convert farms, in theory?

These are excellent questions that could provide the basis of a new research project. Crown entities, such as, AgResearch, New Zealand Institute for Plant and Food Research (Plant and Food Research), Landcare Research – Manaaki Whenua, and the National Institute of Water and

Atmospheric Research (NIWA) could be approached to determine whether they would want to participate in this type of research project.

The research and findings could inform new opportunities for the future of food within the region.

5.3 Localising Food

There are other characteristics (not just geographic locality) that are used to describe the local food economy. For example, in the US production methods (sustainable practices and reduction of synthetic chemicals) are what contribute to the definition of 'local' (Martinez et al. 2010). For some consumers the term sustainable production also includes fair farm labour practices and animal welfare (Martinez et al. 2010). Research shows that the *"concept of local food may also extend to who produced the food: the personality and ethics of the grower; the attractiveness of the farm and surrounding landscape; and other factors that make up the 'story behind the food'"* (Martinez et al. 2010, p.4). In Canada, Wittman et al. argue "*working definition of local food systems as regionally based, community-linked, and embedded within the social economy"* (2012, p.45).

In Australia, Larsen et al. (2008, p.105) state, *"localisation seeks to bring people and their basic necessities closer together, primarily to increase community energy security, strengthen local economies and to achieve large improvements in environmental conditions and social equity"*. It is well argued that localising food strategies are driven by a desire to increase the resilience and self-reliance of local food supplies, particularly in preparation for the dual challenges of climate change and peak oil (Larsen et al. 2008; Lawson and Mirosa 2012; Millar et al. 2016). This type of reasoning behind food localisation can build the connections between those producing food and those consuming it.

The shorter food supply chains (see Figure 69), for example, normally means producers are held accountable for their production methods and the impacts of those methods on the environment (Larsen et al. 2008).

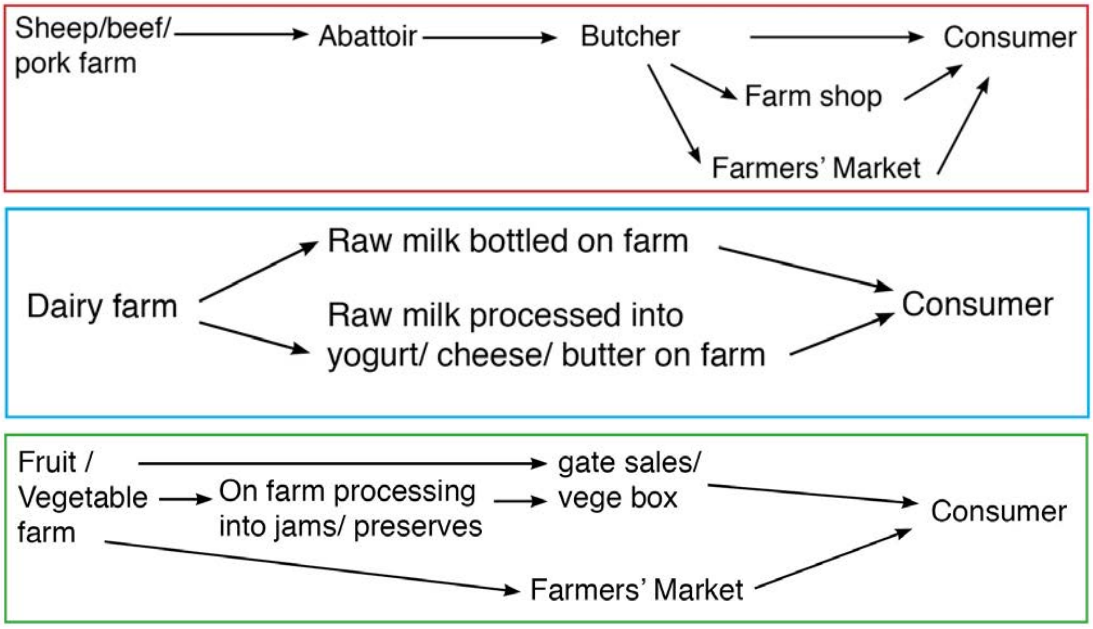

Figure 69: Three examples of shortened supply chain for red meat, dairy and horticulture

Research shows that localising food is synonymous with small farms that are often committed to their community through social and economic relationships (Millar, et al. 2016). Consumers seem to also be motivated by a wide range of issues from concern for food quality and perceived freshness, taste, origin of the food (including trust in the producer), environmental issues, animal welfare issues, food safety and regional economic development (Millar, et al. 2016).

5.3.1 Direct-to-consumer marketing and sales

Direct-to-consumer marketing or sales can be typically described as a cooperative process of communication that uses one or more advertising media to effect, at any location, a quantifiable sale. In terms of local food economies this is often referred to as online sales, Community Supported Agriculture (CSA), vegetable box delivery services, farmers' markets, farm gate sales and pick-your-own (these are each explored in more detail below).

In the US, current successes in direct-to-consumer marketing farms and sales have come from fruit, vegetable, and beef cattle farms. For example, "operations with $50,000 [USD] or more in annual sales increased direct-to-consumer sales by 64%, or $274 million, from 2002 to 2007, which exceeded all other size categories. The number of beef cattle farms involved in direct-to-consumer marketing grew by 33% (or 8,851 farms) from 2002 to 2007, followed by farms marketing vegetables and melons, which grew by 24% (or 3,474 farms)" (Martinez et al. 2010, p.5). The same study reports that according to the 2007 Census of Agriculture, in 1997 direct-to-consumer marketing amounted to $551 million (USD) in current dollar sales and more than doubled to $1.2 billion by 2007 (Martinez et al. 2010).

5.3.1.1 Online sales

A direct-to-consumer wholesaler is a business that sells food products directly to consumers without involving intermediaries like retailers or traditional stores. Operating primarily through online platforms, direct-to-consumer wholesalers bypass retail channels and ship products directly from their distribution centres or production facilities to consumers' doorsteps. This approach allows for greater brand engagement, control over pricing and marketing, and the opportunity to cater to niche markets with unique or artisanal products. The direct-to-consumer model has gained prominence with the growth of e-commerce, providing a transparent and efficient supply chain while fostering direct relationships between wholesalers and consumers.

5.3.1.2 CSA

Community Supported Agriculture (CSA) is an agricultural model where consumers directly support local farmers by purchasing shares or memberships in a farm's harvest. In this arrangement, individuals, known as shareholders or members, pay a fee upfront to a local farm, receiving a portion of the farm's produce throughout the growing season. Members share in both the successes and challenges of the farming season, fostering a direct relationship between consumers and farmers. The produce provided is typically fresh, locally grown, and seasonal, promoting sustainable agriculture practices and supporting the local economy. CSA programs often include a variety of crops, encouraging an appreciation for diverse and seasonal foods. Beyond the economic transaction, CSA contributes to community building by bringing farmers and consumers together, sometimes organizing events or farm visits to strengthen the connection between them. Overall, the

CSA model aligns with principles of sustainability, local food systems, and community engagement in agriculture.

5.3.1.3 Vegetable box delivery service

A vegetable box delivery service operates on a subscription model, delivering regular assortments of locally sourced and seasonal vegetables directly to customers' doorsteps. Subscribers benefit from the convenience of having fresh produce delivered, support local farmers, and contribute to sustainable agriculture. These services often allow for customization based on preferences or dietary needs, promoting a variety of vegetables in each delivery, and encouraging healthy eating habits. The model emphasizes the direct connection between consumers and local farmers, fostering a sense of community and environmental sustainability by reducing the carbon footprint associated with transportation. Overall, vegetable box delivery services have gained popularity for providing convenient access to fresh, diverse, and locally grown produce.

5.3.1.4 Farmers' markets

Farmers' markets are physical spaces where local farmers, growers, and producers gather regularly to sell a diverse range of fresh produce, agricultural goods, directly to consumers. These markets emphasize locally sourced and seasonal products, providing consumers with the opportunity to purchase directly from farmers and learn about the origins of their food. Operating as community hubs, farmers' markets contribute to a sense of community, fostering social interactions and cultural exchange. The direct-to-consumer model supports local economies, ensuring farmers receive fair compensation for their products while promoting sustainable agricultural practices. Additionally, farmers' markets often offer educational opportunities, such as workshops and demonstrations, to inform consumers about farming practices and the benefits of locally sourced products. The selection at these markets reflects seasonal availability, encouraging an appreciation for seasonal eating, and may include artisanal goods and crafts, further supporting local artisans and entrepreneurs (some farmers' markets are food only). Overall, farmers' markets play a vital role in connecting communities with local farmers, promoting sustainability, and contributing to the resilience of local food systems.

5.3.1.5 Farm gate sales

Farm gate sales involve the direct selling of agricultural products by farmers to consumers at the physical location of the farm, typically near the entrance or gate. In these transactions, customers can purchase locally produced and freshly harvested goods directly from the farmer, fostering a direct connection between the producer and the consumer. This approach supports local farmers, promotes the consumption of seasonal and locally sourced products, and provides transparency in the supply chain. Farm gate sales contribute to community engagement as consumers interact directly with farmers, and the model often allows for a variety of products, ranging from fruits and vegetables to eggs, dairy, and other farm-fresh items.

5.3.1.6 Pick your own

"Pick your own" is a farming practice that allows consumers to visit a farm during the harvest season and personally pick fruits, vegetables, or other crops directly from the fields or orchards. In this model, individuals actively engage in the harvesting process, choosing from a variety of crops such as berries,

apples, or pumpkins. This seasonal experience provides families with a recreational and educational activity, fostering a direct connection to agriculture and promoting appreciation for locally grown produce. "Pick your own" supports local farmers, contributes to sustainability by reducing transportation-related carbon footprints, and often creates a community-friendly environment at the farm. The model is popular for its family-friendly and hands-on approach to enjoying fresh, locally sourced food.

5.3.2 Pricing can play a role in stimulating local food economies

Pricing can play a role in stimulating local food economies for consumers. However, in low-income communities, this might not be the case, but research indicates that some consumers choose local options to save money, while others are willing to pay a significant premium for locally sourced products (Millar, et al. 2016). "*Consumers who are willing to pay higher prices for locally produced foods place importance on product quality, nutritional value, methods of raising a product and those methods' effects on the environment, and support for local farmers*" (Martinez et al. 2010, p. iv).

Research on consumers indicates that involvement in the local food economy isn't solely motivated by considerations of price or convenience. This finding aligns with a study on consumer preferences regarding red meat, where "price and value for money" ranked highest (65%), and convenience ranked third (51%) (Millar, 2012 p.12). Notably, consumers who favoured conventionally farmed meat attached greater importance to "price and value for money" and "convenience" compared to those opting for organically certified farmed meat. This suggests that some value-driven consumers, prioritizing social, health, and environmental concerns, are willing to pay higher prices for specific types of local food.

5.4 Best approaches to support food producers/growers

From the food system analysis research, supporting growers is the number one requirement for increasing a local food economy. Without growers and the people who produce food, there would be no food production. This section briefly outlines considerations for supporting local food growers.

5.4.1 Local food does not always mean cheaper food

One particularly difficult area to resolve is the compatibility of using the framework of local food economies to provide readily accessible food to low socio-economic groups, whilst enhancing the viability of farming. Research shows that many farmers are not generating a significant return on their investment, and for many smaller to medium scaled farmers, there is a desire for local food economies to return them a greater profit. The true value of food production needs to include the environmental benefits that are delivered with truly sustainable production, such as clean water and healthy soils. Often, large-scale food production is set up to supply large-scale markets or large-scale aggregators. With scale, comes reduced cost and therefore, it is typically the large-scale food producers who can provide the consistency of supply and at a lower cost. The purchasing of this lower cost food undermines the viability of food growing by forcing farmers to farm more intensively, with resultant negative repercussions on the environment and society. Therefore, local food will not always mean cheaper food.

5.4.2 Reliable distribution options

If growers cannot sell the food they grow, then they cannot generate income.

Research shows that small and mid-scale food growers struggle to access distribution through supermarkets, so alternative systems are required. Direct producer-consumer distribution can work well. For example, farmers' markets are a great way for some types of growers to sell food, but research shows that farmers' markets can be unreliable as the cost-of-living increases and people prioritise convenience and price over freshness and connecting to the grower. Vegetable boxes purchased direct from the farm is another direct producer-consumer distribution system, but these can be time consuming for the farmer if consumers lack education on seasonality.

5.4.3 Products are safe and legal for consumers

Food safety regulations are complicated; guidance exists to help food producers through the compliance needs (see MPI website: www.mpi.govt.nz). However, achieving such compliance can be costly.

Supermarkets and central distributers often require further significant compliance, which can be too onerous/costly for small and mid-scale food producers.

Finding ways to support growers get their food to the consumers, in a safe and legal manner is essential for strengthening the local food economy. This is a role that agencies such as Territorial Authorities can lead.

5.4.4 Capturing value

For small and mid-scale food growers, producing food in the conventional food economy is not necessarily profitable. Often, much of the profitability within conventional supply chains is claimed by the large distributers (for example, supermarkets) and/or large wholesalers. Local food economies offer small-medium scale producers with considerable opportunity to capture more value from the supply chain.

5.5 Best approaches to encourage consumer support of local food

From the food system analysis research, supporting growers is the number one requirement for increasing a local food economy. However, without consumers (someone to purchase the food), there can be no food system. This section briefly outlines what consumers need to support local food growers.

5.5.1 Consumers need consistency of supply

Consumers can be those consuming the food directly, or those value-adding to the food to make a profit on it, for example, food processors turning milk into cheese, meat into sausages or pies, fruit or vegetables into jams or chutneys or food premises, (cafés or restaurants) turning food into ready-made meals.

For cafés and restaurants purchasing local food on a regular basis needs consistency and reliability of supply, they need the same or very similar types of food on a regular basis to provide to their

customers. Food growers, producers or suppliers need to be able to accommodate these needs, otherwise they won't be able to establish and keep regular custom.

Research indicates that the available supply of some types of local food is a major constraint for consistency of supply. For example, the amount of horticultural produce grown in the Wellington Regional Foodshed is not enough to supply the foodshed. Also, there is a lack of existing accessible supply chains for the dairy and meat that is currently produced within the foodshed, to ensure it is accessible across the foodshed.

Scaling up the volume of available food will require additional infrastructure in some cases (dairy and meat), additional growers in others (horticulture) and diversification of crops for others (for example, dairy farming).

5.5.2 Consumers want convenience

Research shows that the majority of consumers value cost and convenience over most other factors when choosing where to purchase food. Convenience can include many reasons, such as saving time (such as time-poor workers, busy parents, etc), reducing effort, or fitting well into a particular context. Supermarkets have trained consumers that they can purchase their food and household items together. For example, not that long ago food types came from different specialised stores (meat from butchers, fruit and vegetables from grocers, cheese, and milk direct from the farm), today those food items are all found together alongside garden, electrical, laundry or bathroom items. Being able to purchase these items together has meant many consumers seek out convenience over knowing where their food comes from, who has grown it or knowledge of the growing and processing.

Being able to support local food growers might mean that local food needs to be sold in convenient locations, reducing the needs for a committed local food consumer having to drive between the butchers, the grocers, and the farm to purchase the desired food items.

5.5.3 Consumer education

There appears to be a lack of education regarding 'local', what is meant by local, who is growing local food and where it can be purchased from. There also appears to be a lack of education regarding seasonality of food (what can be grown and when), as well as the true value of local food (it can be more expensive than non-local food). Therefore, building strong networks and providing further education for consumers on different elements of local food is necessary for strengthening the local food economy.

5.6 Potential opportunities for further development

The afternoon of the second day of the Regional Food System Strategy wānanga, an exercise was conducted with participants to imagine the immediate impacts of climate change, and peak oil on the region, with a specific focus on food production. The exercise created an awareness of a dependence on oil, especially for the production and distribution of food. Questions were raised regarding how the region can move away from a dependence on oil to become more resilience in the event of climate emergencies.

Ideas for further development toward "Energy Independence" included:

- **Land use planning** - considering food growing spaces as a component of housing intensification; also considered less oil dependent farming, less reliance of synthetic fertilisers, building healthier soils.
- **Diversification of crops** - considering the introduction of innovative education and training schemes for new and existing farmers in the diversification of farming and of crop species. Subsidies could help pay for additional training, support for diversification and movement away from energy intensive farming systems to ensure all food types are grown within the region.
- **Diversification of distribution** - considering investment in e-transport systems and changing how we transport food / animals / people, etc. Includes considering strengthening distribution networks for local growers to ensure food gets to where it is needed.
- **Community building around food** - considering how food is accessed, how new skills are developed and how cities are planned around these two ideas. Includes the concept of satellite food hubs to purchase food and to also act as knowledge banks in regard to transference of skills (such as growing, processing, pasteurising, preserving, cooking, seed saving, etc.). Includes considering fostering community resilience such as planning for the concept of "15-minute cities" to enhance access to food.

Further development of these areas directly relates to strengthening the local food economy. Some of these concepts are woven through the following potential opportunities for further development to progress creating a resilient local food system in the Wellington Regional foodshed.

5.6.1 Encourage collaboration and networks

Growth in the local food economy will benefit from the direction of resources and effort into developing producer-distributor-retailer relationships. Some of the base opportunities for growing the local food economy are in the development of business practices that focus on trust and relationships. Local retailer, distributor, farmer networking and planning sessions could create new opportunities for Wellington Regional Foodshed's small and medium-sized farmers.

By focusing attention on capacity building of small and medium sized producers, who are often time and resource poor, and increasing the links between producers and distributers, there is potential to grow appropriately scaled local food economy initiatives. Existing mid-size distributors may be best positioned to move more Wellington Regional Foodshed produce through existing infrastructure in the short-term, but there are also longer-term opportunities associated with working with small or new distributors who are already committed to local products and who could potentially grow and increase their sales volume.

The food economy is complex, and the challenges are significant. Following from the initial scene-setting conversations, there would be benefit from food growers and processors working together in structured groups to facilitate collaboration and co-working directly on their businesses over a longer period of time.

Many stakeholders have flagged cooperatives or collaborations as an avenue to create leverage in domestic (and international) marketplaces. Shared use of processing facilities, storage capacity, distribution trucks, and other infrastructure can reduce costs for all. Co-marketing of complementary products can also help build sales and market share for like-minded producers and processors. Exploring potential partnerships or collaborations with existing players committed to regional food economies are good starting points. Such partners should extend to the likes of transport companies, retailers, and processors.

Further ideas for development (from the wānanga) focused on re-orientating people to the joy and connectedness of kai and mapping where local food can be purchased direct from the producer.

Other tangible actions could include:

- Advertising who grows what/ where / how much to potential retailers.
- Have a person to build relationships with local food businesses, chefs, to assist with seasonal menus, check what businesses need, be the face the organisers on behalf of the growers.
- Create an online ordering system, for both suppliers and consumers.
- Use the shared scale and leverage off existing distributers to utilise existing infrastructure.

5.6.2 Build a brand – build trust

There are a number of challenges for local food economies. The lack of collective (community) understanding as to what constitutes 'local' and what the underlying attributes of local food are, is one. Opinions differ, resulting in mixed understandings and expectations, and a lack of consensus about the integrity of the food or the marketing thereof. Simply being 'local' is not enough. While cafés and restaurants reported customer interest and demand for local food, they were also clear that 'local' alone was not sufficient justification for the price premiums generally sought. To compete against less expensive commodity options, local products must be higher quality and have clear differentiation based on some combination of attributes, certifications, branding, source transparency, and story. If differentiation isn't clear or doesn't seem clear, it is unlikely to be a bountiful regional food economy investment.

The story and associated brand should emphasize both the values associated with the food and on the values associated with the business relationships within the food supply chain. The producers and retailers involved are unlikely to compete successfully on price, so they must compete based on product differentiation for which they can capture value sufficient to create a premium. Differentiation can be achieved based on multiple dimensions related to product attributes, production practices, business structure, geography, brand, or a combination thereof.

Differentiation and provenance are key. The primary food categories produced within the foodshed (red meat and dairy) has well established existing players that have the capacity to shift production practices and compete on any number of differentiating attributes. Local producers will have a very difficult time competing against the conventional economy if consumers are content with its approach being "*good enough*". The lack of understanding from the majority of consumers regarding food production and environmental performance is a barrier, but not one that is insurmountable.

A regional local food economy that is embedded in attributes of provenance, trust, transparency, and environmental integrity, provides the best opportunities for financial viability for small to medium scale growers who wish to participate in a local food economy. Products can be targeted at discerning customers who care, and are willing to pay for, storied product or a transparent supply chain that matches their values.

Research shows that establishing 'trust' is a fundamental requirement for a successful local food economy. 'Certification' was considered a viable method for gaining trust like 'face-to-face'

relationships. Whether face-to-face relationships or certification is the most appropriate method to establish trust is likely to be dependent on:

- The number of participants and the scale of the food economy.
- The larger the size and diversity of the food economy, the greater the requirement for certification.
- The geographical proximity between the producers and consumers. The greater the physical distance, the less likelihood of direct interaction and the greater the likely demand for certification.
- The consumer's demand for knowledge of farm practice and the level of technical detail required. For consumers who have a stronger requirement to understand the technical production processes that underpin a farming system, a more formalised accreditation system will often be required.

For any certification or accreditation scheme to be successful there needs to be widespread producer interest and support for participation. Without broad producer uptake, the market cannot be supplied. As such, production standards need to be set at an appropriate level to encourage participation, whilst ensuring the integrity of the system remains and consumer confidence is maintained.

5.6.3 Work with mid-scale producers

Large-scale food growers/producers tend to supply well-developed supply chains, for example direct to supermarkets or for export. These supply chains have been developed over decades, to provide what the "typical" consumer requires (affordability, reliability, convenience, and taste). Typically, these larger producers will not want to change supply chains unless there is significant gain for them. It needs to be efficient and profitable.

Therefore, the food growers/producers that could be incentivised to work within a local food economy are the small and medium sized producers. It could be easier to motivate this group of food growers/producers to supply different markets that are not the conventional markets by the offer of stable and better pricing, and specifically not being squeezed because of their smaller scale but valued instead.

A prevailing view of medium-large scale farmers is that they do perceive there to be opportunities, and that the ethical values of local food economies are values which they relate to and are motivated by. However, numerous concerns were expressed about the potential to develop the processing and distribution systems that are required to ensure the viability of local food economies. The ability to provide strong benefits for participating farmers must be greater than the perceived risks. Research shows that by facilitating meetings between growers/producers and retailers, some fears can be diminished. This reinforces the need for open conversations and engagement between a diversity of stakeholders. Maintaining a supportive environment and building trust is critical.

At the beginning of the development of a local food economy it is important to work with a smaller group of small to mid-scale food growers who have expressed an interest and commitment to sustainable local food economies. Research shows that food producers who have been operating in the conventional food economy for some time, for example generational farmers can be more cautious

about alternative food economies, even though they can often be cynical about the existing food economy within which they operate. Also, larger producers are more likely to be concerned about upsetting the status quo and the dominant players in the existing food economy. Whilst smaller to medium sized producers are more often seeking to differentiate themselves and their farm products from the status quo.

Often the medium-scaled producers are those too small to compete successfully in commodity markets, and too big to participate exclusively in direct-to-consumer channels such as farmers' markets. Such producers operate at a scale sufficient to productively engage wholesale buyers, and to generate meaningful social and environmental benefits (both on-farm and throughout the value chain). They are also nimble enough to respond quickly to market signals relative to the largest commodity farms, which tend to be slower to change and which themselves are typically more satisfied with the existing commodity-export focused economies.

5.6.4 Create local food hubs – with satellites

Food hubs or co-operatives are value-based supply chain enterprises that facilitate the aggregation, storage, processing, distribution, or marketing of differentiated products. Often, they target small and midsized food producers (farmers, growers, etc), who do not fit with the commodity-based export markets.

A food hub is inherently collaborative, as is the aggregation of products from multiple farms to support larger-scale distribution of local foods into a variety of markets. The hub facilities would need to provide a physical site, the aggregation, marketing and distribution, satellite hubs could be developed to distribute food across the foodshed, due to the geographical size of the Wellington Regional foodshed. A central hub would buy and broker local or regional foods, selling them directly to consumers, or into local sales channels, ideally underneath a provenance brand. Such a hub may purchase / broker all the produce from smaller growers, and potentially smaller amounts from larger-scale growers (where that food type is required to have a broad spectrum of food types).

Complementary enterprises, such as the kitchen or processing facilities, could make use of the seconds, or seasonal gluts, to process into healthy fast foods, prepared meals, or quality processed foods. Integrating healthy 'fast-food' outlets will help with food accessibility issues and will help to break down barriers around community understanding of local food.

Partnering with educational institutes specialising in food training could provide enterprise and employment opportunities, as well as potential income for the Hub (as shown in the diagram in Figure 70 on page 82).

Figure 70: Wellington Regional Foodshed – Food Distribution Hub concept

Food infrastructure is not readily or affordably accessible by Wellington Regional Foodshed's small to medium sized producers, and that lack of access is potentially inhibiting the growth and development of a robust local food economy. The issues are many and varied, so coordination of a wide variety of investment and initiatives will be required to change the overall situation. Models are needed that fill gaps in scale-appropriate aggregation, processing, and distribution infrastructure, whether by working with established industry players to create access for smaller producers, or by developing new infrastructure specifically suited to support a distributed, regional-scale economy.

Participants should recognize that facilities already exist for aggregation and seek ways to work with these existing entities. Research indicates there is room to develop and grow within the current system. Emphasis should be placed on working with existing actors and infrastructure to achieve economies of scope and scale, increase efficiencies, and save resources that would otherwise be spent on developing alternatives.

Increasing their networks and relationships can in part offset the lack of available capital for smaller food businesses. If growers are not able to scale-up because of time or capital constraints, then it is possible to provide technical assistance and infrastructure so that growers can band together to achieve scale, and in doing so, reach larger (or more consistent) markets.

Research shows that food retailers and restaurants want to purchase Wellington Regional Foodshed grown food items, such as fruits, vegetables, meat and dairy but do not want the inconvenience of purchasing from a large number of growers. By working with distributors or aggregators, small and medium farmers can find market access points into the retail sector. The strength of distributors or an aggregator is the ability to source from multiple producers and multiple regions, ensuring an even supply of flow of food for retailers or consumers.

Creating a central invoicing system, so small growers are not invoicing direct to food businesses but though a cooperative entity, would be a relatively simple action to implement.

Local food hubs are a potential model that can provide some practical methods to flatten social inequalities within the food economy. An example is that a food hub with a wholesaling function could be well placed to provide a function of supporting a variety of community food enterprises. Community food enterprises could include knowledge banks, skill transfer banks, (such as growing, processing, pasteurising, preserving, cooking, seed saving,) etc.

6 Appendix One: Methodology of the Baseline Foodshed Analysis

6.1 Factor I: The Size of a Foodshed's Population

The populations of each territorial authority within the Wellington Region and Horowhenua District are calculated from Statistics New Zealand estimate for the population as of 30 June 2022.

Using the estimate for the population, as opposed to the usual resident population, is a statistical projection or estimation of the population size at a given point in time, typically between official census years. These estimates are based on a variety of data sources and statistical methods, including birth and death registration, migration data, and demographic modelling. Estimates are essential for providing up-to-date population figures between census years. They are subject to periodic revisions to improve accuracy and reliability.

The usual resident population refers to the total number of people who reside in a specific geographical area, such as a country, region, city, or district. It includes both permanent residents and long-term temporary residents who have established their residence in that area. The resident population is typically determined through official census counts, which are conducted at regular intervals, such as every five or ten years in many countries. Census data provides a comprehensive and accurate count of the population at a particular point in time.

6.2 Factor II: Working out Average Food Consumption

As there is no data that specifically provides kg per person per year for Aotearoa New Zealand, many different data sets are analysed to produce a set of numbers that could be extrapolated out to create the average food consumption for the Wellington Regional foodshed.

6.2.1 Explaining the MOH data

The New Zealand Ministry of Health's Eating and Activity Guidelines for New Zealand Adults (Ministry of Health, 2020b) and the information sheet on serving sizes (Ministry of Health, 2020a) provides recommendations on how much food one person would eat to maintain a healthy diet.

They define 'healthy diet' as one which provides sufficient energy for the person plus ten key nutrients of protein, thiamine, vitamin A, vitamin C, folate, calcium, iodine, iron, magnesium, and zinc.

The serving size estimates are given in grams but are based on the energy content of the food type and their key nutrient content.

The weight of a serving of vegetables (~75g/serve) is less than half the weight of a serving of milk and milk products (~250g for a cup of milk). So, an adult consuming the recommended servings of 5 vegetables and 3 milk products will eat 375g/day and 700g/day of these food types respectively.

The food group referred to as "Legumes, nuts, seeds, fish and other seafood, eggs, poultry, and/or red meat with the fat removed" in (Figure 71, page 85) is often called the "protein group", because this food group provides many important nutrients, such as protein, iron, zinc, B vitamins.

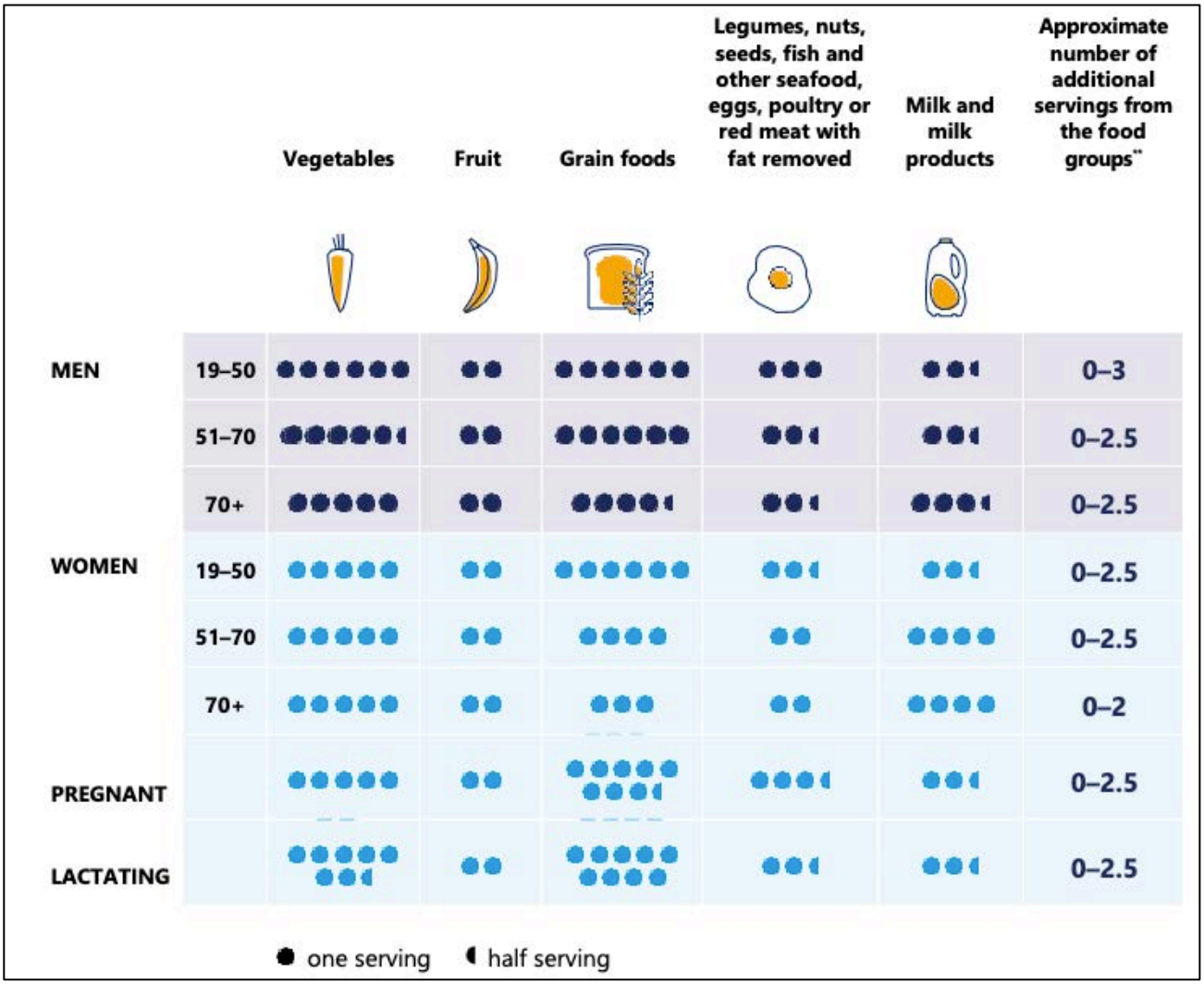

Figure 71: The recommended number of servings per day from each of the food groups for adults in different age groups (Ministry of Health, 2020a, p.5)

To determine average food consumption, the recommended number of servings per day from each of the food groups for men and women in the aged groups 19-50, 51-70 and 70+ (Figure 71) are multiplied by the standard serving weights provided for different types of food within each food group within the same document (Ministry of Health, 2020a).

For example, in the protein group, a standard serving is 500–600 kJ, and is explained as being about the same as:

- 1 cup (150 g) cooked or canned beans, lentils chickpeas, or split peas (preferably with no added salt)
- 170 g tofu
- 30 g nuts, seeds, peanut or almond butter or tahini or other nut or seed paste (no added salt)
- 100 g cooked fish fillet (about 115 g raw) or one small can of fish
- 2 large (2 x 60g=120g) eggs
- 80 g cooked lean chicken (100 g raw)
- 65 g cooked lean meat such as beef, lamb, pork, veal (90–100 g raw) – no more than 500 g cooked (700–750 g) red meat each week.

Taking the weights listed above, the raw food weight is always used and where there are two or more weights, the weight is averaged out and multiplied with the number of servings per day, and then averaged across the food group, thus determining MOH's recommended average food consumption.

6.3 Factor III: Evaluation of the Different Land Use Types

The AgriBase® land-use dataset is used to spatially evaluate land use across the project area. The AgriBase® dataset is selected as the most appropriate and reliable dataset for this research and is purchased from AsureQuality Limited accordingly (note, there are limitations with the dataset, as outlined in Limitations on page 92).

The AgriBase® dataset was imported into ArcInfo, a fully featured Geographic Information System (GIS). The dataset overlaid existing topographic information sourced from the publicly available Google Earth data. Adjustments were made to the GIS layers, ensuring accuracy of alignment of the two layers.

6.4 Factor IV: Food Production Estimates

Factor IV is the approximate food weights produced from the farmland, based on the quantity of each food product that can be grown.

To calculate the volume of food produced across the foodsheds the predominant commercial farming systems that are common across this area were used as the basis by which to calculate farm productivity.

6.4.1 Farming systems analysed

The sheep and beef cattle farming model is representative of farms across the Wairarapa, Horowhenua, and throughout the foothills in the vicinity of the Tarurua forest park. In the Wairarapa soils tend to be shallow, well drained, and silty in nature. The rainfall is around 800 – 1000mm. On the western side of the Tararua forest park south of Shannon the soils tend to be more productive deeper, well drained and loamy in nature. From Shannon north to Tokomaru and Himitangi the soils are also highly productive with deeper loams and silt loams with good drainage. Rainfall here is around 1000 – 1200mm/yr.

The farms have mostly cultivated pastures, with the balance in improved, but steeper, hill country. The typical production system is breeding ewes with some hogget lambing, and the majority of lambs finished. 20% of lambs are held annually as replacements, and 20% of the breeding ewes are culled annually for meat. A small herd of beef cattle is run, with the majority of calves finished, and 20% held as replacements.

Stock numbers from the AgriBase® Data were validated against StatsNZ stock numbers to determine the overall stocking rate across farms in the Wellington Region and Horowhenua District. The overall stocking rate is calculated based on the total farm area (including non-productive parts such as scrub or bush blocks), see Table 17 on page 87.

Table 17: Stock units for pastoral farming models

Stock type	Stock units
Sheep	1.1
Beef cow	6
Rising 2 year beef animal	5
Rising 1 year beef animal	4.5
Weaner calf	2

The sheep and beef cattle farming system is typically dependent on farmer's managing a herd of breeding animals, which are only culled for consumption at a time when they are considered to be unfit for purpose. That is, the breeding livestock are normally retained for breeding, rather than for consuming. Primarily it is the offspring of these breeding stock that are sold each year for consumption.

Typical farm productivity values[19] for extensive pastoral sheep and beef cattle farming in Aotearoa New Zealand are used to characterise these farms, Table 18.

Table 18: Sheep and beef cattle farm productivity information

Sheep and beef cattle farm productivity metric	Metric value
Sheep stocking rate (SU/total farm ha)	6
Beef cattle stocking rate (SU/total farm ha)	14
Lambing rate (%)	130
Calving rate (%)	82
Ewe replacement rate (%)	20
Cow replacement rate (%)	20
Percent of farm stock sheep (%)	70
Percent of farm stock cattle (%)	30

Beef and Lamb NZ in their 2022 annual report calculate meat production across all classes of sheep and beef cattle farm at 125 kg/ha[20]. In the model prepared for the Wellington Region and Horowhenua District, overall meat production across sheep and beef cattle, sheep only, and beef cattle only farms is different as StatsNZ data on sheep numbers per hectare is used, which changes the overall meat production figure to 232 kg/ha/yr.

The United Nations Food and Agriculture Organisation (FAO) international statistical datasets (FAO, 2023) were used as comparative benchmarks to validate local production data. Loss-adjusted primary weights have been used in this analysis, representing the amount of food that is produced given current food handling, storage, and processing practices.

[19] https://beeflambnz.com/sites/default/files/2023-06/Compendium-22.pdf
[20] https://beeflambnz.com/sites/default/files/2023-06/BLNZ-AR-2022.pdf

The primary weights represent the weights of commodity products that have been processed, but still effectively exist in their raw form. These are the measures that are used within Aotearoa New Zealand food industries, and as such are a suitable method for completing the baseline foodshed analysis.

When considering meat products, it is the meat weight that is consumable, and thus removes the inedible parts of an animal, such as bones and offal (though noting that in practice much offal is edible and readily consumed).

It is important to note that dairy cows contribute to the total red meat numbers, as dairy cow culls.

The dairy farming model is based on owner-operated seasonal supply dairy farms which make use of a run-off dairy grazing block. Dairy farm productivity information was drawn from Livestock Improvement Corporation[21] and Dairy NZ[22], while dairy cow numbers were drawn from Statistics NZ[23] and summarised in Table 19.

Table 19: Dairy farm productivity information

Dairy farm productivity metric	Metric value
Stocking rate (cows/ha)	2.5
Milk production (kg Milksolids/ha)	1020
Dairy cow replacement rate (%)	22%
Liveweight at culling (kg)	480

Dairy products have been analysed as milk liquid (raw milk). This is not the common measure for milk production within the Aotearoa New Zealand dairy industry but is the measure that consumers can easily relate to and is easily understandable.

Poultry production information was sourced by phone call from the New Zealand Poultry Association[24] to estimate the number of layer chickens and broilers in the study area and egg production information.

Pork production information was sourced from Pork New Zealand[25] by phone call. This includes the number of farms, number of sows on these farms, reproductive performance of the sows, and the liveweight and dress out percentage of progeny at slaughter.

Crop production was estimated based on yields of peas, barley, wheat, and maize in the four years to 2011[26].

Production from horticultural land was estimated based on production information for lettuces, potatoes, pumpkins, and broccoli. It assumed these types of products each occupied a quarter of the

[21] https://www.lic.co.nz/about/research-publications/dairy-statistics/
[22] www.dairynz.co.nz/media/uzeekwgr/nz-dairy-statistics-2021-22-web.pdf
[23] https://www.stats.govt.nz/indicators/livestock-numbers
[24] https://www.pianz.org.nz/
[25] https://www.nzpork.co.nz/
[26] 'The NZ arable industry' Millner and Roskruge, 2013, https://www.landcareresearch.co.nz/assets/Publications/Ecosystem-services-in-New-Zealand/1_8_Millner.pdf

total horticultural land area and that two crops of lettuces were produced per year, while for the other vegetables there was a single crop per year.

For orchard fruit, yields of apples and pears were taken from New Zealand Apples and Pears information[27] and the yield for other orchard fruit was estimated in tray-of-apple equivalents based on tray carton equivalents for apples.

6.4.2 Fish harvest

Fish consumption per capita for the Wellington Region and Horowhenua District was estimated at 22kg/person/year. This figure is based on the report by FAO of per capita consumption across Aotearoa New Zealand of 22kg[28] and of 26 kg per capita in 2010[29].

Fish harvest data was obtained from Fisheries Inshore New Zealand[30] and from MPI by request[31]. Data also came from the in-shore fishing area[32]. Also, from the delineations of the fish harvest area, which is approximately 500km off Wellington Region and Horowhenua District coastline[33] (in-shore fishing). There is a total fished area of 1,100,000 hectares.

Tonnes of fish caught were provided based on the FMA8 and FMA2 Fish Management Areas[34] surrounding the Wellington Region and Horowhenua District (Figure 72).

[27] www.productivity.govt.nz/assets/Submission-Documents/immigration-settings/DR-172-New-Zealand-Apples-and-Pears-Inc.pdf
[28] https://www.fao.org/documents/card/en/c/ca9229en
[29] https://www.fao.org/fishery/en/facp/nzl?lang=en
[30] https://www.inshore.co.nz/
[31] RDM.SharedRDM@mpi.govt.nz
[32] https://www.gw.govt.nz/assets/Documents/2021/10/NIWA-REPORT-Sites-of-significance-for-indigenous-marine-biodiversity-in-the-Wellington-region.pdf
[33] https://www.gw.govt.nz/environment/our-natural-environment/our-unique-ecosystem-types/coastal-areas/
[34] https://www.mpi.govt.nz/legal/legislation-standards-and-reviews/fisheries-legislation/maps-of-nz-fisheries/

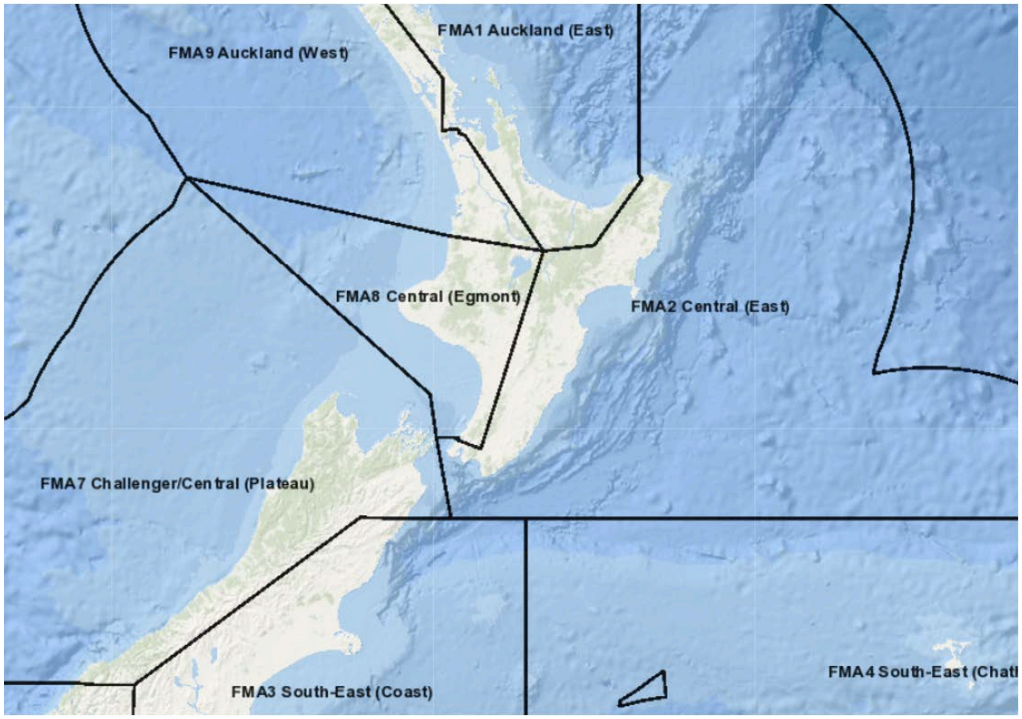

Figure 72: Fish Management Areas[35] in relation to the Wellington Region and Horowhenua District

Assumptions made:

- It is assumed that the area within the 12 nautical mile boundary represents 20% of the total area of the Fish Management areas.
- It is assumed that half of the total catch from the in-shore area comes over the wharf in the Wellington Region and Horowhenua District, while the rest goes to ports elsewhere.

Average annual fish harvest (2016-2020) from FMA8 and FMA2 was 19,485 tonne and 28521 tonne respectively.

Based on these assumptions fish harvest from the in-shore area of the Wellington Region and Horowhenua District was estimated at 4,801t or 4kg/ha/yr.

[35] https://maps.mpi.govt.nz/templates/MPIViewer/?appid=96f54e1918554ebbaf17f965f0d961e1

7 Appendix Two: GIS Spatial Evaluation of Land Use

The GIS spatial evaluation of land use across the project area used the best available dataset. The following data was supplied as part of the purchased AgriBase® dataset.

7.1 Data supply specifications

7.1.1 Farm identification

Each farm within the study area is allocated an identification character, and has total farm size quantified, and the predominant land use categorised, these are shown in Table 20.

Table 20: Farm identification

farm_id	Unique farm identifier assigned by AsureQuality Limited
size_ha	Total area of the property in hectares as reported by farmer/occupier, rounded to one decimal place
ftype	The predominant land use on the property (refer to the Farm Type Descriptions in Table 21)

7.1.2 Farm type descriptions

Based upon information that the landowner submits to AsureQuality Limited, each farm is assigned a farm type code. The farm type code represents the predominant land use on that property. The codes are described in Table 21.

Table 21: Farm Type Descriptions

Farm Type Code	Description
ALA	Alpaca and/or Llama Breeding
API	Beekeeping and hives
ARA	Arable cropping or seed production
BEF	Beef cattle farming
DAI	Dairy cattle farming
DEE	Deer farming
DOG	Dogs
DRY	Dairy dry stock
EMU	Emu bird farming
FIS	Fish, Marine fish farming, hatcheries
FLO	Flowers
FOR	Forestry
FRU	Fruit growing
GOA	Goat farming
GRA	Grazing other people's stock
HOR	Horse farming and breeding
LIF	Lifestyle block
NAT	Native Bush
NEW	New Record - Unconfirmed Farm Type

Farm Type Code	Description
NOF	Not farmed (ie idle land or non-farm use)
NUR	Plant Nurseries
OAN	Other livestock (not covered by other types)
OPL	Other planted types (not covered by other types)
OST	Ostrich bird farming
OTH	Enterprises not covered by other classifications
PIG	Pig farming
POU	Poultry farming
SHP	Sheep farming
SNB	Mixed Sheep and Beef cattle farming
TOU	Tourism (i.e. camping ground, motel)
UNS	Unspecified (i.e. farmer did not give indication)
VEG	Vegetable growing
VIT	Viticulture, grape growing and wine
ZOO	Zoological gardens

7.2 Dataset Limitations

AgriBase® data faces several issues. Data is collected via a questionnaire. Interpretation of the questionnaire varies, especially in determining the dominant farm type with multiple land uses. For example, criteria for determining the dominant farm type poses challenges, such as economic return, land area, or the landowner's preference for classification, are not clearly defined. Despite improvements in the questionnaire over the years, significant omissions persist, including details on grazing stock owned by others and discrepancies in stock numbers provided. Respondents provide varying levels of detail, with inconsistencies like a farm specified as predominantly sheep (SHP) having more beef cattle than sheep. Updates from AsureQuality have not been provided, and after ground truthing some large properties, not every farm is updated. Moreover, AgriBase® has overlapping polygons, potentially leading to double counting, with errors or shared land use by different enterprises. Therefore, there could be errors with the AgriBase® data.

8 Appendix Three: Methodology of the Baseline Food System Analysis

8.1 Food Grower Interview Design and Collection

A series of questions were developed based on the previous experience from the Otago Food Economy research (Millar, et al., 2016). The questions were modified to draw out relevant data from the food producers (farmers and growers of different food types). The intention of the interview was for data to be collected directly from farmers and growers in the Wellington Region and Horowhenua District.

8.1.1 Interview selection

Farmers and growers were identified through NPHS staff who had previously intended to run a workshop with the farmers and growers. Details were provided to the researcher and 29 individuals were contacted and asked to participate in an interview. 17 interviews were conducted.

8.1.2 Data analysis

Interview data was recorded directly into Forms (an Office 365 product) then exported into Excel for analysis. The qualitative data was analysed and within each question, organised into conceptual categories to create themes that were used to analyse the data. The data was reviewed several times to allow for the multiple layers of coding, each time assessing the data to identify the key themes.

8.1.3 Interview limitations

The interview faced challenges due to the time of year the interviews were being conducted. The interviews were conducted in Spring, which is an exceptionally busy time of year from all types of farmers and growers, from animals calving and lambing to crops growing and needing constant management. Therefore, time was limited for the majority of people contacted, meaning many declined to be interviewed. Those who were interviewed, the researcher is very grateful for their time in participating.

8.2 Food Premise Survey Design and Distribution

A series of questions were developed based on the previous experience from the Otago Food Economy research (Millar, et al., 2016). The questions were modified to draw out relevant data from the commercial food retailers. The intention of the survey was for data to be collected directly through an interview, however a survey using the same questions was developed and left with those businesses who were too busy to participate in an interview but showed interest in participating in the study.

8.2.1 Survey/interview selection

30 respondents engaged with the survey. NPHS staff walked down streets in different Territorial Authorities targeting food premises (shops selling food) and asking them to participate. Some

interviews were conducted there and then, others may have been completed later. An example of the NPHS staff member methodology is recorded below:

> *"Here is a breakdown of the number of establishments I covered:*
>
> ***Porirua:***
> - *Cafes: 12*
> - *Restaurants: 4*
>
> ***Wairarapa:***
> - *Cafes: 15*
> - *Restaurants: 4*
>
> *On Wednesday and Thursday, I covered the Porirua central and Wairarapa region (Featherston, Carterton, Greytown, and Masterton). In Porirua, I mostly covered the central area around Coobham Court, Kilkerran Place, and Parumoana Street. I also covered a few cafes in the Porirua North City Mall.*
>
> *In Wairarapa, I covered the main streets of Featherston, Carterton, and Greytown. In Masterton, I covered throughout Queen Street.*
>
> *Overall, I got a very good response from people regarding the surveys. As mentioned earlier, on my first day in Porirua, people weren't very familiar with Te Whatu Ora, so it was a bit tricky to get them to understand the importance of participating in the survey and what they would get from it. However, people seemed interested in it and some even started doing the survey.*
>
> *The next day in Wairarapa, I felt that people were keener. It was very quiet, and I got more time to explain about who is involved and how it would help elevate the business prospects of the local food economy. People seemed to be more interested in it after hearing that. I also found it pretty interesting to learn that many of the cafes and restaurants in Wairarapa source their supplies from either local growers or grow their own supplies. But I forgot to ask who their suppliers were. However, overall, a good response from all".*

8.2.2 Data analysis

Survey data was recorded directly into Forms (an Office 365 product) then exported into excel for analysis. The qualitative data was analysed and within each question, organised into conceptual categories to create themes that were used to analyse the data. The data was reviewed several times to allow for the multiple layers of coding, each time assessing the data to identify the key themes.

8.2.3 Survey limitations

The survey faced challenges as some businesses were hesitant to participate, leading to scepticism and declined invitations. Despite a logical method for selecting businesses by category and location, this changed during data collection. The reselection aimed for unbiased representation by choosing the next closest business within each category. Limited time and budget resulted in insufficient data collection efforts, yielding a small number of responses.

Overall, the survey was carried out successfully with 30 premises.

9 Appendix Four: Further Research Ideas from Wānanga

The following are research ideas from the 3rd November wānanga, which are interesting, but not are included as key recommendations.

9.1 Opportunities to reduce retailer and household food waste

Love Food Hate Waste are trying to tackle the problem of household food waste at source (education of what is food waste in the home and how to reduce it). Ministry for Environment (MfE) is in the process of identifying better data on household food waste in 2024. Also, MfE have brought in standardisation of kerbside collections, including food waste meaning city and district councils will be required to collect food waste at the kerbside from all urban households by 1 January 2030.

9.2 Percentage of food produced within the region that leaves the region

A question from the wānanga was, "*What portion of food (and the economic benefit from it) produced in our region leaves the region never to return?*"

Unfortunately, this is a hard question to answer. The foodshed and food system analysis report provides an explanation of the national export amount for the big food products produced in the region (milk and red meat), with examples of what is happening regarding food imported (pork for example), exported (for example, apples and pears grown in the region), and what is grown for national or local supply (see Table 11: Food produced within Wellington Region and Horowhenua District showing scale and operation, in terms of where food goes, on page 38).

Specific data on what stays within the region is hard to acquire. Further work to specifically evaluate the exact amount of food that stays within the region is a challenging project. For example, each food processor would need to be interviewed. For animal farmers, they are governed by who has space at the abattoir when their animals are ready to leave the farm. Some abattoirs are solely export and some are for national supply, and some are for both.

9.3 Ownership of food producing land

A request from the wānanga to understand who owns Aotearoa's food producing land is an interesting request, but one that is a costly and challenging project to achieve. Most farms registered with AsureQuality Limited[36], have registered confidentially. Therefore, determining who owns what is difficult to identify. Generic information on land ownership from STASNZ can be analysed, but it would be difficult to determine whether landowners' own food producing land or not.

[36] AsureQuality Limited are the owners of the main database used for determining land types AgriBase®

References

Beef + Lamb NZ. (2020). *The Role of Red Meat in Healthy and Sustainable New Zealand Diets.* March 2020. Foodcom

Beef + Lamb NZ. (2022). *Red Meat Report*. December 2022. Issues 05. Meat Industry Association

Colmar Brunton. (2020). *Better Futures Report*. https://www.kantarnewzealand.com/better-futures-reports-2020/

Coster, M., and Kennon, N. (2005). '*New Generation' Farmers' Market in Rural Communities: A Report for the Rural Industries Research Development Corporation*. Australian Government

Drew, J., Cleghorn, C., Macmillan, A., and Mizdrak, A. (2020). *Healthy and Climate-Friendly Eating Patterns in the New Zealand Context*. Environmental Health Perspectives: 128:1 CID: 017007 https://doi.org/10.1289/EHP5996

Egbers, A., and Epp, S. (2009). *Working together for Local Food: Co-operative profiles and resource guide* by Canadian Cooperative Association

FAOSTAT. (2023). *TradeSTAT*. http://www.fao.org/faostat/en/#data/FBS (accessed on 18 August 2023)

Greenwell, J., Grant, M., Young, L., Mackay, S., Bradbury, KE. (2023). *The prevalence of vegetarians, vegans and other dietary patterns that exclude some animal-source foods in a representative sample of New Zealand adults*. Public Health Nutrition. 2023:1-24. doi:10.1017/S1368980023002677

Guthrie, J., Guthrie, A., Lawson, R., and Cameron, A. (2006). *Farmers' markets: the small business counter-revolution in food production and retailing*, British Food Journal, Vol. 108 Iss: 7, pp.560 – 573

Kantar. (2022). *Better Futures Report*. Version-23-March-FINAL

Larsen, K., Ryan, C., and Abraham, A.B. (2008). Sustai*nable and Secure Food Systems for Victoria: What do we know? What do we need to know?* Victorian Eco-Innovation Lab (VEIL) Research Report No.1, Australian Centre for Science, Innovation and Society, University of Melbourne

Lawton, E. (2013). *Ecological Footprint of New Zealand's Urban Form and Lifestyles*. School of Architecture. Wellington, University of Victoria, Wellington. Doctorate

Love Food Hate Waste. (2018) *New Zealand Food Waste Research: Love Food Hate Waste campaign evaluation*. https://lovefoodhatewaste.co.nz/wp-content/uploads/2019/02/Love-Food-Hate-Waste-Research-Results-Summary-February-2019.pdf (accessed on 18 August 2023)

Martinez, S., Hand, M., Da Pra, M., Pollack, S., Ralston, K., Smith, T., Vogel, S., Clark, S., Lohr, L., Low, S., and Newman, C. (2010). *Local Food Systems: Concepts, Impacts, and Issues*. United States Department of Agriculture, Economic Research Service Economic, Research Report Number 97. May 2010

Millar, R. (2012). *Assessing the Potential for Local Food Systems in Otago*. Report prepared for the Otago Dry Hill sheep and beef farmer group. August 2012

Millar, R., Lawton, E., and Bould, N. (2016). *The Otago Food Economy*. Ahikā Consulting and Otago Polytechnic

Ministry of Health. (2008/2009). *New Zealand Adult Nutrition Survey data tables*. 2008/2009. Wellington: Ministry of Health

Ministry of Health. (2020a). *New serving size advice for New Zealand Adults*. November 2020. Wellington: Ministry of Health

Ministry of Health. (2020b). *Eating and Activity Guidelines for New Zealand Adults: Updated 2020*. Wellington: Ministry of Health

Ministry of Health. (2022). Adults' Dietary Habits – *Findings from the 2018/19 and 2019/20 New Zealand Health Survey*. Wellington: Ministry of Health

Ministry for Primary Industries (MPI). (2022). *Apiculture monitoring data*. Retrieved from https://www.mpi.govt.nz/resources-and-forms/economic-intelligence/farm-monitoring/#apiculture (accessed 18 September 2023)

Ministry for the Environment. (2007) *Environment New Zealand 2007* - second national state of the environment report. Ministry for the Environment (MfE), Manatū Mō Te Taiao, PO Box 10362, Wellington, New Zealand

NIWA. (2012). *Sites of significance for indigenous marine biodiversity in the Wellington region*. Prepared for Greater Wellington Regional Council. May 2012. National Institute of Water and Atmospheric Research Ltd (NIWA). https://www.gw.govt.nz/assets/Documents/2021/10/NIWA-REPORT-Sites-of-significance-for-indigenous-marine-biodiversity-in-the-Wellington-region.pdf

OECD/FAO. (2020). *OECD-FAO Agricultural Outlook 2020-2029*. OECD Publishing. Paris. https://doi.org/10.1787/08801ab7-en (accessed on 26 September 2023)

Ritchie, H., Rosado, P., and Roser, M. (2023). *Diet Compositions*. Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/diet-compositions' (accessed on 17 August 2023)

Sense Partners. (2023). *Solid foundations: Dairy's economic contribution to New Zealand.* Sense Partners: Data Logic Action. 4th September 2023

Wilkes, M. (2020). *The grow your own food trend is gaining momentum post lockdown*. Published online by Stuff. Retrieved from: 'https://www.stuff.co.nz/life-style/homed/garden/122234742/the-grow-your-own-food-trend-is-gaining-momentum-post-lockdown' (accessed on 22 August 2023)

Wittman, H., Beckie, M., and Hergesheimer, C. (2012). *Linking Local Food Systems and the Social Economy?* Future Roles for Farmers' Markets in Alberta and British Columbia. Rural Sociology 77(1), 2012, pp. 36–61 DOI: 10.1111/j.1549-0831.2011.00068

Woodburn, V. (2014). *Understanding the characteristics of Australian farmers' markets*. RIRDC (Rural Industries Research and Development Corporation) Publication No. 14/040, June 2014