Adapting tuna dependent Pacific Island communities and economies to climate change:

Options for supplying dietary protein for growing Pacific Island populations

Report prepared for the Pacific Community (SPC)

(RFP22-3866: GCF Study 2)

October, 2023

Pacific Community
Communauté du Pacifique

ANCORS
AUSTRALIAN NATIONAL CENTRE FOR OCEAN RESOURCES & SECURITY

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This report was prepared for the Pacific Community.

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Suggested citation:

Brewer, T., Kottage, H., Andrew, N. (2023). Options for supplying dietary protein for growing Pacific Island populations Report prepared for the Pacific Community. 93 p.

Acknowledgements

The authors would like to acknowledge Drew Wright and Simon Nicol (SPC) for insightful feedback on draft versions of this report. We also acknowledge Australian Centre for International Agriculture Research (ACIAR) project FIS-2018-155 which funded the development of the primary data sources and protein analyses summarized in this report. We also thank partners and collaborators across the Pacific for their input into the development of the databases.

EXECUTIVE SUMMARY

Pacific diets have changed dramatically over the past ~50 years. A transformation from mostly domestic production of fruits and vegetables, including root crops and fish and invertebrates, to dependence on imported cereals, meat and highly processed foods has contributed to significant non-communicable disease challenges across the region. Populations continue to grow and urbanise, particularly in Melanesia, and nearby inshore fish stocks increasingly show signs of localized depletion (Brewer, Cinner et al. 2009, Kronen, Magron et al. 2010, Pratchett, Munday et al. 2011). When the potential effects of climate change, on both domestic production and imports, are also considered there is an urgent need for guiding food system policy and activities towards food security and nutrition through healthy domestic sources. Tuna resources have significant potential to improve nutrition across the region, including to more marginalised populations, and enhance domestic food sovereignty, reducing food security risks associated with global shocks.

Across five chapters, this report summarises the latest data spanning public health, food consumption, food nutrition composition, food pricing, and projected future fish requirements given population growth and dietary protein requirements. This set of analyses is then synthesised in the context of climate change and other plausible drivers of food security and nutrition outcomes across the region.

The report harnesses the most recent and comprehensive datasets on food consumption and food trade for the region, supported by production data, nutrition data, various sources of public health data and human height and body mass index estimates to conduct analysis that have not been possible to date. The data on consumption estimates (Pacific Data Hub – Microdata Library 2023) and food trade (Brewer and Andrew 2023) have been developed in a partnership between the University of Wollongong and the Pacific Community through the Australian Centre for International Agriculture Research (FIS-2018-155). Detailed consumption data allow calculation of both country-level estimates and more detailed estimates, including various population subsets such as 'urban-rural' and analysis by wealth quintile for some countries. These data are invaluable in the context of a general paucity of information, and substantial heterogeneity among Pacific food systems. Continued improvements to these databases is central to ongoing regional food security activities and policy.

As reported elsewhere (e.g. FAO 2021), and presented in Chapter 1, Pacific Island countries have significant public health challenges including micronutrient deficiency (Table 4), globally high rates of obesity and other non-communicable disease (Table 3). This public health burden, and associated economic cost, is partly attributable to significant dietary shifts that have occurred over the preceding decades (Murray 2001, Andrew, Allison et al. 2022), including changing diets from locally-sourced, seasonally diverse foods towards import dependence including processed foods high in salts, fat and sugars (Legge, Gleeson et al. 2011, Brewer, Andrew et al. 2023). This challenge is not isolated to urban areas (Albert, Bogard et al. 2020) and varies significantly across countries. Improving nutrition outcomes, through targeting vulnerable populations, is essential to tackling the ongoing non-communicable disease challenges facing the region. Understanding which populations are vulnerable is still poorly understood and remains a priority for analyses of the large data sets described above.

Chapter 2 summarises dietary intake of protein across food groups for Pacific Island countries, using 'Global Individual Food Consumption Data Tool' food groupings (Leclercq, Allemand et al. 2019) based on Household Income & Expenditure Surveys as the primary data source. Significant cleaning and standardising of HIES data to conduct the analyses in this chapter provide the best available food consumption estimates for countries in the region. Tuna and other pelagic fish currently represent only a small proportion of protein intake, as does canned fish (Table 6), suggesting opportunity to significantly increase their contribution to future protein requirements. Currently, reef and coastal fish, imported chicken, wheat, and rice contribute a large proportion of dietary protein for most

countries. Urban populations tend to consume more tuna and other pelagic fish, while rural populations tend to consume more reef and coastal fish. Assessment of food imports compared to domestic production highlights very high levels of import dependence for non-aquatic sources of protein including chicken, other animal sources foods (e.g., dairy), rice, and wheat. This dependence highlights a potential future risk, depending on the impacts of climate change, and shocks such as possible pandemics and war, on global food production and trade.

There is significant variation in macro- and micronutrient composition across the assessed food groups (Chapter 3, Table 11). Tuna and other pelagic fish are relatively rich in protein and contain Omega 3 fatty acids. Canned fish is high in protein, iron and calcium. Based on nutrient profiles, tuna, fresh or canned, presents a plausible option for enhancing future nutrient intake and ensuring people are consuming adequate calories. Similarly, average prices (Chapter 4) vary significantly across food groups and countries (Table 12). On average fresh tuna and canned fish is more expensive than reef and coastal fish, and comparably priced to chicken, which is now a significant component of Pacific diets, particularly in urban areas. However, the significant variation in prices between food groups across countries prevents confident generalisation.

Chapter 5 presents analysis on future protein requirements for Pacific Island populations. Calculated projections account for recommended protein consumption, given body weight, population projections and the recommendation that 50% of dietary protein is obtained from fish. At an aggregated country level, some countries including Kiribati, Marshall Islands, Federated States of Micronesia, Nauru, Palau and Tuvalu currently consume adequate fish to meet dietary protein recommendations, based on consumption estimates from the year of consumption data collection. Cook Islands, Niue, Samoa and Vanuatu are expected to require increased fish availability out to 2050. A number of assumptions were required to conduct the analysis so it should be viewed with caution. For example, the estimates assume consumption of reef and coastal fish at current per capita rates. Additionally, significant variation does exist in the quality and quantity of fish consumed within countries including between rural and urban populations. Initiatives to increase access to affordable fish should incorporate this variation into decision-making processes to ensure that the food and nutrition security benefits of initiatives are maximised.

Chapter 6 considers plausible options for increasing the supply of dietary protein for Pacific Island countries. In doing so, it considers the evidence presented in the first 5 chapters in combination with other attributes of food including affordability, accessibility and nutrition content. This assessment is made within the general framing of anticipated declining reef and coastal fisheries, additional climate impacts on food systems and population growth. It considers various foods which could substitute reef and coastal fisheries, available through either imports, domestic agricultural and aquaculture production or tuna and other pelagic fish. In weighing the evidence, the chapter concludes that increased consumption of tuna through domestic artisanal and commercial fisheries should be central to future food security and nutrition for the region. It does, however, recommend, enhancing domestic agriculture systems to generate greater dietary diversity and resilience in anticipation of the predicted future climatic context.

ACRONYMS

COICOP	Classification of Individual Consumption According to Purpose
BMI	Body Mass Index
FAD	Fish Aggregation Device
FAOSTAT	Food and Agriculture Organisation Statistics
GIFT	Global Individual Food Consumption Data Tool
HIES	Household Income and Expenditure Survey
NCD	Non-communicable Disease
NCD-RisC	Non-communicable disease Risk Factor Collaboration
PFCD	Pacific Food Consumption Database
PFTD	Pacific Food Trade Database
PIC	Pacific Island Country
PNDB	Pacific Nutrient Database
SPC	Pacific Community
USD	United States Dollars
WHO	World Health Organisation

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INTRODUCTION

Pacific diets and malnutrition

Food systems, among communities in the Pacific Islands region, have evolved rapidly over the past 50 years (Andrew, Allison et al. 2022), shifting from agrarian subsistence, cash crops and fishing to significantly elevated dependence on imports of staples and processed foods, particularly in urban areas. These Pacific food systems are highly vulnerable to the effects of climate change and to exogenous events such as COVID-19 and global political and financial events. As Pacific populations have increased, particularly in Melanesia, import dependence to meet caloric needs has escalated (Brewer, Andrew et al. 2023).

Through lifestyle and dietary changes, combined with embedded poverty and other factors, people of the Pacific have globally high rates of malnutrition, and diet-related incidence of non-communicable diseases (NCDs); roughly 3.85 million people in the region live below the international poverty line (FAO 2021). Non-communicable diseases are the leading cause of death in the region (Hou, Anderson et al. 2017). This public health crisis places significant burden on Pacific Island countries, from health departments through to individual households. Improving Pacific diets is a major regional priority, and fisheries resources, including tuna, are expected to be a significant contributor to diminishing NCD prevalence and positive health outcomes.

Importantly, food systems, poverty and malnutrition vary significantly across countries in the Pacific Islands region and in response to social, demographic and economic factors (FAO 2021), so it is essential to avoid generalisation when considering solutions at a regional scale. Instead, it is imperative to apply the best available data to identify countries and populations with the greatest poverty and dietary challenges, and apply locally-appropriate solutions including by improving accessibility to, and use of, the region's rich tuna resource.

Constraints on supply of nutritious food

Climate change is expected to have significant and varied impacts on the Pacific food system. Foremost is a potential change in the distribution of tuna stocks, which is of significant concern for nutritional food security and government revenue (Bell, Senina et al. 2021). Similarly, as coastal habitats including coral reefs degrade, fisheries productivity declines (Kronen, Magron et al. 2010, Hoegh-Guldberg, Andréfouët et al. 2011, Pratchett, Munday et al. 2011) . Crop production is also likely to be adversely affected by climate change, primarily through increased intensity of cyclones, but also due to changing rainfall and temperature, and increases in pests and diseases (Taylor, McGregor et al. 2016). The vast majority of people in the Pacific live within 5 km of the coastline, making them vulnerable to sea-level rise including salt water inundation of crops (Andrew, Bright et al. 2019).

Tuna in Pacific diets

Historically, a significant portion of Pacific diets has been obtained from the ocean, including coastal and pelagic finfish, and harvesting of invertebrates and seaweeds (Charlton, Russell et al. 2016, Farmery, Scott et al. 2020). Atoll nations with limited arable land have historically been particularly reliant on the ocean for dietary requirements. However, the combination of growing populations, habitat degradation and overfishing of coastal resources has increased the price of seafood through increased relative scarcity (T. Brewer, personal observation). In recent decades, with improved mechanisation and technology (e.g., outboard motors, nylon gears and fish aggregation devices (FADs)), pelagic fish in Pacific diets has increased as a proportion of seafood consumption. Domestic commercial fleets, processing facilities in Papua New Guinea, Solomon Islands and Fiji, and transhipment operations have additionally added to the availability of tuna and other pelagic fish in Pacific diets. Canned tuna has enabled greater access to tuna in the region (Bell, Sharp et al. 2019),

primarily due to its longer shelf life. Given current malnutrition, projected climate impacts, declining coastal fisheries and projected population growth, it is anticipated that pelagic fisheries will provide an increasingly important role in Pacific diets in the future (Bell, Allain et al. 2015). To fulfill projected shortfalls in fish, based on half of dietary protein requirements to be provided by finfish, one proposed solution is to increase total tuna catch dedicated to domestic consumption in Pacific countries (Bell, Allain et al. 2015).

Fish are an essential source of nutritionally important macro- and micronutrients. Tuna, in particular, are high in protein and omega-3 fatty acids and a good source of iron (Bell, Sharp et al. 2019). Securing adequate dietary protein for Pacific Islands communities is of primary importance, and tuna are a viable option which is available domestically through subsistence and artisanal fisheries, transhipping operations and access to locally-canned tuna. Based on World Health Organisation (WHO) recommendations of ~ 0.7g of protein per kg of body weight to be consumed daily and recommendation of up to 50% of dietary protein to be supplied by finfish[1], it is expected that there will be significant shortfalls in the supply of reef fish for many Pacific Island countries in the future (Bell, Allain et al. 2015). This shortfall is anticipated based on a combination of population growth and the limits to fish production from coral reefs and other coastal fish habitats. Increasing tuna consumption to fill the anticipated gap in fish supply of 25% by 2035 will require ~ 6% of the commercial tuna catch from the region to be made available to island populations (Bell, Allain et al. 2015).

Pelagic fisheries have many advantages as a priority source of nutrition in the Pacific Island region to both fill the projected shortfall in dietary protein and to diminish the incidence of diet-related non-communicable diseases. First, there are ample local supplies of tuna and other pelagic fish, which ensure reasonable price stability irrespective of global supply chains. Second, tuna is a good source of protein, essential fatty acids, vitamins and minerals (Bell, Sharp et al. 2019, Hicks, Cohen et al. 2019). Third, tuna and other pelagic fish are already part of the cultural and economic system of the Pacific, with well-established fisheries. However, increasing tuna in Pacific diets of the future will require a supply chain focus (Bell, Allain et al. 2015) (see also Technical Studies 2 and 5), from harvest through to consumption and consideration of affordability, sustainability, and equity of access among other factors.

Figure 1. Tuna for sale at a local market in Auki, Malaita, Solomon Islands. Image from T. Brewer

[1] SPC Policy Brief 1/2008 here:
https://pacificdata.org/data/dataset/oai-www-spc-int-ced24e95-7e0a-401a-9f0b-d79316c49cb0

Alternatives to tuna in Pacific diets

Pelagic fish, and primarily tuna, has the potential to be a major component of the future Pacific diet. However, consideration of alternative foods, with comparable nutrition profiles allows for better understanding of future dietary options. For example, Pacific countries import a significant volume of poultry, pork, and beef. Imports of chicken are increasing exponentially in some countries (e.g., FAO and University of Wollongong 2023). Currently, a meaningful proportion of protein in Pacific diets is derived from imported wheat and rice (Brewer, Andrew et al. 2023). When considering trade-offs between future protein sources it is important to consider factors such as reliability of supply, pricing, specific macro- and micronutrients within specific foods, and impacts on domestic supply chains, health outcomes and the national financial burden associated with malnutrition and high incidence of NCDs.

Forward summary

This study covers a broad set of objectives under the general aim of reviewing options, including tuna, for supplying dietary protein for growing Pacific Island populations. Within the study, we summarise the public health status of member countries of the Pacific Community (SPC), characterise and summarise current Pacific protein across a range of food groups, summarise the nutritional value of each of the summarised food groups, tabulate pricing across food groups, and estimate future protein requirements given projected population growth. We conclude by synthesising this information to identify options for supplying dietary protein, with a focus on tuna.

Specific study deliverables are stated in Appendix 1.

Countries included in analysis are Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands. Niue, Nauru, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

CHAPTER 1. PUBLIC HEALTH STATUS OF PACIFIC ISLAND MEMBER COUNTRIES

a. Background

Pacific Island countries are experiencing very high rates of non-communicable diseases (NCDs) by global standards. Major drivers include changing lifestyles and diets, high prevalence of tobacco smoking and limited resources available for health interventions. Changing diets have contributed to obesity and diseases such as diabetes and cardiovascular disease (FAO 2021). Some countries are experiencing deficiencies in key macro- and micro-nutrients (FAO 2021). Increased imports of unhealthy foods high in sugar, fats and salts, and declining per capita production of local foods, are driving this dietary change (Brewer, Andrew et al. 2023). Access to affordable protein is of particular concern. Contributing to this is a projected decline in coastal fisheries production, due to a combination of factors including the adverse impacts of climate change, habitat degradation and poor resource management. Meat imports are currently partly filling the animal-sourced protein gap, however, increased dependence on imports in an increasingly volatile trade context (due, for example, to future epidemics and animal disease such as avian influenza, and impacts of climate change on global food production systems) is not desirable.

There is significant variation in public health status among Pacific Island countries, related to various factors including affluence, and the urban or rural settings where people live (Sharp, Troubat et al. in press). Understanding this variation is vital to diet-related health interventions, including evaluating the future role of tuna in contributing to adequate protein consumption across the region. Here, we present key health attributes across the 14 countries to highlight both the range in health status across countries and concerning outliers. We present updated estimates of public health indicators included in Bell, Sharp et al. (2019, Appendix 5). Due to the significant number of public health indicators included, this chapter is divided into the following indicator groups: demographics, nutrition status among children < 5 years, lifestyle risk factors and NCDs, micronutrient deficiency, and dietary intake.

b. Demographics

Pacific countries vary across demographic indicators (Table 1). Melanesian high islands with a large land area and fertile soils have the largest populations, while Micronesian and Polynesian atolls with small land areas and infertile soils have very small populations by global standards. Papua New Guinea has by far the largest population, which is significantly greater than all other Pacific Island countries (PICs) combined. Female life expectancy across the region is higher than for males, though lower than in more affluent developed countries. Melanesian countries have high population growth rates through natural increase, whereas some atoll countries are experiencing declining populations, partly caused by emigration to countries including Australia, New Zealand, and the US. Infant mortality per 1000 births varies significantly across countries, reflecting the variation in maternal health care, among other factors. Overall, basic demographics vary significantly across the region and are important to consider in the context of expected impacts of climate change on food security.

Table 1 Demographic attributes of countries including indicator values and year of indicator value.

	Population size (1)		Life expectancy at birth (1)		Births per year (per 1000 population) (1)	Infant mortality (per 1000 live births) (1)
	All	< 5 years	Male	Female		
Cook Islands	15406	1106	72	79	13	9
	2022	*2022*	*2013*	*2013*	*2019*	*2019*
FSM	105987	11632	69	72	24	30
	2022	*2022*	*2010*	*2010*	*2018*	*2013*
Fiji	901603	78157	68	72	23	16
	2022	*2022*	*2017*	*2017*	*2017*	*2017*
Kiribati	122735	14345	58	66	27	41
	2022	*2022*	*2015*	*2015*	*2019*	*2019*
Marshall Islands	54446	6166	71	73	25	23
	2022	*2022*	*2016*	*2016*	*2018*	*2016*
Nauru	11928	1599	58	61	29	25
	2022	*2022*	*2017*	*2017*	*2018*	*2017*
Niue	1532	107	73	75	12	0
	2022	*2022*	*2017*	*2017*	*2018*	*2017*
Palau	17976	1163	68	78	14	12
	2022	*2022*	*2015*	*2015*	*2018*	*2018*
Papua New Guinea	9311874	1298172	63	68	29	33
	2022	*2022*	*2016*	*2016*	*2018*	*2018*
Samoa	200999	25101	74	76	27	14
	2022	*2022*	*2016*	*2016*	*2018*	*2016*
Solomon Islands	744407	102141	61	62	30	19
	2022	*2022*	*2010*	*2010*	*2018*	*2015*
Tonga	99283	11249	69	73	24	17
	2022	*2022*	*2011*	*2011*	*2018*	*2012*
Tuvalu	10778	1326	64	67	25	23
	2022	*2022*	*2014*	*2014*	*2018*	*2016*
Vanuatu	307941	38538	66	69	29	28
	2022	*2022*	*2010*	*2010*	*2018*	*2013*

[1]Latest available data sourced from the Pacific data hub (https://pacificdata.org).

c. Nutrition status among children < 5 years

Although data on child nutrition were not available for all countries, it is evident that the nutrition status among children varies significantly across countries, and between boys and girls within some countries (Table 2). Rates of stunting are extremely high in Papua New Guinea, Solomon Islands, Vanuatu and Marshall Islands, and moderately high in Kiribati and Nauru. The incidence of underweight children is not as high but proportionately similar to stunting across countries with data. Papua New Guinea has relatively high rates of both overweight children and underweight children, suggesting economic inequality. Tonga also has high rates of overweight children. Rates of exclusive

breastfeeding in infants is highly variable across countries. These results highlight both marked variation between countries and significant malnutrition among children <5 years old across the Pacific, reflecting a need for improved nutrition which is targeted to populations with the highest malnutrition rates. The absence of data for some countries, and the outdated data for some countries where data are available, reflects a need for greater coverage and frequency of health surveys.

Table 2 Nutrition status among children <5 years of age. Data presented as % of population with diet-related condition.

	Stunting (height for weight <2SD) (2)		**Wasting (weight for height <2SD) (2)**		**Underweight (weight for age <2SD) (2)**		**Overweight (Weight for height > +2 SD) (2)**		**Exclusive breastfeeding (3)**
	Boys	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Infants <6 months**
Cook Islands	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
FSM	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
Fiji	8.0% *2004*	6.9% *2004*	4.7% *2004*	8.2% *2004*	4.9% *2004*	8.2% *2004*	5.4% *2004*	4.8% *2004*	40.0% *2014-2020*
Kiribati	16.4% *2018*	14.0% *2018*	3.7% *2018*	3.4% *2018*	8.1% *2018*	3.4% *2018*	3.3% *2018*	0.9% *2018*	64.0% *2014-2020*
Marshall Islands	39.3% *2017*	30.0% *2017*	4.6% *2017*	2.4% *2017*	14.1% *2017*	9.5% *2017*	4.9% *2017*	3.2% *2017*	43.0% *2014-2020*
Nauru	22.1% *2007*	25.8% *2007*	2.2% *2007*	0.0% *2007*	6.9% *2007*	2.9% *2007*	4.6% *2007*	1.3% *2007*	67.0% *2014-2020*
Niue	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
Palau	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
Papua New Guinea	50.9% *2010*	47.9% *2010*	14.4% *2010*	13.7% *2010*	28.9% *2010*	26.6% *2010*	14.3% *2010*	13.1% *2010*	60.0% *2014-2020*
Samoa	7.6% *2019*	6.9% *2019*	2.9% *2019*	3.2% *2019*	3.3% *2019*	3.4% *2019*	9.0% *2019*	8.5% *2019*	70.0% *2014-2020*
Solomon Islands	33.7% *2015*	29.6% *2015*	8.4% *2015*	8.5% *2015*	16.2% *2015*	16.1% *2015*	8.4% *2015*	8.5% *2015*	76.0% *2014-2020*
Tonga	2.5% *2019*	1.8% *2019*	1.2% *2019*	1.0% *2019*	1.0% *2019*	0.5% *2019*	12.2% *2019*	9.9% *2019*	40.0% *2014-2020*
Tuvalu	5.7% *2019*	5.6% *2019*	3.2% *2019*	2.2% *2019*	3.5% *2019*	2.1% *2019*	4.8% *2019*	3.6% *2019*	35.0% *2014-2020*
Vanuatu	33.2% *2013*	24.5% *2013*	5.5% *2013*	4.0% *2013*	13.0% *2013*	10.3% *2013*	5.2% *2013*	4.7% *2013*	73.0% *2014-2020*

[2] https://data.unicef.org/resources/dataset/malnutrition-data/

[3] https://data.unicef.org/resources/dataset/the-state-of-the-worlds-children-2021-statistical-tables/ (Table 9)

d. Lifestyle risk factors and non-communicable diseases

Rates of obesity in adults are extremely high in the Pacific. Reasons include malnutrition, primarily through increased consumption of unhealthy foods, changed lifestyles, and cultural preferences for specific foods (Reeve, Lamichhane et al. 2022). There is, however, significant variation among countries (Table 3). For example, Melanesian countries tend to have lower rates of obesity than Micronesian and Polynesian countries. However, all countries have experienced comparable increases in the proportion of adults that are overweight since the 1970s (FAO 2021). Women have consistently higher rates of obesity, compared to men, across Pacific Island countries (Table 3). Incidence of diabetes in the Pacific is extremely high by global standards, as is raised blood cholesterol. The diets of Pacific populations are causing a significant health burden and high incidence of premature death (FAO 2021). Healthier diets would decrease the prevalence of NCDs and contribute to the regional achievement of Sustainable Ddevelopment Goals (SDGs) 2 and 3, viz. no hunger and good health and well-being.

Table 3 Lifestyle risk factors and non-communicable diseases.

	Overweight prevalence (% population 18+y with BMI ≥25 kg/m2) (4)		**Obesity prevalence (% population 18+y with BMI ≥30 kg/m2) (5)**		**% with raised blood pressure (SBP ≥140 OR ≥90, age standardised estimate) (6)**		**% with diabetes (fasting plasma glucose levels >=7.0 mmol/L (126 mg/dl); (7)**		**Mean total cholesterol (mmol/L) (Raised total cholesterol (>= 5.0 mmol/L, age-standardized estimate) # (8)**		**% with raised blood cholesterol (Raised total cholesterol (>= 5.0 mmol/L, age-standardized estimate) (9)**
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	
Cook Islands	83.7% *2016*	85.8% *2016*	52.6% *2016*	59.2% *2016*	24.9% *2015*	19.5% *2015*	28.3% *2014*	26.7% *2014*	4.7 *2018*	4.7 *2018*	59.0% *2008*
FSM	72.1% *2016*	79.8% *2016*	40.1% *2016*	51.5% *2016*	26.6% *2015*	23.2% *2015*	20.5% *2014*	23.4% *2014*	4.1 *2018*	4.4 *2018*	48.0% *2008*
Fiji	59.9% *2016*	67.7% *2016*	25.1% *2016*	35.3% *2016*	22.4% *2015*	20.7% *2015*	15.9% *2014*	18.9% *2014*	4.7 *2018*	4.7 *2018*	53.0% *2008*
Kiribati	76.6% *2016*	80.9% *2016*	41.6% *2016*	50.4% *2016*	24.0% *2015*	19.0% *2015*	22.0% *2014*	22.6% *2014*	4 *2018*	4.4 *2018*	36.0% *2008*
Marshall Islands	82.1% *2016*	84.9% *2016*	48.4% *2016*	57.3% *2016*	23.8% *2015*	18.6% *2015*	20.8% *2014*	21.5% *2014*	4.3 *2018*	4.5 *2018*	46.0% *2008*
Nauru	88.3% *2016*	88.7% *2016*	58.7% *2016*	63.3% *2016*	23.8% *2015*	17.2% *2015*	30.1% *2014*	28.4% *2014*	4.3 *2018*	4.3 *2018*	46.0% *2008*
Niue	77.6% *2016*	82.5% *2016*	44.8% *2016*	55.1% *2016*	26.1% *2015*	22.1% *2015*	26.8% *2014*	27.3% *2014*	4.2 *2018*	4.4 *2018*	n.a.
Palau	84.3% *2016*	85.9% *2016*	51.8% *2016*	58.8% *2016*	25.7% *2015*	20.0% *2015*	24.8% *2014*	21.6% *2014*	4.1 *2018*	4.4 *2018*	55.0% *2008*
Papua New Guinea	47.4% *2016*	58.1% *2016*	16.6% *2016*	25.8% *2016*	25.1% *2015*	25.8% *2015*	15.4% *2014*	14.3% *2014*	4.4 *2018*	4.5 *2018*	38.0% *2008*
Samoa	73.6% *2016*	82.0% *2016*	39.9% *2016*	55.0% *2016*	26.6% *2015*	21.0% *2015*	22.7% *2014*	26.6% *2014*	4.3 *2018*	4.6 *2018*	35.0% *2008*

Solomon Islands	49.6% *2016*	60.5% *2016*	17.9% *2016*	27.1% *2016*	20.4% *2015*	23.6% *2015*	12.6% *2014*	15.1% *2014*	4.3 *2018*	4.6 *2018*	33.0% *2008*
Tonga	74.8% *2016*	82.2% *2016*	41.4% *2016*	54.5% *2016*	25.4% *2015*	21.8% *2015*	21.9% *2014*	26.4% *2014*	4.6 *2018*	4.6 *2018*	50.0% *2008*
Tuvalu	80.0% *2016*	83.8% *2016*	47.0% *2016*	56.2% *2016*	26.1% *2015*	21.2% *2015*	23.2% *2014*	24.3% *2014*	4.2 *2018*	4.4 *2018*	n.a.
Vanuatu	52.2% *2016*	62.0% *2016*	20.2% *2016*	30.1% *2016*	24.2% *2015*	24.1% *2015*	15.7% *2014*	16.0% *2014*	4.4 *2018*	4.5 *2018*	38.0% *2008*

[#] or using insulin or oral hypoglycaemic drugs; or having a history of diagnosis of diabetes; age standardised estimate)

[4] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-overweight-among-adults-bmi-=-25-(age-standardized-estimate)-(-)

[5] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-obesity-among-adults-bmi-=-30-(age-standardized-estimate)-(-)

[6] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/raised-blood-pressure-(sbp-=140-or-dbp-=90)-(age-standardized-estimate)

[7] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/raised-fasting-blood-glucose-(7-0-mmol-l)(age-standardized-estimate)

[8] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/mean-total-cholesterol-(age-standardized-estimate)

[9] https://www.fao.org/3/cb5758en/cb5758en.pdf

e. Micro-nutrient deficiency

Pacific Island countries have high rates of micro-nutrient deficiency by global standards. Iron deficiency anaemia rates among children in PICs range from moderate (≥20%) to severe (≥40%). Anaemia rates among both pregnant and non-pregnant women are moderate, with an average of around 30% (FAO 2021). As expected, pregnant women do have higher rates of anaemia than non-pregnant women (Table 4). Tuna, among other foods, is high in iron, so higher rates of tuna consumption would likely reduce rates of anaemia. Deficiency of Vitamin A among children (6-59 months) ranges from 6%-17% in PICs (Table 4). Vitamin A deficiency is a leading cause of childhood blindness and contributes to morbidity and mortality associated with infection. Fruits and vegetables are a key source of Vitamin A. Comprehensive data on salt consumption are not available for the Pacific. The data on salt consumption (Table 4) are limited to the percentage of households which have salt, and which tested positive for iodine (>0ppm). The available percentages suggest consistent salt consumption, however, determining whether salt consumption levels in PICs requires better metrics (e.g., volume consumed per capita per day) with better country coverage. Overall, the tabulated indicators suggest micro-nutrient deficiency, as previously published (FAO 2021).

Table 4 Micro-nutrient (Iron and Vitamin A) deficiency and iodised salt consumption among Pacific Island countries.

	% of iron deficiency anaemia (Hb<110g/L) in children aged 6-59 months (< 5 yo) (10)	% iron deficiency anaemia (Hb<120g/L) in non-pregnant women (aged 15-49) (12)	% iron deficiency anaemia (Hb<110g/L) in pregnant women (aged 15 - 49) (12)	Vitamin A deficiency in children 6-59 months (%) (13)	% Iodized salt consumption (>0 ppm) among all tested households with salt (14)
Cook Islands	27% *2019*	27% *2019*	33% *2019*	n.a	n.a
FSM	37% *2019*	24% *2019*	35% *2019*	17% *2013*	n.a
Fiji	40% *2019*	32% *2019*	41% *2019*	11% *2013*	n.a
Kiribati	49% *2019*	32% *2019*	42% *2019*	9% *2013*	96% *2018*
Marshall Islands	40% *2019*	30% *2019*	39% *2019*	13% *2013*	n.a
Nauru	42% *2019*	29% *2019*	36% *2019*	n.a *2015*	n.a
Niue	36% *2019*	27% *2019*	34% *2019*	n.a	n.a
Palau	34% *2019*	28% *2019*	34% *2019*	n.a	n.a
Papua New Guinea	47% *2019*	34% *2019*	44% *2019*	11% *2013*	99% *2005*
Samoa	36% *2019*	26% *2019*	39% *2019*	6% *2013*	98% *2014*
Solomon Islands	38% *2019*	37% *2019*	49% *2019*	8% *2013*	98% *2015*
Tonga	34% *2019*	28% *2019*	37% *2019*	6% *2013*	n.a
Tuvalu	42% *2019*	27% *2019*	34% *2019*	n.a.	n.a
Vanuatu	31% *2019*	29% *2019*	28% *2019*	6% *2013*	68% *2013*

[10] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-anaemia-in-children-under-5-years-(-)

[11] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/anaemia-in-non-pregnant-women-prevalence-(-)

[12] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-anaemia-in-pregnant-women-(-)

[13] International Food Policy Research Institute country profiles. https://www.ifpri.org/

[14]https://data.unicef.org/resources/data_explorer/unicef_f/?ag=UNICEF&df=NUTRITION&ver=1.0&dq=PLW+NIU+TON+TUV+WSM.NT_IOD_ANY_TH+NT_IOD_ANY_TS..._T._T._T._T&startPeriod=2000&endPeriod=2022

f. Dietary intake

Understanding dietary intake is essential to better decision-making and policy outcomes relating to food production and distribution systems, and to health outcomes including malnutrition. Dietary intake was calculated using consumption estimates from Household Income and Expenditure Surveys (HIES) (Appendix 2, 4) and the Pacific Nutrient Database (PNDB) (FAO and SPC 2020). Food consumption data derived from HIES were thoroughly cleaned (Sharp, unpublished) and integrated with the PNDB to create the Pacific Food Consumption Database (PFCD) (Pacific Data Hub – Microdata Library 2023). The PFCD provides nutrient profiles for each food item acquired by households across the Pacific, including information on numerous macro- and micro-nutrients. While this information source is the best available for the region, it should be noted that HIES are generally conducted every 5-10 years so estimates will rarely be current.

To obtain nutrient profiles, the per capita consumption of edible portion, in grams, of each food item (Appendix 4) was multiplied by the corresponding fraction of each nutrient in each food item (grams nutrient/grams of food item) from the PNDB (Statistics for Development Division 2020). Consequently, the PFCD contains valuable nutrient data for each food item, according to the Classification of Individual Consumption According to Purpose (COICOP) code, consumed by each household including information on purchased quantity per capita per day and edible quantity per capita per day across nutrients.

The calculation of the average nutrient intake per capita per day (carbohydrates, fat, and protein) involves several steps:

1. Firstly, the total carbohydrates (or protein or fat) for each household was calculated by summing the carbohydrates in all food items consumed by the household. The estimation is based on per-person per-day because, in PFCD, the consumption per day per person is provided for each food item consumed by the household.
2. Then, the weighted averages across all households were calculated for each country.

The percentage nutrients of the diet in Table 5 are calculated in two steps:

1. The sum of the nutrients and edible quantities of all food items consumed by the population of the country was calculated.

2. The total for each nutrient was then divided by the total edible quantities and multiplied by 100 to obtain the percentage of nutrient in the diet.

The PFCD includes the amounts spent on each food item by each household, as well as the total of all expenditure of each corresponding household. Consequently, the percentages of expenditure on food in Table 5 are calculated using the following steps:

1. The total food expenditure is calculated for each household.
2. Next, the weighted sums of the food expenditure and total expenditure are calculated for each country.
3. Finally, the percentage of total expenditure spent on food is calculated by dividing the country's total food expenditure by the country's total expenditure and multiplying the result by 100.

Primary sources of rich carbohydrates in Pacific diets are root crops and imported rice and wheat (see Chapter 3). From the countries included here, Cook Islands and Niue consume less carbohydrate than other countries. Fat consumption varies from 46 grams per capita per day in Kiribati to 108 grams per capita per day in Samoa and comprises roughly 4-10% of dietary intake across countries. Importantly, these data do not disaggregate fats, including saturated and trans-fats. WHO recommends limiting total fat intake to 30% of total energy intake to reduce the risk of unhealthy weight gain (WHO 2023). Protein consumption will be discussed in Chapter 2 at higher resolution.

At an aggregated national level, the analysis suggests that Pacific populations are obtaining adequate calories. However, significant disparities are likely to exist between populations within countries. For example, wealthier households are likely to consume more calories than poor households (FAO 2021). Expenditure on food and non-alcoholic beverages as a proportion of total expenditure ranges from 25% in Palau to 59% in Kiribati. Considering these estimates, it is important to note the variation in timing of data collection when interpreting the meaning of results. For example, they are the best available, data for Nauru were collected in 2012-13, and data for Kiribati, Marshall Islands and Vanuatu were collected in 2019-2020. These time differences could have significant implications for drawing conclusions concerning trends, given the rapidly-changing diets of Pacific people in recent decades.

Table 5 Dietary intake (average) across countries, including available energy and % of expenditure dedicated to food and non-alcoholic beverages. Data for all except Fiji are derived from the most recent HIES (Appendix 2). Note, these estimates are specific to the nutrients, rather than whole food quantities containing the nutrients. The estimates exclude food consumed ''away from home'' which is a very small fraction of total consumption and can be considered inconsequential.

	Carbohydrate		**Fat**		**Protein**			
	(g)/capita/day	**% of diet**	**(g)/capita/day**	**% of diet**	**(g)/capita/day**	**% of diet**	**Energy (kcal) availabl e/capita /day**	**% of the total Household expenditure on food and non-alcoholic beverages**
Cook Islands	207 2015	16.41 2015	94 2015	7.44 2015	91 2015	7.23 2015	2117 2015	32.02 2015
FSM	404 2013	28.42 2013	77 2013	5.39 2013	105 2013	7.39 2013	2779 2013	34.04 2013
Fiji	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	36.3 (15)
Kiribati	415 2019	36.93 2019	46 2019	4.50 2019	81 2019	7.43 2019	2426 2019	58.69 2019
	341	29.65	65	5.78	102	8.65	2398	43.26

Marshall Islands	2019	2019	2019	2019	2019	2019	2019	2019
Nauru	324 2012	37.18 2012	52 2012	6.01 2012	93 2012	10.67 2012	2162 2012	32.83 2012
Niue	227 2015	16.22 2015	78 2015	5.61 2015	93 2015	6.64 2015	2086 2015	40.36 2015
Palau	345 2013	24.50 2013	92 2013	6.50 2013	119 2013	8.44 2013	2725 2013	25.62 2013
Papua New Guinea	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Samoa	350 2013	26.43 2013	108 2013	8.17 2013	73 2013	5.51 2013	2721 2013	35.54 2013
Solomon Islands	408 2012	26.34 2012	70 2012	4.54 2012	69 2012	4.44 2012	2606 2012	41.82 2012
Tonga	392 2015	24.89 2015	75 2015	4.75 2015	85 2015	5.39 2015	2646 2015	44.74 2015
Tuvalu	415 2015	38.04 2015	97 2015	8.89 2015	84 2015	7.67 2015	2905 2015	44.74 2015
Vanuatu	413 2019	23.63 2019	74 2019	4.30 2019	74 2019	4.33 2019	2686 2019	53.53 2019

[15] 2019/20, https://www.statsfiji.gov.fj/images/documents/HIES_2019-20/2019-20_HIES_Main_Report.pdf, (page 61)

CHAPTER 2. SOURCES AND QUANTITIES OF PROTEIN IN PACIFIC DIETS.

a. Chapter background

This chapter presents an overview of the main sources of protein currently in Pacific diets, which have historically been dominated by fruits and vegetables, including root crops and seafood. Rice and wheat, which is almost entirely import derived, are now a dominant staple in Pacific diets (Brewer, Andrew et al. 2023). Consumption of imported meats, primarily chicken, has increased in recent years, particularly in urban areas. Imports of highly-processed foods, often containing high levels of salts, fats and sugars, now dominates narratives around health and nutrition in the region and are a significant contributor to the high incidence of non-communicable diseases.

Estimating total protein consumption, by food groups, is essential to determining the relative contribution of tuna-based protein in Pacific diets, both now and in the future. Here, we analyse different food groups to better understand their contribution to regional food security and nutrition. Appendix 1 outlines the food group categories analysed, which were adopted for two main reasons. First, definitional constraints within the HIES data, including some fish acquisition records being defined as neither pelagic nor coastal, means that there is a composite fish category. Second, additional categories, including 'all other food' were included to ensure comprehensive analyses and estimation of total protein consumption.

The food groups are aligned with the FAO & WHO GIFT (global individual food consumption data tool) categories (Leclercq, Allemand et al. 2019). The GIFT categorization was developed as a simple nutrition-sensitive approach to grouping foods. The categories developed here are aligned with the GIFT groupings, whilst acknowledging the constraints in HIES data and the focus of the research being on current and future tuna availability for food security and nutrition in the Pacific region in the face of climate change.

The food groups include (1) reef and coastal fish, (2) tuna and pelagic fish, (3) composite fish (not defined as either 1 or 2), (4) canned fish, (5) invertebrates, (6) beef, (7) chicken, (8) pork, (9) processed meat and canned meat, (10) other animal-sourced foods, (11) cereals and their products, (12) vegetables, roots and tubers, (13) pulses, seeds and nuts, (14) composite meals and (15) all other foods (not included in categories 1-14). These categories, including 'all other foods' enables estimation of total protein consumption. Specific foods (by COICOP definition) included in each category are provided in Appendix 3.

Figure 2 Mixed reef fish for sale at Gizo market, Western Province, Solomon Islands. Image supplied by T. Brewer.

This chapter includes 1) an overview of protein consumption by food groups across countries, 2) an assessment of the implications of proximity to the coast for consumption, 3) an analysis of differences in consumption between rural and urban settings, and 4) an analysis of the proportion of consumption derived from domestic or imported sources.

b. Protein consumption across food groups and countries

Background

Fish, including tuna, have historically been the dominant source of protein in Pacific Islands diets. While there has been a shift to increased consumption of meat and imported grains and cereals, seafood still comprises an essential dietary component. As coastal fisheries continue to decline there is expected to be a significant shortfall in fish-derived caloric intake and protein (Bell, Allain et al. 2015). This trend is compounded by growing populations and habitat degradation, among other factors.

Here, we present an overview of total protein consumed per capita in each country, separated into the food groups described above as a baseline for understanding the current status and to project future needs. This analysis summarizes work completed under ACIAR project FIS/2018/155 and prepared for publication as Kottage, Brewer et al. (submitted ms.).

Methods

The information presented in this chapter is primarily derived from HIES conducted across 12 of the 14 PICs. Details of the specific HIES used for each country are presented in Appendix 2. As described in Chapter 1, under 'dietary intake', a cleaning protocol was applied to primary HIES data (Sharp, Troubat et al. in press) to develop the PFCD, from which consumption estimates were derived. Population estimates, including source, are provided in Appendix 4. This method for calculating protein consumption was used for Cook Islands, Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Niue, Palau, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

The PFCD includes information on protein per capita per day for each food item (COICOP code) consumed by the members of each household. The calculation process involved the following steps:

1. Estimation of total protein consumption (g) per capita per day for each food group within the household.

2. This quantity was then divided by 1000 and multiplied by 365 to obtain the total consumption of protein in kilograms per year for each food group within a particular household.

Finally, the weighted average total protein consumption for each food group was calculated for each country. It should be noted that food consumed away from home may not be included in the calculations due to lack of quantity data. However, food away from home represents a negligible proportion of consumption so discounting it would not meaningfully influence results.

Consumption data were not available for either Papua New Guinea or Fiji. Comparable estimates were derived using FAOSTAT production data (https://www.fao.org/faostat/en/#data) and net import (imports minus exports) data from the Pacific Food Trade Database (Brewer and Andrew 2023). From each database, food and beverage commodities for Fiji and PNG were classed following the groupings used for the other 12 PICs. The commodity definitions do not correlate, precisely, between databases, however, it is assumed that the dominant commodities, in terms of volume, were correctly attributed. For Papua New Guinea and Fiji, the specific foods within each food group are defined in Appendix 5 (FAOSTAT) and Appendix 6 (PFTD).

Net import and production estimates of protein for Papua New Guinea and Fiji were calculated in terms of kilograms per capita per annum. Total per capita protein consumption for each of the food groups for PNG and Fiji was then calculated using the aggregated protein (grams/kilograms) estimate presented in Chapter 3 below.

Importantly, the derived estimates for Papua New Guinea and Fiji are not as robust as estimates for the other countries because edible portion is not controlled for. However, apart from fish and certain cuts of beef and pork, edible portion is likely to comprise the vast majority of the total weight available for consumption. Similarly, domestically processed foods are not included in FAOSTAT production data. The population estimates used for calculating per capita consumption were derived from the Pacific Data Hub (https://pacificdata.org/population-dashboard) using 2018 data and are 8,558,701 for Papua New Guinea and 887,394 for Fiji.

Both FAOSTAT and the PFTD have some data limitations, requiring the use of additional data sources to complete analyses. The PFTD includes all food groups except ‘tuna’ and ‘all other foods’. Tuna is excluded due to complexities of including transhipment and foreign fishing fleet harvest which are not necessarily reported in trade data. Some analysis of tuna imports is presented in the assessment of imports relative to production (section 4 below) but excluded here. Tuna imports, except for those outlined in section 4 of this chapter, are marginal because most tuna consumption is derived from domestic production.

FAOSTAT production data include only beef, chicken, pork, other animal-sourced foods, cereals and their products, vegetables, roots and tubers, and pulses, seeds and nuts (Appendix 5). Given inadequate data on production (harvest) of aquatic foods for Fiji and Papua New Guinea, estimates for the included aquatic food groups (groups 1-5) were taken from Bell, Sharp et al. (2019) and a recent assessment of fish production for the region (Gillett and Fong 2023). Specifically, per capita consumption of reef and coastal fish was calculated from Gillett and Fong (2023) by combining 'coastal commercial', 'coastal subsistence', 'freshwater', and 'aquaculture', harvest estimates from Tables 8-4 and 14-5 and dividing by 2021 Pacific Data Hub population estimates for 2021 (Fiji = 898,402; Papua New Guinea = 9,122,994). Tuna & pelagic fish includes 'offshore local', from the same tables in Gillett and Fong (2023), with the same population estimates used to derive an estimate of per capita availability. 'Offshore local' can include tuna for export which was not possible to differentiate from tuna for consumption. Per capita consumption of canned fish was calculated using the per capita canned fish consumption estimates provided in Table 1 of Bell, Sharp et al. (2019). These per capita estimates for the three aquatic food groups were then multiplied by the estimated protein fraction (see Table 11 below) to derive a per capita protein consumption estimate.

Figure 3 Tuna entering the local market during transhipment in Honiara, Solomon Islands. Image supplied by T. Brewer.

Results & Discussion

Tuna and other pelagic fish currently contribute a minor portion of total protein consumption across the region (Table 6). These estimates are likely to be lower than previous estimates because they control for edible portion for each specific food (COICOP). Edible portion of fish is around 60% but varies between species. Canned fish similarly provides only a small portion of protein intake across countries. These protein consumption estimates highlight the potential to significantly increase consumption of tuna in the region to compensate for expected shortfalls due to declining coastal productivity and population growth, among other factors. Reef and coastal fish provide significant per capita quantities of protein in some countries including Fiji, Marshall Islands and Palau. Extrapolation of these estimates to future requirements, including total fish quantity, are presented in Chapter 5.

The food group that provides the greatest quantity of protein to Pacific diets is cereals and their products, reflecting the multi-decadal transition to increased rice and wheat consumption (Brewer, Andrew et al. 2023) through imports. Chicken is also a major source of protein across most countries. Based on the data presented here, protein consumption is, on average, sufficient across PICs in the year HIES data were collected (Appendix 2). However, stark disparities among populations within countries in factors such as wealth (FAO and University of Wollongong 2023) show significant variation in access to, and consumption of, particular food types which would influence protein consumption. Additionally, a large portion of the protein is derived from less desirable sources including rice and

wheat instead of root crops and from 'all other foods', which includes numerous highly-processed foods containing high levels of salt, fats and sugar.

The supplementary estimates used for both Papua New Guinea and Fiji generally sit within the range of highest to lowest estimates across countries for each of the food groups. However, some estimates for Fiji are higher than expected, including reef and coastal fish, and cereals and their products. Controlling edible portion for reef and coastal fish, assuming 60% recovery, would reduce the estimate from 8.16 to 4.89 kilograms of protein per capita per annum for Fiji, which is better aligned with estimates in other countries. Fiji has a flour mill and is a significant consumer of both wheat and rice, so the estimate of 25.46 kilograms per capita per annum is plausible. The high estimate of pulses, seeds, and grains for Papua New Guinea could be a function of the significant coconut industry, much of which is refined to copra oil for export, rather than eaten (Appendix 5). An additional factor to consider with the supplementary estimates is that they do not control for imports and production for tourism and other non-resident consumption, and so do not reflect local consumption as well as HIES data which uses household surveys. When consumption estimates are derived from both the Papua New Guinea and Fiji HIES data these estimates should be updated so they are standardised with other PICs.

Table 6 National protein consumption (kilograms p.c./year) across food groups for 14 Pacific Island countries (calculated from HIES data excluding food consumed away from home).

Country	Cook Islands	Fiji	FSM	Kiribati	Marshall Islands	Nauru	Niue	Palau	Papua New Guinea	Samoa	Solomon Islands	Tonga	Tuvalu	Vanuatu
Reef & coastal fish	0.67	8.16**	4.91	5.56	10.36	2.26	0.24	10.66	1.63**	0.42	3.07	0.18	2.65	2.47
Tuna & other pelagic fish	1.74	2.80**	2.68	3.40	1.28	9.18	0.78	1.47	4.35**	0.16	1.31	0.29	4.07	0.71
Composite fish	2.20	0.05#	2.23	2.36	0.05	0.16	2.11	2.31	0.00#	1.79	3.80	4.07	0.36	0.04
Canned fish	0.54	1.88*	3.79	0.69	1.24	0.31	2.01	1.03	0.40*	1.88	0.83	0.64	0.85	1.34
Invertebrates	0.28	^	0.46	1.10	0.22	0.06	0.48	0.25	^	0.12	1.56	0.95	1.37	0.48
Chicken	9.20	9.59#	3.26	0.85	5.94	3.86	9.08	6.70	0.53#	6.09	0.23	6.86	4.41	1.94
Beef	1.09	1.81#	0.21	0.04	0.54	0.76	1.11	1.37	0.27#	0.35	0.04	0.69	0.01	1.74
Pork	2.51	1.26#	1.44	0.18	0.46	0.11	0.58	1.78	2.31#	0.44	0.11	0.25	1.57	0.77
Processed and canned meat	2.14	0.08#	2.07	1.17	2.12	1.92	4.35	1.25	0.08#	0.68	0.13	1.91	0.90	0.26
Other animal sourced food	2.52	7.36#	2.14	0.48	0.81	3.15	3.41	1.68	7.72#	2.11	0.12	2.89	2.92	0.73
Vegetables, roots and tubers	1.08	5.71#	0.84	0.39	0.17	0.19	1.81	1.17	6.20#	2.38	5.20	3.76	0.20	4.94
Cereals and their products	4.97	25.46#	10.05	11.17	10.67	9.63	4.66	8.56	4.53#	5.00	5.29	5.54	7.16	6.56
Pulses, seeds and grains	1.04	4.92#	0.65	0.51	0.59	0.17	0.30	0.46	22.97#	1.84	2.14	0.55	1.98	1.32
Composite meals	0.75	n.a.	0.10	0.21	0.53	0.34	0.43	0.96	n.a.	0.52	0.41	0.22	0.03	1.46
All other foods	2.48	n.a.	3.51	1.37	2.25	1.83	2.48	3.76	n.a.	2.87	0.90	2.18	2.03	2.41
Total Protein (kilograms p.c./year)	33.23	n.a.	38.33	29.48	37.21	33.93	33.84	43.40	n.a.	26.67	25.14	31.00	30.52	27.19

* Estimates derived from Bell, Sharp et al. (2019).

**Estimates are based on capture, derived from Gillett and Fong (2023), Tables 8-4 and 14-5. For both Fiji and Papua New Guinea 'Reef fish' includes 'coastal commercial', 'coastal subsistence', 'freshwater', and 'aquaculture', and 'Tuna & pelagic fish' includes 'offshore local', from the tables.

Estimates derived from Pacific Food Trade Database and FAOSTAT using approach described above in text.

^ Gillett and Fong (2023) did not include independent estimates of invertebrates harvest so it is assumed all invertebrates are included in 'coastal subsistence'. However, not all invertebrates are harvested for subsistence purposes so there will inevitably some differences in estimates and actual consumption. B êche-de-mer and trochus, for example, are primarily exported although trochus meat may be consumed locally.

c. Differences in coastal-inland protein per capita consumption per country by food type

Except for Papua New Guinea and Fiji, the vast majority of the population of the Pacific Island countries in this study resides in close proximity to the coast (Figure 4). Therefore, for most countries, the influence of household location relative to the coastline is unlikely to have significant impact on dietary composition. Inland populations of both Papua New Guinea and Fiji, however, are likely to have different dietary profiles to populations living closer to the coast (Figure 4). Georeferenced HIES food acquisition data do not exist for either of these countries, so it is not possible to analyse differences in protein intake between inland and coastal populations. We, assume distance from the coast to be relatively benign in influencing seafood consumption for those countries where data are available. However, it is likely that inland populations in Melanesia consume more terrestrial meat relative to coastal populations.

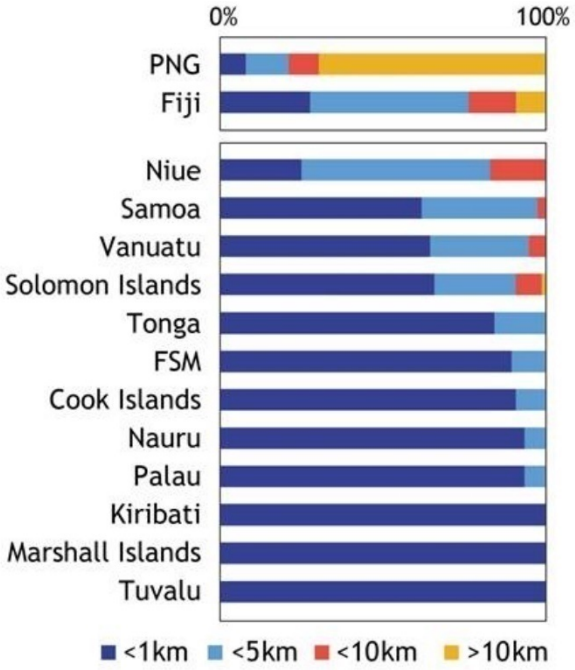

Figure 4 Percentage of PIC populations living within defined distances from the coastline. Adapted from Andrew, Bright et al. (2019)**.**

d. Differences in urban-rural protein consumption per capita per country by food type

Background

The Pacific Island region is extremely heterogenous, both between countries and within countries. It is, therefore, essential to understand intra-country variation when considering food security and nutrition in the context of climate change. Broader variation stems from island geomorphology, with atolls and high islands having different capacities for food production. Similarly, coastal fisheries productivity is highly variable, depending on latitude and extent of coral reefs and other coastal habitats, among other factors.

A rural or urban lifestyle is a significant factor in determining both dietary composition and non-communicable disease outcomes across the region (FAO 2021). While both rural and urban populations in the Pacific experience significant malnutrition, people in rural settings tend to have greater access to domestically-produced agricultural products and aquatic foods, including fish. A major hurdle to ensuring future food security is ensuring affordable, nutritious food, including tuna, is available in urban settings. Here, we compare per capita consumption of protein derived from the food groups used in rural and urban settings across countries by presenting urban consumption, rural consumption, and a comparison of the two.

Methods

HIES data identify whether households are in an urban or rural setting, allowing separation of consumption data into the two categories. However, due to small sample sizes, HIES data do not differentiate between rural and urban populations for two countries; Nauru and Niue. As with section 3a, current HIES data are not available within the SPC microdata archive, so these , together with Papua New Guinea and Fiji, are not included here. Following methods used in section 3a, we present protein consumption (kilograms p.c./year) estimates for both rural and urban populations in the other ten countries. We also compare the two different estimates, as the proportion of urban consumption compared to rural consumption, computed by dividing urban consumption by rural consumption.

Results and Discussion

Dominant sources of protein in urban diets vary significantly among countries (Table 7). Tuna and other pelagic fish currently contribute marginally to total protein intake, as does canned fish. Chicken is the dominant source of animal protein in urban areas across the region, except for Kiribati, Palau, and Solomon Islands. Urban populations in FSM, Kiribati and Solomon Islands consume more protein from aquatic foods than all other animal-sourced foods. Cereals and their products (e.g., baked goods, rice, other wheat products) provide more dietary protein to urban populations than any other food group.

Populations in rural areas tend to consume more protein from reef and coastal fish than tuna and other pelagic fish (Table 8). Chicken-based protein consumption varies significantly across rural populations (Table 8). Dietary protein from beef and pork is negligible in rural areas in most countries. – interesting – given the prevalence of pigs in rural communities.

Table 7 Protein consumption (kilograms p.c./year) by urban populations in year of HIES (calculated excluding food consumed away from home).

Country	Cook Islands	FSM	Kiribati	Marshall Islands	Palau	Samoa	Solomon Islands	Tonga	Tuvalu	Vanuatu
Reef & coastal fish	0.11	4.03	3.29	6.22	12.15	0.39	0.91	0.05	0.85	1.23
Tuna & pelagic fish	0.93	3.19	4.57	1.44	1.62	0.15	0.84	0.35	3.07	1.77
Composite fish	1.03	1.44	1.17	0.01	2.09	0.98	2.15	4.19	0.18	0.01
Canned fish	0.52	3.85	0.77	1.11	0.99	1.58	1.70	0.50	0.92	1.92
Invertebrates	0.27	0.16	0.26	0.10	0.23	0.08	0.44	0.72	0.01	0.20
Chicken	10.46	4.79	1.33	6.90	6.83	6.41	0.71	7.71	5.17	4.75
Beef	1.28	0.40	0.06	0.70	1.40	0.42	0.19	0.83	0.02	2.47

Pork	2.53	1.29	0.25	0.33	2.03	0.34	0.09	0.26	1.03	0.23
Processed and canned meat	2.18	2.77	1.50	2.22	1.31	1.00	0.27	2.08	1.18	0.56
Other animal sourced food	2.66	2.72	0.60	0.91	1.71	3.23	0.13	3.26	2.14	1.55
Vegetables, roots and tubers	0.95	0.63	0.40	0.20	1.20	1.47	2.23	2.80	0.21	3.94
Cereals and their products	4.55	10.71	13.21	10.96	8.37	6.01	9.01	5.44	8.14	8.62
Pulses, seeds and grains	0.37	0.62	0.41	0.45	0.47	0.68	0.91	0.66	0.18	0.72
Composite meals	0.86	0.17	0.29	0.56	1.13	1.02	0.66	0.48	0.03	1.92
All other foods	2.41	3.88	1.43	2.24	4.18	2.60	1.09	2.29	1.50	2.85
Total aquatic foods	2.86	12.67	10.06	8.88	17.09	3.19	6.03	5.81	5.03	5.13
All other animal-sourced foods	19.12	11.98	3.73	11.06	13.27	11.40	1.39	14.14	9.52	9.56
Total	31.12	40.65	29.52	34.35	45.70	26.37	21.32	31.62	24.60	32.74

Table 8 Protein consumption (kilograms p.c./year) by rural populations in year of HIES (calculated excluding food consumed away from home).

Country	**Cook Islands**	**FSM**	**Kiribati**	**Marshall Islands**	**Palau**	**Samoa**	**Solomon Islands**	**Tonga**	**Tuvalu**	**Vanuatu**
Reef & coastal fish	2.01	5.43	8.16	22.77	4.12	0.43	3.56	0.22	4.60	2.91
Tuna & pelagic fish	3.71	2.37	2.05	0.78	0.83	0.16	1.42	0.27	5.16	0.34
Composite fish	5.02	2.70	3.71	0.19	3.30	1.98	4.17	4.04	0.56	0.05
Canned fish	0.59	3.76	0.60	1.64	1.16	1.95	0.64	0.69	0.78	1.13
Invertebrates	0.32	0.64	2.06	0.57	0.29	0.13	1.82	1.02	2.83	0.58
Chicken	6.18	2.36	0.30	3.07	6.11	6.01	0.12	6.61	3.60	0.94
Beef	0.63	0.09	0.02	0.05	1.26	0.34	0.01	0.65	0.00	1.48
Pork	2.45	1.53	0.09	0.86	0.70	0.47	0.11	0.25	2.16	0.96
Processed and canned meat	2.04	1.65	0.80	1.80	0.99	0.61	0.10	1.86	0.61	0.16
Other animal sourced food	2.20	1.80	0.35	0.50	1.55	1.86	0.12	2.78	3.76	0.44
Vegetables, roots and tubers	1.39	0.96	0.38	0.09	1.01	2.59	5.87	4.04	0.18	5.29
Cereals and their products	5.98	9.66	8.85	9.78	9.41	4.77	4.45	5.57	6.10	5.82
Pulses, seeds and grains	2.65	0.67	0.64	1.00	0.43	2.10	2.42	0.52	3.92	1.54
Composite meals	0.49	0.06	0.13	0.42	0.20	0.41	0.35	0.15	0.04	1.30
All other foods	2.66	3.29	1.30	2.30	1.91	2.94	0.85	2.15	2.59	2.26
Total aquatic foods	11.65	14.90	16.59	25.95	9.70	4.65	11.61	6.23	13.94	5.01
All other animal-sourced foods	13.50	7.42	1.56	6.27	10.60	9.28	0.46	12.15	10.13	3.98
Total	38.32	36.96	29.44	45.81	33.26	26.74	26.01	30.82	36.91	25.20

The relative consumption of protein between rural and urban populations for each food type reveals significant disparities (Table 9). Rural populations, except in Palau and Vanuatu, consume more aquatic protein than their urban counterparts. On the other hand, with the exception of Tuvalu, rural populations in all PICs consume less protein from all other animal-sourced foods than their urban counterparts. Rural populations also consume less protein from cereals and their products compared

to their urban counterparts. On a per capita basis, consumption of chicken, and canned and processed meat, is consistently higher in urban areas. Relatively less tuna and other pelagic fish is consumed in urban areas in Cook Islands, Samoa, Solomon Islands and Tuvalu. Accessibility and a higher unit price for tuna and other pelagic fish, compared to reef and coastal fish, in urban areas in Cook Islands, Solomon Islands and Tuvalu is a possible explanation for this (see Chapter 4).

Table 9 Urban per capita protein consumption per food group relative to rural per capita consumption. Low scores (<1) represent relative protein poverty in urban areas, whereas high scores (>1) represent relative protein poverty in rural settings. For example, a score of 0.057 (Reef and coastal fish in Cook Islands) means that the per capita urban consumption is 5.7% of the quantity that the rural population consumes. The difference in the total is instructive for overall rural/urban disparity in protein consumption.

Country	Cook Islands	FSM	Kiribati	Marshall Islands	Palau	Samoa	Solomon Islands	Tonga	Tuvalu	Vanuatu
Reef & coastal fish	0.06	0.74	0.40	0.27	2.95	0.91	0.26	0.22	0.19	0.42
Tuna & pelagic fish	0.25	1.34	2.23	1.84	1.96	0.94	0.59	1.28	0.59	5.27
Composite fish	0.20	0.53	0.32	0.05	0.63	0.50	0.51	1.04	0.31	0.25
Canned fish	0.87	1.02	1.27	0.68	0.85	0.81	2.67	0.73	1.18	1.69
Invertebrates	0.86	0.26	0.12	0.18	0.81	0.64	0.24	0.71	0.00	0.35
Chicken	1.69	2.03	4.44	2.25	1.12	1.07	6.18	1.17	1.43	5.07
Beef	2.04	4.37	3.10	15.09	1.11	1.25	15.14	1.27	-	1.67
Pork	1.03	0.85	2.65	0.38	2.90	0.73	0.80	1.04	0.47	0.24
Processed and canned meat	1.07	1.67	1.88	1.24	1.32	1.65	2.78	1.12	1.93	3.52
Other animal sourced food	1.21	1.52	1.72	1.81	1.10	1.74	1.10	1.17	0.57	3.52
Vegetables, roots and tubers	0.69	0.66	1.05	2.12	1.19	0.57	0.38	0.69	1.13	0.74
Cereals and their products	0.76	1.11	1.49	1.12	0.89	1.26	2.03	0.97	1.33	1.48
Pulses, seeds and grains	0.14	0.93	0.64	0.45	1.09	0.33	0.37	1.28	0.04	0.47
Composite meals	1.75	2.85	2.24	1.33	5.57	2.51	1.90	3.26	0.75	1.47
All other foods	0.91	1.18	1.10	0.97	2.19	0.89	1.27	1.06	0.58	1.26
Total aquatic foods	0.25	0.85	0.61	0.34	1.76	0.69	0.52	0.93	0.36	1.02
All other animal-sourced foods	1.42	1.61	2.40	1.76	1.25	1.23	3.04	1.16	0.94	2.40
Total	0.81	1.10	1.00	0.75	1.37	0.99	0.82	1.03	0.67	1.30

e. Sources of protein by imports and domestic production per country

Background

Domestic production and imports vary significantly across countries and food types. Processed foods, rice and wheat, and meat are primarily imported, whereas root crops and reef and coastal fish trade is negligible; most domestic production is consumed domestically. For some food groups, it is not

possible to ascertain the proportion of total consumption derived from imports primarily due to the absence of production data.

Methods

Standardised and current estimates of production and imports were obtained using 2018 data from FAOSTAT and PFTD (Brewer and Andrew 2023) to calculate the proportion of available chicken, beef, pork, other animal sourced foods, vegetables, roots and tubers, cereals and their products, pulses seeds and nuts that are typically imported. Imported frozen fish and canned tuna are addressed separately. Estimates for canned and other fish are derived from Bell, Sharp et al. (2019) because production estimates are not available in FAOSTAT. Estimates of the amount of available frozen fish imported are derived from the PFTD (Brewer and Andrew 2023).

Caution is required in interpretating these results as there is low confidence in the completeness and accuracy of FAOSTAT production data and the completeness of the PFTD data, particularly for fish. FAOSTAT does not include comprehensive fisheries data, and neither data source is comprehensively linked to the PNDB so total weight is used instead of the protein contribution. Additionally, FAOSTAT does not include data for Federated States of Micronesia and is very limited for Marshall Islands, so both were excluded from analysis. Pacific production data are severely limited and warrant significant investment to facilitate comprehensive analyses. However, the data used here are currently the best available sources for conducting this analysis.

Results and Discussion

With the exception of domestic fisheries and other productio such as fruits, vegetables and root crops, Pacific Island countries and particularly smaller atoll countries, are highly dependent on food imports (Table 10). Beef and chicken are primarily imported, with significant variation between countries, but most pork is domestically produced. Cereals and their products are almost entirely imported, with Fiji being a major regional re-trade hub. Negligible pulses, seeds and grains are imported. 'All other foods' (see Appendix 5 & 6 for specific foods in this food group) should be interpreted with caution due to the differences between commodities in FAOSTAT and the PFTD.

The vast majority of imported frozen fish is tuna or fish 'not elsewhere specified' (Appendix 7). It is difficult to determine whether this fish enters the local food system and is consumed domestically or also comprises tuna that is landed from locally-based fishing operations prior to export. For example, the large quantities recorded as imports for Marshall Islands likely largely comprise fish that is recorded in customs prior to export. Frozen fish imported to Kiribati is, however, likely to be predominantly for local consumption. Therefore, these estimates should be interpreted with caution.

Generally, the estimates presented in Table 10 are likely to be robust for the following food groups: meats, cereals and their products, and pulses, seeds and grains. These groups include limited processing so are more likely to be captured in FAOSTAT data and unambiguously represented in both FAOSTAT data and PFTD data. Aquatic foods including tuna, other animal-sourced foods, and all other foods are less reliable. However, canned fish estimates are likely to be robust due to limited domestic canning operations, except in Fiji, Papua New Guinea and Solomon Islands (Bell, Sharp et al. 2019) and ease of collecting data on canned fish.

While partially informative, this analysis underscores the need for investment in data collection for two reasons. First, improved data on agricultural products and the extent of local processing would greatly improve domestic production estimates, thereby enhancing national assessments for food security and nutrition. Second, improved tuna data, covering the various stages in value chains from harvest through to consumption, would enable clearer guidance on current production for domestic consumption and the potential for increasing this consumption.

Table 10 Percentage of total availability of each food type (domestic production and net imports) comprised of net imports. Negative values are explained by significant export of cash crops, among other food production types. For example, Vanuatu exports beef, and Fiji has a significant food-processing industry and exports products from this industry throughout the region.

Country	Beef	Chicken	Pork	Other animal sourced foods	Vegetables, roots and tubers	Cereals and their products	Pulses, seeds and grains	All other foods	Canned tuna/other fish*	Frozen fish (kg p.c./ yr.)**
Cook Islands	99	99	28	96	38	100	0	79	100/100	1.5
FSM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100/100	4.2
Fiji	40	11	12	53	24	97	38	-27	32/54	8.6
Kiribati	100	63	4	85	5	100	0	20	100/100	10.4
Marshall Islands	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100/100	55.8
Nauru	35	79	7	60	4	71	0	47	100/100	1.8
Niue	100	94	9	87	90	100	0	40	100/100	12.4
Palau	99	98	78	98	33	100	2	90	100/100	2.5
Papua New Guinea	62	69	5	6	1	96	1	-13	61/27	0.9
Samoa	49	98	36	96	11	100	-1	22	100/100	4.8
Solomon Islands	39	96	8	77	1	97	1	-13	9/100	3.9
Tonga	68	98	13	92	-4	100	-1	39	100/100	8.3
Tuvalu	n.d.	92	5	79	16	100	0	56	100/100	6.9
Vanuatu	-4	87	7	70	4	95	0	-11	100/100	0.0

n.d. = no data

*2014 estimates derived from Bell, Sharp et al. (2019). Note that only Fiji, Papua New Guinea, and Solomon Islands have commercial canning operations so values of both canned tuna and other fish are 100% for other PICs.

**Frozen fish imports are 2018 estimates from the Pacific Food Trade Database (Brewer and Andrew 2023). Net imports are not calculated due to the significant export of tuna, which comprises the majority of fish trade. The list of frozen fish, and their tonnage is shown in Appendix 7, noting it is dominated by tuna.

CHAPTER 3. NUTRITIONAL VALUE OF FOOD TYPES

a. Background

The food groups presented in Chapter 2 tend to have greater nutritional similarity within groups compared to between groups. The groups contain a large diversity of specific foods with different nutrient profiles. The resulting nutritional values of the food groups consumed will be dependent on the proportion of each specific food type consumed, which will vary markedly across countries subject to attributes, such as cultural preference, affluence, access.

Information on hormones, antibiotics and other additives in imported foods is poorly documented in the Pacific, with different countries having different requirements. Similarly, additives included during domestic processing are likely to be country-specific. It is therefore beyond the scope of this study to present specific details (see Appendix 1). However, it is worth noting that bulk carbohydrate imports including rice and wheat, are generally fortified.

b. Methods

Here we present the mean nutritional values of all foods within each food group. The numbers are derived from the Pacific Nutrient Database (PNDB) (SPC Statistics for Development Division 2020). The PNDB does not include exhaustive nutrient profiles for all foods. We therefore present commonly measured nutrients that also contained the most complete data within the database. Farmery, Scott et al. (2020) provides a more complete set of nutrients for seafood in Pacific diets. The PNDB includes the nutrient information for 100 g of each food item (COICOP code). The data presented in Table 11 are calculated by taking the average of the nutrients for all the COICOP codes that belong to each specific food group. A complete list of all foods within each food group is shown in Appendix 3.

c. Results and Discussion

Nutrient composition varies significantly across the assessed food groups. Tuna and other pelagic fish are reasonably high in energy (131.4 kcal, Table 11), while tuna alone have 164 kcal of energy per 100 g serve (Farmery, Scott et al. 2020). Meats, other animal-sourced foods, cereals and grains, and pulses nuts and seeds are more energy dense. With respect to protein, tuna and other pelagic fish is the most protein-rich food groups (Table 11). Tuna alone, is estimated at 25 g per 100 g serve for the species commonly consumed in the Pacific (Farmery, Scott et al. 2020). Tuna is low in fats compared to terrestrial meats and high in omega 3 fatty acids. Canned fish is high in energy, has a high protein content, and is a rich source of calcium. Tuna has a similar iron content to other meats and is higher than other finfish. Cereals, pulses and grains are higher in iron, however, heme iron derived from animal-based foods is more bioavailable. Canned fish is both a rich source of iron and vitamin B12.

Both fresh and canned tuna can contain high concentrations of mercury (Kumar 2018). Consumption of foods with high concentrations of methylmercury by pregnant and lactating women can affect the neurological development of children (Choy, Popp et al. 2009). However, increasing consumption of the more commonly consumed tuna species in the Pacific (skipjack and yellowfin) is not expected to cause mercury poisoning because at the size these fish are consumed in the region they have relatively low mercury concentrations. Bell, Allain et al. (2015) estimate that even if the entire fish consumption of 35 kg per person per year recommended by SPC (2008) was comprised only of these species, the limits for mercury ingestion recommended by the United Nations Environment Programme (UN Environment 2019) would not be exceeded.

Table 11 Mean nutritional values per 100 g serve for key macro- and micro-nutrients in Pacific diets across food groups used in this study.

	Energy (kcal)	Protein (g)	Carbohydrates (g)	Fats (g)	Calcium (mg)	Iron (mg)	Vitamin A (RE) (Âµg)	Vitamin B12 (Âµg)
Reef and coastal fish	106.7	21.3	0.2	2.3	15.7	0.7	24.7	1.5
Composite fish	152.0	27.9	0.5	4.3	68.7	1.1	22.7	5.0
Tuna and pelagic fish	131.4	23.2	0.2	4.2	88.1	1.5	46.3	1.8
Invertebrates	95.9	16.8	1.6	2.5	130.4	2.3	30.0	5.2
Canned fish	180.6	20.7	2.0	9.9	132.5	3.6	35.8	5.9
Beef	200.3	23.7	0.1	11.7	6.6	2.3	175.8	2.8
Chicken	204.1	21.2	0.1	13.2	11.5	1.4	304.3	2.1
Pork	187.4	21.8	0.5	10.9	11.3	1.9	87.1	1.3
Processed meat and canned meat	226.8	15.7	3.5	16.5	23.3	1.7	474.5	1.2
Other animal sourced food	255.7	14.3	7.2	18.8	154.9	1.2	89.4	1.4
Vegetables, roots and tubers	60.0	2.2	10.4	0.4	51.8	1.2	183.9	0.0
Cereals and their products	304.2	8.4	55.3	4.5	71.2	3.3	8.2	0.1
Pulses, seeds and grains	338.6	10.9	11.1	26.4	66.7	2.4	4.8	0.0
Composite meals	154.5	8.9	14.4	6.5	39.6	0.9	71.0	0.4
All other foods	208.7	3.7	25.9	8.4	88.0	3.5	113.7	0.1

** See Appendix 3 for specific foods within each group. The mean is the average of all foods within each group.

Âµg = micrograms

CHAPTER 4. COST OF FOOD TYPES

a. Background

Acquisition of food and beverages represents a large portion of total household expenditure across the Pacific (Table 5). Affordability will, therefore, have a significant influence on household consumption patterns. Additionally, limited awareness of the nutritional content of foods and what constitutes a healthy diet, as for example described by the Public Health Division of the Pacific Community (2017), means that some more expensive foods are likely to be avoided despite containing key nutrients for NCD prevention. Similarly, the rise of unhealthy food consumption, including pot noodles, soft drinks and other highly-processed foods offer longer shelf-life, convenience and affordability. Shifting consumption patterns to these mostly imported processed foods are contributing to diet-related NCDs and malnutrition.

If demand for reef fish by growing populations is maintained or increses as supply diminishes, due to unsustainable exploitation and climate impacts, it is expected that the unit price of reef fish will increase relative to other foods where supply is not constrained. There is not yet regionally representative evidence of this, however, there is evidence of significant reef fish price increases during COVID-19 in Solomon Islands (Farrell, Bogard et al. 2023). Imported meat, primarily chicken, has partially filled this gap (Brewer, Andrew et al. 2023), as has the artisanal pelagic fishery and the bycatch available at ports used by commercial fishing fleets. PICs are unable to control supply and pricing of imports, so over-dependence on them will increase food security vulnerability. Increasing consumption of tuna and other pelagic fish as populations grow and supply from coastal fisheries diminishes, is preferable.

b. Methods

The Pacific Food Consumption Database contains information on each food item (COICOP code) consumed by the members of a household, including the quantity of food (in grams) and its corresponding value in the local currency. To determine the amount in USD expended for each food item of each household, the relevant exchange rates for the specific month and year of the household's survey are applied (Appendix 8). Subsequently, the price per gram is calculated by dividing the amount in USD by the quantity. It is important to note that food consumed away from home is excluded from the analysis, as it has been from other sections of this report, due a lack of data.

To provide a more comprehensive view, the weighted average of the price per gram is calculated for each food group in each country and then multiplied by 1000 to obtain the price per kilogram. Here we present pricing ($US/kg) for all countries, except Papua New Guinea and Fiji, across all of the included food groups. As stated previously, cleaned acquisition and consumption data are not yet available for Papua New Guinea or Fiji. It is important to note that comparison between countries should not be made because of the variation in the timing of the HIES (Appendix 2). Instead, relative pricing between food groups is a more robust analytic framing. We also present an estimate of the relative cost of tuna and other pelagic fish in urban areas relative to rural areas where data are available.

c. Results and Discussion

Complete results on unit prices of food groups within PICs are tabulated below (Table 12). Here we focus on a comparison of fresh tuna and canned fish (which is mostly tuna; see Appendix 3) with other aquatic foods and meat. For the nationally aggregated data, tuna and other pelagics are marginally more expensive than reef fish across most countries. Tuna is comparably priced, or cheaper, than both beef and pork across countries. In Vanuatu, beef is significantly cheaper, which is likely due to the presence of a beef grazing industry. Price differences between chicken and tuna and other pelagic fish

are highly variable across countries. Other processed and canned meats are significantly more expensive than tuna and other pelagic fish in all countries except Federated States of Micronesia (FSM). In most countries, tuna and pelagic fish is cheaper in rural areas (Table 12), however, the differences are marginal and could partly be explained by a small sample size, price variation between species and time of survey.

Figure 5 Transhipment of tuna from a purse seine vessel at Honiara, Solomon Islands. Image supplied T. Brewer.

Canned fish is marginally more expensive than fresh tuna and other pelagic fish across the region, although the relative pricing is highly variable across countries. When making this comparison, it is important to note the nutritional differences between these two groups and the long shelf-life of canned fish, which is a major advantage in the Pacific where fish preservation is difficult. Canned fish is similarly priced to other meats and cheaper than processed and canned meats across the countries. Due to the absence of food price data for Papua New Guinea and Fiji, which both have tuna-processing facilities, it is difficult to confidently ascertain whether presence of processing facilities has a significant impact on domestic canned fish prices.

The observed differences in relative pricing of food groups within, and between, countries can be attributed to a number of factors. First, as stated above, there is significant temporal variation in the timing of HIES surveys. Second, domestic production and demand play a significant role in the purchase price of foods. Third, remoteness and associated cost of shipping significantly impacts the price of imports. Fourth, events outside the region, such as the Asian rice crisis and the war in Ukraine can have dramatic impact on wholesale pricing, so if such events occur during HIES years, prices will reflect these events. Finally, the effects of longer-term climate change and continuing climate variability (e.g., El Niño – Southern Oscillation), including impacts on sea surface temperature, air temperature and rainfall, can have dramatic impacts on domestic production including on projected tuna distributions and agricultural productivity (Bell, Senina et al. 2021, Taylor, McGregor et al. 2016). Similarly, weather events such as cyclones, which are expected to become more intense with increased global warming, can have dramatic localised negative impacts on inshore and terrestrial food production systems.

Table 12 Cost of food types ($US/kg) in year of HIES (Appendix 2).

	Reef fish	Composite fish	Tuna and pelagic fish	Invertebrates	Canned fish	Beef	Chicken	Pork	Processed meat and canned meat	Other animal sourced food	Vegetables, roots and tubers	Cereals and their products	Pulses, seeds and grains	Composite meals	Everything else	Tuna and pelagic fish**
Cook Islands	3.41	7.06	6.00	85.92	9.58	9.71	2.79	7.90	11.38	8.99	4.36	6.72	5.91	11.83	10.83	1.15
Fiji	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
FSM	2.79	2.19	2.49	2.61	2.14	2.59	3.12	2.54	2.41	2.15	1.77	3.27	2.33	2.87	2.81	0.99
Kiribati	1.63	2.38	2.01	4.49	4.63	9.85	4.90	6.68	6.38	8.29	4.44	2.10	1.75	10.93	83.71	n.d.
Marshall Islands	1.44	10.80	4.32	5.97	8.92	11.22	2.90	5.66	9.99	6.89	6.50	4.19	3.86	13.78	14.22	0.83
Nauru	1.96	6.06	3.83	12.62	9.70	52.94	4.14	14.06	12.10	10.56	5.79	7.32	7.13	11.15	10.07	n.d.
Niue	4.00	15.44	13.30	8.95	7.60	10.48	3.43	21.22	11.01	6.34	6.27	7.24	4.91	25.82	9.89	n.d.
Palau	2.59	4.26	3.57	8.08	7.21	7.61	2.91	4.74	8.11	4.61	3.64	3.97	7.05	10.47	6.96	0.81
Papua New Guinea	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Samoa	4.67	2.49	5.47	6.84	3.13	5.24	1.84	12.37	5.82	5.30	2.03	3.25	1.54	9.79	5.73	1.19
Solomon Islands	1.87	2.20	3.13	1.45	6.20	11.25	7.08	19.71	8.44	9.17	1.09	3.75	6.13	2.00	60.84	1.31
Tonga	12.12	2.92	4.47	8.34	5.10	6.57	2.43	42.47	13.73	6.17	1.72	2.62	5.50	9.07	3.63	4.80
Tuvalu	2.74	5.33	2.54	4.56	8.70	6.77	3.14	4.32	9.21	7.59	2.71	4.23	24.55	6.62	8.53	1.37
Vanuatu	2.64	6.96	4.18	2.83	4.75	3.13	5.48	3.19	9.39	5.71	1.26	2.44	0.87	1.40	17.44	n.d.

** Tuna and pelagic fish price per kg in urban areas relative to rural areas. Values >1 represent higher urban pricing. Values <1 represent cheaper urban pricing.

CHAPTER 5. FUTURE PROTEIN REQUIREMENTS

a. Chapter background

Most Pacific countries have rapidly-growing populations compared to the global average (https://pacificdata.org/population-dashboard). Over time, carrying capacity of domestic production systems has been exceeded and imports have increased dramatically, including for grains and cereals, meat, and highly-processed foods (Andrew, Allison et al. 2022, Brewer, Andrew et al. 2023). This significant shift has contributed to high incidences of non-communicable disease (NCDs). Looking forward, it is a regional aspiration to improve the nutritional quality of diets. For example, Pacific countries engaged with the 2021 UN Food Systems Summit to develop food systems pathways which articulate national ~~food systems~~ visions aligned with increased food and nutrition security. Overshadowing this aspiration of healthy and resilient food systems is the expected negative effects of climate change on both agriculture and fisheries (Bell, Taylor et al. 2016), including tuna stocks (Bell, Reid et al. 2013). A vital piece of the puzzle in planning for the future aspirations of the Pacific food system is estimating future food requirements given expected population changes.

There are several components to this analysis, including average weight of men, women and children in 2030 and 2050 for each country, the total number of men, women and children in each country in 2030 and 2050 and calculation of future dietary fish requirement based on populations, weights, and estimated protein fraction of fish. This analyses summarizes work completed under ACIAR project FIS/2018/155 and published as Kottage, Brewer et al. (submitted ms.). The structure of this chapter is divided into these three components.

b. Population estimates

Methods

Projected population estimates were obtained from the Pacific Data Hub. Total populations were tabulated initially and then supplemented with data on the proportion of children (<14years old) for both 2030 and 2050. Male and female populations in 2030 and 2050 were calculated as 50% of the proportion not classified as children because projections of the proportions of men and women are not available. We also note that the forecasts to 2050 are >25 years from now, so contain significant assumptions about continuity of current trends in population structures. For countries with small populations, in particular, the actual population and population structure in 2050 could be significantly different to current projections.

Papua New Guinea has a significant inland population, so assuming the entire population should obtain 50% of their dietary protein from fish is not plausible. Instead, we assume that it is the estimate of 21% of the population living within 5 km of the coastline from Andrew, Bright et al. (2019) that will require 50% of their dietary protein from fish. We do, however, assume the same national proportion of men, women, and children within the population sub-set. It is reasonable to assume that relatively less fish would be consumed further from the coast, so the 5 km threshold is relatively arbitrary. For reference, as estimated by Andrew, Bright et al. (2019), 8% of the population live within 1 km of the coast and 30% of the population live within 10 km of the coast. Therefore, the estimated tuna requirement for the coastal population of Papua New Guinea would vary dramatically depending on the chosen distance threshold.

Results and Discussion

Change in total population is predicted to vary significantly across countries (Table 13). Melanesian countries are expected to experience significant population growth through to 2050, and from relatively large current populations relative to historic baselines, compared to other countries in Polynesia and Micronesia. Both Samoa and Kiribati are also expected to experience significant

population growth. However, Cook Islands, Marshall Islands, Nauru, Niue, and Tuvalu are predicted to have relatively stable populations to 2050 and Federated States of Micronesia, Palau and Tonga are predicted to experience population declines largely due to immigration. Across most countries, as birth rate diminishes it is expected that the child population will diminish as a proportion of total population. Therefore, even with reduced population growth, protein demand will be heightened because adults have a higher average weight than children.

Table 13 Projected male, female, and child populations across countries in 2030 and 2050. For Papua New Guinea, the estimate is based on the population living within 5 km of the coast, which is estimated at 21% of the total population.

	2030 Population				2050 Population			
	Adult male	Adult female	Children (<14 yrs.)	Total	Adult male	Adult female	Children (<14 yrs.)	Total
Cook Islands	6,276	6,276	3,337	15,889	6,393	6,393	2,999	15,786
Fiji	345,368	345,368	230,245	920,980	365,108	365,108	218,117	948,333
Kiribati	47,933	47,933	43,070	138,935	65,465	65,465	50,917	181,848
Marshall Islands	18,354	18,354	17,275	53,983	18,886	18,886	14,689	52,460
FSM	37,810	37,810	30,887	106,507	38,480	38,480	21,707	98,667
Nauru	3,965	3,965	4,658	12,588	4,690	4,690	5,051	14,431
Niue	550	550	293	1,393	526	526	314	1,367
Palau	7,262	7,262	3,407	17,930	6,741	6,741	2,959	16,441
Papua New Guinea	727,413	727,413	818,339	2,273,165	1,077,688	1,077,688	1,014,295	3,169,671
Samoa	68,045	68,045	73,279	209,369	76,378	76,378	78,693	231,449
Solomon Islands	281,009	281,009	330,074	892,093	453,429	453,429	426,756	1,333,614
Tonga	33,554	33,554	30,150	97,257	34,058	34,058	25,194	93,310
Tuvalu	3,769	3,769	3,713	11,250	4,262	4,262	3,315	11,839
Vanuatu	121,672	121,672	119,856	363,200	185,461	185,461	137,191	508,113

c. Average weight of men, women, and children

Methods

We obtained the mean weight of men, women, and children using data from the Non-communicable disease Risk Factor Collaboration (NCD-RisC) database (https://www.ncdrisc.org/data-downloads.html), which holds the most globally-comprehensive data on body mass index and height, among other variables. Body weight data were not available so was calculated as Weight (kg) = Height(m)^2 * BMI. Calculations were done separately for men, women and children. For Papua New Guinea, we assume that BMI and height estimates for the population living within 10 km of the coast are the same as those for the whole population.

Although mean body weights are used, the long-term projection should be viewed with caution, primarily because of how rapidly body weights have increased throughout the region since the mid-1970s (Abarca-Gómez, Abdeen et al. 2017, FAO 2021, Figure 4). Additionally, birth rates, while high in some countries (consider footnoting those countries?), are declining across most of the region. If this trend continues, there will be proportionately less children (compared to adults) in the future

compared to current estimates. This has, however, been accounted for in the disaggregated projections derived from modelling by the SPC Statistics for Development Division.

Results and Discussion

Height and BMI estimates were used to calculate weight of men, women, and children across the 14 countries in this study (Table 14). Average weights of men vary significantly across countries, ranging from 67.56 kg in Papua New Guinea to 104.48 kg in Cook Islands. Men in Melanesian countries tend to have lower weights as a function of both smaller heights and lower BMI. While lower, variation in women and children's weights across countries tends to follow a similar pattern. Importantly, both BMI and average weights in both Polynesia and Micronesia are extremely high by global standards (Cassels 2006, Abarca-Gómez, Abdeen et al. 2017). Higher rates of obesity, linked to lifestyle and diet, are a major contributor to non-communicable disease in the region (FAO 2021).

Table 14 Mean height, body mass index (BMI) and weight of men, women and children in the 14 study countries.

	Men			**Women**			**Children (5-18 yrs) ~~average~~**		
	2019 Height (cm)	2016 BMI	Weight (kg)	2019 Height (cm)	2016 BMI	Weight (kg)	2019 Height (cm)	2016 BMI	Weight (kg)
Cook Islands	178.32	32.86	**104.48**	167.31	33.36	**93.39**	149.78	23.71	**53.18**
Fiji	173.98	26.81	**81.13**	164.28	29.00	**78.28**	146.11	19.34	**41.30**
Kiribati	170.09	29.17	**84.39**	161.04	31.30	**81.18**	144.36	21.73	**45.29**
Marshall Islands	165.26	29.08	**79.42**	154.76	30.67	**73.45**	139.40	20.99	**40.79**
FSM	169.57	28.34	**81.49**	159.66	31.53	**80.38**	141.99	21.00	**42.34**
Nauru	169.57	32.28	**92.83**	157.82	32.95	**82.06**	141.54	23.65	**47.38**
Niue	177.19	31.59	**99.18**	167.03	33.51	**93.49**	148.62	23.52	**51.96**
Palau	170.62	29.64	**86.28**	159.52	29.72	**75.62**	144.23	22.83	**47.49**
Papua New Guinea	163.10	25.40	**67.56**	156.89	26.01	**64.02**	139.34	20.69	**40.17**
Samoa	174.42	30.63	**93.18**	163.82	34.34	**92.15**	143.13	22.12	**45.31**
Solomon Islands	163.07	25.81	**68.63**	156.79	27.08	**66.56**	137.80	19.02	**36.12**
Tonga	175.11	30.72	**94.21**	166.08	34.01	**93.80**	148.01	22.63	**49.58**
Tuvalu	171.30	30.23	**88.71**	163.57	31.87	**85.27**	145.91	22.67	**48.25**
Vanuatu	168.29	25.71	**72.82**	160.48	26.97	**69.45**	141.79	20.05	**40.31**

d. Future fish consumption estimation

Methods

To estimate 2030 and 2050 fish consumption requirement based on 50% of dietary protein from fish (50% of 0.7 g per kg of body weight per day) we first calculated the protein requirement using body weight and population data. Total annual protein requirement (tonnes) for men women, and children in each country was calculated as:

$$Protein\ requirement_k = \frac{(^1/_2 \times daily\ protein\ requirement) \times Mean\ weight_k \times Cohort\ population_k \times 365}{1000000}$$

where $k = males, females, children$

Here, $^1/_2 \times daily\ protein\ requirement = ^1/_2 \times 0.7 = 0.35$ and divided by 1,000,000 to convert grams to tonnes.

To convert total protein requirements to be derived from tuna and other pelagic fish in 2030 and 2050 we used the average protein content of these fish (23.2%) from Table 11. The protein value for tuna and other pelagic fish was used, rather than other fish food groups, because it is assumed that tuna and other pelagic fish will comprise an increasing proportion of the fish in diets to 2050 and beyond. This series of calculations provides estimates of total tonnes of fish required in 2030 & 2050 to fulfill 50% of protein intake. We also present current (year of HIES) estimates of total fish consumption per capita for countries as a baseline. It is important to note that when projecting forward, the base tuna consumption varies among countries based on the year the HIES was conducted.

Results and Discussion

Protein required from fish, based on the population estimates (Table 13), body weight estimates (Table 14), and consumption of 0.35 grams (50% of 0.7g) of fish-based protein per kg of body weight per day, are outlined in Table 15. Significant variation between countries is a function of projected population size across men, women and children and estimated differences in the weight of men, women and children among countries. Importantly, this analysis assumes that current average body weight estimates will remain stable through the projected period.

Projections of total fish required by 2050, assuming average protein content of 23.2% for tuna and pelagic fish (Table 11), are tabulated in Table 16. Current (year of HIES consumption and population estimates) total per capita fish consumption estimates and projected per capita fish consumption requirements are outlined in Table 17. Some countries are predicted to be consuming adequate quantities of fish out to 2050, assuming current availability is maintained, whereas others are predicted to experience a significant shortfall in fish consumption. Comparison between current and future fish requirements was not possible for Fiji or Papua New Guinea because detailed food consumption data are not available. These estimates assume current total reef and inshore harvests will be the same in the future. It is difficult to project the anticipated declines in this fishery so our calculations of future requirements from tuna is likely to be underestimated.

There are four important points to consider when reviewing these aggregate estimates. First, the threshold of 5 km from the coast used here to estimate the relevant Papua New Guinea population is relatively arbitrary, and using a different threshold would significantly alter estimates. Second, and as

mentioned throughout this report, is the significant variation in equity and access within countries, including gender, economic affluence, access to healthy foods, and education. The averages and aggregates presented here, even for countries with surplus fish supply, does not mean that all people are consuming nutritious diets or obtaining adequate protein from fish. Third, this analysis assumes that the current average weight of men, women and children will be the same to 2050 as they are currently. Given the rapid historic increase in BMI across most countries, future average weights are likely to differ significantly from current weights. Plausible scenarios are either a marginal increase in weights if diets and lifestyles do not improve, or a decline in average weights if diets improve and lifestyles are less sedentary. Fourth, and significantly, the current and future consumption estimates (Table 17) assume that the supply of reef and inshore fish will be sustained in 2030 and 2050. This is unlikely given declining inshore harvests and the expected climate impacts on coral reef and other inshore habitats. While these caveats and considerations suggest that the estimates should be treated with caution, the data used to generate them are the best available.

Table 15 Projected total protein (tonnes) consumption required from fish by 2050 at recommended fish-based protein intake of 0.35 grams of protein per day per kilogram of body weight. Calculations are based on estimates in Table 13 and Table 14.

	2030 fish-based protein requirement				2050 fish-based protein requirement			
	Adult male	Adult female	Children (<14 yrs.)	Total	Adult male	Adult female	Children (<14 yrs.)	Total
Cook Islands	84	75	23	181	85	76	20	182
Fiji	3,580	3,454	1,215	8,248	3,784	3,651	1,151	8,586
Kiribati	517	497	249	1,263	706	679	295	1,679
Marshall Islands	186	172	90	448	192	177	77	445
FSM	394	388	167	949	401	395	117	913
Nauru	47	42	28	117	56	49	31	135
Niue	7	7	2	15	7	6	2	15
Palau	80	70	21	171	74	65	18	157
Papua New Guinea	6,278	5,949	4,200	16,428	9,302	8,814	5,205	23,322
Samoa	810	801	424	2,035	909	899	456	2,264
Solomon Islands	2,464	2,389	1,523	6,376	3,976	3,856	1,969	9,800
Tonga	404	402	191	997	410	408	160	978
Tuvalu	43	41	23	107	48	46	20	115
Vanuatu	1,132	1,079	617	2,829	1,725	1,645	707	4,077

Table 16 Projected estimates, in tonnes, of total fish required in 2030 and 2050, for men, women and children to obtain 50% of their protein intake from fish for each of the 14 countries.

	2030 fish-based dietary requirement (tonnes)			2050 fish-based dietary requirement (tonnes)		
	Adult men	Adult women	Children (<14 yrs.)	Adult men	Adult women	Children (<14 yrs.)
Cook Islands	361	323	98	368	329	88
Fiji	15430	14886	5236	16312	15737	4960
Kiribati	2227	2143	1074	3042	2926	1270
Marshall Islands	803	742	388	826	764	330
FSM	1697	1674	720	1727	1703	506
Nauru	203	179	122	240	212	132
Niue	30	28	8	29	27	9
Palau	345	302	89	320	281	77
Papua New Guinea	27062	25644	18103	40094	37993	22437
Samoa	3491	3453	1828	3919	3876	1963
Solomon Islands	10620	10300	6565	17136	16619	8487
Tonga	1741	1733	823	1767	1759	688
Tuvalu	184	177	99	208	200	88
Vanuatu	4879	4653	2661	7437	7092	3045

Table 17 Country estimates of current consumption and future (2030 & 2050) required consumption in both total tonnes per year and kilograms per capita per year. Current consumption estimates include all fish food groups in this study (reef and coastal, tuna and other pelagic, composite and canned). The shading is a coarse indicator of fish shortfall (red) versus adequate supply (green). See Appendix 2 for year of HIES data, noting that HIES were conducted over the past decade so do not necessarily reflect current consumption. Current estimates are total consumption of reef and coastal fish, tuna and other pelagic fish, composite fish, and canned fish. Estimates of whole harvest assume total edible portions in 2030 and 2050 are derived from tuna with an estimated edible portion of 60%.

	Current Consumption (Year of HIES)		2030 Consumption Requirements			2050 Consumption Requirements		
	Tonnes/year	Kilograms p.c./year	Tonnes/year (edible portion)	Tonnes/year (whole harvest)	Kilograms p.c./year (edible portion)	Tonnes/ year	Tonnes/year (whole harvest)	Kilograms p.c./year (edible portion)
Cook Islands	543	36	782	1,303	49	784	1,307	50
Fiji	n.a.	n.a.	35,552	59,253	39	37,009	61,681	39
Kiribati	9,971	84	5,444	9,074	39	7,239	12,064	40
Marshall Islands	4,962	91	1,933	3,222	36	1,920	3,199	37
FSM	9,430	91	4,090	6,817	38	3,936	6,560	40
Nauru	1,009	98	503	839	40	583	972	40
Niue	55	34	67	111	48	65	108	47
Palau	1,858	106	736	1,227	41	678	1,131	41
Papua New Guinea	n.a.	n.a.	70,809	118,015	31	100,524	167,540	32
Samoa	6,059	30	8,773	14,621	42	9,758	16,263	42
Solomon Islands	39,303	64	27,484	45,807	31	42,243	70,405	32
Tonga	3,821	38	4,297	7,161	44	4,214	7,023	45
Tuvalu	628	55	460	766	41	496	827	42
Vanuatu	9,210	31	12,192	20,321	34	17,575	29,291	35

CHAPTER 6. SYNTHESIS

Fish has historically been an essential source of protein in the diets of Pacific Island people and central to cultural identity. Traditionally, the reliability of reef and coastal fish stocks has ensured relative food security when other food sources were scarce and provided an accessible source of financial livelihood. However, overfishing and climate change-driven habitat degradation, among other factors, has reduced, and will continue to reduce, coastal fish stocks across the region (Kronen, Magron et al. 2010, Pratchett, Munday et al. 2011, Bell, Taylor et al. 2016). Furthermore, populations continue to grow, particularly in Melanesia, placing further pressure on coastal food resources (e.g., Brewer, Cinner et al. 2009). In recent decades, imports of staples including rice, wheat flour and meat have increased dramatically to fill the gap in local food production and now form an essential portion of caloric intake (Brewer, Andrew et al. 2023). Additionally, imports of processed foods with adverse health benefits have increased dramatically, leading to a globally high incidence of diet-related, non-communicable disease (Thow, Heywood et al. 2011). This unfolding reality of increased scarcity of domestic protein sources and increased reliance on low nutritional-quality imports increases the vulnerability of Pacific food systems. This is compounded by any global shocks impacting food production among key suppliers. Recent events, including COVID-19, the war in Ukraine and the ban on rice exports from India due to crop failure highlight this vulnerability, which is anticipated to become more acute with increased severity of climate impacts on global food production systems.

Overall, climate change is expected to dramatically influence Pacific food systems. Climate change is projected to cause inshore habitat degradation in the tropics, primarily through degradation of coral reefs caused by increased sea surface temperature and ocean acidification, but also through the effects of sea-level rise and increased intensity of cyclones on all coastal habitats, with flow-on impacts on reef and coastal fisheries production (Technical Study 1). It is also expected to affect agricultural production, including crops and livestock, through saltwater inundation, more intense cyclone events, and more variable and intense dry and wet periods (Taylor, McGregor et al. 2016). Climate change is also anticipated to cause changes to the distribution of tuna stocks in the region, which could have far-reaching consequences for both food security and government revenue (Bell, Senina et al. 2021). Climate change impacts on food systems will not be isolated to the Pacific Island region, so reliance on imports has associated risks. Importantly, high island and atoll systems will be affected differently by climate change.

In this chapter, we compare various options for supplying future nutrition requirements to Pacific Island communities, accounting for the broad drivers of climate change and population growth based on the evidence presented in chapters 1-5. We also consider the dynamic complexity of Pacific food systems, including nutrition composition, reliability of supply and access. Nutrition profiles vary among food groups and among specific foods that are processed and prepared in different ways (Table 11). Prioritising specific foods as future protein sources will inevitably result in trade-offs in various components of nutrition profiles. Access considerations include, but are not limited to, pricing, perishability, and stability of adequate supply. We also consider social, other environmental, and economic impacts and benefits of the various options. The other environmental impacts include land and sea degradation due to runoff and pollution from increased intensive domestic agricultural production and forestry (Taylor, McGregor et al. 2016). Social impacts include potential exclusion from supply chains due to income or cultural reasons or impacts on cultural food practises caused by the increase in access to non-traditional alternatives. Economic impacts include consideration of the level of concentration and diffusion of the benefits of one food type compared to others. For example, there are a multitude of participants in fish and wheat value chains compared to rice value chains. This means that fish and wheat consumption provide greater opportunity for income generation compared to rice.

Fish vary significantly in their macro- and micro-nutrient profiles (SPC Statistics for Development Division 2020), so it is difficult to ascribe specific changes in nutrient availability associated with reduced coastal fish harvest. Additionally, reef and coastal fish species are poorly represented in the PNDB, further reducing confidence in assessment of nutrients derived from coastal fisheries (Farmery, Scott et al. 2020, SPC Statistics for Development Division 2020), particularly for specific micro-nutrients. We therefore focus on reduced fish availability in terms of protein and calories, and do not make assumptions about future availability of other specific nutrients resulting from coastal fishery decline.

Plausible alternative sources of protein and calories to fill the gap in the anticipated shortfall in availability of nutritious food from reduced reef and coastal fish production fall into three broad categories - increased imports, increased domestic agriculture production, or increased consumption of tuna and other pelagic fish. Here, we outline each of these alternatives, including dominant foods available in each category and their advantages and disadvantages in terms of nutrition, reliability of supply and access.

Alternative foods to reef and coastal fish from increased imports are predominantly meat and cereals, both of which currently comprise a large portion of Pacific diets (Brewer, Andrew et al. 2023). Meat imports are largely comprised of beef, pork, and chicken. Chicken imports are increasing rapidly across the Pacific and demand is expected to continue to increase. However, meat imports are highly perishable in the absence of cold supply chains, are relatively expensive, and primarily available in urban areas only. Both rice and wheat are already imported in significant quantities and, except for protein, do not have comparable nutrient profiles to fish, however, some fortification does occur. Both cereal types are comparatively affordable and relatively shelf stable. Even so, their contribution to broader domestic Pacific economies, including employment, is relatively limited, both are highly vulnerable to global supply shocks, and additionally are seen as an alternative to root crops. While it is inevitable that both meat and cereal imports will remain dominant in Pacific diets, further increasing their role as coastal fisheries decline, would present further food security vulnerability.

Alternative foods to reef and coastal fish from increased domestic agricultural production (crops and Livestock) are more varied and context-dependent compared to opportunities presented by possible imports. Of the plausible locally-produced, animal-sourced food options, chicken production is the most viable due to affordability, ease of scaling, and relatively simple animal husbandry requirements including financial outlay. Chicken farming can also provide eggs, which are rich in protein. Other feasible domestic alternatives include fish farming, primarily small-pond production of tilapia (Pickering, Ponia et al. 2011). Some tilapia farming has been occurring in Melanesia for a significant period of time. Current production estimates are 500-1000 metric tonnes/year (t/yr) in PNG, 300 t/yr in Fiji, 150 t/yr in Solomon Islands and 8 t/yr in Vanuatu, (Gillett and Fong 2023). However, it is unlikely that tilapia farming could expand to fill expected national dietary shortfalls in protein to a significant extent. Instead, we assume that it has the potential to provide some increased access to protein in inland areas of Melanesia where it is not practical to develop tuna supply chains. Some increased domestic production of plant-based alternatives such as nuts, vegetables, also offers potential (ref needed).

Considering the parameters outlined above, including nutrition, reliability of supply, and cost, overlayed with broader factors that present risks and opportunities, such as global crises that can influence both pricing and reliability of supply, it is apparent that increasing the availability of tuna for domestic consumption will be increasingly important as a significant contributor to national food security. Tuna is good source of protein, omega 3 fatty acids and iron (Table 11), and consumption of tuna up to 50% of recommended protein intake is not expected to exceed safe levels of mercury consumption (Bell, Allain et al. 2015). The vast majority of people live along coastal fringes in all PICs

except Papua New Guinea and Fiji so tuna is relatively accessible to artisanal fishers, and consumers through short supply chains. Tuna is also relatively accessible to artisanal fishers, especially where nearshore fish aggregating devices (FADs) have been installed (Technical Study 3). Tuna harvest for domestic consumption is sustainable, and increasing domestic consumption would not significantly impact total commercial harvest (Bell, Allain et al. 2015). Access to tuna is also largely immune to global events such as supply shocks, except in indirect ways such as potential increase in fuel costs. Importantly, even though the spatial distribution of tuna is likely to change due to climate impacts (Bell, Senina et al. 2021, Erauskin-Extramiana, Arrizabalaga et al. 2019), this is not expected to have a significant impact on the availability of tuna for domestic consumption (Bell, Cisneros-Montemayor et al. 2018). In addition, tuna are not vulnerable to other climate-driven impacts, e.g., the effects of more powerful cyclones or rainfall variability on coastal fish habitats due to of increased runoff. Tuna will be important, not only to help meet domestic dietary requirements, but also in expanding domestic livelihood opportunities, and in managing risks associated with import dependence. Increased access to tuna should sit centrally within the general approach of diversifying local diets outlined above. Improving domestic value chains, including increased access to commercial bycatch, canned tuna, and increasing artisanal harvest through FAD deployment activities are pragmatic and feasible vehicles for enabling increased tuna consumption (Bell, Allain et al. 2015).

Although increasing access to tuna has an important role to play in increasing food and nutritional security and food sovereignty in the region, and concurrent reduction in diet-related non-communicable disease, these goals will also be enhanced by increasing domestic production of other nutritious foods that are resilient to the current and anticipated impacts of climate change. A diverse range of context-appropriate livestock, horticultural and aquaculture production systems will be needed for this purpose. Such investments will help to ensure resilience to climatic impacts and unanticipated global events, and support healthy balanced diets. Importantly, increasing food diversity is more feasible on fertile high islands than in countries comprised entirely or mainly of coral atolls, which will inevitably be more heavily dependent on imports and aquatic resources into the future. This variability in potential for food production between island types should be considered when prioritising food security and nutrition interventions.

Finally, although our analysis demonstrates that increasing access to tuna represents the best option for diversifying and improving nutrition where population growth and the effects of climate change on reef and coastal fisheries resources significantly reduce recommended per capita availability of fish-based protein, the level at which tuna is needed to fill gaps in protein supply can be expected to vary among countries.

The reason for this is that some countries have small and relatively stable populations, and large areas of coral reef relative to population size. In these countries, the projected effects of climate change on reef and coastal fish production are not likely to reduce protein supply below recommended levels (Table 17) for rural communities simply because the area of coral reef is so large relative to population size. For these countries, even when their reefs are degraded they will have the potential to supply the quantities of fish required. However, economically-viable distribution of reef and coastal fish from distant reefs to urban populations in such countries is often a problem (Bell, Reid et al. 2011). Expanding the use of FADs (Technical Study 3) within a practical fish-distribution radius of urban centres, and improving the distribution of bycatch in such countries where transhipping operations occur (Technical Study 5), will help to enure equitable national access to recommended levels of protein from fish. Countries in this category include Cook Islands, Federated States of Micronesia, Kiribati, Marshall Islands, Niue, Palau, Tonga and Tuvalu. In some of these countries ciguatera fish poison prevents people consuming reef fish (Pratchett, Munday et al. 2011) and in others, increasing access to tuna will also be needed to supply fish for tourists, creating livelihoods.

In all remaining countries (Fiji, Nauru, Papua New Guinea, Samoa, Solomon Islands and Vanuatu), which collectively comprise X% of the total population of the 14 countries participating in the GCF tuna programme (Andrew, Bright et al. 2019), a significant gap is expected to occur between the amount of reef and coastal fish needed for good nutrition and the quantity of these fish that can be harvested sustainably from coral reefs and other coastal habitats degraded by climate change. In these countries, increasing access to tuna is essential to national plans to provide both rual and urban communities with access to adequate fish protein per capita.

APPENDICES

Appendix 1. Study tasks and deliverables

Study 2: Options for supplying dietary protein for growing Pacific Island populations

Objectives: The SPC Public Health Division recommends that 50% of the protein needed for good nutrition of Pacific Island people should be derived from fish because of the problems involved in producing nutritious dietary protein in the region due to (often severe) limitations on agriculture and animal husbandry. It has been widely recognised that as the human populations of many Pacific Island countries continue to grow rapidly, and as harvests of coastal fisheries decline due to the degradation of coral reefs and other effects of climate change, more tuna and other oceanic fish species (hereafter grouped as 'tuna') will need to be allocated to domestic food security to ensure that fish provides 50% of dietary protein.
The purpose of this study is to prepare the report entitled 'Options for supplying dietary protein for growing Pacific Island populations' required for the 'options' analysis in the Feasibility Study (see GCF Study 9). This study is needed to make an objective assessment of possible alternatives to tuna (e.g., fish imports, agricultural/meat imports, increased local agricultural/meat production, aquaculture), for filling the gap in dietary protein needed by each of the 14 Pacific Island countries in 2030 and 2050.

The specific tasks to be completed during this Study are described below:

(i) A desk study of the public health status (including, where feasible, nutritional status, e.g., malnourished, obese, incidence of diet-driven non-communicable diseases) in each of the 14 Pacific Island countries participating in the Programme (based on the relevant SPC, WHO and FAO databases).

(ii) An overview of the main sources and quantities (kg per person per year) of protein consumed by coastal and urban communities in the 14 Pacific Island countries participating in the Programme[1]. This information should be derived from the most recent Household Income and Expenditure Surveys (HIES) conducted by programme-targeted countries' national statistics agencies and summarized into the following food types, where available (with gaps and uncertainties identified where it is not):

i • locally available coastal and freshwater fish species from capture fisheries and aquaculture;
ii • locally available tuna (fresh, bycatch, canned),
iii • imported frozen fish;
iv • imported canned fish (including imported canned tuna);
v • chicken (separated into local and imported);
vi • beef (separated into local and imported);
vii • pork (separated into local and imported);
viii • imported canned meat in general;
ix • local root crops and vegetables
x • imported grains and cereals
xi • other sources of protein.

(iii) The nutritional value of each of the sources of dietary protein listed above, in terms of protein, energy, fat, minerals and vitamins, for children (including infants in utero and while breast feeding), women and men.

(iv) The average cost per kg (in USD) of each food type in each of the 14 participating countries. In the case of tuna, this analysis should account for the fact that:

- Some of the tuna consumed by coastal communities will come from subsistence fishing supported by the proposed expansion of National FAD Programmes, and
- Tuna bycatch is available at low cost at several urban centres in the region through transhipping operations, e.g., in Honiara, Solomon Islands.

(v) Analysis of the quantity of dietary protein to be supplied by fish (based on the recommendation that fish provides 50% of dietary protein) in each of the 14 participating countries by 2030 and 2050 based on:

- Expected population sizes in each country in those years.
- Recommendation from WHO that human diets should contain 0.7 g of protein per kg body weight per day.
- Average body weight of children, women and men in each country.

(vi) Synthesis of the above information to compare the advantages and disadvantages, in terms of nutrition, reliability of supply (particularly for imports, which could be affected by changes in global trade arrangements due to pandemics, economic crises and security risks) and cost, of using tuna to ensure that enough fish is available in total to supply 50% of dietary protein in the face of reduced coastal fisheries production and greater human populations, as opposed to substituting tuna with other sources of dietary protein.

Outputs/Deliverables: The main output will be a report that documents:

I. Public health status in each of the 14 countries participating in the Programme. This section of the report should include a table, similar to Supplementary Table 5 in the publication available at: https://doi.org/10.1016/j.marpol.2018.10.034

II. The main sources and quantities of protein consumed in each of the 14 countries, including a table that summarises the per capita consumption of protein derived from each of the sources (food types) listed above (in kg per person per year based on the percentage protein content of each food type, for example, if tuna is 25% protein and 50 kg of tuna is consumed, the quantity of protein derived from tuna would be 12.5 kg). Where relevant, consumption patterns should be shown for both coastal and rural communities.

III. The nutritional value of each of the food types listed above, in terms of average protein, energy, fat, minerals and vitamins. This section of the report should include a table, similar to Supplementary Table 2 in the publication available at: https://doi.org/10.1016/j.marpol.2018.10.034. Information on hormone and antibiotic levels in imported meat products, and heavy metals and persistent organic pollutants in fresh fish products, should also be included if available.

IV. A table summarizing available information on the average cost per kg (converted to USD) of each food type in each of the 14 participating countries.

V. The gap in dietary protein recommended to be filled by fish in each of the 14 participating countries by 2030 and 2050.

VI. Synthesis of the above information to compare the advantages and disadvantages, in terms of nutrition, cost and reliability of supply, of using tuna to fill the gap in recommended protein supply, created by population growth and degradation of coral reefs due to climate change, compared to

other sources of locally available or imported dietary protein. This section of the report should evaluate nutritional benefits not only in terms of protein content by also availability of micro-nutrients. It should also briefly identify the risks to continuity of supply of each source of protein.

The report must be a stand-alone document that describes the findings from this study in detail, with an appropriate Executive Summary.

Appendix 2. HIES surveys used for 12 of 14 countries in this study for chapters 1, 2, 3, 4, 5.

Country	HIES year	Data Source
COK	2015-16	"Cook Islands Statistics Office, Household Income and Expenditure Survey 2015-2016 (HIES 2015), Version 01 of the licensed dataset (February 2017), provided by the Microdata Library. https://microdata.pacificdata.org/index.php/home"
FSM	2013-14	Division of statistics of Federated States of Micronesia, Household Income and Expenditure Survey 2013-2014 (HIES 2013-2014), Version 01 of the licensed datasets (2014), provided by the Pacific Microdata Library. http://pdl.spc.int/index.php/home
KIR	2019-20	"Kiribati National Statistics Office, Household Income and Expenditure Survey 2019 (HIES 2019), Version 01 of the licensed dataset (December 2020), provided by the Pacific Data Hub - Microdata Library. https://microdata.pacificdata.org/index.php/home"
MHL	2019-20	"Economic Policy Planning and Statistics Office of Marshall Islands, Household Income and Expenditure Survey 2019 (HIES 2019), Version 01 of the licensed dataset (March 2021), provided by the Pacific Data Hub - Microdata Library. https://microdata.pacificdata.org/index.php/home"
NRU	2012-13	"Nauru Bureau of Statistics Office, Household Income and Expenditure Survey 2012-2013 (HIES 2012-2013), Version 01 of the licensed datasets (November 2019), provided by the Microdata Library: https://microdata.pacificdata.org/index.php/home"
NIE	2015-16	"Niue National Statistics Office, Household Income and Expenditure Survey 2015-2016 (HIES 2015-2016), Version 01 of the licensed datasets (February 2018), provided by the Pacific Microdata Library. http://pdl.spc.int/index.php/home"
PLW	2013-14	"Office of Planning and Statistics of Palau, Household Income and Expenditure Survey 2013-2014 (HIES 2013), Version 01 of the licensed dataset (January 2005), provided by the Microdata Library. https://microdata.pacificdata.org/index.php/home"
SLB	2012-13	"Solomon Islands National Statistics Office, Household Income and Expenditure Survey 2012-2013 (HIES 2012), Version 01 of the licensed dataset (January 2020), provided by the Microdata Library. https://microdata.pacificdata.org/index.php/home"
TON	2015-16	"Tonga Statistics Department, Household Income and Expenditure Survey 2015-2016 (HIES 2015-2016), Version 01 of the licensed datasets (February 2020), provided by the Microdata Library. https://microdata.pacificdata.org/index.php/home"
TUV	2015-16	"Central Statistics Division of Tuvalu, Household Income and Expenditure Survey 2015-2016 (HIES 2015), Version 01 of the licensed dataset (November 2019), provided by the Microdata Library. https://microdata.pacificdata.org/index.php/home"
VUT	2019-20	"Vanuatu National Statistics Office, Household Income and Expenditure Survey 2019-2020 (HIES 2019), Version 01 of the licensed dataset (September 2020), provided by the Microdata Library. https://microdata.pacificdata.org/index.php/home
WSM	2018	"Samoa Bureau of Statistics, Household Income and Expenditure Survey 2018 (HIES 2018), Version 01 of the licensed dataset (December 2020), provided by the Microdata Library. https://microdata.pacificdata.org/index.php/home"

Appendix 3. Food COICOP codes and nutrient database descriptions of all foods included in chapter 2 analysis for the 12 countries that had consumption estimates derived from HIES data.

Food Group	COICOP code	Pacific Nutrient Database description
1. Reef & Coastal fish	01.1.3.1.9_04	Stingray, raw
	01.1.3.1.9_02	Snapper, flesh, raw
	01.1.3.1.9_98	Fish, reef, composite, raw
2. Tuna & Pelagic fish	01.1.3.1.5_01	Tuna, albacore, flesh, raw
	01.1.3.1.5_02	Tuna, skip jack, flesh, raw
	01.1.3.1.5_03	Tuna, yellow fin, flesh, raw
	01.1.3.1.5_99	Tuna, flesh, composite, raw
	01.1.3.1.6_01	Mackerel, Spanish, “Walu”, raw
	01.1.3.1.6_02	Sardine, Australian, whole, raw
	01.1.3.1.6_99	Fish, pelagic/ocean, composite, raw
	01.1.3.1.9_01	Shark, flesh, composite, raw
	11.1.1.1.1_62	Tuna, raw, sashimi style, restaurant style
3. Composite fish	01.1.3.1.9_99	Fish, composite, raw
	01.1.3.2.9_02	Fish, dried, salted
	01.1.3.2.9_03	Fish, smoked, composite, raw
4. Canned fish	01.1.3.2.9_01	Tuna, canned in brine, drained
	01.1.3.3.1_01	Tuna, canned in oil, drained
	01.1.3.3.1_02	Tuna, canned in tomato
	01.1.3.3.1_03	Tuna canned, composite
	01.1.3.3.2_01	Herring, Atlantic, canned in brine, pickled, drained
	01.1.3.3.2_02	Mackerel, canned, composite
	01.1.3.3.2_03	Sardines, canned, composite
	01.1.3.3.9_02	Salmon, canned, unflavoured, drained, composite
	01.1.3.3.9_97	Fish, composite, canned in oil, drained
	01.1.3.3.9_99	Fish, canned, composite, drained
	01.1.3.6.3_01	Mussels, smoked, canned in oil, drained
	01.1.3.6.3_02	Oysters, smoked, canned in oil, drained
5. Invertebrates	01.1.3.4.1_99	Prawn/shrimp, flesh, composite, raw
	01.1.3.4.2_01	Crab, mud, fresh, raw
	01.1.3.4.2_02	Crab, mud, fresh, raw
	01.1.3.4.2_03	Crab, mud, fresh, raw
	01.1.3.4.2_98	Crab, flesh, composite, raw
	01.1.3.4.2_99	Crayfish / lobster, composite, raw
	01.1.3.4.3_01	Mussels, raw
	01.1.3.4.3_02	Octopus, raw
	01.1.3.4.3_03	Scallop, raw
	01.1.3.4.3_04	Sici-shell, meat, raw
	01.1.3.4.3_05	Squid, composite, raw
	01.1.3.4.3_06	Oyster, Pacific, flesh, raw
	01.1.3.4.5_01	Paua, raw
	01.1.3.4.5_02	Sea snail
	01.1.3.4.5_99	Sea-hare, composite, raw

	01.1.3.4.9_01	Sea urchin, raw
	01.1.3.4.9_04	Sea cucumber, edible muscle
	01.1.9.1.2_28	Crab, flesh, purchased steamed or boiled
	01.1.9.1.2_30	Mussels, green, meat, boiled
	01.1.9.1.2_31	Octopus, marinated, baked, grilled, fried or BBQ'd, fat not further defined
	01.1.9.1.2_33	Prawn/shrimp, cooked, composite
	01.1.9.1.2_35	Squid, battered, takeaway outlet, deep fried
	01.1.9.1.2_36	Squid, cooked, composite
	01.1.9.1.2_99	Crab, flesh, cooked, not further specified
	01.1.3.6.2_01	Crab, imitation, surimi
6. Beef	01.1.2.2.1_01	Beef, mince/ground, lean (<5% fat), raw
	01.1.2.2.1_02	Beef, mince/ground, regular fat (5-10% fat), raw
	01.1.2.2.1_03	Beef, lean (fully-trimmed), raw, cuts not specified
	01.1.2.2.1_04	Beef, regular (untrimmed), raw, cut not specified
	01.1.2.2.1_98	Beef, steak, composite, raw
	01.1.2.2.1_99	Beef, composite, raw
	01.1.9.1.2_03	Beef,lean meat and flesh, fried, composite
	01.1.9.1.2_05	Beef, untrimmed, grilled/bbq, composite
	01.1.9.1.2_06	Beef, untrimmed, simmered/stewed, composite
	01.1.9.1.2_91	Beef, cooked, composite
	11.1.1.1.1_41	Beef, rib, shortribs, separable lean and fat, braised
	01.1.2.4.0_95	Beef, offal, composite, raw
7. Chicken	01.1.2.4.0_96	Chicken, offal, composite, raw
	01.1.2.1.4_01	Chicken, purchased live, whole, flesh and skin, raw
	01.1.2.2.4_01	Chicken, breast, flesh, fat and skin, raw
	01.1.2.2.4_02	Chicken, quarters, flesh, fat and skin, raw
	01.1.2.2.4_03	Chicken, thighs, flesh, fat and skin, raw
	01.1.2.2.4_04	Chicken, whole, flesh and skin, raw
	01.1.2.2.4_96	Chicken, composite, raw
	01.1.9.1.2_07	Chicken, light meat, fried
	01.1.9.1.2_09	Chicken, flesh and skin, grilled/bbq, no added fat, composite
	01.1.9.1.2_11	Chicken, lean meat, skin and fat, simmered/stewed, with or without added fat, composite
	01.1.9.1.2_92	Chicken cooked, flesh, skin and fat, no added fat, composite
8. Pork	01.1.2.4.0_99	Pork, offal, composite, raw
	01.1.2.1.2_01	Swine, purchased live, carcass, separable lean and fat, raw
	01.1.2.2.2_01	Pork, lean (fully-trimmed), composite, raw
	01.1.2.2.2_02	Pork, regular (untrimmed), composite, raw
	01.1.2.2.2_99	Pork, composite, raw
	01.1.9.1.2_12	Ham steak, grilled, no added fat
	01.1.9.1.2_17	Pork, fried (puaa vela)
	01.1.9.1.2_94	Pork, cooked, no added fat, composite
9. Processed meat & canned meat	01.1.2.5.2_01	Beef, canned, corned
	01.1.2.5.2_02	Camp pie, canned
	01.1.2.5.2_04	Chicken and vegetable curry, canned
	01.1.2.5.2_05	Duck, stewed in soysauce, canned

	01.1.2.5.2_08	Pork, ham, lean and fat, canned
	01.1.2.5.2_10	Spam, canned
	01.1.2.5.2_96	Beef, canned, composite
	01.1.2.5.2_99	Canned meat, composite
	01.1.2.5.9_02	Luncheon meat, chicken
	01.1.2.3.1_01	Beef, cured, dried
	01.1.2.3.2_01	Salami
	01.1.2.3.2_02	Bacon, composite
	01.1.2.5.1_01	Sausage, beef, fresh, raw
	01.1.2.5.1_02	Sausage, vienna, chicken, beef and pork, canned
	01.1.2.5.1_03	Sausage, chicken, fresh, raw
	01.1.2.5.1_05	Sausage, hot dog, composite
	01.1.2.5.1_06	Sausage, lamb, fresh, raw
	01.1.2.5.1_07	Sausage, pork, fresh, raw
	01.1.2.5.1_99	Sausage, fresh, composite, raw
	01.1.2.5.3_01	Pate, liver, composite
	01.1.2.5.9_01	Devon/fritz, processed luncheon meat, beef and pork
	01.1.9.1.2_08	Chicken, crumbed, fried, composite
	01.1.9.1.2_10	Chicken, nuggets, crumbed, deep fried or baked
	01.1.9.1.2_21	Sausage, beef, grilled, no added fat
10. Other animal sourced foods	01.1.4.8.1_01	Egg, chicken, fresh, whole, raw
	01.1.4.8.1_02	Egg, duck, fresh, whole, raw
	01.1.4.8.2_01	Egg, turtle, fresh, whole, raw
	01.1.9.1.5_01	Egg, chicken, whole, fried, oil not further defined
	01.1.9.1.5_02	Egg, chicken, whole, hardboiled
	01.1.9.1.5_04	Egg, chicken, scrambled
	01.1.9.1.5_05	Omelette, plain, without salt
	01.1.9.1.5_99	Egg, chicken, cooked, composite
	01.1.5.2.1_01	Ghee/clarified butter
	01.1.5.2.1_99	Butter, plain, salted
	01.1.5.9.9_03	Shortening, commercial, composite
	01.1.5.9.1_01	Lard and suet
	01.1.5.9.9_01	Dripping, beef
	01.1.2.2.9_09	Grub, larva, raw
	01.1.2.2.5_01	Rabbit, farmed, whole, raw
	01.1.2.2.6_01	Horse, mule, donkey, camel and the like, raw, composite
	01.1.2.2.9_02	Flying fox, flesh, raw
	01.1.2.2.9_06	Deer, meat, raw
	01.1.2.2.9_07	Dog, meat, raw
	01.1.2.2.9_10	Possum, wild caught, flesh, cooked
	01.1.2.2.9_13	Snake, raw
	01.1.3.4.9_03	Turtle, raw
	01.1.9.1.2_95	Meat, regular, separable fat, cooked, composite
	01.1.9.1.2_96	Meat, bbq/grill/fry cuts, semi-trimmed, cooked, no added fat, composite
	01.1.9.1.2_98	Sausage, grilled, composite
	01.1.2.2.4_06	Turkey, tail, raw
	01.1.2.2.4_07	Turkey, wing, flesh, fat and skin, raw

	01.1.2.2.4_97	Turkey, flesh, without skin, composite, raw
	01.1.2.2.4_98	Goose, flesh and skin, raw
	01.1.2.2.4_99	Duck, flesh, fat and skin, raw
	01.1.2.2.9_04	Bird, all others, composite, raw
	11.1.1.1.1_42	Turkey tail, cooked
	01.1.2.2.3_01	Goat meat, lean, composite, raw
	01.1.2.2.3_02	Lamb and mutton, lean (fully-trimmed), composite, raw
	01.1.2.2.3_03	Lamb and mutton, regular (untrimmed), composite, raw
	01.1.2.2.3_04	Mutton flaps, boneless, separable lean and fat, raw
	01.1.2.2.3_99	Lamb and mutton, composite, raw
	01.1.9.1.2_13	Lamb, lean meat and fat, fried, composite
	01.1.9.1.2_15	Lamb, grilled/bbq, no added fat, composite
	01.1.9.1.2_93	Lamb, cooked, composite
	01.1.4.1.1_01	Milk, cow, fluid, whole
	01.1.4.1.1_02	Milk, cow, fluid, whole, long life, shelf stable (UHT)
	01.1.4.2.0_01	Milk, cow, fluid, lite/low fat, 1.5% fat
	01.1.4.2.0_03	Milk, cow, fluid, skim
	01.1.4.2.0_98	Milk, cow, fluid, long life, shelf stable (UHT), composite
	01.1.4.2.0_99	Milk, fresh, fluid, composite
	01.1.4.3.1_01	Milk, condensed, skim, sweetened, canned
	01.1.4.3.1_02	Milk, condensed, whole, sweetened, canned
	01.1.4.3.1_04	Milk, condensed, whole, sweetened, canned
	01.1.4.3.1_06	Milk, cow, evaporated, whole, canned
	01.1.4.3.1_98	Milk, condensed, sweetened, composite, canned
	01.1.4.3.1_99	Milk, cow, evaporated,composite
	01.1.4.3.2_01	Milk, cow, powdered, full cream
	01.1.4.3.2_02	Milk, cow, powdered, skim
	01.1.4.3.2_99	Milk, cow, powdered, composite
	01.1.4.3.3_04	Cream, sour, regular fat
	01.1.4.3.3_98	Cream, dairy based, composite
	01.1.4.5.0_01	Cheese, block, composite
	01.1.4.5.0_03	Cheese, cheddar, processed, regular fat
	01.1.4.5.0_05	Cheese, spreads, cheddar, regular fat
	01.1.4.5.0_99	Cheese, composite
	01.1.4.6.0_01	Yoghurt, fruit
	01.1.4.6.0_03	Yoghurt, plain/natural
	01.1.4.6.0_04	Yoghurt, composite
	01.1.4.7.0_02	Milk, cow, fluid, flavoured, composite
11. Cereals & their products	01.1.1.1.2_01	Rice, brown, dry, unpolished, raw
	01.1.1.1.2_99	Rice, white, dry, polished, raw
	01.1.1.2.1_01	Flour, wheat, white, plain, unfortified
	01.1.1.2.2_01	Flour, rice, composite (white/brown), dry
	01.1.1.2.6_01	Flour, cornflour/maize, from maize starch
	01.1.1.2.9_99	Flour, wheat, white, plain, unfortified
	01.1.1.3.1_01	Bread, from white flour
	01.1.1.3.1_02	Bread, from wholemeal flour
	01.1.1.3.1_03	Bread, with mixed grains, commercially prepared

	01.1.1.3.1_04	Bread, all others, composite
	01.1.1.3.1_06	Bread, garlic
	01.1.1.3.1_07	Flatbread, naan, commercial
	01.1.1.3.1_08	Flatbread, all others, commercially prepared, composite
	01.1.1.3.1_09	Breadroll, white flour, commercially prepared
	01.1.1.3.1_10	Breadroll, wholemeal flour
	01.1.1.3.1_97	Bread, loaf, from white flour
	01.1.1.3.1_98	Breadroll, from white flour
	01.1.1.4.0_01	Breakfast cereal, flakes of corn, added nuts and/or sugar coated, added minerals and vitamins
	01.1.1.4.0_02	Breakfast cereal, flakes of corn, no sugar added, added minerals and vitamins (iron, vitamins B1, B2 and B3), e.g. corn flakes
	01.1.1.4.0_03	Breakfast cereal, wheat bran flakes, with dried fruits, added minerals and vitamins (iron, zinc, vitamins B1, B2, B3 and B6) e.g. sultana bran/raisin bran
	01.1.1.4.0_04	Breakfast cereal, mixed grain (rice & wheat), flakes, sweetened, added minerals and vitamins (iron, calcium, zinc, vitamins B1, B2, B3 and B6), e.g. special K
	01.1.1.4.0_05	Breakfast cereal, puffed or popped rice, added minerals and vitamins (iron, vitamins B1, B2 and B3), e.g. rice bubbles
	01.1.1.4.0_06	Breakfast cereal, puffed or popped rice, cocoa coating, added minerals and vitamins (iron, vitamins B1, B2 and B3), e.g. coco pops
	01.1.1.4.0_07	Breakfast cereal, whole wheat, biscuit, added mineral and vitamins (iron, B1, B2 and B3), e.g. weetbix, vita-brits
	01.1.1.4.0_08	Oats, porridge, dry, raw
	01.1.1.4.0_98	Muesli, composite
	01.1.1.4.0_99	Breakfast cereal, composite
	01.1.1.5.0_01	Noodles, wheat, instant (Maggi-type), dry, raw
	01.1.1.5.0_03	Pasta, plain, white wheat flour, dry (spaghetti, macaroni etc), raw
	01.1.1.5.0_99	Noodles, dry, raw, composite
	01.1.1.9.0_04	Popcorn, cooked, composite
	01.1.1.9.0_98	quinoa
	01.1.4.4.4_01	Milk, rice, fluid
	01.1.9.1.1_01	Noodles, instant boiled, drained
	01.1.9.1.1_02	Oats, plain, boiled with water
	01.1.9.1.1_04	Rice, white, boiled, no fat or salt added
	01.1.9.1.1_99	Rice, boiled, composite, no fat or salt added
	11.1.1.1.1_09	Bread, white, Maori, fried
12. Vegetables, roots and tubers	01.1.7.5.1_99	Potato, combined cultivars, flesh, raw
	01.1.7.5.2_01	Sweet potato, composite, raw
	01.1.7.5.3_01	Cassava, raw
	01.1.7.5.4_99	Yam, composite, raw
	01.1.7.5.5_01	Taro, common, composite, raw
	01.1.7.5.5_02	Taro, giant, raw
	01.1.7.5.5_99	Taro, composite, raw
	01.1.7.8.0_01	Banana, cooking, raw

01.1.7.9.1_01	Flour, cassava
01.1.9.1.3_02	Banana, cooking, ami, baked, no fat or salt added
01.1.9.1.3_03	Banana, cooking, boiled, no fat or salt added
01.1.9.1.3_26	Cassava, tuber, boiled, no fat or salt added
01.1.9.1.3_68	Potato, pale skin, peeled, baked, no fat or salt added
01.1.9.1.3_69	Potato, white, peeled, boiled, no fat or salt added
01.1.9.1.3_80	Sweet potato, composite, tuber, boiled, no fat or salt added
01.1.9.1.3_84	Taro, common, corm, flesh, baked, no salt or fat added
01.1.9.1.3_85	Taro, common, corm, boiled, no salt or fat added
01.1.9.1.3_86	Taro, giant, baked, no salt or fat added
01.1.9.1.3_87	Taro, giant, boiled, no salt or fat added
01.1.9.1.3_88	Taro, common, corm, flesh, baked, no salt or fat added
01.1.9.1.3_90	Taro, cooked, composite, no salt or fat added
01.1.9.1.3_99	Yam, composite, cooked, no salt or fat added
11.1.1.1.1_58	Takeaway, yam/taro
11.1.1.1.1_60	Tapioca, pearl or seed style, boiled in water, no added fat or salt
11.1.1.1.1_61	Taro, composite, boiled, no salt or fat added
01.1.3.4.9_02	Seaweed, fresh, raw
01.1.7.1.2_01	Cabbage, slippery bush, leaves, raw
01.1.7.1.2_02	Cabbage, Chinese, raw
01.1.7.1.2_03	Cabbage, European, white, raw
01.1.7.1.2_04	Cabbage, fern, leaves, raw
01.1.7.1.2_99	Cabbage, composite, raw
01.1.7.1.3_01	Broccoli, raw
01.1.7.1.4_01	Lettuce, composite, raw
01.1.7.1.5_01	Spinach, water, fresh, raw
01.1.7.1.5_99	Spinach, composite, raw
01.1.7.1.9_01	Oriental radish, peeled, raw
01.1.7.1.9_03	Taro, leaves, raw
01.1.7.1.9_04	Pumpkin, leaves, raw
01.1.7.1.9_05	Leaves, watercress, raw
01.1.7.2.1_01	Chilli, red, flesh, raw
01.1.7.2.2_01	Cucumber, common, unpeeled, raw
01.1.7.2.3_01	Eggplant, flesh, raw
01.1.7.2.4_01	Tomato, common, raw
01.1.7.2.5_01	Pumpkin, raw
01.1.7.2.5_03	Courgette, green, unpeeled, raw
01.1.7.2.6_01	Okra, raw
01.1.7.2.9_01	Choko, peeled, fresh, raw
01.1.7.2.9_99	Capsicum, composite, raw
01.1.7.3.1_01	Beans, green, fresh, raw
01.1.7.3.1_02	Beans, yardlong, in pod, raw
01.1.7.3.1_03	Beans, sprouts, raw
01.1.7.3.3_01	Peas, green, fresh, seed, raw
01.1.7.4.1_01	Carrot, raw
01.1.7.4.2_01	Garlic, peeled, fresh, raw
01.1.7.4.3_01	Onion, mature, peeled, raw
01.1.7.4.3_02	Onion, shallot, fresh, raw

	01.1.7.4.3_03	Onion, spring, fresh, raw
	01.1.7.4.8_01	Corn, cob, fresh or frozen, raw
	01.1.7.4.9_99	Vegetables, composite, raw
	01.1.7.9.2_01	Asparagus, canned in brine, drained
	01.1.7.9.2_02	Beetroot, canned in brine, drained
	01.1.7.9.2_03	Cucumber pickled, dill
	01.1.7.9.2_04	Mushrooms, canned in brine, drained
	01.1.7.9.2_05	Tomato, whole, canned in tomato juice, undrained
	01.1.7.9.2_06	Tomato paste, salted
	01.1.7.9.2_99	Corn, composite, canned in brine, drained
	01.1.7.9.9_07	Kimchee, pickled vegetables, Korean
	01.1.7.9.9_08	Peas, green, canned, drained
	01.1.7.9.9_09	Potato, mashed, powdered, unprepared
	01.1.9.1.3_19	Edible hibiscus, leaves, boiled, no fat or salt added
	01.1.9.1.3_20	Cabbage, Chinese, cooked, no fat or salt added
	01.1.9.1.3_22	Cabbage, composite, boiled, no fat or salt added
	01.1.9.1.3_27	Cauliflower, boiled, no fat or salt added
	01.1.9.1.3_28	Celery, boiled, no fat or salt added
	01.1.9.1.3_32	Corn, cob, baked, no fat or salt added
	01.1.9.1.3_34	Eggplant, boiled, no fat or salt added
	01.1.9.1.3_39	Leaves, choko, boiled, no fat or salt added
	01.1.9.1.3_46	Leaves, okra, boiled, no fat or salt added
	01.1.9.1.3_51	Leaves, taro, boiled, no fat or salt added
	01.1.9.1.3_55	Leaves, wingedbeans, cooked, no fat or salt added
	01.1.9.1.3_56	Leek, boiled, no fat or salt added
	01.1.9.1.3_67	Snow pea, with edible pod, fresh, boiled, drained, no fat or salt added
	01.1.9.1.3_71	Pumpkin, peeled, fresh, boiled, drained, no fat or salt added
	01.1.9.1.3_74	Spinach, frozen, boiled, no fat or salt added
	01.1.9.1.3_76	Spinach, fresh, leaves, baked, no fat or salt added
	01.1.9.1.3_92	Vegetables, mixed, boiled, no fat or salt added
	11.1.1.1.1_33	Salad, garden, made from leafy greens, cucumber & tomato, no added dressing
13. Pulses, seeds and nuts and their products	01.1.4.3.3_02	Cream, coconut, canned/UHT
	01.1.4.3.3_03	Cream, coconut, fresh, no water
	01.1.4.3.3_99	Cream, coconut, composite
	01.1.4.4.2_01	Milk, almond, fluid
	01.1.4.4.3_01	Milk, soya bean, fluid
	01.1.6.1.8_01	Coconut, embryo germinating
	01.1.6.1.8_02	Coconut, green (immature), flesh and water
	01.1.6.1.8_03	Coconut, brown (mature), flesh
	01.1.6.1.8_99	Coconut, flesh, composite, raw
	01.1.6.7.9_02	Coconut, dried
	01.1.6.8.1_01	Almond, composite, raw
	01.1.6.8.3_01	Chestnut, composite, raw
	01.1.6.8.9_01	Betelnut, kernels, dried, raw
	01.1.6.8.9_03	Cutnut, Vanuatu, raw
	01.1.6.8.9_04	Pandanus nuts, kernel

	01.1.6.8.9_05	Peanut, kernel and skin, raw, unsalted
	01.1.6.8.9_08	Pilinut (Ngali/nangai), composite
	01.1.6.8.9_99	Nuts, composite, raw
	01.1.6.9.4_01	Nuts, mixed, salted
	01.1.6.9.4_03	Peanut, kernels, salted, roasted
	01.1.6.9.4_04	Peanut, roasted, unsalted
	01.1.7.6.4_01	Lentils, dry, raw
	01.1.7.9.9_01	Beans, legumes, composite, canned in brine, drained
	01.1.7.9.9_99	Baked beans, canned, composite
	01.1.8.4.0_99	Peanut butter, composite
	01.1.9.1.3_13	Beans, red kidney, dried, boiled, no fat or salt added
	01.1.9.1.3_15	Beans, soya, dried, boiled, drained, no fat or salt added
	01.1.9.1.3_57	Lentils, boiled,drained, no fat or salt added
	01.1.9.4.0_25	Tahini, sesame seed butter
14. Composite meals	01.1.1.5.0_02	Pasta, in tomato and cheese sauce, canned
	01.1.2.4.0_01	Beef, soup, bones and vegetable broth
	01.1.2.5.2_07	Pie, steak and kidney, canned
	01.1.2.5.2_09	Sausage roll
	01.1.2.5.2_11	Stew/Irish stew, canned
	01.1.2.5.2_12	Vegetables and sausages, canned
	01.1.2.5.2_13	Vegetables and steak, canned
	01.1.2.5.2_97	Hamburger patties, rissoles, composite, raw
	01.1.2.5.2_98	Pie, meat, composite
	01.1.3.3.9_03	Fish finger, crumbed, purchased frozen, raw
	01.1.3.3.9_05	Pie, fish, potato top, frozen meal, microwaved
	01.1.9.1.4_01	Quiche, savory, baked, composite
	01.1.9.1.4_02	Pizza, frozen, commercial, composite
	01.1.9.1.6_01	Soup, beef and vegetable, from cafe or restaurant
	01.1.9.1.6_02	Soup, chicken and vegetable, from cafe or restaurant
	01.1.9.1.6_03	Soup, chicken, noodle, dry mix, prepared
	01.1.9.1.6_04	Soup, pumpkin
	01.1.9.1.6_05	Soup, tomato, prepared, canned
	01.1.9.1.6_06	Soup, vegetable, canned
	01.1.9.1.6_08	soup, crab
	01.1.9.1.9_01	Breadfruit, boiled
	11.1.1.1.1_01	Bacon and chicken egg, fried
	11.1.1.1.1_02	Bacon and chicken egg, poached
	11.1.1.1.1_03	Bacon and chicken egg, scrambled, cooked with added fat
	11.1.1.1.1_04	Bacon and chicken egg, composite
	11.1.1.1.1_08	Bun, steamed, savory, pork
	11.1.1.1.1_16	Spring roll, meat & vegetable filling, deep fried, commercial
	11.1.1.1.1_17	Noodle bowl, wheat flour, flavoured, boiled, undrained, Shin Ramyun Noodle Soup Hot & Spicy, Nong Shim
	11.1.1.1.1_18	Noodle bowl, wheat flour, flavoured, boiled, undrained, Shin Ramyun Noodle Soup Hot & Spicy, Nong Shim
	11.1.1.1.1_19	Noodles, Chow Mein, Chinese, takeaway
	11.1.1.1.1_20	Pancake, with syrup, McDonald's
	11.1.1.1.1_21	Pancake, plain, commercial

	11.1.1.1.1_22	Pasta, commercial, cooked, with dairy based sauce
	11.1.1.1.1_25	Poi, paiai (30% solids)
	11.1.1.1.1_27	Potato, pale skin, mashed with cows milk and butter, no salt added
	11.1.1.1.1_28	Ravioli, commercial
	11.1.1.1.1_29	Rice, boiled, with coconut cream
	11.1.1.1.1_30	Rice, boiled with eggs, chicken and vegetables, fried
	11.1.1.1.1_31	Rice, fried, combination, ready to eat. Chinese, takeaway
	11.1.1.1.1_32	Rice and vegetable, stir fry syle, using soy sauce
	11.1.1.1.1_34	Sandwich, filled with chicken
	11.1.1.1.1_35	Sandwich, filled with egg
	11.1.1.1.1_36	Sandwich, filled with ham
	11.1.1.1.1_37	Sandwich, filled with ham and cheese
	11.1.1.1.1_38	Soup, chicken and vegetables from café or restaurant
	11.1.1.1.1_39	Soup, mixed vegetable from café or restaurant
	11.1.1.1.1_40	Sushi,tuna, with seaweed
	11.1.1.1.1_43	Takeaway, noodle, Chinese, chow mein
	11.1.1.1.1_44	Stir-fry, homemade, beef and vegetable, with rice
	11.1.1.1.1_45	Stir-fry, chicken, with rice or noodles, commercial
	11.1.1.1.1_46	Stir-fry, homemade, pork and vegetable, with rice or noodles
	11.1.1.1.1_47	Takeaway, chicken, crumbed, breast, fried, ready to eat, Kentucky Fried Chicken
	11.1.1.1.1_48	Curry, homemade, chicken, with rice
	11.1.1.1.1_49	Fish, white flesh, fried or bbq'd, fat not further defined
	11.1.1.1.1_50	Hamburguer, plain
	11.1.1.1.1_51	Hot dog, bread roll, frankfurt and sauce filling
	11.1.1.1.1_52	Takeaway, pizza, ham and pineapple
	11.1.1.1.1_53	Takeaway, pizza, meat, thin base
	11.1.1.1.1_54	Takeaway, pizza, vegetarian, thick crust
	11.1.1.1.1_55	Takeaway, pizza, composite
	11.1.1.1.1_56	Takeaway, salad, potato, added dressing
	11.1.1.1.1_57	Salad, mixed vegetables (leafy greens, carrot, cucumber and tomato), no added dressing
	11.1.1.1.1_66	Chicken, fried with rice
	11.1.1.1.1_67	Takeaway, fish, battered, deep fried and potato chips
	11.1.1.1.1_70	Fish, baked, with rice, boiled
	11.1.1.1.1_71	Fish, with rice and taro; mixed cooking methods
	11.1.1.1.1_77	Steak, mixed cooking methods with rice, boiled and taro, boiled
	11.1.1.1.1_78	Rice and taiyo (rice with tinned fish)
	11.1.1.1.1_99	Buatoro (Kiribati)
15. All other foods	01.1.8.5.3_01	Cocoa, powder
	01.1.8.5.9_02	Ovaltine, powder
	01.2.1.0.0_01	Coconut toddy, fresh
	01.2.1.0.0_02	Coconut, water only
	01.2.1.0.0_03	Juice, apple, commercial, no added sugar
	01.2.1.0.0_04	Fruit drink, guava, commercial, added sugar
	01.2.1.0.0_05	Fruit drink, lemon, commercial, added sugar

01.2.1.0.0_06	Fruit drink, mango, commercial, added sugar
01.2.1.0.0_07	Juice, orange, commercial
01.2.1.0.0_08	Juice, pineapple, commercial
01.2.1.0.0_09	Juice, tomato, canned, salted
01.2.1.0.0_10	Juice, tropical, commercial
01.2.1.0.0_11	Juice, vegetable, commercial
01.2.1.0.0_99	Juice, fruit, commercial, composite
01.2.2.0.1_01	Coffee, roasted, ground
01.2.2.0.1_02	Coffee, instant, powder (e.g. nescafe), unprepared
01.2.2.0.1_99	Coffee, composite
01.2.2.0.9_01	Coffee, iced, regular fat cows milk
01.2.2.0.9_02	Coffee, mix (e.g. 3in1), unprepared
01.2.3.0.2_01	Tea, black, bag, unprepared
01.2.3.0.3_01	Tea, commerical, ready-to-drink, sweetned, lemon
01.2.3.0.4_01	Tea, chai, instant dry powder, unprepared
01.2.3.0.4_02	Tea, powder, unprepared
01.2.3.0.9_99	Tea, unprepared, composite
01.2.4.0.0_01	Iced chocolate, commercial
01.2.4.0.0_02	Beverage, chocolate flavour, from base (Milo)
01.2.5.0.0_01	Bottled water, still
01.2.5.0.0_02	Mineral water, natural, unflavoured
01.2.6.0.0_01	Cola flavour soft drink, regular
01.2.6.0.0_02	Lemonade, soft drink, regular
01.2.6.0.0_03	Mineral, water, flavored, intense sweetened or diet
01.2.6.0.0_04	Soft drink, diet, intense sweetened
01.2.6.0.0_05	Tonic water
01.2.6.0.0_99	Soft drink, composite
01.2.9.0.0_01	Coconut toddy, boiled
01.2.9.0.0_02	Energy drinks, caffeine added, e.g. red bull, V
01.2.9.0.0_03	Jelly based drinks, e.g. aloevera
01.2.9.0.0_04	Powdered drink/flavouring, dry powder e.g. kool aid/Tang
01.2.9.0.0_05	Sports drinks, dry powder, all flavours
01.2.9.0.0_99	Cordial, concentrated sugar-based syrup, with fruit juice, regular
02.1.1.0.0_02	Gin (29.6% alcohol)
02.1.1.0.0_04	Rum (30.6% alcohol)
02.1.1.0.0_06	Vodka (33.4% alcohol)
02.1.1.0.0_07	Whiskey (20.3% alcohol)
02.1.2.1.0_01	Brandy (29.4% alcohol)
02.1.2.1.0_03	Wine, red (9.5% alcohol)
02.1.2.1.0_04	Wine, sparkling (9.3% alcohol)
02.1.2.1.0_05	Wine, white (10.9% alcohol)
02.1.2.1.0_99	Wine, composite (10.1% alcohol)
02.1.3.0.0_01	Beer, bitter/draught (3.1% alcohol)
02.1.3.0.0_02	Beer, homebrew (2.1% alcohol)
02.1.3.0.0_03	Beer, lager (3.6% alcohol)
02.1.3.0.0_99	Beer, composite (2.4% alcohol)
02.1.9.0.0_01	Tuba (3.8 % alcohol)
11.1.1.1.2_01	Coffee, brewed

11.1.1.1.2_02	Tea, black, brewed, no milk or sugar
11.1.1.1.2_03	Tea, black, brewed, with milk, no added sugar
11.1.1.1.2_05	Tea, green, brewed, no milk or sugar
01.1.5.1.3_01	Oil, olive
01.1.5.1.6_01	Oil, coconut
01.1.5.1.9_01	Oil, vegetable, blend
01.1.5.1.9_02	Oil, vegetable, blend
01.1.5.1.9_99	Oil, composite
01.1.5.3.0_01	Margarine, cooking
01.1.5.3.0_99	Margarine, composite
01.1.4.3.3_01	Creamer, non dairy, powdered
01.1.9.4.0_28	Vanilla extract (34.4% alcohol)
01.1.9.9.0_01	Baking powder
01.1.9.9.0_02	Baking soda
01.1.9.9.0_03	Stock cube
01.1.9.9.0_10	Yeast/baker's yeast, compressed
01.1.9.2.1_01	Infant formula, powder, with iron, not reconstituted
01.1.6.1.1_01	Avocado, flesh, raw
01.1.6.1.2_01	Banana, common varieties, ripe, raw
01.1.6.1.2_02	Banana, raw, composite
01.1.6.1.5_01	Guava, raw
01.1.6.1.5_02	Mango, peeled, composite, raw
01.1.6.1.6_01	Papaya, orange flesh, peeled, raw
01.1.6.1.6_02	Pawpaw, raw
01.1.6.1.7_01	Pineapple, peeled, raw
01.1.6.1.9_01	Breadfruit, pulp, mature, raw
01.1.6.1.9_02	Custard apple, peeled, raw
01.1.6.1.9_05	Jackfruit, peeled, raw
01.1.6.1.9_06	Pandanus, fruit , raw
01.1.6.1.9_07	Passionfruit, raw
01.1.6.1.9_08	Rambutan
01.1.6.1.9_11	Sour sop, raw
01.1.6.1.9_12	Starfruit, raw
01.1.6.1.9_14	Tamarind, pods, fresh, raw
01.1.6.1.9_16	Tava, raw
01.1.6.1.9_17	Wax jambu, raw
01.1.6.1.9_18	Inikori, mangrove fruit (SLB)
01.1.6.2.1_01	Grapefruit, raw
01.1.6.2.1_02	Pomelo, flesh, raw
01.1.6.2.2_01	Lemon, peeled, raw
01.1.6.2.2_02	Lime, peeled, raw
01.1.6.2.3_01	Orange, peeled, raw
01.1.6.2.4_01	Mandarin, peeled, raw
01.1.6.3.1_01	Apple, unpeeled, composite, raw
01.1.6.3.2_01	Pear, packhams, raw
01.1.6.3.5_01	Nectarine, raw
01.1.6.3.5_02	Peach, raw
01.1.6.3.6_01	Plum, red, raw

01.1.6.3.9_01	Chinese apple, "bair", raw
01.1.6.3.9_02	Lychee, peeled, raw
01.1.6.4.5_01	Strawberry, raw
01.1.6.5.1_01	Grapes, raw
01.1.6.5.2_01	Kiwi fruit, flesh and seed, raw
01.1.6.5.3_01	Melon, composite, raw
01.1.6.5.4_01	Watermelon, red pulp, raw
01.1.6.5.9_99	Fruit, composite, raw
01.1.6.7.9_99	Mixed dried fruit, composite
01.1.6.9.2_03	Pear, canned in juice, undrained
01.1.6.9.2_05	Pineapple, canned in juice, no sugar added, undrained
01.1.6.9.2_06	Pineapple, canned in syrup, undrained
01.1.6.9.2_99	Fruit, canned, composite, undrained
01.1.7.9.3_01	Olives, canned in brine, drained
11.1.1.1.1_05	Banana, cooked in small amount of fat
11.1.1.1.1_06	Breadfruit, cooked, composite, no fat or salt added
02.3.1.8.2_01	tobacco/cigarette
02.3.1.8.3_01	Marijuana
02.3.1.8.7_01	Kava
02.3.1.8.9_02	Betel leaves
01.1.1.3.1_12	Crackers/crispbread, plain, composite
01.1.1.3.1_13	Crackers, all others, composite
01.1.1.3.1_99	Crackers, composite
01.1.7.9.9_02	Chips, banana, commercial
01.1.7.9.9_03	Chips, breadfruit, fried in vegetable oil
01.1.7.9.9_05	Chips, potato, plain, salted
01.1.7.9.9_06	Chips, taro, commercial
01.1.7.9.9_10	Savoury snacks, chips, composite
01.1.7.9.9_98	Chips, composite
01.1.9.1.3_29	Chips, banana, deep fried, commercial
01.1.9.1.3_30	Chips, taro, fried
11.1.1.1.1_26	Potato, chips, regular, deep fried, blended oil, salted, independent takeaway outlet
01.1.9.1.9_03	Gravy powder, prepared
01.1.9.3.1_01	Salt, table, iodised
01.1.9.3.1_02	Salt, table, non iodised
01.1.9.3.1_99	Salt, table, composite
01.1.9.3.9_02	Monosodium glutamate seasoning
01.1.9.3.9_03	Chutney or relish, commercial
01.1.9.3.9_04	Dressing, salad, composite
01.1.9.3.9_06	Kimchee, pickled vegetables, Korean
01.1.9.3.9_07	Mayonnaise, commercial, dressing type
01.1.9.3.9_08	Mustard, cream style
01.1.9.3.9_09	Mustard, French style
01.1.9.3.9_10	Chutney or relish, commercial
01.1.9.3.9_11	Salsa, tomato based, commercial
01.1.9.3.9_12	Sauce, BBQ, commercial
01.1.9.3.9_13	Sauce, chilli, bottled

01.1.9.3.9_14	Sauce, soy/shoyu, commercial
01.1.9.3.9_15	Sauce, tomato, for pasta, commercial
01.1.9.3.9_16	Sauce, tomato, ketchup
01.1.9.3.9_17	Sauce, Worcestershire, commercial
01.1.9.3.9_18	Tabasco, sauce
01.1.9.3.9_19	Vinegar
01.1.9.3.9_98	Sauce, composite
01.1.9.3.9_99	Vinegar, composite
01.1.9.4.0_01	Basil, fresh, raw
01.1.9.4.0_02	Bay leaves, dried, crumbled
01.1.9.4.0_04	Chili, dried
01.1.9.4.0_05	Chilli powder
01.1.9.4.0_06	Cinnamon, powder
01.1.9.4.0_07	Cloves
01.1.9.4.0_08	Coriander leaves and stems, fresh, raw
01.1.9.4.0_09	Coriander seeds
01.1.9.4.0_10	Cumin, seeds
01.1.9.4.0_11	Curry powder
01.1.9.4.0_12	Garam masala
01.1.9.4.0_13	Ginger root, fresh, raw
01.1.9.4.0_14	Lemon grass, raw
01.1.9.4.0_15	Mint, fresh, raw
01.1.9.4.0_19	Paprika
01.1.9.4.0_21	Parsley, leaves, fresh, raw
01.1.9.4.0_22	Pepper, ground, black or white
01.1.9.4.0_26	Thyme, dried, ground
01.1.9.4.0_27	Turmeric, powder
01.1.9.4.0_99	Spices, composite
01.1.9.9.0_05	Gravy powder, dried, unprepared
01.1.9.9.0_06	Maggi, seasoning mix
01.1.9.9.0_08	Noodle seasoning, dry powder
01.1.9.9.0_09	Yeast spread, vegemite
01.1.1.3.1_11	Bun, sweetened, with dried fruit
01.1.1.3.1_14	Coconut bread, ring, sprinkled with shredded coconut meat
01.1.1.3.9_01	Biscuits, chocolate
01.1.1.3.9_02	Biscuits, sweet, plain
01.1.1.3.9_03	Biscuits, sweet, all others, composite
01.1.1.3.9_04	Biscuits, cream, wafer
01.1.1.3.9_05	Cake, plain, commercial
01.1.1.3.9_06	Cake, cheesecake, commercial
01.1.1.3.9_07	Cake, chocolate, commercial
01.1.1.3.9_08	Muffin, plain, commercial, uniced
01.1.1.3.9_09	Muffin, chocolate, chocolate chip, commercial, uniced
01.1.1.3.9_10	Croissant, plain
01.1.1.3.9_11	Manihiki bread
01.1.1.3.9_12	Pie, sweet/fruit, all others, composite
01.1.1.3.9_13	Pastry, breakfast, composite
01.1.1.3.9_95	Biscuits, sweet, composite

01.1.1.3.9_96	Cake, composite
01.1.1.3.9_97	Muffin, commercial, composite
01.1.1.3.9_98	Pastry, composite
01.1.1.3.9_99	Doughnut, composite
01.1.1.9.0_01	Cake mix, dry powder, raw, composite
01.1.1.9.0_03	Pancake mix, plain, dry mix, raw
01.1.4.7.0_01	Custard
01.1.4.7.0_03	Pudding (dairy based)
01.1.8.2.0_02	Syrup, sweet pouring, composite
01.1.8.2.0_03	Sugar, brown
01.1.8.2.0_04	Sugar, white
01.1.8.2.0_98	sugar cane
01.1.8.2.0_99	Sugar, composite
01.1.8.3.1_01	Honey
01.1.8.3.9_01	Fruit, prepared, pureed, commercially prepared
01.1.8.3.9_03	Jam, unspecified
01.1.8.3.9_04	Jelly, prepared
01.1.8.3.9_05	Jelly, crystals/powder, unprepared
01.1.8.3.9_06	Marmalade, orange
01.1.8.5.1_02	Chocolate, milk
01.1.8.5.1_03	Chocolate, milk with nuts
01.1.8.5.1_04	Chocolate, white
01.1.8.5.1_99	Chocolate, composite
01.1.8.5.9_01	Chocolate candies, chocolate centre, sugar-coated
01.1.8.5.9_03	Nutella, hazelnut spread, Ferrero
01.1.8.6.0_01	Ice stick, water-based, various flavours
01.1.8.6.0_02	Ice cream, chocolate, standard
01.1.8.6.0_03	Ice cream, with confectionery and waffle cone, chocolate coated, regular fat
01.1.8.6.0_04	Ice cream, fruit based, various flavours, regular fat
01.1.8.6.0_05	Ice cream, vanilla, regular fat
01.1.8.6.0_99	Sorbet, fruit or fruit juice, regular fat
01.1.8.9.9_01	Chewing gum
01.1.8.9.9_03	Sweets, boiled
01.1.8.9.9_04	Sweets, jelly lollies
01.1.9.9.0_04	Custard powder, dry mix, commercial
11.1.1.1.1_14	Milkshake, chocolate or coffee flavour, regular fat cows milk, without ice cream
11.1.1.1.1_15	Milkshake, non-chocolate or coffee flavours, regular fat cows milk, without ice cream
11.1.1.1.1_63	Waffle, plain, frozen, commercial

Appendix 4. Country population estimates, year, and source.

Country	HIES year	Population	Source
COK	2015-16	15,007	Cook Islands: household income and expenditure survey (HIES), report 2015-2016. https://purl.org/spc/digilib/doc/jo4zv
FSM	2013-14	103,382	Federated States of Micronesia 2013-14 HIES report. . Noumea, New Caledonia: Secretariat of the Pacific Community. 108 p. https://purl.org/spc/digilib/doc/dm5j2
KIR	2019-20	118,480	Kiribati 2019–2020 Household Income and Expenditure Survey Report, September 2021. https://purl.org/spc/digilib/doc/kjrto
MHL	2019-20	54,295	Estimated from Pacific Food Consumption Database (PFCD)
NRU	2012-13	10,293	Nauru 2012 2013 HIES Report. . Noumea, New Caledonia: Secretariat of the Pacific Community. 63 p. https://purl.org/spc/digilib/doc/3erjo
NIE	2015-16	1,611	Niue 2015-2016 HIES full Report. . Noumea, New Caledonia: Secretariat of the Pacific Community. 61 p. https://purl.org/spc/digilib/doc/4si9u
PLW	2013-14	17,581	Palau 2014 HIES Report. Noumea, New Caledonia: Secretariat of the Pacific Community. 103 p. https://purl.org/spc/digilib/doc/vsu93
SLB	2012-13	615,804	Solomon Islands 2012-2013 HIES NATIONAL REPORT vol1. Noumea, New Caledonia: Pacific Community. 178 p. https://purl.org/spc/digilib/doc/iux3i
TON	2015-16	99,557	Anon. 2017. Tonga: household income and expenditure, survey 2015-2016. Noumea, New Caledonia: Pacific Community (SPC). 247 p. https://purl.org/spc/digilib/doc/kgyww
TUV	2015-16	11,469	Estimated from Pacific Food Consumption Database) (PFCD)
VUT	2019-20	295,495	Vanuatu HIES 2019-20. Labour Market Monograph. https://www.ilo.org/surveyLib/index.php/catalog/7347/download/45288
WSM	2018	199,331	Estimated from Pacific Food Consumption Database (PFCD)

Appendix 5. FAOSTAT food items, by food group, used in estimating domestic production for Fiji and Papua New Guinea.

Note that the list is not exhaustive as it includes only items with quantities for either Fiji or Papua New Guinea. Raw animal hides were excluded post data acquisition. Note, FAOSTAT production data does not include aquatic foods.

Food group	Foods within food groups
Beef	Edible offal of cattle, fresh, chilled or frozen
	Meat of cattle with the bone, fresh or chilled
Chicken	Meat of chickens, fresh or chilled
Pork	Edible offal of pigs, fresh, chilled or frozen
	Meat of pig with the bone, fresh or chilled
Other animal sourced foods	Butter of cow milk
	Buttermilk, dry
	Cattle fat, unrendered
	Edible offal of goat, fresh, chilled or frozen
	Edible offal of sheep, fresh, chilled or frozen
	Edible offals of horses and other equines, fresh, chilled or frozen
	Eggs from other birds in shell, fresh, n.e.c.
	Fat of pigs
	Game meat, fresh, chilled or frozen
	Goat fat, unrendered
	Hen eggs in shell, fresh
	Horse meat, fresh or chilled
	Meat of ducks, fresh or chilled
	Meat of goat, fresh or chilled
	Meat of sheep, fresh or chilled
	Meat of turkeys, fresh or chilled
	Pig fat, rendered
	Sheep fat, unrendered
	Skim milk of cows
	Tallow
Cereals and their products	Maize (corn)
	Rice
	Sorghum
Vegetables, roots and tubers	Broad beans and horse beans, green
	Cabbages
	Cassava, fresh
	Cauliflowers and broccoli
	Chillies and peppers, green (Capsicum spp. and Pimenta spp.)
	Cucumbers and gherkins
	Edible roots and tubers with high starch or inulin content, n.e.c., fresh
	Eggplants (aubergines)
	Green corn (maize)
	Lettuce and chicory
	Okra
	Onions and shallots, dry (excluding dehydrated)
	Other beans, green
	Other vegetables, fresh n.e.c.
	Plantains and cooking bananas

	Potatoes
	Pumpkins, squash and gourds
	Sweet potatoes
	Taro
	Tomatoes
	Yams
Pulses, seeds and nuts	Coconuts, in shell
	Groundnuts, excluding shelled
	Other nuts (excluding wild edible nuts and groundnuts), in shell, n.e.c.
	Other pulses n.e.c.
All other food	Coconut oil
	Groundnut oil
	Oil palm fruit
	Other oil seeds, n.e.c.
	Palm kernels
	Palm oil
	Avocados
	Bananas
	Beer of barley, malted
	Cantaloupes and other melons
	Chillies and peppers, dry (Capsicum spp., Pimenta spp.), raw
	Cocoa beans
	Coffee, green
	Ginger, raw
	Lemons and limes
	Mangoes, guavas and mangosteens
	Molasses
	Natural honey
	Nutmeg, mace, cardamoms, raw
	Oil of palm kernel
	Oranges
	Other berries and fruits of the genus vaccinium n.e.c.
	Other citrus fruit, n.e.c.
	Other fruits, n.e.c.
	Other stimulant, spice and aromatic crops, n.e.c.
	Other tropical fruits, n.e.c.
	Papayas
	Pepper (Piper spp.), raw
	Pineapples
	Pomelos and grapefruits
	Raw cane or beet sugar (centrifugal only)
	Raw milk of cattle
	Raw milk of goats
	Sugar cane
	Tangerines, mandarins, clementines
	Tea leaves
	Vanilla, raw
	Watermelons

Appendix 6. Pacific Food Trade Database (PFTD) foods included in study 2 analysis for Fiji, PNG, and calculating proportion imports.

Food Group	Commodity Subheading	HS92 Definition
Tuna & Pelagic fish	030231	Fish: albacore or longfinned tunas (thunnus alalunga), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030232	Fish: yellowfin tunas (thunnus albacares), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030233	Fish: skipjack or stripe-bellied bonito, fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030239	Fish: tuna, fresh or chilled, n.e.s. in item no. 0302.3 (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030264	Fish: mackerel (scomber scombrus, scomber australasicus, scomber japonicus), fresh of chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030341	Fish: albacore or longfinned tunas (thunnus alalunga), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030342	Fish: yellowfin tunas (thunnus albacares), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030343	Fish: skipjack or stripe-bellied bonito, frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030349	Fish: tuna, frozen, n.e.s. in item no. 0303.4 (excluding fillets, livers, roes and other fish meat of heading no. 0304)
Composite fish	030191	Fish: live, trout (salmo trutta, salmo gairdneri, salmo clarki, salmo aguabonita, salmo gilae)
	030192	Fish: live, eels (anguilla spp.)
	030193	Fish: live, carp
	030199	Fish: live, n.e.s. in heading no. 0301
	030211	Fish: trout (salmo trutta, salmo gairdneri, salmo clarki, salmo aguabonita, salmo gilae), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030212	Fish: Pacific salmon (oncorhynchus spp.), Atlantic salmon (salmo salar), Danube salmon (hucho hucho), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030219	Fish: salmonidae, fresh or chilled, n.e.s. in item no. 0302.1 (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030221	Fish: halibut (reinhardtius hippoglossoides, hippoglossus hippoglossus, hippoglossus stenolepis), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030222	Fish: plaice (pleuronectes platessa), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030223	Fish: sole (solea spp.), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030229	Fish: flat fish, fresh or chilled, n.e.s. in item no. 0302.2 (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030240	Fish: herrings (clupea harengus, clupea pallasii), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030250	Fish: cod (gadus morhua, gadus ogac, gadus macrocephalus), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030261	Fish: sardines (sardina pilchardus, sardinops spp.), sardinella (sardinella spp.), brisling or sprats (sprattus sprattus), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030262	Fish: haddock (melanogrammus aeglefinus), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
	030263	Fish: coalfish (pollachius virens), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)

030265	Fish: dogfish and other sharks, fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030266	Fish: eels (anguilla spp.), fresh or chilled (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030269	Fish: fresh or chilled, n.e.s. in heading no. 0302 (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030270	Fish: livers and roes, fresh or chilled
030310	Fish: Pacific salmon, (oncorhynchus spp.), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030321	Fish: trout (salmo trutta, salmo gairdneri, salmo clarki, salmo aguabonita, salmo gilae), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030322	Fish: Atlantic salmon (salmo salar) and Danube salmon (hucho hucho), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030329	Fish: salmonidae, frozen, n.e.s. in item no. 0302.1 and 0302.2 (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030331	Fish: halibut (reinhardtius hippoglossoides, hippoglossus hippoglossus, hippoglossus stenolepis), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030332	Fish: plaice (pleuronectes platessa), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030333	Fish: sole (solea spp.), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030339	Fish: flat fish, frozen, n.e.s. in item no. 0303.3 (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030350	Fish: herrings (clupea harengus, clupea pallasii), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030360	Fish: cod (gadus morhua, gadus ogac, gadus macrocephalus), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030375	Fish: dogfish and other sharks, frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030376	Fish: eels (anguilla spp.), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030377	Fish: sea bass (dicentrarchus labrax, dicentrarchus punctatus), frozen, (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030378	Fish: hake (merluccius spp., urophycis spp.), frozen (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030379	Fish: frozen, n.e.s. in heading no. 0303 (excluding fillets, livers, roes and other fish meat of heading no. 0304)
030380	Fish: livers and roes, frozen
030410	Fish: fillets and other fish meat, fresh or chilled (whether or not minced)
030420	Fish: fillets, frozen
030490	Fish: fish meat n.e.s. in heading no. 0304 (whether or not minced), fresh, chilled or frozen
030510	Fish meal: fit for human consumption
030520	Fish: livers and roes, dried, smoked (whether or not cooked before or during the smoking process), salted or in brine
030530	Fish: fillets, dried, salted or in brine, but not smoked
030541	Fish: Pacific salmon (oncorhynchus spp.), Atlantic salmon (salmo salar) and Danube salmon (hucho hucho), including fillets, smoked (whether or not cooked before or during the smoking process)
030542	Fish: herrings (clupea harengus, clupea pallasii), including fillets: smoked (whether or not cooked before or during the smoking process)
030549	Fish: smoked (whether or not cooked before or during the smoking process), n.e.s. in item no. 0305.4 (including fillets)
030551	Fish: cod (gadus morhua, gadus ogac, gadus macrocephalus), dried (whether or not salted but not smoked)
030559	Fish: dried (whether or not salted but not smoked), n.e.s. in item no. 0305.51
030561	Fish: herrings (clupea harengas, clupea pallasii), salted or in brine but not dried or smoked

	030562	Fish: cod (gadus morhua, gadus ogac, gadus macrocephalus), salted or in brine but not dried or smoked
	030563	Fish: anchovies (engraulis spp.), salted or in brine but not dried or smoked
	030569	Fish: salted or in brine, but not dried or smoked, n.e.s. in item no. 0305.6
	160300	Extracts and juices: of meat, fish or crustaceans, molluscs or other aquatic invertebrates
Canned fish	160411	Fish preparations: salmon, prepared or preserved, whole or in pieces (but not minced)
	160412	Fish preparations: herrings, prepared or preserved, whole or in pieces (but not minced)
	160413	Fish preparations: sardines, sardinella and brisling or sprats, prepared or preserved, whole or in pieces (but not minced)
	160414	Fish preparations: tunas, skipjack and Atlantic bonito (sarda spp.), prepared or preserved, whole or in pieces (but not minced)
	160415	Fish preparations: mackerel, prepared or preserved, whole or in pieces (but not minced)
	160416	Fish preparations: anchovies, prepared or preserved, whole or in pieces (but not minced)
	160419	Fish preparations: fish prepared or preserved, whole or in pieces (but not minced), n.e.s. in heading no. 1604
	160420	Fish preparations: fish minced or in forms n.e.s. in heading no. 1604, prepared or preserved
	160430	Fish preparations: caviar and caviar substitutes
	160510	Crustacean preparations: crab, prepared or preserved
	160520	Crustacean preparations: shrimps and prawns, prepared or preserved
	160530	Crustacean preparations: lobster, prepared or preserved
	160540	Crustacean preparations: prepared or preserved crustaceans (excluding crab, shrimps, prawns and lobster)
	160590	Molluscs and other aquatic invertebrates: prepared or preserved (excluding crustaceans)
Invertebrates	030611	Crustaceans: rock lobsters and other sea crawfish (palinurus spp., panulirus spp., jasus spp.), frozen (whether in shell or not, whether or not cooked by steaming or by boiling in water)
	030612	Crustaceans: lobsters (homarus spp.), frozen (whether in shell or not, whether or not cooked by steaming or by boiling in water)
	030613	Crustaceans: shrimps and prawns, frozen (whether in shell or not, whether or not cooked by steaming or by boiling in water)
	030614	Crustaceans: crabs, frozen (whether in shell or not, whether or not cooked by steaming or by boiling in water)
	030619	Crustaceans: frozen, n.e.s. in item no. 0306.1 (whether in shell or not, whether or not cooked by steaming or by boiling in water)
	030621	Crustaceans: rock lobster and other sea crawfish (palinurus spp., panulirus spp., jasus spp.), not frozen, (whether in shell or not, whether or not cooked by steaming or by boiling in water)
	030622	Crustaceans: lobsters (homarus spp.), not frozen, (whether in shell or not, whether or not cooked by steaming or by boiling in water)
	030623	Crustaceans: shrimps and prawns, not frozen, (whether in shell or not, whether or not cooked by steaming or by boiling in water)
	030624	Crustaceans: crabs, not frozen, (whether in shell or not, whether or not cooked by steaming or by boiling in water)
	030629	Crustaceans: not frozen, n.e.s. in heading no. 0306, (whether in shell or not, whether or not cooked by steaming or by boiling in water)
	030710	Molluscs: oysters, live, fresh, chilled, frozen, dried, salted or in brine (whether in shell or not)
	030721	Molluscs: scallops (including queen scallops of the genera pecten, chlamys or placopecten), live, fresh or chilled (whether in shell or not)
	030729	Molluscs: scallops (including queen scallops of the genera pecten, chlamys or placopecten), frozen, dried, salted or in brine (whether in shell or not)
	030731	Molluscs: mussels (mytilus spp., perna spp.), live, fresh or chilled (whether in shell or not)
	030739	Molluscs: mussels (mytilus spp., perna spp.), frozen, dried, salted or in brine (whether in shell or not)
	030741	Molluscs: cuttle fish and squid, live, fresh or chilled (whether in shell or not)
	030751	Molluscs: octopus (octopus spp.), live, fresh or chilled

	030759	Molluscs: octopus (octopus spp.), frozen, dried, salted or in brine
	030760	Molluscs: snails (other than sea snails), live, fresh, chilled, frozen, dried, salted or in brine (whether in shell or not)
	030791	Molluscs and other aquatic invertebrates: live, fresh or chilled (whether in shell or not), n.e.s. in heading no. 0307
	030799	Molluscs and other aquatic invertebrates: frozen, dried, salted or in brine (whether in shell or not), n.e.s. in heading no. 0307
Beef	020110	Meat: of bovine animals, carcasses and half-carcasses, fresh or chilled
	020120	Meat: of bovine animals, cuts with bone in (excluding carcasses and half-carcasses), fresh or chilled
	020130	Meat: of bovine animals, boneless cuts, fresh or chilled
	020210	Meat: of bovine animals, carcasses and half-carcasses, frozen
	020220	Meat: of bovine animals, cuts with bone in (excluding carcasses and half-carcasses), frozen
	020230	Meat: of bovine animals, boneless cuts, frozen
	020610	Offal, edible: of bovine animals, fresh or chilled
	020621	Offal, edible: of bovine animals, tongues, frozen
	020622	Offal, edible: of bovine animals, livers, frozen
	020629	Offal, edible: of bovine animals, (other than tongues and livers), frozen
	021020	Meat, preserved: of bovine animals, salted, in brine, dried or smoked
Chicken	020721	Meat and edible offal: fowls of the species gallus domesticus, not cut in pieces, frozen
	020741	Meat and edible offal: of fowls of the species gallus domesticus, poultry cuts and offal (excluding livers), frozen
Pork	020311	Meat: of swine, carcasses and half-carcasses, fresh or chilled
	020312	Meat: of swine, hams, shoulders and cuts thereof, with bone in, fresh or chilled
	020319	Meat: of swine, n.e.s. in item no. 0203.1, fresh or chilled
	020321	Meat: of swine, carcasses and half-carcasses, frozen
	020322	Meat: of swine, hams, shoulders and cuts thereof, with bone in, frozen
	020329	Meat: of swine, n.e.s. in item no. 0203.2, frozen
	020630	Offal, edible: of swine, fresh or chilled
	020641	Offal, edible: of swine, livers, frozen
	020649	Offal, edible: of swine, (other than livers), frozen
	021011	Meat, preserved: of swine, hams, shoulders and cuts thereof, with bone in, salted, in brine, dried or smoked
	021012	Meat, preserved: of swine, bellies (streaky) and cuts thereof, salted, in brine, dried or smoked
	021019	Meat, preserved: of swine, salted, in brine, dried or smoked, n.e.s. in item no. 0210.1
Processed & canned meat	160100	Meat preparations: sausages and similar products, of meat, meat offal or blood, and food preparations based on these products
	160210	Meat preparations: homogenised preparations of meat, meat offal or blood
	160220	Meat preparations: of the prepared or preserved liver of any animal (excluding homogenised preparations)
	160231	Meat preparations: of turkeys, prepared or preserved meat or meat offal (excluding livers and homogenised preparations)
	160239	Meat preparations: of poultry (excluding turkeys), prepared or preserved meat or meat offal (excluding livers and homogenised preparations)
	160241	Meat preparations: of swine, hams and cuts thereof, prepared or preserved (excluding homogenised preparations)
	160242	Meat preparations: of swine, shoulders and cuts thereof, prepared or preserved (excluding homogenised preparations)
	160249	Meat preparations: of swine, meat or meat offal (including mixtures), prepared or preserved, n.e.s. in heading no. 1602
	160250	Meat preparations: of bovine animals, meat or meat offal, prepared or preserved (excluding livers and homogenised preparations)

	160290	Meat preparations: of meat, meat offal or the blood of any animal, n.e.s. in heading no. 1602
	020410	Meat: of sheep, lamb carcasses and half-carcasses, fresh or chilled
Other animal sourced foods	020421	Meat: of sheep, carcasses and half-carcasses (excluding carcasses and half-carcasses of lamb), fresh or chilled
	020422	Meat: of sheep (including lamb), cuts with bone in (excluding carcasses and half-carcasses), fresh or chilled
	020423	Meat: of sheep (including lamb), boneless cuts, fresh or chilled
	020430	Meat: of sheep, lamb carcasses and half-carcasses, frozen
	020441	Meat: of sheep, carcasses and half-carcasses (excluding carcasses and half-carcasses of lamb), frozen
	020442	Meat: of sheep (including lamb), cuts with bone in (excluding carcasses and half-carcasses), frozen
	020443	Meat: of sheep (including lamb), boneless cuts, frozen
	020450	Meat: of goats, fresh, chilled or frozen
	020500	Meat: of horses, asses, mules or hinnies, fresh, chilled or frozen
	020680	Offal, edible: of sheep, goats, horses, asses, mules or hinnies, fresh or chilled
	020690	Offal, edible: of sheep, goats, horses, asses, mules or hinnies, frozen
	020710	Meat and edible offal: poultry, not cut in pieces, fresh or chilled
	020722	Meat and edible offal: turkeys, not cut in pieces, frozen
	020723	Meat and edible offal: ducks, geese and guinea fowls, not cut in pieces, frozen
	020731	Offal, edible: of geese or ducks, fatty livers, fresh or chilled
	020739	Meat and edible offal: poultry cuts and offal (including livers but excluding the fatty livers of geese or ducks), fresh or chilled
	020742	Meat and edible offal: of turkeys, poultry cuts and offal (excluding livers), frozen
	020743	Meat and edible offal: of ducks, geese or guinea fowls, poultry cuts and offal (excluding livers) frozen
	020750	Offal, edible: of poultry, livers, frozen
	020810	Meat and edible meat offal: of rabbits or hares, fresh, chilled or frozen
	020820	Meat and edible meat offal: frogs' legs, fresh, chilled or frozen
	020890	Meat and edible meat offal: n.e.s. in chapter 2, fresh, chilled or frozen
	020900	Fat: pig fat, free of lean meat, and poultry fat, (not rendered), fresh, chilled, frozen, salted, in brine, dried or smoked
	021090	Meat and edible meat offal, preserved: salted, in brine, dried or smoked, and edible flours and meals of meat or meat offal, n.e.s. in heading no. 0210
	040110	Dairy produce: milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content not exceeding 1% (by weight)
	040120	Dairy produce: milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content exceeding 1% but not exceeding 6% (by weight)
	040130	Dairy produce: milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content exceeding 6% (by weight)
	040210	Dairy produce: milk and cream, concentrated or containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content not exceeding 1.5% (by weight)
	040221	Dairy produce: milk and cream, concentrated, not containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content exceeding 1.5% (by weight)
	040229	Dairy produce: milk and cream, containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content exceeding 1.5% (by weight)
	040291	Dairy produce: milk and cream, concentrated, not containing added sugar or other sweetening matter, other than in powder, granules or other solid forms
	040299	Dairy produce: milk and cream, containing added sugar or other sweetening matter, other than in powder, granules or other solid forms
	040310	Dairy produce: yoghurt, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit or cocoa

	040390	Dairy produce: buttermilk, curdled milk or cream, kephir, fermented or acidified milk or cream, whether or not concentrated or containing added sweetening, flavouring, fruit or cocoa (excluding yoghurt)
	040410	Dairy produce: whey, whether or not concentrated or containing added sugar or other sweetening matter
	040490	Dairy produce: natural milk constituents (excluding whey), whether or not containing added sugar or other sweetening matter, n.e.s. in chapter 04
	040500	Dairy produce: butter and other fats and oils derived from milk
	040610	Dairy produce: fresh cheese (including whey cheese), not fermented, and curd
	040620	Dairy produce: cheese of all kinds, grated or powdered
	040630	Dairy produce: cheese, processed (not grated or powdered)
	040640	Dairy produce: cheese, blue-veined (not grated, powdered or processed)
	040690	Dairy produce: cheese (not grated, powdered or processed), n.e.s. in heading no. 0406
	040700	Eggs: birds' eggs, in the shell, fresh, preserved or cooked
	040811	Eggs: birds' eggs, yolks, dried, whether or not containing added sugar or other sweetening matter
	040819	Eggs: birds' eggs, yolks, fresh, cooked by steaming or by boiling in water, moulded, frozen or otherwise preserved, whether or not containing added sugar or other sweetening matter
	040891	Eggs: birds' eggs (not in shell, excluding yolks only), dried, whether or not containing added sugar or other sweetening matter
	040899	Eggs: birds' eggs (not in shell, excluding yolks only), fresh, cooked by steaming or boiling in water, moulded, frozen, otherwise preserved, whether or not containing added sugar or other sweetening matter
	041000	Animal products: edible, n.e.s. in this or other chapters
	150100	Lard: other pig fat and poultry fat, rendered, whether or not pressed or solvent-extracted
	150200	Fats of bovine animals, sheep or goats: raw or rendered, whether or not pressed or solvent-extracted
	150300	Lard stearin, lard oil, oleostearin, oleo-oil and tallow oil: not emulsified or mixed or otherwise prepared
	150430	Fats and oils and their fractions: of marine mammals
	150600	Animal fats and oils and their fractions: whether or not refined, but not chemically modified, n.e.s. in chapter 15
Vegetables, root and tubers	070190	Vegetables: potatoes (other than seed), fresh or chilled
	070200	Vegetables: tomatoes, fresh or chilled
	070310	Vegetables, alliaceous: onions and shallots, fresh or chilled
	070320	Vegetables, alliaceous: garlic, fresh or chilled
	070390	Vegetables, alliaceous: leeks and other kinds n.e.s. in heading no. 0703, fresh or chilled
	070410	Vegetables, brassica: cauliflowers and headed broccoli, fresh or chilled
	070420	Vegetables, brassica: brussel sprouts, fresh or chilled
	070490	Vegetables, brassica: edible, n.e.s. in heading no. 0704, fresh or chilled
	070511	Vegetables: cabbage (head) lettuce (lactuca sativa), fresh or chilled
	070519	Vegetables: lettuce (lactuca sativa), (other than cabbage lettuce), fresh or chilled
	070521	Vegetables: witloff chicory (cichorium intybus var. foliosum), fresh or chilled
	070529	Vegetables: chicory (cichorium spp.), (other than witloof chicory), fresh or chilled
	070610	Vegetables, root: carrots and turnips, fresh or chilled
	070690	Vegetables, root: salad beetroot, salsify, celeric, radishes and similar edible roots, fresh or chilled
	070700	Vegetables: cucumbers and gherkins, fresh or chilled
	070810	Vegetables, leguminous: peas (pisum sativum), shelled or unshelled, fresh or chilled
	070820	Vegetables, leguminous: beans (vigna spp., phaseolus spp.), shelled or unshelled, fresh or chilled
	070890	Vegetables, leguminous: (other than peas and beans), shelled or unshelled, fresh or chilled
	070910	Vegetables: globe artichokes, fresh or chilled

070920	Vegetables: asparagus, fresh or chilled
070930	Vegetables: aubergines, (egg plants), fresh or chilled
070940	Vegetables: celery (other than celeriac), fresh or chilled
070951	Vegetables: mushrooms, fresh or chilled
070952	Vegetables: truffles, fresh or chilled
070960	Vegetables: fruits of the genus capsicum or of the genus pimenta
070970	Vegetables: spinach, New Zealand spinach and orache spinach (garden spinach), fresh or chilled
070990	Vegetables: edible, n.e.s. in chapter 7, fresh or chilled
071010	Vegetables: potatoes, uncooked or cooked by steaming or boiling in water, frozen
071021	Vegetables, leguminous: peas (pisum sativum), shelled or unshelled, uncooked or cooked by steaming or boiling in water, frozen
071022	Vegetables, leguminous: beans (vigna spp., phaseolus spp.), shelled or unshelled, uncooked or cooked by steaming or boiling in water, frozen
071029	Vegetables, leguminous: (other than peas or beans), shelled or unshelled, uncooked or cooked by steaming or boiling in water, frozen
071030	Vegetables: spinach, New Zealand spinach and orache spinach (garden spinach), uncooked or cooked by steaming or boiling in water, frozen
071040	Vegetables: sweetcorn, uncooked or cooked by steaming or boiling in water, frozen
071080	Vegetables: uncooked or cooked by steaming or boiling in water, frozen, n.e.s. in chapter 7
071090	Vegetable mixtures: uncooked or cooked by steaming or boiling in water, frozen
071110	Vegetables: onions, provisionally preserved by sulphur dioxide gas, but unsuitable in that state for immediate consumption
071120	Vegetables: olives, provisionally preserved but unsuitable in that state for immediate consumption
071130	Vegetables: capers, provisionally preserved but unsuitable in that state for immediate consumption
071140	Vegetables: cucumbers and gherkins, provisionally preserved but unsuitable in that state for immediate consumption
071190	Vegetables and mixed vegetables: n.e.s. in heading no. 0711, provisionally preserved but unsuitable in that state for immediate consumption
071210	Vegetables: potatoes, whether or not cut or sliced but not further prepared, dried
071220	Vegetables: onions, whole, cut, sliced, broken or in powder but not further prepared, dried
071230	Vegetables: mushrooms and truffles, whole, cut, sliced, broken or in powder but not further prepared, dried
071290	Vegetables: mixtures of vegetables n.e.s. in heading no. 0712, whole, cut, sliced, broken or in powder but not further prepared, dried
071310	Vegetables, leguminous: peas (pisum sativum), shelled, whether or not skinned or split, dried
071320	Vegetables, leguminous: chickpeas (garbanzos), shelled, whether or not skinned or split, dried
071331	Vegetables, leguminous: beans of the species vigna mungo (l.) hepper or vigna radiata (l.) wilczek, dried, shelled, whether or not skinned or split
071332	Vegetables, leguminous: small red (adzuki) beans (phaseolus or vigna angularis), shelled, dried, whether or not skinned or split
071333	Vegetables, leguminous: kidney beans, including white pea beans (phaseolus vulgaris), dried, shelled, whether or not skinned or split
071339	Vegetables, leguminous: n.e.s. in item no. 0713.30, dried, shelled, whether or not skinned or split
071340	Vegetables, leguminous: lentils, shelled, whether or not skinned or split, dried
071350	Vegetables, leguminous: broad beans (vicia faba var. major) and horse beans (vicia faba var. equina and vicia faba var. minor), dried, shelled, whether or not skinned or split
071390	Vegetables, leguminous: n.e.s. in heading no. 0713, shelled, whether or not skinned or split, dried
071410	Vegetable roots and tubers: manioc (cassava), with high starch or inulin content, whether or not sliced or in the form of pellets, fresh or dried

	071420	Vegetable roots and tubers: sweet potatoes, with high starch or inulin content, whether or not sliced or in the form of pellets, fresh or dried
	071490	Vegetable roots and tubers: arrowroot, salep, Jerusalem artichokes and similar roots and tubers, high starch or inulin content, whether or not sliced or in the form of pellets, fresh or dried: sago pith
	200110	Vegetable preparations: cucumbers and gherkins, prepared or preserved by vinegar or acetic acid
	200120	Vegetable preparations: onions, prepared or preserved by vinegar or acetic acid
	200190	Vegetable preparations: vegetables, fruit, nuts and other edible parts of plants, prepared or preserved by vinegar or acetic acid (excluding cucumbers, gherkins and onions)
	200210	Vegetable preparations: tomatoes, whole or in pieces, prepared or preserved otherwise than by vinegar or acetic acid
	200290	Vegetable preparations: tomatoes, (other than whole or in pieces), prepared or preserved otherwise than by vinegar or acetic acid
	200310	Vegetable preparations: mushrooms, prepared or preserved otherwise than by vinegar or acetic acid
	200320	Vegetable preparations: truffles, prepared or preserved otherwise than by vinegar or acetic acid
	200410	Vegetable preparations: potatoes, prepared or preserved otherwise than by vinegar or acetic acid, frozen
	200490	Vegetable preparations: vegetables and mixtures of vegetables (excluding potatoes), prepared or preserved otherwise than by vinegar or acetic acid, frozen
	200510	Vegetable preparations: homogenised vegetables, prepared or preserved otherwise than by vinegar or acetic acid, not frozen
	200520	Vegetable preparations: potatoes, prepared or preserved otherwise than by vinegar or acetic acid, not frozen
	200530	Vegetable preparations: sauerkraut
	200540	Vegetable preparations: peas (pisum sativum), prepared or preserved otherwise than by vinegar or acetic acid, not frozen
	200551	Vegetable preparations: beans, shelled, prepared or preserved otherwise than by vinegar or acetic acid, not frozen
	200559	Vegetable preparations: beans, (not shelled), prepared or preserved otherwise than by vinegar or acetic acid, not frozen
	200560	Vegetable preparations: asparagus, prepared or preserved otherwise than by vinegar or acetic acid, not frozen
	200570	Vegetable preparations: olives, prepared or preserved otherwise than by vinegar or acetic acid, not frozen
	200580	Vegetable preparations: sweetcorn (zea mays var. saccharata), prepared or preserved otherwise than by vinegar or acetic acid, not frozen
	200590	Vegetable preparations: vegetables and mixtures of vegetables n.e.s. in heading no. 2005, prepared or preserved otherwise than by vinegar or acetic acid, not frozen
Cereals & their products	100110	Cereals: durum wheat
	100190	Cereals: meslin and wheat other than durum
	100200	Cereals: rye
	100300	Cereals: barley
	100400	Cereals: oats
	100590	Cereals: maize (corn), other than seed
	100610	Cereals: rice in the husk (paddy or rough)
	100620	Cereals: husked (brown) rice
	100630	Cereals: rice, semi-milled or wholly milled, whether or not polished or glazed
	100640	Cereals: rice, broken
	100820	Cereals: millet
	100890	Cereals: n.e.s. in chapter 10
	110100	Wheat or meslin flour

110210	Cereal flour: of rye
110220	Cereal flour: of maize (corn)
110230	Cereal flour: of rice
110290	Cereal flours: n.e.s. in heading no. 1102
110311	Cereal groats and meal: of wheat
110312	Cereal groats and meal: of oats
110313	Cereal groats and meal: of maize (corn)
110314	Cereal groats and meal: of rice
110319	Cereal groats and meal: n.e.s. in heading no. 1103
110321	Cereal pellets: of wheat
110329	Cereal pellets: of cereals other than wheat
110411	Cereal grains: rolled or flaked, of barley
110412	Cereal grains: rolled or flaked, of oats
110419	Cereal grains: rolled or flaked, of cereals excluding barley and oats
110421	Cereal grains: worked (eg hulled, pearled, sliced or kibbled) of barley
110422	Cereal grains: worked (eg hulled, pearled, sliced or kibbled) of oats
110423	Cereal grains: worked (eg hulled, pearled, sliced or kibbled) of maize (corn)
110429	Cereal grains: worked (eg hulled, pearled, sliced or kibbled) of cereals n.e.s. in item no. 1104.2, except rice of heading no. 1006
110430	Cereal: germ of cereals, whole, rolled, flaked or ground
110510	Flour and meal: of potatoes
110520	Flakes: of potatoes
110610	Flour and meal: of the dried leguminous vegetables of heading no. 0713
110620	Flour and meal: of sago, roots or tubers of heading no. 0714
110630	Flour, meal and powder: of the products of chapter 8
110710	Malt: not roasted
110720	Malt: roasted
110811	Starch: wheat
110812	Starch: maize (corn) starch
110813	Starch: potato
110814	Starch: manioc (cassava)
110819	Starch: n.e.s. in item no. 1108.11 to 1108.14
110820	Inulin
110900	Wheat gluten: whether or not dried
190110	Food preparations: of flour, meal, starch, malt extract or milk products, for infant use, put up for retail sale
190120	Food preparations: mixes and doughs for the preparation of bread, pastry, cakes, biscuits and other bakers' wares
190190	Food preparations: of flour, meal, starch, malt extract or milk products, for uses n.e.s. in heading no. 1901
190211	Food preparations: pasta, containing eggs, uncooked, not stuffed or otherwise prepared
190219	Food preparations: pasta, uncooked (excluding that containing eggs), not stuffed or otherwise prepared
190220	Food preparations: pasta, stuffed (with meat or other substances), whether or not cooked or otherwise prepared
190230	Food preparations: pasta (excluding stuffed), cooked or otherwise prepared
190240	Food preparations: couscous
190300	Food preparations: tapioca and substitutes thereof, prepared from starch in the form of flakes, grains, pearls, siftings or similar
190410	Food preparations: obtained by the swelling or roasting of cereals or cereal products

	190490	Food preparations: cereal or cereal products (excluding maize), in grain form, pre-cooked or otherwise prepared
	190510	Food preparations: crispbread, whether or not containing cocoa
	190520	Food preparations: gingerbread and the like, whether or not containing cocoa
	190530	Food preparations: sweet biscuits, waffles and wafers, whether or not containing cocoa
	190540	Food preparations: rusks, toasted bread and similar toasted products, whether or not containing cocoa
	190590	Food preparations: bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa: communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products
Pulses, seeds and nuts and their products	080110	Nuts, edible: coconuts, fresh or dried, whether or not shelled or peeled
	080120	Nuts, edible: Brazil nuts, fresh or dried, whether or not shelled or peeled
	080130	Nuts, edible: cashew nuts, fresh or dried, whether or not shelled or peeled
	080211	Nuts, edible: almonds, fresh or dried, in shell
	080212	Nuts, edible: almonds, fresh or dried, shelled
	080221	Nuts, edible: hazelnuts or filberts (corylus spp.), fresh or dried, in shell
	080222	Nuts, edible: hazelnuts or filberts (corylus spp.), fresh or dried, shelled
	080231	Nuts, edible: walnuts, fresh or dried, in shell
	080232	Nuts, edible: walnuts, fresh or dried, shelled
	080240	Nuts, edible: chestnuts (castanea spp.), fresh or dried, whether or not shelled or peeled
	080250	Nuts, edible: pistachios, fresh or dried, whether or not shelled or peeled
	080290	Nuts, edible: n.e.s. in heading no. 0801 and 0802, fresh or dried, whether or not shelled or peeled
	120100	Soya beans: whether or not broken
	120210	Ground-nuts: in shell, not roasted or otherwise cooked
	120220	Ground-nuts: shelled, not roasted or otherwise cooked, whether or not broken
	120400	Oil seeds: linseed, whether or not broken
	120500	Oil seeds: rape or colza seeds, whether or not broken
	120600	Oil seeds: sunflower seeds, whether or not broken
	120740	Oil seeds: sesamum seeds, whether or not broken
	120750	Oil seeds: mustard seeds, whether or not broken
	120760	Oil seeds: safflower seeds, whether or not broken
	120791	Oil seeds: poppy seeds, whether or not broken
	120799	Oil seeds and oleaginous fruits: n.e.s. in heading no. 1207, whether or not broken
	120810	Flours and meals: of soya beans
	120890	Flours and meals of oil seeds or oleaginous fruits: excluding soya beans and mustard seeds
	121210	Locust beans, including locust bean seeds: of a kind used primarily for human consumption, fresh or dried, whether or not ground
All other foods	040900	Honey: natural
	080300	Fruit, edible: bananas, (including plantains), fresh or dried
	080410	Fruit, edible: dates, fresh or dried
	080420	Fruit, edible: figs, fresh or dried
	080430	Fruit, edible: pineapples, fresh or dried
	080440	Fruit, edible: avocados, fresh or dried
	080450	Fruit, edible: guavas, mangoes and mangosteens, fresh or dried
	080510	Fruit, edible: oranges, fresh or dried
	080520	Fruit, edible: mandarins (including tangerines and satsumas), clementines, wilkings and similar citrus hybrids, fresh or dried
	080530	Fruit, edible: lemons (citrus limon, citrus limonum), limes (citrus aurantifolia)
	080540	Fruit, edible: grapefruit, fresh or dried

080590	Fruit, edible: citrus fruit n.e.s. in heading no. 0805, fresh or dried
080610	Fruit, edible: grapes, fresh
080620	Fruit, edible: grapes, dried
080710	Fruit, edible: melons (including watermelons), fresh
080720	Fruit, edible: papaws (papayas), fresh
080810	Fruit, edible: apples, fresh
080820	Fruit, edible: pears and quinces, fresh
080910	Fruit, edible: apricots, fresh
080920	Fruit, edible: cherries, fresh
080930	Fruit, edible: peaches including nectarines, fresh
080940	Fruit, edible: plums and sloes, fresh
081010	Fruit, edible: strawberries, fresh
081020	Fruit, edible: raspberries, blackberries, mulberries and loganberries, fresh
081030	Fruit, edible: black, white or red currants and gooseberries, fresh
081040	Fruit, edible: cranberries, bilberries and other fruits of the genus vaccinium, fresh
081090	Fruit, edible: fruits n.e.s. in heading no. 0801 to 0810, fresh
081110	Fruit, edible: strawberries, uncooked or cooked by steaming or boiling in water, frozen, whether or not containing added sugar or other sweetening matter
081120	Fruit, edible: raspberries, blackberries, mulberries, loganberries, black, white or red currants and gooseberries, uncooked or cooked, whether or not containing added sugar or other sweetening matter
081190	Fruit, edible: fruit and nuts n.e.s. in heading no. 0811, uncooked or cooked, frozen whether or not containing added sugar or other sweetening matter
081210	Fruit, edible: cherries, provisionally preserved, but unsuitable in that state for immediate consumption
081220	Fruit, edible: strawberries, provisionally preserved, but unsuitable in that state for immediate consumption
081290	Fruit, edible: fruit and nuts n.e.s. in heading no. 0812, provisionally preserved, but unsuitable in that state for immediate consumption
081310	Fruit, edible: apricots, dried
081320	Fruit, edible: prunes, dried
081330	Fruit, edible: apples, dried
081340	Fruit, edible: fruit n.e.s. in heading no. 0812, dried
081350	Nuts, edible: mixtures of nuts or dried fruits of chapter 8
081400	Peel: of citrus fruit or melons (including watermelons), fresh, frozen, dried or provisionally preserved in brine, in sulphur water and other preservative solutions
090111	Coffee: not roasted or decaffeinated
090112	Coffee: decaffeinated, not roasted
090121	Coffee: roasted, not decaffeinated
090122	Coffee: roasted, decaffeinated
090130	Coffee: husks and skins
090140	Coffee: substitutes containing coffee, in any proportion
090210	Tea, green: (not fermented), in immediate packings of a content not exceeding 3kg
090220	Tea, green: (not fermented), in immediate packings of a content exceeding 3kg
090230	Tea, black: (fermented) and partly fermented tea, in immediate packings of a content not exceeding 3kg
090240	Tea, black: (fermented) and partly fermented tea, in immediate packings of a content exceeding 3kg
090300	Mate
090411	Spices: pepper (of the genus piper), neither crushed nor ground
090412	Spices: pepper (of the genus piper), crushed or ground

090420	Spices: fruits of the genus capsicum or pimenta, dried or crushed or ground
090500	Spices: vanilla
090610	Spices: cinnamon and cinnamon-tree flowers, neither crushed nor ground
090620	Spices: cinnamon and cinnamon-tree flowers, crushed or ground
090700	Spices: cloves (whole fruit, cloves and stems)
090810	Spices: nutmeg
090820	Spices: mace
090830	Spices: cardamoms
090910	Spices: anise or badian seeds
090920	Spices: coriander seeds
090930	Spices: cumin seeds
090940	Spices: caraway seeds
090950	Spices: fennel or juniper seeds
091010	Spices: ginger
091020	Spices: saffron
091030	Spices: turmeric (curcuma)
091040	Herbs: thyme, bay leaves
091050	Curry
091091	Spices: mixtures
091099	Spices: mixtures of 2 or more products of the same heading
120300	Copra
121010	Hop cones: neither ground nor powdered nor in the form of pellets
121020	Hop cones: ground, powdered or in the form of pellets: lupulin
121220	Seaweeds and other algae: of a kind used primarily for human consumption, fresh or dried, whether or not ground
121230	Apricot, peach or plum stones and kernels: of a kind used primarily for human consumption
121291	Sugar beet: of a kind used primarily for human consumption, fresh or dried, whether or not ground
121292	Sugar cane: of a kind used primarily for human consumption, fresh or dried, whether or not ground
121299	Vegetable products (including unroasted chicory roots, chicorium intybus sativum variety): n.e.s. in chapter 12, fresh or dried, ground or unground, primarily for human consumption
150410	Oils of fish: fish-liver oils and their fractions, whether or not refined, but not chemically modified
150420	Fats and oils and their fractions: of fish, (excluding liver-oils)
150710	Vegetable oils: soya-bean oil and its fractions, crude, whether or not degummed, not chemically modified
150790	Vegetable oils: soya-bean oil and its fractions, other than crude, whether or not refined, but not chemically modified
150810	Vegetable oils: ground-nut oil and its fractions, crude, not chemically modified
150890	Vegetable oils: ground-nut oil and its fractions, other than crude, whether or not refined, but not chemically modified
150910	Vegetable oils: olive oil and its fractions, virgin, whether or not refined, but not chemically modified
150990	Vegetable oils: olive oil and its fractions, other than virgin, whether or not refined, but not chemically modified
151000	Vegetable oils: oils and their fractions n.e.s. in chapter 15, obtained solely from olives, whether or not refined, but not chemically modified, including blends of these oils or fractions with oils or fractions of heading no. 1509
151110	Vegetable oils: palm oil and its fractions, crude, not chemically modified
151190	Vegetable oils: palm oil and its fractions, other than crude, whether or not refined, but not chemically modified

151211	Vegetable oils: sunflower seed or safflower oil and their fractions, crude, not chemically modified
151219	Vegetable oils: sunflower seed or safflower oil and their fractions, other than crude, whether or not refined, but not chemically modified
151221	Vegetable oils: cotton-seed oil and its fractions: crude, whether or not gossypol has been removed, not chemically modified
151229	Vegetable oils: cotton-seed oil and its fractions, other than crude, whether or not refined, but not chemically modified
151311	Vegetable oils: coconut (copra) oil and its fractions, crude, not chemically modified
151319	Vegetable oils: coconut (copra) oil and its fractions, other than crude, whether or not refined, but not chemically modified
151321	Vegetable oils: palm kernel or babassu oil and their fractions, crude, not chemically modified
151329	Vegetable oils: palm kernel or babassu oil and their fractions, other than crude, whether or not refined, but not chemically modified
151410	Vegetable oils: rape, colza or mustard oil and their fractions, crude, not chemically modified
151490	Vegetable oils: rape, colza or mustard oil and their fractions, other than crude, whether or not refined, but not chemically modified
151511	Vegetable oils: linseed oil and its fractions, crude, not chemically modified
151519	Vegetable oils: linseed oil and its fractions, other than crude, whether or not refined, but not chemically modified
151521	Vegetable oils: maize (corn) oil and its fractions, crude, not chemically modified
151529	Vegetable oils: maize (corn) oil and its fractions, other than crude, whether or not refined, but not chemically modified
151550	Vegetable oils: sesame oil and its fractions, whether or not refined, but not chemically modified
151560	Vegetable oils: jojoba oil and its fractions, whether or not refined, but not chemically modified
151590	Vegetable fats and oils and their fractions: fixed, n.e.s. in heading no. 1515, whether or not refined, but not chemically modified
151610	Animal fats and oils and their fractions: partly or wholly hydrogenated, inter-esterified, re-esterified or elaidinised, whether or not refined, but not further prepared
151620	Vegetable fats and oils and their fractions: partly or wholly hydrogenated, inter-esterified, re-esterified or elaidinised, whether or not refined, but not further prepared
151710	Margarine: excluding liquid margarine
151790	Edible mixtures or preparations of animal or vegetable fats or oils or of fractions of different fats or oils of this chapter, other than edible fats or oils of heading no. 1516
170111	Sugars: cane sugar, raw, in solid form, not containing added flavouring or colouring matter
170112	Sugars: beet sugar, raw, in solid form, not containing added flavouring or colouring matter
170191	Sucrose: chemically pure, containing added flavouring or colouring matter, in solid form
170199	Sucrose: chemically pure, not containing added flavouring or colouring matter, in solid form
170210	Sugars: lactose, chemically pure, in solid form: lactose syrup, not containing added flavouring or colouring matter
170220	Sugars: maple sugar chemically pure, in solid form: maple syrup, not containing added flavouring or colouring matter
170230	Sugars: glucose and glucose syrup, not containing fructose or containing in the dry state less than 20% by weight of fructose, the syrup not containing added flavouring or colouring matter
170240	Sugars: glucose and glucose syrup, containing in the dry state at least 20% but less than 50% by weight of fructose, the syrup not containing added flavouring or colouring matter
170250	Sugars: fructose, chemically pure, in solid form
170260	Sugars: fructose (excluding chemically pure fructose), in solid form, containing in the dry state more than 50% by weight of fructose: fructose syrup, not containing added flavouring or colouring matter
170290	Sugars: n.e.s. in heading no. 1702, including invert sugar
170310	Sugars: molasses, from sugar cane, resulting from the extraction or refining of sugar
170390	Sugars: molasses, from sugar beet, resulting from the extraction or refining of sugar

170410	Sugar confectionery: chewing gum, whether or not sugar-coated, not containing cocoa
170490	Sugar confectionery: (excluding chewing gum, including white chocolate), not containing cocoa
180100	Cocoa beans: whole or broken, raw or roasted
180310	Cocoa: paste, not defatted
180320	Cocoa: paste, wholly or partly defatted
180400	Cocoa: butter, fat and oil
180500	Cocoa: powder, not containing added sugar or other sweetening matter
180610	Cocoa: powder, containing added sugar or other sweetening matter
180620	Chocolate & other food preparations containing cocoa: in blocks, slabs or bars weighing more than 2kg or in liquid, paste, powder, granular or other bulk form in containers or immediate packings, content exceeding 2kg
180631	Chocolate and other food preparations containing cocoa: in blocks, slabs or bars, filled, weighing 2kg or less
180632	Chocolate and other food preparations containing cocoa: in blocks, slabs or bars, (not filled), weighing 2kg or less
180690	Chocolate and other food preparations containing cocoa: n.e.s. in chapter 18
200600	Fruit, nuts, fruit-peel and other parts of plants: preserved by sugar (drained, glace or crystallised)
200710	Jams, fruit jellies, marmalades, fruit or nut puree and fruit or nut pastes: homogenised, cooked preparations, whether or not containing added sugar or other sweetening matter
200791	Jams, jellies, marmalades, purees and pastes: of citrus fruit, being cooked preparations (excluding homogenised), whether or not containing added sugar or other sweetening matter
200799	Jams, fruit jellies, marmalades, purees and pastes: of fruit or nuts n.e.s. in heading no. 2007, cooked preparations (excluding homogenised), whether or not containing added sugar or other sweetening matter
200811	Nuts: ground-nuts, whether or not containing added sugar, other sweetening matter or spirit
200819	Nuts and other seeds: whether or not containing added sugar, other sweetening matter or spirit (excluding ground-nuts except in mixtures)
200820	Fruit: pineapples, prepared or preserved in ways n.e.s. in heading no. 2007, whether or not containing added sugar, other sweetening matter or spirit
200830	Fruit: citrus, prepared or preserved in ways n.e.s. in heading no. 2007, whether or not containing added sugar, other sweetening matter or spirit
200840	Fruit: pears, prepared or preserved in ways n.e.s. in heading no. 2007, whether or not containing added sugar, other sweetening matter or spirit
200850	Fruit: apricots, prepared or preserved in ways n.e.s. in heading no. 2007, whether or not containing added sugar, other sweetening matter or spirit
200860	Fruit: cherries, prepared or preserved in ways n.e.s. in heading no. 2007, whether or not containing added sugar, other sweetening matter or spirit
200870	Fruit: peaches, prepared or preserved in ways n.e.s. in heading no. 2007, whether or not containing added sugar, other sweetening matter or spirit
200880	Fruit: strawberries, prepared or preserved in ways n.e.s. in heading no. 2007, whether or not containing added sugar, other sweetening matter or spirit
200891	Palm hearts: prepared or preserved, whether or not containing added sugar, other sweetening matter or spirit
200892	Fruit: mixtures, prepared or preserved, whether or not containing added sugar, other sweetening matter or spirit
200899	Fruit, nuts and other edible parts of plants: prepared or preserved, whether or not containing added sugar, other sweetening matter or spirit, n.e.s. in heading no. 2008
200911	Juice: orange, frozen, unfermented, (not containing added spirit), whether or not containing added sugar or other sweetening matter
200919	Juice: orange, not frozen, unfermented, (not containing added spirit), whether or not containing added sugar or other sweetening matter
200920	Juice: grapefruit, unfermented, (not containing added spirit), whether or not containing added sugar or other sweetening matter

200930	Juice: of single citrus fruit (excluding orange or grapefruit), unfermented, (not containing added spirit), whether or not containing added sugar or other sweetening matter
200940	Juice: pineapple, unfermented, (not containing added spirit), whether or not containing added sugar or other sweetening matter
200950	Juice: tomato, unfermented, not containing added spirit, whether or not containing added sugar or other sweetening matter
200960	Juice: grape (including grape must), unfermented, not containing added spirit, whether or not containing added sugar or other sweetening matter
200970	Juice: apple, unfermented, not containing added spirit, whether or not containing added sugar or other sweetening matter
200980	Juice: of any single fruit or vegetable n.e.s. in heading no. 2009, unfermented, not containing added spirit, whether or not containing added sugar or other sweetening matter
200990	Juices: mixtures, unfermented, not containing added spirit, whether or not containing added sugar or other sweetening matter
210110	Extracts, essences and concentrates: of coffee and preparations with a basis of these extracts, essences or concentrates or with a basis of coffee
210120	Extracts, essences and concentrates: of tea or mate, and preparations with a basis of these extracts, essences or concentrates or with a basis of tea or mate
210130	Chicory, roasted and other roasted coffee substitutes: extracts, essences and concentrates thereof
210210	Yeasts: active
210220	Yeasts: inactive, other single-cell micro-organisms, dead
210230	Baking powders: prepared
210310	Sauces: soya
210320	Sauces: tomato ketchup and other tomato sauces
210330	Mustard flour and meal and prepared mustard
210390	Sauces and preparations therefor: mixed condiments and mixed seasonings
210410	Soups and broths and preparations therefor
210420	Homogenised composite food preparations
210500	Ice cream and other edible ice: whether or not containing cocoa
210610	Protein: concentrates and textured protein substances
210690	Food preparations: n.e.s. in item no. 2106.10
220110	Waters: mineral and aerated, including natural or artificial, (not containing added sugar or other sweetening matter nor flavoured)
220190	Waters: other than mineral and aerated, (not containing added sugar or other sweetening matter nor flavoured), ice and snow
220210	Waters: including mineral and aerated, containing added sugar or other sweetening matter or flavoured
220290	Non-alcoholic beverages: n.e.s. in item no. 2202.10, not including fruit or vegetable juices of heading no. 2009
220300	Beer: made from malt
220410	Wine: sparkling
220421	Wine: still, in containers holding 2 litres or less
220429	Wine: still, in containers holding more than 2 litres
220430	Grape must: n.e.s. in heading no. 2009, n.e.s. in item no. 2204.2
220510	Vermouth and other wine of fresh grapes, flavoured with plants or aromatic substances, in containers holding 2 litres or less
220590	Vermouth and other wine of fresh grapes, flavoured with plants or aromatic substances, in containers holding more than 2 litres
220600	Beverages, fermented: (eg cider, perry, mead)
220710	Undenatured ethyl alcohol: of an alcoholic strength by volume of 80% vol. or higher
220810	Alcoholic preparations: compound, of a kind used for the manufacture of beverages
220820	Spirits obtained by distilling grape wine or grape marc

220830	Whiskies
220840	Rum and tafia
220850	Gin and geneva
220890	Spirits, liqueurs and other spirituous beverages: n.e.s. in heading no. 2208
220900	Vinegar and substitutes for vinegar: obtained from acetic acid
240110	Tobacco, (not stemmed or stripped)
240120	Tobacco: partly or wholly stemmed or stripped
240130	Tobacco refuse
240210	Cigars, cheroots and cigarillos: containing tobacco including the weight of every band, wrapper or attachment thereto
240220	Cigarettes: containing tobacco
240290	Cigars, cigarillos and cheroots: containing tobacco substitutes including the weight of every band, wrapper or attachment thereto
240310	Tobacco, smoking: whether or not containing tobacco substitutes in any proportion
240391	Tobacco: ""homogenised"" or ""reconstituted""
240399	Tobacco: other than ""homogenised"" or ""reconstituted"" or ""smoking""

Appendix 7. Commodities included in frozen fish import estimates and their associated tonnage for the 14 countries in 2018.

HS92 definition (abridged)	Tonnes
Fish: albacore or longfinned tunas (thunnus alalunga), frozen	178,680
Fish: frozen, n.e.s. in heading no. 0303	147,020
Fish: skipjack or stripe-bellied bonito, frozen	72,714
Fish: tuna, frozen, n.e.s. in item no. 0303.4	72,405
Fish: yellowfin tunas (thunnus albacares), frozen	68,536
Fish: fillets, frozen	25,714
Fish: fish meat n.e.s. in heading no. 0304 (whether or not minced), fresh, chilled or frozen	15,255
Fish: herrings (clupea harengus, clupea pallasii), frozen	2,753
Fish: flat fish, frozen, n.e.s. in item no. 0303.3	2,244
Fish: dogfish and other sharks, frozen	1,853
Fish: salmonidae, frozen, n.e.s. in item no. 0302.1 and 0302.2	1,077
Fish: Pacific salmon, (oncorhynchus spp.), frozen	637
Fish: Atlantic salmon (salmo salar) and Danube salmon (hucho hucho), frozen	277
Fish: hake (merluccius spp., urophycis spp.), frozen	176
Fish: livers and roes, frozen	143
Fish: cod (gadus morhua, gadus ogac, gadus macrocephalus), frozen	122
Fish: halibut (reinhardtius hippoglossoides, hippoglossus hippoglossus, hippoglossus stenolepis), frozen	55
Fish: trout (salmo trutta, salmo gairdneri, salmo clarki, salmo aguabonita, salmo gilae), frozen	46
Fish: sole (solea spp.), frozen	30
Fish: plaice (pleuronectes platessa), frozen	27
Fish: sea bass (dicentrarchus labrax, dicentrarchus punctatus), frozen	9
Fish: eels (anguilla spp.), frozen	6

Appendix 8. Local currencies of non-USD Pacific countries and the exchange rates during the time of HIES. The currency of the PICs, Federated States of Micronesia, Marshall Islands, and Palau is USD.

country	Currency	Year	Month	Exchange rate	country	Currency	Year	Month	Exchange rate
Cook Islands	New Zealand dollar	2015	11	0.65667	Tonga	Tongan Pa'anga	2015	10	0.4533
		2015	12	0.67368			2015	11	0.4487
		2016	1	0.65203			2015	12	0.4506
		2016	2	0.66334			2016	1	0.4438
		2016	3	0.67329			2016	2	0.4431
		2016	4	0.68917			2016	3	0.448
		2016	5	0.68034			2016	4	0.4527
		2016	6	0.70336			2016	5	0.4475
		2016	7	0.71231			2016	6	0.45
		2016	8	0.72293			2016	7	0.4547
		2016	9	0.73090			2016	8	0.4561
		2016	10	0.71584			2016	9	0.4589
		2016	11	0.71528			2016	10	0.4576
		2016	12	0.70484	Tuvalu	Australian dollar	2015	11	0.7189
Kiribati	Australian dollar	2019	5	0.6916			2015	12	0.7306
		2019	6	0.7013			2016	1	0.7100
		2019	7	0.6894			2016	2	0.7140
		2019	8	0.6718			2016	3	0.7657
		2019	9	0.6749			2016	4	0.7655
		2019	10	0.6926			2016	5	0.7242
		2019	11	0.6777			2016	6	0.7426
		2019	12	0.7006			2016	7	0.7522
		2020	1	0.6724			2016	8	0.7514

		2020	2	0.6524			2016	9	0.7630
		2020	3	0.6175			2016	10	0.7613
Nauru	Australian dollar	2012	9	1.0464			2016	11	0.7474
		2012	10	1.0378			2016	12	0.7236
		2012	11	1.0431	Vanuatu	Vatu	2019	2	0.0089
		2012	12	1.0384			2019	3	0.0088
		2013	1	1.0394			2019	4	0.0088
		2013	2	1.0275			2019	5	0.0088
		2013	3	1.0426			2019	6	0.0087
		2013	4	1.0368			2019	7	0.0087
		2013	5	0.9649			2019	8	0.0086
		2013	6	0.9275			2019	9	0.0086
		2013	7	0.9037			2019	10	0.0086
		2013	8	0.8947			2019	11	0.0086
		2013	9	0.9309			2019	12	0.0087
Niue	New Zealand dollar	2015	11	0.65667			2020	1	0.0087
		2015	12	0.67368			2020	2	0.0085
		2016	1	0.65203			2020	3	0.0082
		2016	2	0.66334	Samoa	Samoan Tala	2018	3	0.3989
		2016	3	0.67329			2018	4	0.3979
		2016	4	0.68917			2018	5	0.3907
		2016	5	0.68034			2018	6	0.39
		2016	6	0.70336			2018	7	0.3863
		2016	7	0.71231			2018	8	0.3836
		2016	8	0.72293			2018	9	0.3806
		2016	9	0.73090			2018	10	0.3785
		2016	10	0.71584			2018	11	0.3837
		2016	11	0.71528					
		12	10	0.1364					

Solomon Islands	Solomon Island dollar	12	11	0.1361
		12	12	0.1359
		13	1	0.1358
		13	2	0.1368
		13	3	0.137
		13	4	0.1369
		13	5	0.1373
		13	6	0.1372
		13	7	0.1377
		13	8	0.1381
		13	9	0.137
		13	10	0.136

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