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United Nations



The role of diets and food systems in the prevention of obesity and non-communicable diseases in Fiji

Gathering evidence and supporting multistakeholder engagement



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The FIRST programme has been working in Fiji since 2016 to produce evidence and information useful to inform decision-making related to Food Security and Nutrition in the country. Two key aspects of this work are the adoption of a multi-sectoral approach, considered essential to achieve sustainable results, and a food systems perspective that includes a wide range of processes and stakeholders and goes beyond the food supply chains, including food environments, consumer behaviours and diets.

The research is aligned with the FIRST approach and is an important contribution to the work done so far, incorporating key updated information and analysis on the Fijian Food System, including current challenges related to the COVID-19 crisis.

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Abbreviations and acronyms

| | |
|---------|--|
| AMA | Agricultural Marketing Authority |
| ASF | Animal sourced foods |
| COP | Costed Operational Plan |
| DDS | Dietary diversity score |
| DR-NCD | Diet related non-communicable disease |
| FAO | Food and Agriculture Organization of the United Nations |
| FCCC | Fijian Competition and Consumer Commission |
| FCLC | Fiji Crop and Livestock Council |
| FHFB | Fiji Healthy Food Basket |
| FIRST | Food and Nutrition Security Impact, Resilience, Sustainability and Transformation |
| FJD | Fijian dollars |
| FNPF | Fiji National Provident Fund |
| FNU | Fiji National University |
| HDDS | Household dietary diversity score |
| HIES | Household income and expenditure survey |
| HPS | Health Promoting Schools |
| IDDS | Individual dietary diversity score |
| MOEHA | Ministry of Education, Heritage and Arts |
| MOFISH | Ministry of Fisheries |
| MOFOR | Ministry of Forestry |
| MOHMS | Ministry of Health and Medical Services |
| MOIMS | Ministry of Infrastructure and Meteorological Services |
| MOITDMS | Ministry of Infrastructure, Transport, Disaster Management & Meteorological Services |
| MOITT | Ministry of Industry, Trade and Transport |
| MOWCPA | Ministry of Women, Children and Poverty Alleviation |
| MOWE | Ministry of Waterways and Environment |
| MOYS | Ministry of Youth and Sport |
| MSG | Melanesian Spearhead Group |
| NCD | Non-communicable disease |
| NDP | National Development Plan |
| NFNC | National Food and Nutrition Centre |

| | |
|-------|---|
| PIC | Pacific Island Countries |
| PICTA | Pacific Islands Countries Trade Agreement |
| SDG | Sustainable Development Goal |
| SDP | Strategic Development Plan |
| SPC | Pacific Community |
| SSB | Sugar sweetened beverages |
| UN | United Nations |
| USC | University of the Sunshine Coast |
| USP | University of the South Pacific |
| WHO | World Health Organization |
| WTO | World Trade Organization |

Executive summary

Over the past few decades nutrition transition has occurred in Pacific Islands Countries (PICS), influencing the health profile of Pacific Islands populations and resulting in significant rates of diet related non-communicable diseases (DR-NCD). In most PICS, including Fiji, imported processed foods, in particular refined rice, flour products, sugar, fatty meats, vegetable oils, and other processed foods have become predominant in most people's diet (FAO, 2011b; WHO Regional Office for the Western Pacific, 2003). These foods are usually higher in fat, salt and sugar compared to minimally processed foods and there is an increased availability of highly processed foods (Snowdon et al., 2013; Sievert et al., 2019). While nutritious traditional foods, such as taro, breadfruit, banana, coconut, fish and seafood, are still consumed, they are done so less frequently. There is an assumption that food systems have changed, particularly in urban areas, but more work is needed to assess this and to identify mechanisms of policy impact.

The aim of this report is to provide evidence and information to facilitate and enhance policy dialogue in various forums, to produce recommendations and a roadmap for policy change to prevent overweight, obesity and NCDs in Fiji. The information contained in this report will be synthesised for use at a UN Food Systems Summit Event in Fiji in 2021.

This project had four components, each with several related activities. These activities were; (i) collate evidence-based data and information of nutritional and health outcomes and dietary patterns in Fiji, (ii) develop a better understanding of the food retail environment in Fiji, including food accessibility, the retail food environment around schools and priority vulnerable groups, (iii) provide a detailed understanding of the multisector policy landscape and how this influences the food system and diets in Fiji, and (iv) define a road-map to outline opportunities for future research and actions to inform a comprehensive and evidence-based approach to preventing overweight, obesity and NCDs. Due to the impact of Covid-19, component (iv) was not undertaken, however this report presents a synthesis of the project findings to inform policy dialogue in 2021.

This project used a stepwise approach based on the FAO 'Strengthening sector policies for better food security and nutrition results: Food systems for healthy diets policy guidance note' (FAO, 2018). A situational analysis was used to understand Fiji's food systems and how they contribute to nutrition challenges in the country. A systematic literature search identified sources of information examining dietary intake in resident Fijians. Several activities were used to assess food systems, food consumption

and food behaviours in Fiji. These activities utilised data from sites across Viti Levu and Vanua Levu, data collected in five key locations and pre-existing data sets (FAOSTAT). A mapping and analysis of Fiji's policy landscape was conducted to understand its influence on the food system and diets. Fiji's policy context, policy measures, and capacity for policy effectiveness were all examined using a multisectoral and food system-wide approach, to provide a comprehensive view of entry points to shape the food system and support healthy diets. An additional survey explored the impact of COVID-19 on smallholder farmers, vendors and market consumers.

Despite the lack of literature and inconsistencies in research aims and methods, it is evident that dietary intake has been shifting from traditional food consumption patterns to diets that are heavily reliant on imported and increasingly processed foods in Fiji (O'Meara et al., 2019; Wate et al., 2013; Lako and Nguyen, 2001; Medina Hidalgo et al., 2020; Schultz et al., 2007). This is apparent in both rural and urban populations. This is likely due to the food systems of Fiji, which have been classified as 'mixed food systems', according to the criteria provided in 'Strengthening sector policies for better food security and nutrition results: Food systems for healthy diets' (FAO, 2018). Availability of food items varies depending on location, however there is evidence of food environments with high availability of energy dense, nutrient poor foods, in both rural and urban locations. Food environments around vulnerable populations, for example schools, are of concern, with 80 percent of the outlets surveyed within 400 m school zones selling sugar-sweetened beverages.

While the process of developing policies that support a healthy diet is enabled by Fiji's whole-of-government commitment to improving food nutrition security, there are competing priorities and points of incoherence that deter this, particularly relating to economic growth. Owing to this, efforts to improve food and nutrition security focus on the production and supply of food, with demand-side interventions to facilitate the consumption of nutrient-rich foods undervalued and resourced. A national food and nutrition security policy that seeks to address these issues has long been awaiting approval, and in its absence, there is a lack of multisectoral coordination to address nutrition in Fiji.

A range of specific policy measures have been introduced in Fiji by different government sectors that influence all facets of the food system. Measures that support a healthy diet include: inputs and subsidies to assist the household and commercial production of diverse nutrient-rich foods in rural and urban areas; regulations to control the marketing of breastmilk substitutes; regulations to ensure the safety, quality and suitable labelling of foods, which include measures to enhance the nutritional value of certain staples; initiatives to strengthen market linkages and market infrastructure to facilitate access to local nutrient-

rich foods; fiscal measures to improve the affordability of fruits and vegetables not produced locally, and to reduce the affordability of imported sugar-sweetened drinks; policy to control the provision of foods in schools; and nationally endorsed dietary guidelines. Measures that support an unhealthy diet include: land tenure agreements that reduce investment in long-term and sustainable agriculture; inputs and subsidies to intensify the household and commercial production of milled rice, being energy-dense and low in nutritional value; the recent removal of tariffs on certain imported highly processed foods; and the easing of regulations on commercial businesses.

Capacities required to develop and deliver policies are limited across government, primarily by the allocation of resources and technical expertise. This reduces the effectiveness of existing policy measures to support healthy diets, and the progression of new measures. A range of gaps and opportunities exist among the policy measures identified, and entry points lie throughout the food system and associated policy environment to improve dietary behaviour in Fiji.

The next step in this work is to undertake policy dialogue with key stakeholders. This step will further identify current coordination and multi-stakeholder mechanisms, key entry points for policy dialogue and change, and advocate for policy change. To date, collaboration appears to work well, with established partnerships with Fijian and International partners. However, initial discussions suggest that more multi sector engagement would be of use and should be better supported. An outcome of this policy dialogue will be to develop a roadmap at country-level to raise level of awareness and inform the next steps for acting on food systems in the context of healthy diets.

BACKGROUND

Over the past decades nutrition transition has occurred in Pacific Islands Countries (PICS), influencing the health profile of Pacific Islands populations and resulting in significant rates of diet related non-communicable diseases (DR-NCD). The prevalence of obesity in the Pacific Island region is among the highest in the world, with rates as high as 61 percent in Nauru and 48 percent in Tonga, compared to a global average of about 13 percent (WHO, 2019). The prevalence of both overweight and obesity is higher for women, in line with global data, and increasing for adolescents. Increasing rates of diabetes, certain cancers and cardiovascular diseases have also been observed (WHO, 2018). In 2016 for example, diabetes was responsible for 22 percent of all deaths in Fiji, and in 2010 the proportion of premature deaths caused by non-communicable diseases (NCDs) was as high as 42 percent for women in Vanuatu and 38 percent in the Solomon Islands. The consequences of this are significant, for example, public health expenditure in 2016 represented an average of about 16 percent of total government expenditure for the sub-region and is seen as an unsustainable burden for governments (The World Bank, 2014).

Global evidence shows that the number one risk factor for NCDs is diet-related (Global Health Data Exchange, 2016). Malnutrition in the sub-region is closely correlated to a shift in dietary patterns in PICS. In most PICS, imported processed foods, in particular refined rice, flour products, sugar, fatty meats, vegetable oils, and other processed foods low in nutrients and fibre, and high in fat, salt and sugar, have become predominant in most people's diet (FAO, 2011b; WHO Regional Office for the Western Pacific, 2003). There is an increased availability of highly processed foods (Snowdon *et al.*, 2013; Sievert *et al.*, 2019). While nutritious traditional foods, such as taro, breadfruit, banana, coconut, fish and seafood, are still consumed, they are done so less frequently.

In line with global and regional evidence (Imamura *et al.*, 2015), PICS have been experiencing a concomitant rise in overweight, obesity and NCD rates with rapid income growth and urbanisation (Asian Development Bank, 2012). However, the recent rise in overweight, obesity and NCDs requires systematic analysis in the context of PICS to understand which population groups or geographic areas are most affected. While there is an assumption that rapid income growth and urbanisation in the country have led to significant changes in people's diets, away from staples and fresh foods towards higher-value meat products and high processed foods, the increase in Body Mass Index (BMI) is in fact slightly higher in rural areas, especially for women (Bixby *et al.*, 2019).

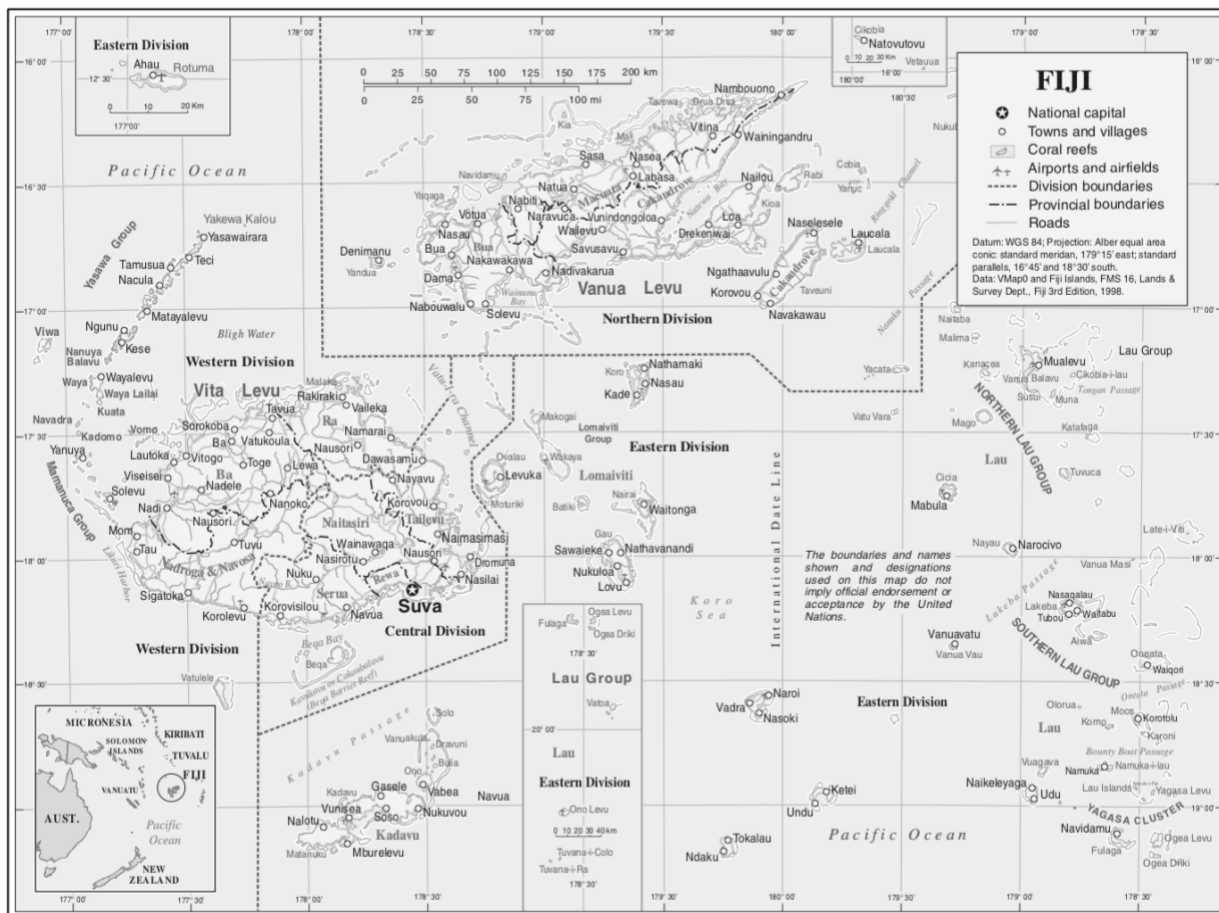
While it is acknowledged that changes in income levels have led to a shift in patterns of demand, there is evidence that the latter has also been influenced by an evolution in the structure and nature of food systems (Swinburn *et al.*, 2011). Diets are a consequence of the food system, which encompasses all of the elements involved in taking food from production to consumption (The High Level Panel of Experts, 2017). Food systems are shaped by policy measures introduced by all sectors of government. Policy measures can facilitate the consumption of a healthy diet, or an unhealthy diet. Changes in the production, processing, and retail sub-systems have led to a transformation of the food environment that surrounds people. This environment affects people's day-to-day buying decisions, especially in urban areas, by making certain foods high in fats, salt and sugar more affordable and more physically available, while making others, such as diverse fresh foods, less so. Changing food production and processing modes exposes people to certain substances, such as antibiotics, food additives, flavoring agents and agricultural residues that affect their health status. It is posited that similar changes have occurred in PICS, however little systematic evidence of the evolution of these trends and how they are associated with changes in the food system exist. Understanding these changes in the context of low income and least developed countries embedded in the complex web of regional economic interdependence is a key to moving towards reducing PICS levels of overweight, obesity and NCDs.

The 2018-2019 Country level Food and Nutrition Security policy effectiveness analysis carried out by FAO Food and Nutrition Security Impact, Resilience, Sustainability and Transformation (FIRST) Programme in Fiji identified similar issues. Despite Fiji's food systems potential to produce a wide variety of staple and traditional food crops (such as dalo, cassava and kumala), tropical fruits and vegetables, food and nutrition security indicators have scarcely improved during the last few decades, and many Fijians cannot afford a healthy diet. This is related to poor agricultural practices that cause poor soil fertility and erosion; and poor control of pests, diseases and invasive species, and limited access by small-scale subsistence farmers, who mainly produce the food crops, to modern technology, knowledge and markets. The high cost of production and labor, coupled with low productivity and inefficiency, are disincentives to staying in the agricultural sector which is reflected in the increasing average age of farmers, with young people preferring to look for better and more secure jobs out of the sector affecting the workforce.

The Republic of Fiji (Fiji), is in Melanesia, north of New Zealand, and north-east of Australia in the South Pacific Ocean (Figure 1). The 2017 Population and Housing Census reported a population of approximately 884,887, with a median age of 27.5 years and 50.7 percent of the population as male (Statistics., 2018 2017). Just over half (55.9 percent) of Fijians lived in urban areas, with more of those in the age ranges 20–24, 25-29, 30–34 and 35-39 living in urban areas (Fiji Bureau of Statistics, 2018). There are two main ethnic groups in Fiji; the iTaukei (Indigenous Fijians) and Indo-Fijians. These ethnic groups have distinct

cultural backgrounds and traditions, but some cultural overlap given their coexistence in Fiji (Department of Foreign Affairs and Trade, 2016). Traditional diets within these two ethnic groups vary.

Figure 1. Map of Fiji.



Source: United Nations, Department of Field Support. Cartographic Section, 2009. Map no. 4371.

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and evidence-based approach to preventing overweight, obesity and NCDs. Due to the impact of COVID-19, component (iv) was not undertaken, however this report presents the project findings to inform policy dialogue in 2021.

Project changes due to COVID-19

The COVID-19 pandemic has had a significant impact globally. International travel was restricted during most of 2020, and domestically, curfew, social distancing and travel restrictions were in place in Fiji for some of this time. The original project timeline (January–August 2020) coincided with COVID-19, presenting challenges to data collection. Several elements of this project were adapted due to impact of COVID-19, including an extension to the timeline (January – December 2020), and the methodology of several activities. The major changes to this project are listed here and elaborated on where relevant in this report.

- The original methodology for this project included mapping the food retail environments of selected neighbourhoods in urban areas, depending on the outcome of report 1. As COVID-19 has affected the order in which activities could take place, this mapping was based on selected locations used in Activity 1, but not dependent on report 1.
- The original methodology for this project included multiple forms of dietary assessment. As the research team could not travel to Fiji, dietary diversity score (DDS) was used as an indicator of dietary intake. This method was considered more robust when using in-country enumerators and aligned with recent assessments of dietary intake in Fiji and consequently was more useful in drawing comparisons to the relevant literature.
- The value chain activity was not completed because of the requirement of post-harvest expertise to be present and directly involved in this activity.
- The original methodology for component four of the project (Towards policy dialogue) included face-to-face workshops, to be held both mid and end of project for policy dialogue. As face-to-face workshops have not been possible, the materials for a policy dialogue workshop have been developed, in anticipation of this workshop occurring once travel and social distancing restrictions are lifted.

Terminology

Throughout this report the term ‘food and nutrition security’ has been used. This is different to the terminology used by FAO, which is ‘food security and nutrition’. ‘Food and nutrition security’ has been used in this report as it aligns with Fijian documentation and the Fijian context.

METHODS

Approvals

The following approvals were received for this project:

- Fiji Human Health Research and Ethics Review Committee (09/2020)
- Ministry of Education, Heritage and Arts research approval (RA 29/20)
- USC Human Research Ethics Committee (A201355)

Table 1. Key indicators and data sources used for the situational analysis

| Key indicator | Data source(s) and indication of scope |
|---|---|
| Status of underweight, stunting, micronutrient deficiency, overweight and obesity | <ul style="list-style-type: none"> • Review of existing literature (18 sources) |
| Usual dietary intake and food behaviours | <ul style="list-style-type: none"> • Representative dietary intake (household/individual dietary diversity) (467 individuals) • Survey of purchasing behaviours, influences on food choice, child and infant feeding practices (467 individuals) • Review of existing literature (18 sources) • COVID-19 impact study (567 vendors, farmers and consumers) |
| Affordability of a healthy diet | <ul style="list-style-type: none"> • Fiji Healthy Food Basket (newly developed) (13 data sets) • Food price monitoring data (FAOSTAT) |
| Diversity and stability of the food supply | <ul style="list-style-type: none"> • Local environment mapping for food availability (284 food outlets) • COVID-19 impact study (567 vendors, farmers and consumers) • GIS mapping of the fresh food system (1 185 commercial outlets, including 505 shops, 278 fixed road-side stalls, 179 mobile road-side stalls, 137 supermarkets, 63 cluster road-side markets, and 19 municipal markets) |
| Healthfulness of the food environment in various settings | <ul style="list-style-type: none"> • School food environment assessments: Survey of food environments around schools, and in key rural/urban locations (88 school environments, 197 food outlets and interviews with stakeholders from 84 schools) • Survey of consumer perceptions of food environments (63 online survey responses) |

Approach

This project used a stepwise approach, based on the FAO ‘Strengthening sector policies for better food security and nutrition results: Food systems for healthy diets policy guidance note’ (FAO, 2018). A situational analysis was used to understand Fiji’s food systems and how they contribute to nutrition challenges in the country. This was complemented with a mapping and analysis of Fiji’s policy landscape to understand its influence on the food system and diets.

Situational analysis

The situational analysis used several activities, as indicated in Table 1, to understand Fiji’s food system and how these contribute to nutrition challenges.

As this project included several activities, a summary of methods is provided in this chapter, with reference to appendices providing further detail.

Food systems, food consumption, and food behaviours

Several activities were used to assess food systems, food consumption, and food behaviours in Fiji. These activities were adapted because of the impact of COVID-19 on domestic and international travel and government advice (i.e. social distancing). These activities utilised data from sites across Fiji’s two major islands Viti Levu and Vanua Levu (GIS mapping of the fresh food system and school food environment assessments), data collected in five key locations on these islands (local environment mapping for food availability, Fiji Healthy Food Basket [HFAB], dietary diversity and food behaviours) and pre-existing data sets (FAOSTAT). These methods are outlined in the subsequent sections.

GIS mapping of the fresh food system

This study sought to spatial map where fresh fruits and vegetables were being commercially sold in Fiji to provide base-line data on accessibility (for full method see Appendix I). A total of 1 185 commercial outlets (i.e. shops, supermarkets, municipal markets and road-side vendors) were surveyed, including 505 shops, 278 fixed road-side stalls, 179 mobile road-side stalls, 137 supermarkets, 63 cluster road-side markets, and 19 municipal markets were surveyed for this activity.

School food environment assessments

This activity aimed to assess school food environments. Schools accredited with the World Health Organization (WHO) Health Promoting School program (HPS) were randomly selected through stratified sampling. Assessments comprised the mapping of outlets selling food items, including type of outlet and items for sale, within the immediate area outside the school and a short interviewer administered survey

with a school representative (for full method see Appendix II). Eighty-eight schools were included in this activity, with 197 food outlets mapped and 84 schools participating in an interview.

Local food environments and dietary behaviours

In response to the impact of COVID-19, five locations were selected with FAO and the National Food and Nutrition Centre (NFNC), to investigate:

- local environment mapping for food availability,
- the Fiji Healthy Food Basket,
- dietary diversity, and
- influences on food choice and consumer purchasing behaviours.

These locations were used for several data collection points to provide a robust picture of dietary behaviours and food systems in these areas.

Within each of these five locations, areas were selected as the sites of data collection (Table 2). The locations were chosen to represent urban (n= 3) and rural (n= 2) locations, given the 2017 population distribution of 56 percent in urban and 44 percent in rural areas. Three urban areas were selected given the population density in these divisions.

Table 2. Sites for data collection (local food environments, dietary intake and behaviours)

| Urban/rural status | Island | Division | Location | Area one | Area two | Area three |
|--------------------|------------|----------|----------|--------------|-----------|------------|
| Urban | Viti Levu | Central | Suva | Suva City | Lami | Valelevu |
| Urban | | Western | Lautoka | Lautoka City | Saweni | Drasa |
| Rural | | Western | Sigatoka | Lomawai | Nawaicoba | Nadroumai |
| Urban | Vanua Levu | Northern | Labasa | Labasa Town | Vulovi | Wailevu |
| Rural | | Northern | Bua | Wainunu | Lekutu | Nabouwalu |

Local environment mapping for food availability

This activity aimed to assess the local retail environment of selected locations in Fiji, specifically the availability of food outlets and of food items. To map the retail environment of selected neighbourhoods, local trained enumerators collected information on the food outlets (places where food was available for purchase), and types of food available within these outlets, within a pre-determined 500m zone of each

location (Table 2), during November 2020 (for full method see Appendix III). Two-hundred and eighty-four outlets were included for mapping in this activity.

Fiji Healthy Food Basket

The Fiji Healthy Food Basket (FHFB) assessment is a cross-sectional survey of the costs and availability of basic food items that promote healthy food choices. This includes a variety of basic foods that are culturally appropriate for both iTaukei and Indo-Fijian populations and meet nutrition requirements and recommendations for the reference family for one fortnight. The development of the FHFB survey tool was based on methodology used for healthy food baskets developed for Australian contexts (Palermo and Wilson, 2007), with modifications to reflect the food environment for a Fijian context and significant input from the NFNC and FAO. The survey data (which is the price of each food item in the FHFB survey) was collected from selected stores (Table 3) in November 2020 (for full method see Appendix VI). Thirteen data sets were collected for this activity as data was unable to be collected from two of the initial proposed sites.

Table 3. Initial sites for data collection of the Fiji Healthy Food Basket

| Urban/rural status | Island | Location | Area one | Area two | Area three | Number of stores |
|------------------------|------------|----------|--------------|-----------|------------|------------------|
| Urban | Viti Levu | Suva | Suva City | Lami | Valelevu | 3 |
| Urban | | Lautoka | Lautoka City | Saweni | Drasa | 3 |
| Rural | | Sigatoka | Lomawai | Nawaicoba | Nadroumai | 3 |
| Urban | Vanua Levu | Labasa | Labasa Town | Vulovi | Wailevu | 3 |
| Rural | | Bua | Wainunu | Lekutu | Nabouwalu | 3 |
| Total number of stores | | | | | | 15 |

Dietary diversity and food behaviours

The aim of this activity was to collect and assess current data on dietary intake and behaviours in resident Fijians. Given the challenges faced with COVID-19, this was collected using several methods, including a dietary diversity method (to calculate dietary diversity score [DDS]) and online questionnaire. During November 2020, individuals in the key locations (Table 2) were invited to take part in an interviewer administered survey to collect data on dietary diversity (individual or household), influences on food choice, child and infant feeding practices (if relevant) and consumer purchasing behaviours (for full method see Appendix V). Four-hundred and sixty-seven individuals provided data for this activity. This is

presented as dietary intake in the results, with sections outlining household and individual dietary diversity scores, indicators of micronutrient consumption, child and infant feeding practices, growing and purchasing food and influences on food choice.

In addition to the DDS interviews, the online survey aimed to explore dietary behaviours in Fijians, focusing specifically on eating away from home, food literacy, drivers of food choice and the impact of COVID-19 on food consumption behaviours (for full method see Appendix VI). Sixty-seven individuals completed the online survey. The findings are presented as food behaviours and food literacy in the results. Covid-19 related results are presented in the Covid-19 section of the results.

Food imports and food price

The FAOSTAT database was used to identify food system related data, including food imports (FAO, 2020b) and food price inflation (FAO, 2020a). The initial analysis aimed to assess common food items (white rice, brown rice, full fat milk, skimmed milk, common processed meats, unprocessed meats and fresh fruit and vegetables) to describe annual import quantity trends over the last 18 years (2000-2018). Unofficial and FAO estimate data points were removed for analysis. Due to an inability to assess certain food items separately, only white rice, brown rice, full fat milk and skimmed milk were included for analysis. Monthly food price inflation was analysed to identify any trends over the last 19 years (2001-2020). The data used in this analysis were downloaded from the FAOSTAT database during December 2020.

COVID-19

As COVID-19 has significantly impacted food systems globally, several facets of this project were adapted to gather information on the impact of COVID-19 on food systems and consumers in Fiji. This included the impact of COVID-19 on food behaviours, food accessibility and food consumption in the online survey (for full method see Appendix VI). Where participants made comment related to COVID-19 in other data collection activities, these have been collated and presented in the COVID-19 results section.

A complementary report presents findings from a study that surveyed 1 292 Pacific Island smallholder horticultural farmers, market vendors and consumers in Tonga, Fiji and Samoa, over a five-month period (July to November 2020). The Fijian cohort of this study comprises n= 150 farmers, n= 216 vendors and n= 201 consumers (total: n= 567) (Underhill *et al.*, 2020).

The policy landscape

This activity aimed to provide a detailed understanding of the multi-sectoral policy landscape in Fiji and how this influences the food system and diets. A desk-based review was initially undertaken to identify current Fijian policy documents from all sectors with potential to influence the food system and diets. Policy documents were identified through an internet search of grey literature, including Fijian government websites and social media pages, and international food and agricultural policy databases. A questionnaire and capacity assessment tool was then developed for key informant interviews to: (i) verify the currency of and gaps in policy documents identified from the desk-based review; (ii) identify current and planned policy measures that may influence the food system and diets; and (iii) establish capacity needs and assets for policy development and delivery. The tool is provided in Appendix VII. Key informant interviews were then conducted. Because of COVID-19, some key informant interviews were conducted face-to-face by an in-country consultant, while others were completed remotely over web-based calls by a USC team member. Interviews were conducted with representatives involved in policy processes from government departments and agencies, scientific and technical organisations, and the private sector. A list of organisations interviewed is provided in Appendix VIII.

Results have been analysed and presented in three parts: policy context, policy measures, and capacity for policy effectiveness. **Policy context** examines the key guiding documents identified that inform the development of policies in Fiji that influence the food system and diets, by defining strategic and policy priorities. They include international, whole-of-government and sector-specific documents. **Policy measures** examines the existing, planned and lacking policy measures in Fiji that influence each function of the food system. Measures examined are informed by key international and regional guiding documents including: the Second International Conference on Nutrition (ICN2) Framework for Action (FAO and WHO, 2014b); FAO Policy Guidance Series: Strengthening Sector Policies for Better Food Security and Nutrition Results (FAO, 2018); FAO Nutrition-Sensitive Agriculture and Food System in Practice: Options for Intervention (FAO, 2017); Pacific NCD Roadmap (World Bank, 2014); and WHO 'Best-buys' and other recommended interventions for the prevention and control of NCDs (WHO, 2017). While all policy measures examined have the potential to influence the food system and diets, those established globally as most effective for the prevention and control of overweight, obesity and NCDs are specifically acknowledged. **Capacity for policy effectiveness** provides an overview of capacity assets and needs at the enabling environment, organisational and individual levels that affect policy processes in Fiji, including policy development and review; policy implementation; and policy monitoring and enforcement.

Research activities and collaboration

A third desk review was then used to identify recent (within the previous five years), current and planned research activities with relevance to food systems, health, food security and policy in Fiji. An initial discussion with key researchers was undertaken to identify recent, current and planned collaborations, and barriers and enablers to research collaboration (for full method see Appendix VII). This will be expanded as part of the policy dialogue workshops and will contribute to development of a roadmap to inform future research needs for a comprehensive and science-based approach to preventing overweight, obesity and diet-related non-communicable diseases.

RESULTS AND DISCUSSION

As the results of the situational analysis and policy landscape are interrelated, the results and discussion of this project have been combined in this section.

Situational analysis

Review of the literature

Eighteen references that directly or indirectly relate to dietary intake in Fiji were identified, including both original (n=15) and secondary (n=3) sources (Table 4).

In the past 20 to 30 years accelerated changes to local food systems and dietary patterns in Fiji have contributed to rising rates of overweight and obesity (Chand *et al.*, 2020). The rise in this form of malnutrition has led to an increase in the incidence of a range of DR-NCD, such as diabetes, certain cancers and cardiovascular diseases (Chand *et al.*, 2020). NCDs now represent over 80 percent of deaths in Fiji annually, generating a significant social and economic burden (Chand *et al.*, 2020). Understanding historical changes to dietary patterns in Fiji is an important step towards identifying drivers of nutritional/health outcomes of affected populations and associations with key evolutions in the food system. Literature reporting the dietary intake of resident Fijians is limited. The literature is presented within a summary table (Table 4), and a summary is provided here.

Dietary consumption has been measured with different methods (Fiji National Food and Nutrition Committee, 1995), including 24-hour recalls (Lako and Nguyen, 2001; Schultz *et al.*, 2007; Hill Laboratories (New Zealand), 2010; Tomisaka *et al.*, 2002), weighed food diaries (Owen, 2002; Tunidau-Schultz *et al.*, 1996), dietary diversity assessments (O'Meara *et al.*, 2019; Medina Hidalgo *et al.*, 2020) and food frequency questionnaires (Snowdon *et al.*, 2011; Wate *et al.*, 2013; Lako and Nguyen, 2001) and therefore results are difficult to compare. A variety of dietary factors have also been investigated, including dietary intake of phytochemicals (Lako *et al.*, 2006), feeding practices of infants and preschool aged children (Singh and King, 2003), adolescence consumption of carbonated soft drinks (Cdc.gov, 2016) and consumption of fruits and vegetables (Snowdon *et al.*, 2011), salt (Pillay *et al.*, 2017) and iron fortified food items (Hill Laboratories (New Zealand), 2010).

Several studies have investigated links between dietary patterns and type 2 diabetes (Tomisaka *et al.*, 2002) and the relationship between healthy and less healthy dietary behaviour and standard body mass

index (Wate *et al.*, 2013). In the past five years multiple studies have focused on measuring dietary diversity (O'Meara *et al.*, 2019; Medina Hidalgo *et al.*, 2020; Haynes *et al.*, 2020). However, the methods used to assess dietary diversity have varied across sample populations (O'Meara *et al.*, 2019; Medina Hidalgo *et al.*, 2020; Haynes *et al.*, 2020). Although some studies aimed to measure food and dietary patterns and nutritional status across the entire Fijian population (Schultz *et al.*, 2007; Fiji National Food and Nutrition Committee, 1995), and several studies compared the changes in food consumption patterns in specific locations over certain periods of time (Tunidau-Schultz *et al.*, 1996), it is evident that most research has been isolated and focused on subsets of the population. As demonstrated in Table 4, there are significant gaps in understanding dietary intake and behaviours, particularly within some demographic groups. Furthermore, factors such as ethnicity, gender, age and geographic zoning are under-represented in the literature. It is worth noting that a national nutrition survey was completed for Fiji during 2014-2015, however only preliminary findings pertaining to nutrition variables have been released to the general public.

Despite the lack of literature and inconsistencies in research aims and methods, it is evident that dietary intake has been shifting from traditional food consumption patterns to diets that are heavily reliant on imported and increasingly processed foods (O'Meara *et al.*, 2019; Wate *et al.*, 2013; Lako and Nguyen, 2001; Medina Hidalgo *et al.*, 2020; Schultz *et al.*, 2007). This is apparent in both rural and urban populations. This is likely due to the food systems of Fiji, which have been classified as 'mixed food systems', according to the criteria provided in 'Strengthening sector policies for better food security and nutrition results: Food systems for healthy diets' (FAO, 2018). Traditionally, Fijian households relied on local fisheries, agriculture and wild food supplies to sustain dietary needs, comprising a range of fresh fruits, vegetables, roots, tubers and seafood. Although many communities still rely on this subsistence lifestyle, declining self-sufficiency has led to a reduction in the consumption of locally acquired food and the introduction of imported store-bought non-perishable food items (O'Meara *et al.*, 2019; Medina Hidalgo *et al.*, 2020; Haynes *et al.*, 2020). These include cereals, white rice, pulses, vegetable oil and fat, canned meat products, tinned fish, sugar, sugar sweetened beverages (SSB) and a variety of other processed foods that are often high in fat, salt and sugar (Schultz *et al.*, 2007). Although Indo-Fijians and iTaukei have maintained variations and certain aspects of their cultural and traditional diets, imported food now represents a relatively large percentage of daily food consumption, with greater changes to eating patterns seen among iTaukei (Wate *et al.*, 2013; Schultz *et al.*, 2007). Regardless of ethnicity, urban and rural Fijians have also shown similar shifts in eating patterns, but this is more so for urban Fijians (Owen, 2002; Lako and Nguyen, 2001; Schultz *et al.*, 2007). Over the past two decades, the Fijian population has, in general, increased their consumption of animal protein (fresh and canned), sugar, cereals (e.g., rice, roti), and decreased their consumption of local fruits, vegetables, traditional starchy

roots (e.g., taro, breadfruit (Morgan *et al.*, 2020; Medina Hidalgo *et al.*, 2020; Haynes *et al.*, 2020; Schultz *et al.*, 2007), resulting in lower overall dietary diversity (Haynes *et al.*, 2020; Morgan *et al.*, 2020).

Understanding the various drivers of changing consumption patterns in Fiji provides important insight towards policy development and public health interventions (Medina Hidalgo *et al.*, 2020), but has been under-researched. Earlier literature has attributed value for money, ease of preparation, and personal preferences as important factors influencing food consumption among Fijians (Owen, 2002). In a recent study from a remote coastal village in Fiji, participants described issues of price, availability, access, freshness, convenience, time barriers, preparation and palatability all as important factors contributing to the shift in diets over the past 20 to 30 years (Medina Hidalgo *et al.*, 2020). However, these studies do not represent all Fijians and further investigation into dietary patterns across all Fijian populations (i.e. ethnic groups, gender, age, income status and geographical location) is necessary to understand drivers of food choice and identify at-risk groups.

Currently, COVID-19 related restrictions are causing reduced incomes and purchasing power for Fijian households (Morgan *et al.*, 2020). Some Fijians are returning to villages and have increased their involvement in household gardening and farming (Morgan *et al.*, 2020). As a result, households are sourcing more food from backyard gardens and local farms (80-90 percent of households), whilst reducing store or market purchases (Morgan *et al.*, 2020). However, diversity of food is apparently decreasing as crop variety is limited and families experience barriers to food consumption due to food insecurity (Morgan *et al.*, 2020). It is expected that food security issues will worsen in coming months, further challenging the nutritional adequacy of diets and livelihoods in Fiji (Morgan *et al.*, 2020).

Table 4. Fiji dietary intake data (1993-2020) disaggregated by age, gender, ethnicity, rural/urban and geographic zone (please see key below).

| Original sources of data | | | | | | | | | | | | | | | | | | | |
|--|------------|-------------------------------------|----------|-------------|--------|-----------|---------------|---------|-------|------------|--------|-----------------|---|---|---|----|-----------------|-------|------------|
| Article/Report Title [Reference] | Time frame | Age (years, for all except infants) | | | | | Ethnicity (%) | | | Gender (%) | | Geographic Zone | | | | | Rural/Urban (%) | | |
| | | Infants (months) | Children | Adolescents | Adults | Household | Indo-Fijian | iTaukei | Other | Male | Female | 1 | 2 | 3 | 4 | 5 | Rural | Urban | Peri-urban |
| Assessing nutrition and socio-economic impact of COVID-19 on rural and urban communities in Fiji | ≤ 5 yrs | | | | >15 | 339 | | | | | | | | | | | | | |
| Food Sources and Dietary Quality in Small Island Developing States: Development of Methods and Policy Relevant Novel Survey Data from the Pacific & Caribbean. | ≤ 5 yrs | | | | ≥15 | 95 | 21 | 78 | 1 | | | | | | | | 44 | 56 | |
| Sustaining healthy diets in times of change: linking climate hazards, food systems and nutrition security in rural communities of the Fiji Islands | ≤ 5 yrs | | | | RA | | | | | | | | | | | | | | |
| Predictors of Dietary Diversity of Indigenous Food-Producing Households in Rural Fiji | ≤ 5 yrs | | | | 18-54 | 161 | | | | 27 | 73 | | | | | | | | |
| Assessment of a Salt Reduction Intervention on Adult Population Salt Intake in Fiji. | ≤ 5 yrs | | | | 25-64 | | | 52.5 | 47.5 | 50.9 | 49.1 | | | | | | | | |
| Fiji Islands - Global School-based Student Health Survey | ≤ 5 yrs | | | 13-17 | | | | | | | | | | | ? | | | | |
| Fiji NCD Risk Factors Steps Report 2011 | ≤ 10 yrs | | | | 25-64 | | | 42.5 | 54.7 | 2.8 | 43.8 | 56.2 | | | | | | | |
| Fiji Impact Study of Iron Fortified Flour 2010 | ≤ 10 yrs | | | 15-19 | 19-45 | | | 37.4 | 61.4 | 1.2 | | | | | | | | | |
| Adolescent dietary patterns in Fiji and their relationships with standardized body mass index | ≤ 10 yrs | | | 13-18 | | | | | | | 47.6 | 52.4 | | | | | | | |
| 2004 Fiji National Nutrition Survey *24 hour recall specific | ≤ 20 yrs | | | 15-18 | ≥19 | | | 39.8 | 57.7 | 2.5 | | No P/L | | | ? | 55 | 45 | | |
| Infant and child feeding practices and dental caries in 6 to 36 months old children in Fiji | ≤ 20 yrs | 6-36 | | | | | | | | | | | | | | | | | |
| Determinants of Food Choice in Fiji: Their role in demand for nutritionally dense food and nutrition security | ≤ 20 yrs | | | | | | | | | | | | | | ? | | | | |
| Dietary patterns and risk factors of diabetes mellitus among urban indigenous women in Fiji | ≤ 27 yrs | | | | 30-39 | | | | | | | | | | | | | | |
| 1993 Fiji National Nutrition Survey | ≤ 27 yrs | <5 year | <15 | 15-18 | | | | 46 | 48 | 6 | 49.3 | 50.7 | | | | | 62.4 | 37.6 | |
| Report of the 5th Decennial Naduri Nutrition and Health Survey 1994 | ≤ 27 yrs | <5 year | <15 | 15-20 | >20 | | | | | | 50.9 | 49.1 | | | | | | | |

| Based on combination of previously published data (listed above) | | | | | | | | | | | | | | | | | | | |
|---|------------|-------------------------------------|----------|-------------|--------|-----------|---------------|---------|-------|------------|--------|-----------------|---|---|---|---|-------------|-------|------------|
| Article/Report Title | Time frame | Age (years, for all except infants) | | | | | Ethnicity (%) | | | Gender (%) | | Geographic Zone | | | | | Rural/Urban | | |
| | | Infants (months) | Children | Adolescents | Adults | Household | Indo-Fijian | iTaukei | Other | Male | Female | 1 | 2 | 3 | 4 | 5 | Rural | Urban | Peri-urban |
| Phytochemical intakes of the Fijian population. | ≤ 15 yrs | | | | | | | | | | | | | | ? | | | | |
| Dietary patterns and risk factors for Type 2 diabetes mellitus in Fijian, Japanese and Vietnamese populations | ≤ 27 yrs | | | | 30-39 | | | | | | | | | | | | | | |
| Dietary trend and diabetes: Its association among indigenous Fijians 1952 to 1994 | ≤ 27 yrs | | | | | | | | | | | | | | ? | | | | |

KEY:

Shaded boxes indicate that data is available within the presented source. If a description of the number is available, this has been added to the corresponding box. Age is presented in years for all groups (some as ranges where indicated in the source), except infants which is provided in months. Ethnicity, gender and rural/urban are presented as a proportion, as indicated in the source. Geographic zones = 1. Western division, 2. Central division, 3. Eastern division, 4. Northern division, 5. Rotuma. No P/L = No pregnant or lactating women. RA = Reproductive age, ? = Stated that entire Fiji population was represented, but Rotuma was not specified. Indo Fijians = Fijians of Indian descent, iTaukei = Indigenous Fijians.

| | | | |
|---|--|---|---|
| Indicates sources published in the last 5 years | Indicates sources published in the last 5 – 10 years | Indicates sources published in the last 10 – 20 years | Indicates sources published in the last 20 – 27 years |
|---|--|---|---|

Food systems, food consumption and food behaviours

This section presents the key findings of the food systems analysis including;

- GIS mapping of the fresh food system,
- school food environment assessments,
- local environment mapping for food availability,
- the Fiji Healthy Food Basket,
- dietary diversity and food behaviours (influences on food choice, purchasing behaviours, child and infant feeding practices), and
- analysis using food pricing data

GIS mapping of the fresh food system

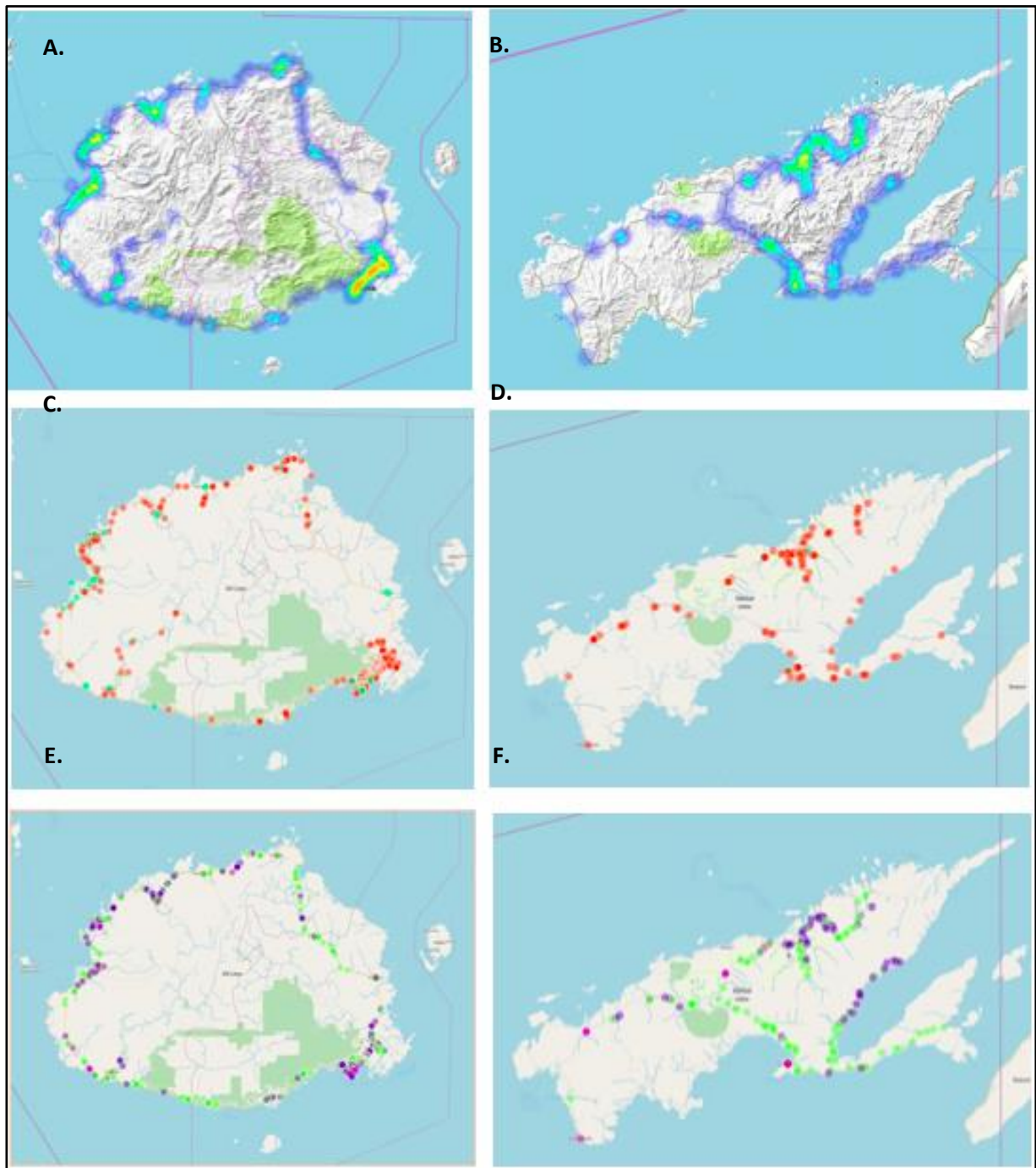
A total of 1185 commercial outlets (i.e. shops, supermarkets, municipal markets and road-side vendors) were surveyed, including 505 shops, 278 fixed road-side stalls, 179 mobile road-side stalls, 137 supermarkets, 63 cluster road-side markets, and 19 municipal markets (n= 4 unknown).

A total of 70.5 percent (n= 835 of 1 184) of outlets sold fresh vegetables, 50.2 percent (n= 595) sold fresh fruit, 54.1 percent (n= 641) sold root crops, 26.7 percent (n = 304) sold dairy (and associated products), and 16.7 percent (n= 198) sold fish and seafood (fresh and frozen). Most outlets had limited diversity of products, with 33.1 percent (n= 394) of all outlets selling just one type of vegetable, and 21.9 percent (n= 259) of all outlets selling just one type of fruit. Only 9.0 percent (n= 107) of all outlets sold five or more types of fruits, and 9.6 percent (n= 114) of all outlets sold five or more types of vegetables (Table 5).

Most outlets were located close to public transport, with 84.1 percent (n= 997 of 1 184) of outlets within 100m of a bus stop. A total of 89.1 percent (n= 1 056 of 1 183) of all outlets were located near or adjacent to a sealed road (i.e. easily access by private vehicle). A total of 88.1 percent (n= 1 044 of 1 183) of outlets had ample parking (i.e. parking space was available and non-limited), with 11.7 percent (n= 139) of outlets either having no available close proximity parking or paid parking (Table 6).

Macuata province (Vanua Levu) and Ba and Naitasiri provinces (Viti Levu) had the largest number of food outlets. Cakaudrove province had the largest number of fresh food outlets per 1 000 population, whereas Rewa province had the least. Seru and Nadroga/Navosa had the lowest proportion of outlets selling fresh vegetables (Figure 2, Tables 5 and 6).

Figure 2. Location of outlets selling fresh fruits and vegetables in Fiji



Key: (A) Heat map illustrating all outlet types on Viti Levu Island. (B) Heat maps illustrating all outlet types on Vanua Levu Island. (C) Location of shops and supermarkets on Viti Levu Island selling fresh fruits and vegetables. (D) Location of shops and supermarkets on Vanua Levu Island sell fresh fruits and vegetable. (E) Location of municipal markets and road-side vendors on Viti Levu Island sell fresh fruits and vegetables. (F) Location of municipal markets and road-side vendors on Vanua Levu Island sell fresh fruits and vegetables and Vanua Levu. (Map source: OpenTopMap © with GIS overlays).

Table 5. Fresh food outlets (per division and province) on Viti Levu and Vanua Levu Islands (Fiji) selling fresh fruits and vegetables and associated socio-demographic information.

| Location | Total population (2017) ¹ | Number of food outlets ² | Number of fresh food outlets / population (1000s) | Shops and supermarkets (%) | Road-side markets (all types) (%) | Percent outlets selling fruits | Percent outlets selling vegetables | Percent outlets selling ≥5 types of fruits | Percent outlets selling ≥5 types of vegetables |
|--------------------------|--------------------------------------|-------------------------------------|---|----------------------------|-----------------------------------|--------------------------------|------------------------------------|--|--|
| Northern Division | | | | | | | | | |
| Bua | 15 466 | 17 | 1.1 | 58.8 (10) | 41.2 (7) | 76.5 (13) | 82.4 (14) | 0 | 0 |
| Cakaudrove | 50 469 | 128 | 2.5 | 37.5 (48) | 60.9 (78) | 59.1 (75) | 66.9 (85) | 4.7 (6) | 5.5 (7) |
| Macuata | 6 5983 | 180 | 2.7 | 47.8 (86) | 52.8 (93) | 42.8 (77) | 68.9 (124) | 3.9 (7) | 5.0 (9) |
| Western Division | | | | | | | | | |
| Ba | 247 708 | 176 | 0.71 | 52.3 (92) | 44.9 (79) | 60.2 (106) | 70.0 (123) | 10.2 (18) | 12.5 (22) |
| Nadroga / Navosa | 58 931 | 65 | 1.1 | 36.9 (24) | 61.5 (40) | 64.6 (42) | 32.3 (21) | 4.6 (3) | 6.2 (4) |
| Ra | 30 432 | 48 | 1.6 | 50 (24) | 47.9 (23) | 43.8 (21) | 87.5 (42) | 2.1 (1) | 2.1 (1) |
| Central Division | | | | | | | | | |
| Naitasiri | 177 678 | 263 | 1.5 | 70.3 (185) | 28.9 (76) | 43.3 (114) | 86.3 (227) | 10.6 (28) | 10.3 (27) |
| Namosi | 7 871 | 9 | 1.1 | 11.1 (1) | 88.9 (8) | 55.6 (5) | 66.7 (6) | 0 | 0 |
| Rewa | 10 8016 | 104 | 0.96 | (61) | (40) | 63.5 (66) | 84.6 (88) | 32.7 (34) | 35.6 (37) |
| Serua | 20 031 | 32 | 1.6 | 43.8 (14) | 50.0 (17) | 50.0 (16) | 31.3 (10) | 12.5 (4) | 9.4 (3) |
| Tailevu | 64 552 | 91 | 1.4 | 59.3 (54) | 38.5 (35) | 45.1 (41) | 79.1 (72) | 3.3 (3) | 5.5 (5) |

¹ Fiji Bureau of Statistics, 2018.

² All outlet types include municipal fruit, vegetable and fish markets.

Table 6. Permanent (shops and supermarkets) outlets in Fiji selling fresh fruits and vegetables relative to selected socio-demographic attributes.

| Location | Total population ¹ | Total Urban population (2017) ¹ | Labour force dependent on paid work | Number of shops and supermarkets / urban population (1 000) | Number of shops and supermarkets / paid labour force (1 000) | Private vehicle ownership ³ |
|------------------|-------------------------------|--|-------------------------------------|---|--|--|
| Bua | 15 466 | 625 | 1 393 | 16.0 | 7.2 | 222 |
| Cakaudrove | 50 469 | 10 999 | 9 047 | 4.4 | 5.3 | 3 006 |
| Macuata | 65 983 | 27 182 | 14 662 | 3.2 | 5.9 | 8 638 |
| Ba | 15 466 | 165 411 | 69 562 | 0.6 | 1.3 | 40 983 |
| Nadroga / Navosa | 247 708 | 10 293 | 13 844 | 2.3 | 1.7 | 4 532 |
| Ra | 58 931 | 5 987 | 5 085 | 4.0 | 4.7 | 2 000 |
| Naitasiri | 30 432 | 148 697 | 49 944 | 1.2 | 3.7 | 27 850 |
| Namosi | 177 678 | 0 | 952 | - | 1.1 | 356 |
| Rewa | 7 871 | 93 483 | 31 759 | 0.65 | 1.9 | 25 140 |
| Serua | 108 016 | 7 005 | 4 620 | 1.9 | 3.0 | 1 831 |
| Tailevu | 20 031 | 2 0320 | 13 730 | 2.7 | 3.9 | 4 312 |

¹ Fiji Bureau of Statistics, 2018.

² Labour force population dependent paid income (i.e. cohort likely to be solely dependent on commercially sourced food).

³ Private vehicle ownership census data at the province level, is only currently available for 2007. Values were adjusted proportional to the increase in vehicle ownership between 2007 and 2018 using national private vehicle registrations.

School food environment assessments

Schools can provide an environment to promote and support healthy diets, for both students and the wider school community (United Nations System Standing Committee on Nutrition, 2017; Hawkes, 2013). This can be through multiple mechanisms including the provision of food in schools, and food and nutrition education in school curriculum. Schools play an important role in Pacific society, influencing societal attitudes and behaviours (Fletcher *et al.*, 2013), providing an ideal setting for intervention.

The food environments of 88 schools were assessed, representing 43 percent of the 204 schools with World Health Organization (WHO) Health Promoting Schools (HPS) accreditation (2016-2019) (WHO *et al.*, 2016-2019). Schools were within eight of the nine education districts: Suva (n= 21), Nausori (n= 14), Lautoka/Yasawa/Nadi (n= 12), Ba-Tavua (n= 12), Bua/Macuata (n= 9), Ra (n= 8), Cakaudrove (n= 6) and Nadroga (n= 6). Eighty-four (95.5 percent) of the schools consented to take part in an interviewer administered survey. Reasons for non-participation included representatives not available to invite, or permission not granted.

School food/nutrition policy

Eighty-one of the 84 surveyed schools (96.4 percent) reported use of a food and/or nutrition policy. This may not represent policy compliance.

Food production in schools

Seventy-one of the 84 surveyed schools (84.5 percent) reported having a garden. The garden was used for food production for school children and/or the wider community in 58 schools. Over half (n= 42) of the schools with a garden reported that food was harvested in the last month. The most common purpose of the garden produce was to provide food for school students (n= 33 schools) and to provide food for both school students and local community (n= 16 schools). Of the produce grown in the past month, most of this was consumed by students (Table 7).

Table 7. Proportion of total school garden produce grown in the past month consumed by students

| Proportion of produce consumed by students | 0 | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Number of Schools | 5 | 6 | 3 | 2 | 4 | 4 | 5 | 1 | 6 | 3 | 19 |

The most common foods grown in school gardens were; cabbage (English and Chinese) (n= 51 schools), beans (Long and French) (n= 36), cassava (n= 33), tomatoes (n= 26), tropical/seasonal/citrus fruits (n= 24), coriander (n= 21), bele (n= 20) and eggplant (n= 20). Ten schools reported other food production activities, including; chicken/poultry (n= 4), hydroponics (n= 3), bees (n= 2), fishpond (n= 1), piggery (n= 1), and fruit trees (n= 1).

Food provision in schools

Forty-seven of the surveyed schools (56 percent) reported having a kitchen, with 32 reporting the kitchen was currently used to prepare food for students. Meals were provided for students at 39 schools, with the most common mealtime lunch (Table 8). Thirty-four schools reported that there were guidelines in place for meals.

Table 8. Mealtimes when food is provided to school students

| Meal provided | Number of schools |
|--|-------------------|
| Lunch | 21 |
| Breakfast and lunch | 7 |
| Morning snack and lunch | 5 |
| Morning snack, lunch and afternoon snack during school hours | 2 |
| All mealtimes (breakfast, morning snack, lunch, afternoon snacks during, after school hours) | 2 |
| Morning snack, lunch, afternoon snacks during and after school hours | 1 |

Fifty-nine schools (79 percent) reported having a canteen/tuckshop, with the most common foods sold and consumed being; boiled peas/peas, fruit juice and fried beans/beans. Students from three schools could leave school grounds to purchase food within school hours, while external food services (i.e. vendors) were permitted to enter school grounds to sell food to students in nine schools.

School representatives expressed a desire for improved school food/feeding programs during school food assessments, which warrants further investigation. School feeding programmes can be an important social protection scheme (Bundy *et al.*, 2013), however these are used in varying capacities in Fiji.

Food and nutrition education (curriculum)

Food and nutrition education is important for the development of knowledge, skills and attitudes needed to plan, source, select, prepare and eat foods that contribute to a healthy diet (recognised as ‘food

literacy'). Sixty-eight schools reported that their garden was linked to the school curriculum, however it is unclear if this through a nutrition focus or linked for example, to agriculture. Previous work has identified a need for clear alignment between curriculum and food production activities, to assist students to learn about healthy, sustainable diets, and have the skills required to produce and prepare food (FAO, 2019).

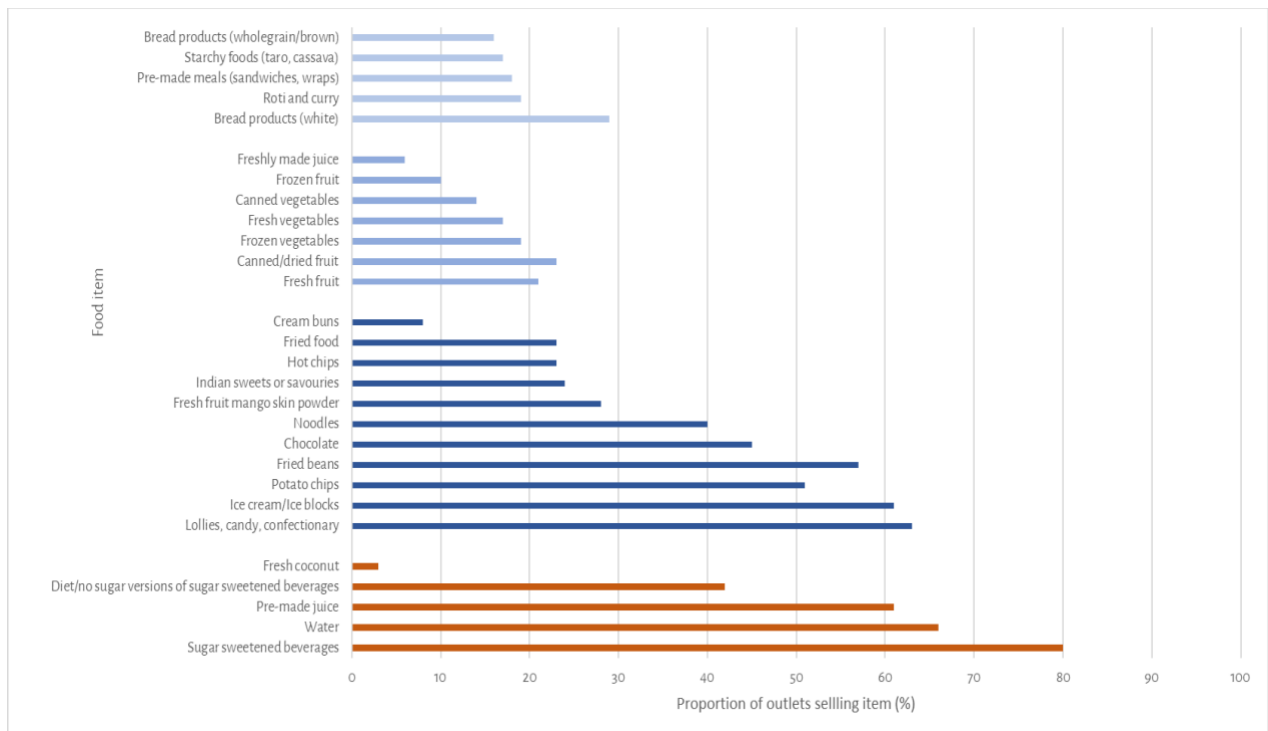
Local school food environments

A total of 197 outlets were surveyed in the zones around schools. The number of food outlets in the zones surrounding the surveyed schools ranged from 0 – 22 (mean = 2.25, SD: 3.54, variance= 12.534). The most frequently surveyed food outlet was a corner store (n= 97, 49.24 percent), with restaurant (n= 33, 16.75 percent), street stall (n= 16, 8.12 percent), supermarket (n= 16, 8.12 percent), fruit and vegetable market (n= 9, 4.57 percent), canteen (n= 6, 3.05 percent), fast food store (n= 6, 3.05 percent), other (laundry store/unknown) (n= 4, 2.03 percent), bean cart/coffee/tea shop (n= 3, 1.52 percent), bakery (n= 3, 1.52 percent), bus station (n= 2, 1.02 percent) and service (fuel) station (n= 2, 1.02 percent) also included. Eleven outlet owners declined to participate in the survey (n= 9 corner stores, n= 1 restaurant and n= 1 unknown) and therefore information on items for sale were not collected in these outlets.

The most common food item available was sugar sweetened beverages (SSB), which were sold in 159 outlets, representing 80 percent of the food outlets surveyed. Lollies/candy/confectionary (n= 125, 63 percent), fried beans (n= 112, 57 percent) and potato chips (crisps) (n= 101, 51 percent) were all sold in over 50 percent of the surveyed food outlets (Figure 4).

The environments immediately surrounding schools in Fiji are of concern. While the number of food outlets within the 400m zone directly around the schools surveyed varied, with more in urban areas, it appears that students have access to several types of food items, mostly those which are recommended for limited consumption in the dietary guidelines. While this activity highlights the food available in the immediate school environment, more work is required to assess purchasing and consumption behaviours in school aged children. It was outside the scope of this project to map advertising and marketing within the school environment zone, but this would be a productive step forward, given that marketing influences children's eating preferences and behaviours (Sadeghirad *et al.*, 2016), and could serve as a baseline for evaluation of regulations, should these come into effect.

Figure 3. Proportion of stores within school zones selling identified food items (based on n= 187 outlets)



Local environment mapping for food availability

The local food retail environment was mapped in selected neighbourhoods across Viti Levu and Vanua Levu (Figure 4), resulting in the inclusion of 284 food outlets in total. This included: restaurants (n= 92), fast food outlets (n= 62), corner stores (n= 53), supermarkets (n= 18), canteens (n= 16), street stalls (n= 15), bakeries (n= 13), coffee carts/café/tea shops (n= 6), bus stands (n= 5) and seafood/fish markets (n= 2). Two outlets were not recorded/unknown (n= 1) or other (n= 1 cinema). These outlets were in addition to those mapped in the school food environment assessments

The most prevalent food items for sale were SSBs (n= 222 outlets), water (n= 200), pre-packaged juice (n= 153), fried food (e.g. fried chicken) (n= 144) (Table 9). Food availability varied depending on location (Figures 5 - 9), with higher availability in urban areas.

Table 9. Number of outlets surveyed that have identified food items available for purchase

| Item | n outlets available to purchase from |
|---|--------------------------------------|
| Sugar sweetened beverages | 222 |
| Water | 200 |
| Pre-packaged juice | 153 |
| Fried foods (e.g. fried chicken) | 144 |
| Hot chips | 132 |
| Candy/confectionary/lollies | 121 |
| Diet/no sugar versions of sugar sweetened beverages | 110 |
| Ice creams/Ice blocks | 109 |
| Noodles | 90 |
| Milk, cheese or yoghurt | 89 |
| Fried beans | 88 |
| Pre-made meals (e.g. sandwiches, wraps) | 87 |
| Chocolate | 87 |
| Roti and curry | 84 |
| Lean meats/chicken | 79 |
| White rice | 79 |
| Eggs | 76 |
| Indian sweets and savouries | 76 |
| Potato chips (crisps) | 75 |
| Lentils/Dhal | 72 |
| Canned/processed meats | 57 |
| Frozen vegetables | 57 |
| Nuts | 52 |
| Fresh fruit | 52 |
| Fresh fish/seafood | 50 |
| Starchy foods | 39 |
| White breads | 35 |
| Freshly made juice | 32 |
| Canned/dried fruit | 26 |
| Raw mango powder/Tahitian lime powder | 26 |
| Frozen vegetables | 24 |
| Wholegrain/brown breads | 21 |
| Canned/dried vegetables | 19 |
| Frozen fruit | 17 |
| White pasta | 14 |
| Brown rice | 13 |
| Cream buns | 11 |
| Brown pasta | 7 |
| Coconut (to drink) | 2 |

Figure 4. Mapping local food environments (numbers on pins represent outlets, a single pin without a number indicates one outlet).

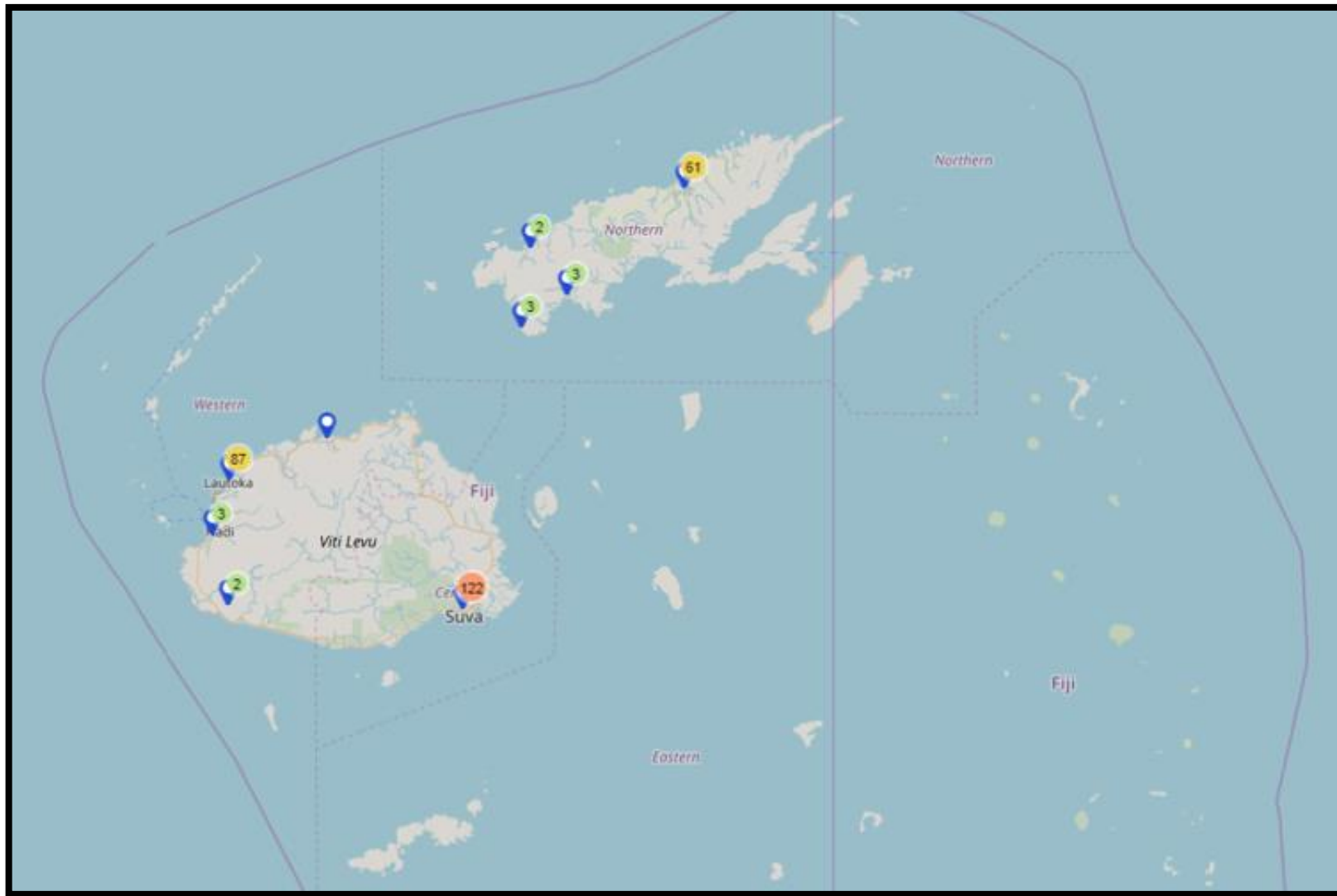


Figure 5. Food availability in Suva based on food groups

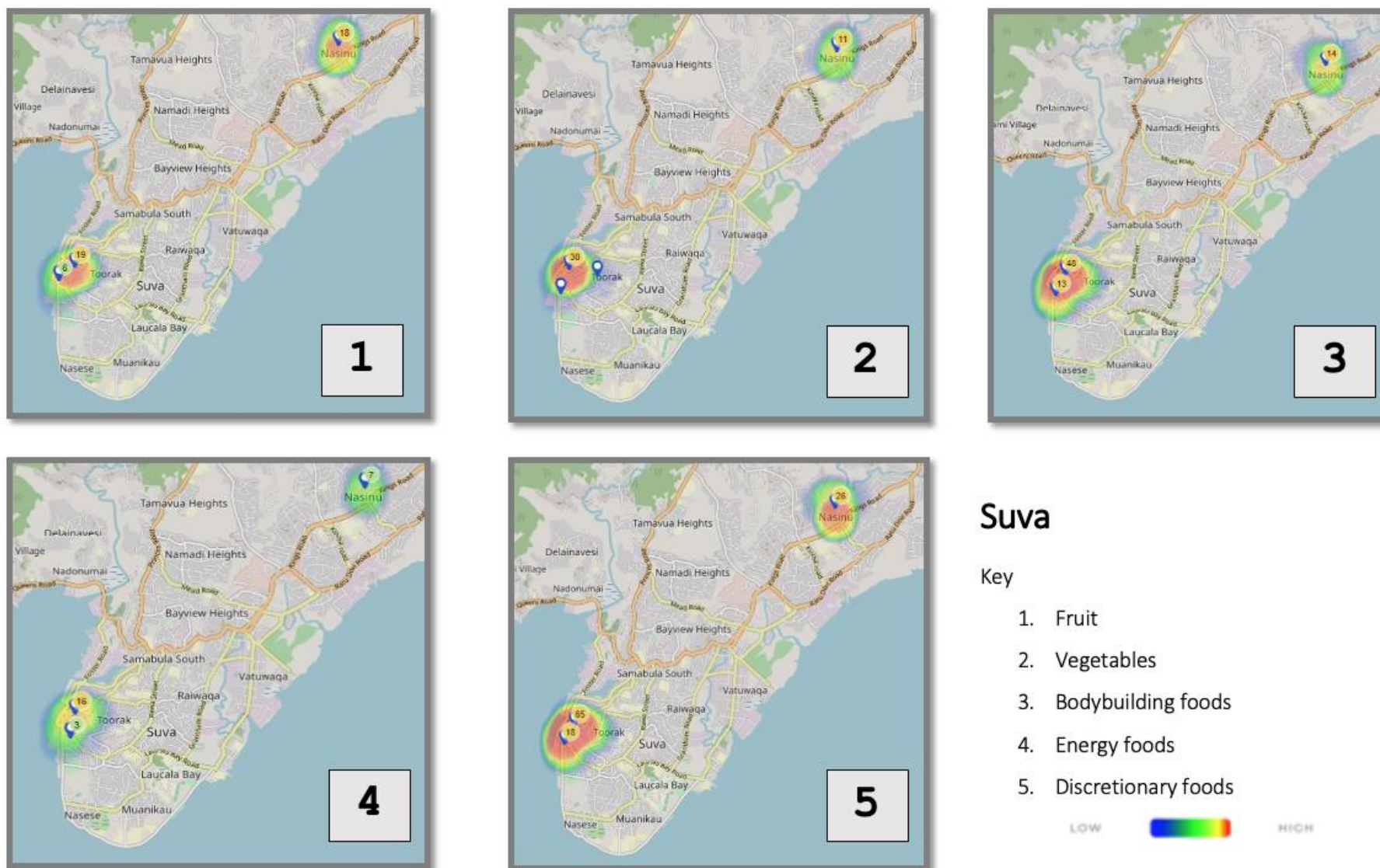
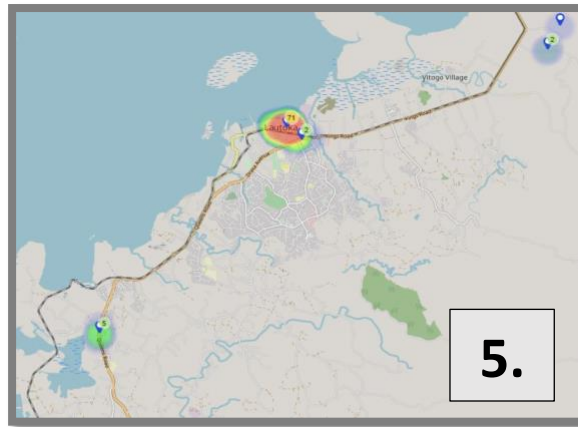
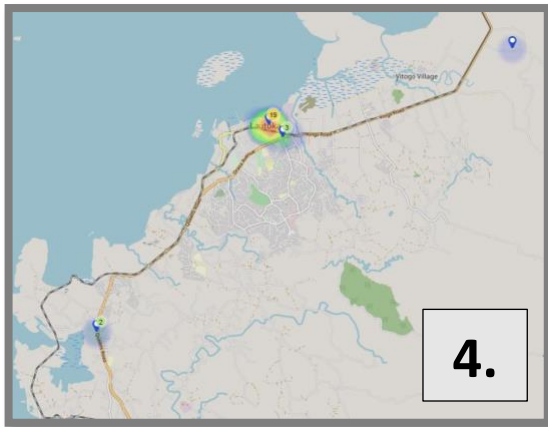
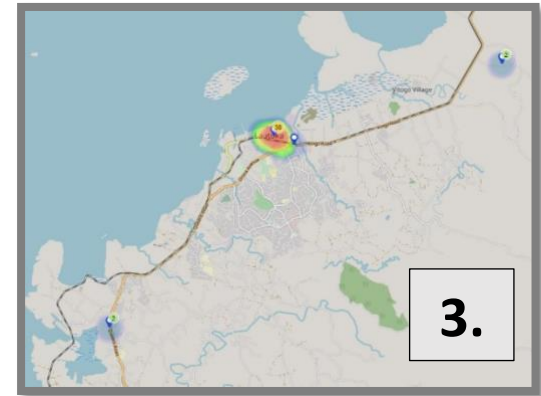


Figure 6. Food availability in Lautoka and surrounds based on food groups



Lautoka and surrounds

Key

1. Fruit
2. Vegetables
3. Bodybuilding foods
4. Energy foods
5. Discretionary foods

LOW  HIGH

Figure 7. Food availability in Nadi and surrounds based on food groups

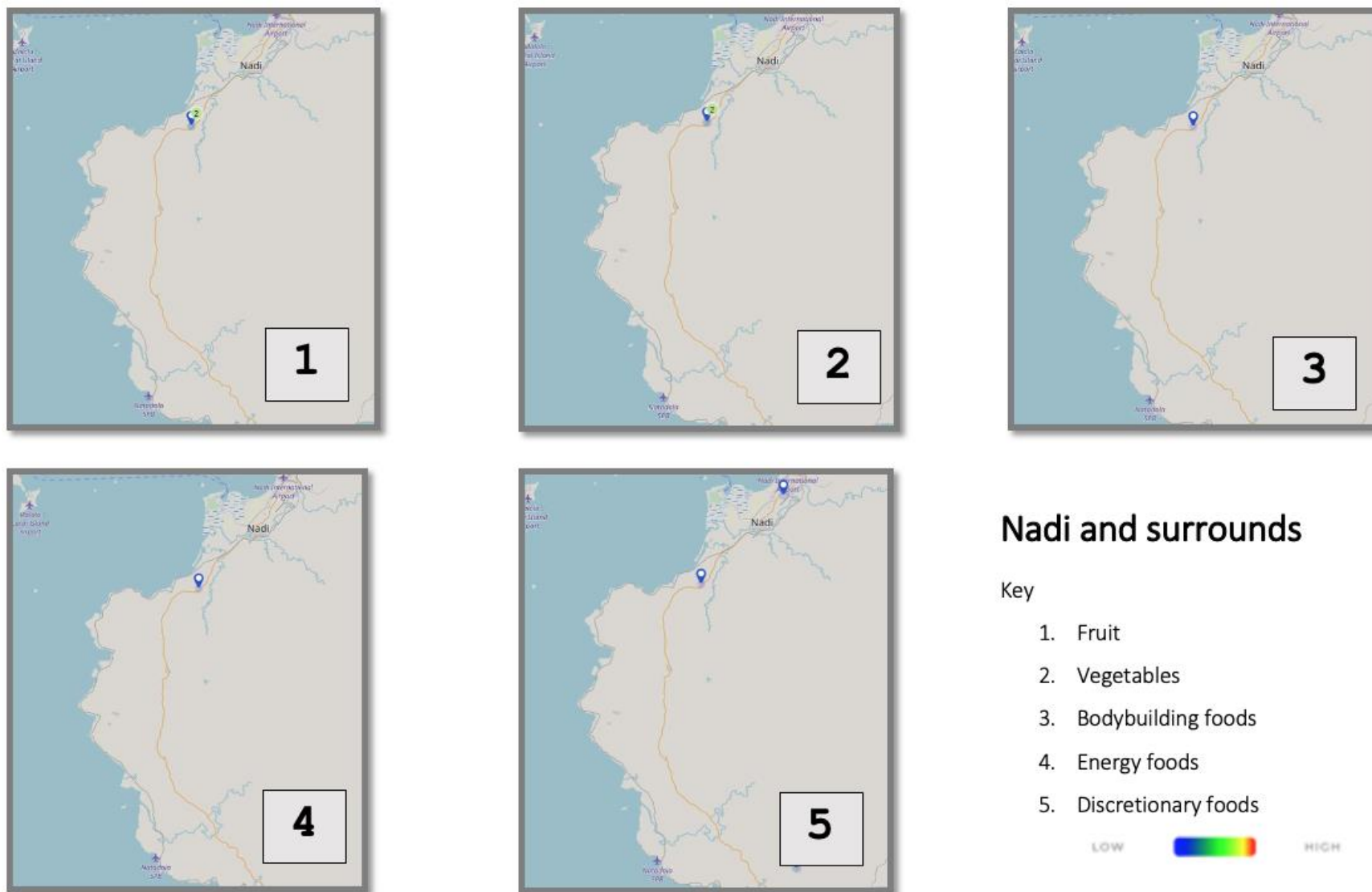


Figure 8. Food availability in Nabowalu and surrounds based on food groups

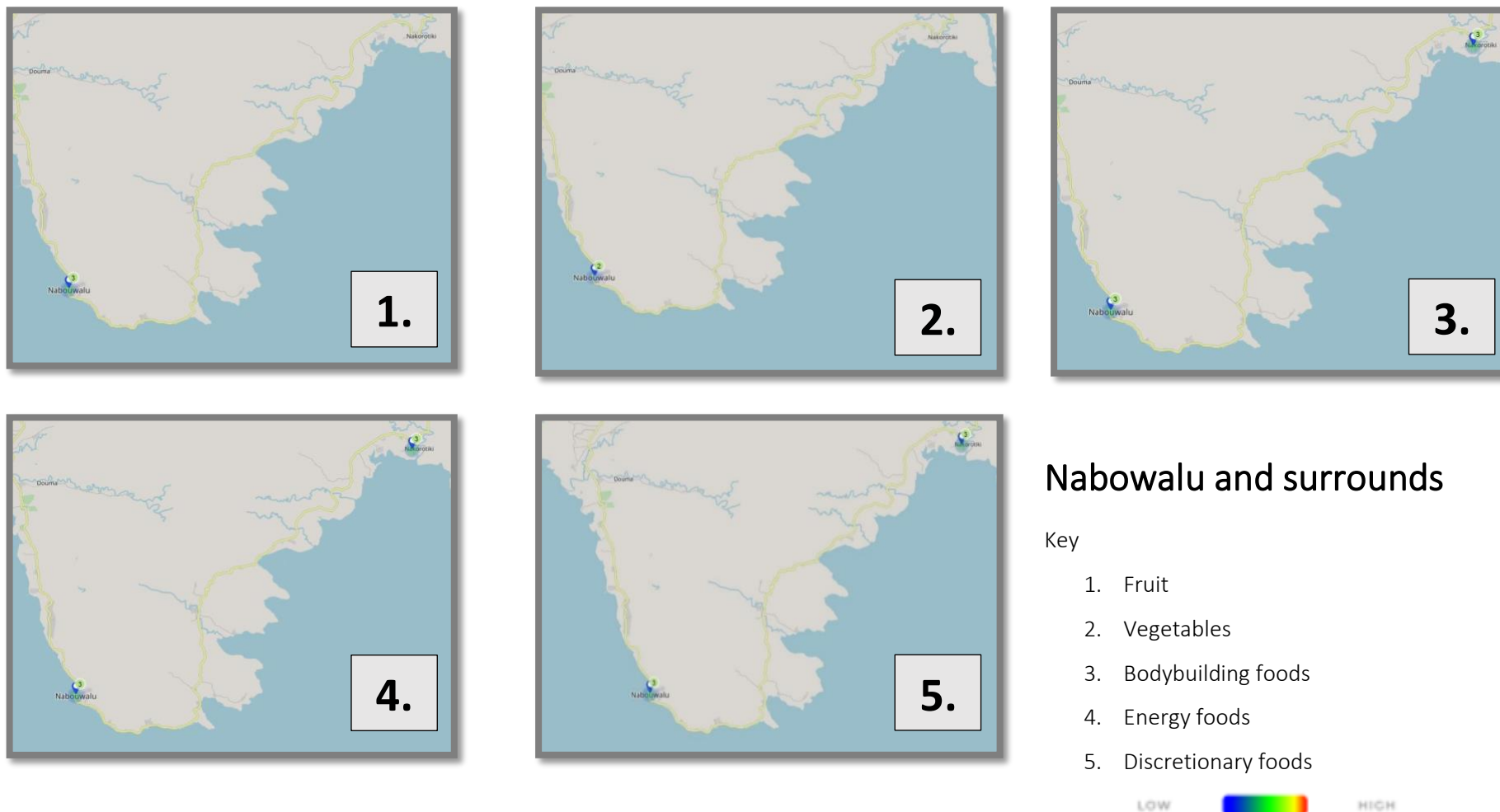
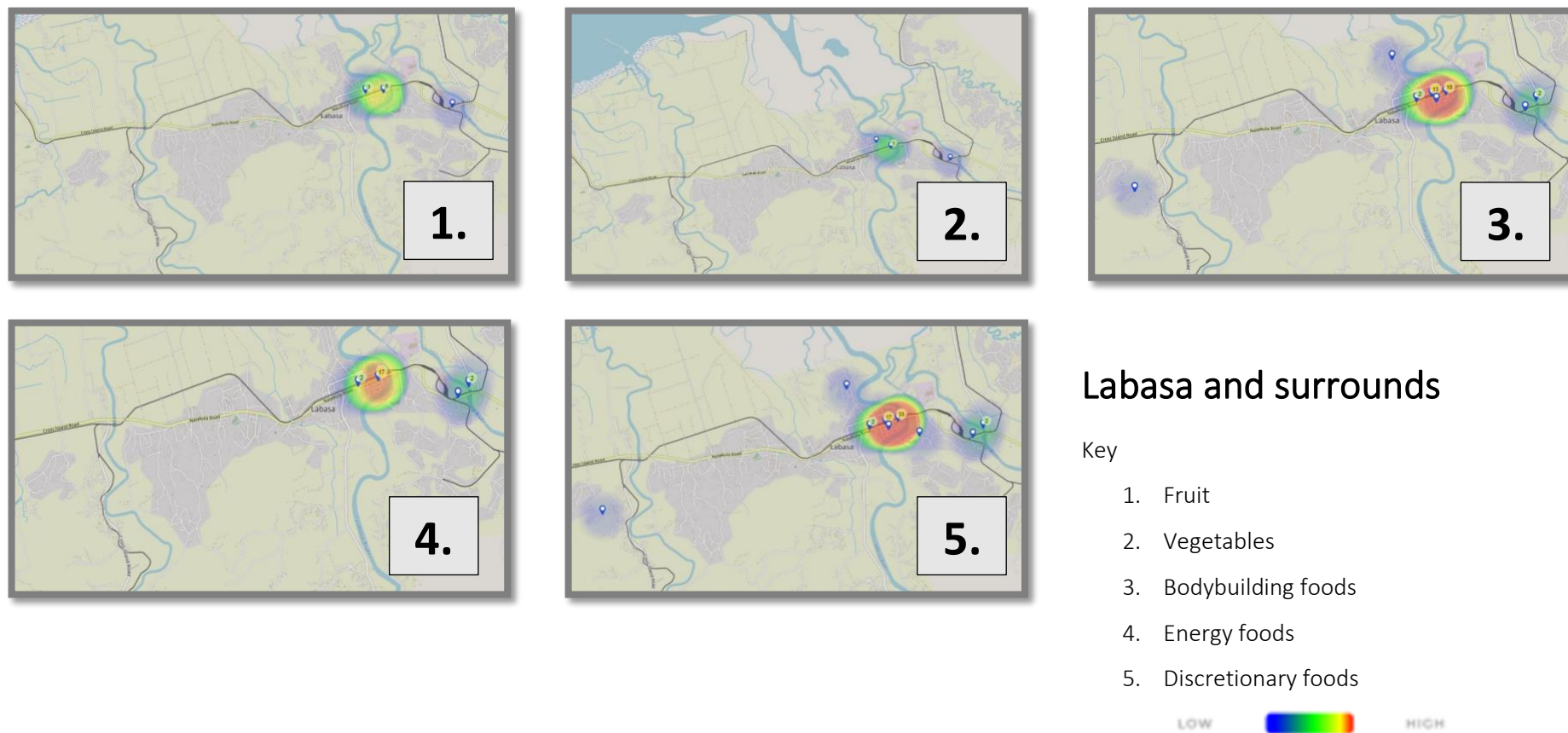


Figure 9. Food availability in Labasa and surrounds based on food groups



Highly processed, nutrient poor foods are of major concern given the now established link between these foods and NCDs (Monteiro *et al.*, 2019). Mapping of local food environments showed that there is a high availability of energy-dense and nutrient poor foods, in urban and some rural areas. Beverages, including SSB, diet/no sugar versions of SSB and pre-made juices were highly available, including in the area directly outside schools.

Fiji Healthy Food Basket

Data for the FHFB was collected from 13 of the 15 selected locations (Figure 10), with no stores available in two locations. Food item price and availability were recorded (Table 10). Types of food outlets visited included canteens, supermarkets and markets depending on availability. If a food outlet did not have all food items from the FHFB available, additional stores were visited as this represented typical consumer behaviour.

Availability

Figure 10. Map of survey locations with food outlets available for FHFB data collection



Key: red tags represent urban locations; blue tags represent rural locations. Locations are: (1) Lautoka City (Lautoka); (2) Saweni (Lautoka); (3) Drasa (Lautoka); (4) Suva City (Suva); (5) Lami (Suva); (6) Valelevu (Suva); (7) Labasa Town (Labasa); (8) Vulovi (Labasa); (9) Wailevu (Labasa); (10) Wainunu (Bua); (11) Lekutu (Bua); (12) Nabouwalu (Bua); (13) Nawaikoba (Sigatoka).

Table 10. Total food basket availability by location and food groups (%)

| Map Tag/Location* | Vegetables | Fruit | White Roots & Tubers | Grains & Cereals | Legumes, nuts & Seeds | Eggs | Seafood | Meat | Dairy | Sweets | Oils & Fats | Spices, Condiments & Beverages | Total Availability |
|------------------------------|------------|-----------|----------------------|------------------|-----------------------|------------|------------|-----------|------------|-------------|-------------|--------------------------------|--------------------|
| Urban Locations n (%) | | | | | | | | | | | | | |
| 1 | 2 (10) | - | - | 4 (50) | - | 1 (100) | 2 (100) | 1 (20) | 1 (50) | 1 (33.3) | 1 (50) | 2 (25) | 15 (23) |
| 2 | 18 (90) | 6 (86) | 3 (100) | 8 (100) | 3 (100) | 1 (100) | 2 (100) | 4 (80) | 2 (100) | 3 (100) | 2 (100) | 6 (75) | 58 (91) |
| 3 | 2 (10) | 2 (29) | 1 (33) | 7 (88) | 2 (67) | 1 (100) | 1 (50) | 4 (80) | 2 (100) | 3 (100) | 2 (100) | 3 (38) | 30 (45) |
| 4 | 18 (90) | 5 (71) | 3 (100) | 6 (75) | 2 (67) | 1 (100) | 1 (50) | 4 (80) | 2 (100) | 3 (100) | 2 (100) | 4 (50) | 51 (80) |
| 5 | 16 (80) | 5 (71) | 3 (100) | 7 (88) | 2 (67) | 1 (100) | 1 (50) | 4 (80) | 2 (100) | 3 (100) | 2 (100) | 3 (38) | 49 (77) |
| 6 | 16 (80) | 6 (86) | 2 (67) | 7 (88) | 2 (67) | 1 (100) | 1 (50) | 4 (80) | 2 (100) | 3 (100) | 2 (100) | 5 (63) | 51 (80) |
| 7 | 16 (80) | 6 (86) | 3 (100) | 6 (75) | 3 (100) | 1 (100) | 2 (100) | 4 (80) | 2 (100) | 3 (100) | 2 (100) | 6 (75) | 54 (84) |
| 8 | 2 (10) | - | 1 (33) | 7 (88) | 2 (67) | 1 (100) | 1 (50) | 4 (80) | 2 (100) | 3 (100) | 2 (100) | 6 (75) | 31 (48) |
| 9 | 2 (10) | - | 1 (33) | 6 (75) | 1 (33) | - | 1 (50) | 2 (40) | 1 (50) | 1 (33) | 2 (100) | 3 (38) | 20 (31) |
| Rural Locations (%) | | | | | | | | | | | | | |
| 10 | 5 (25) | 2 (29) | 2 (67) | 7 (88) | 1 (33) | 1 (100) | 2 (100) | 3 (60) | 1 (50) | 2 (67) | 2 (100) | 6 (75) | 33 (52) |
| 11 | 2 (10) | - | 1 (33) | 4 (50) | - | 1 (100) | 1 (50) | - | 1 (50) | 1 (33) | 1 (50) | - | 12 (19) |
| 12 | 4 (20) | 4 (57) | 2 (67) | 6 (75) | 1 (33) | 1 (100) | 1 (50) | 4 (80) | 1 (50) | 3 (100) | 2 (100) | 5 (63) | 34 (52) |
| 13 | 4 (20) | - | 1 (33) | 1 (88) | 3 (100) | 1 (100) | 1 (50) | 4 (80) | 2 (100) | 2 (67) | 2 (100) | 6 (75) | 33 (52) |

*1: Lautoka City (Lautoka), 2: Saweni (Lautoka), 3: Drasa (Lautoka), 4: Suva City (Suva), 5: Lami (Suva),

6:(Valelevu (Suva), 7: Labasa Town (Labasa), 8: Vulovi (Labasa), 9: Wailevu (Labasa), 10: Wainunu (Bua), 11:

Lekutu (Bua), 12. Nabouwalu (Bua), 13., Nawaicoba (Sigatoka).

Availability of items from each basket was limited, with a total mean availability of 56.3 percent, while differences in food item availability between the Indo-Fijian and iTaukei baskets was negligible (Table 11).

Table 11. Total mean food item availability by food basket

| Food Basket | Total possible food items | Total food item availability n (%) |
|-----------------------|---------------------------|---------------------------------------|
| Urban Indo Fijian | 52 | 34 (65.4) |
| Urban iTaukei | 50 | 34 (68) |
| Rural Indo Fijian | 46 | 20 (43.5) |
| Rural iTaukei | 51 | 23 (45.1) |
| Combined Food Baskets | 64 | 36 (56.3) |

All food items were categorised into food groups. The total availability of food items from each food group was calculated for each individual location. The mean availability of food items from each food group was compared for urban and rural locations. The majority of food groups had higher availability of food items in urban locations compared to rural, particularly for vegetable and fruit food groups (Table 12). Overall, the oils and fats, eggs, dairy, sweets, grains and cereals food groups had the highest mean food item availability across all locations. Whereas the vegetables and fruit food groups had the least mean food item availability.

Table 12. Total mean availability of food items from each food group, separated by urban and rural locations

| Food group | Rural locations n (%) | Urban locations n (%) | All locations n (%) |
|---------------------------------------|--------------------------|--------------------------|------------------------|
| Vegetables | 3.8 (19) | 10.2 (51) | 8.2 (41) |
| Fruit | 1.5 (21.4) | 3.3 (47.1) | 2.8 (40) |
| White roots & tubers | 1.5 (50) | 1.9 (63.3) | 1.8 (60) |
| Grains and cereals | 6 (75) | 6.4 (80) | 6.3 (78.8) |
| Legumes, nuts & seeds | 1.3 (43.3) | 1.9 (63.3) | 1.7 (56.7) |
| Eggs | 1 (100) | .9 (90) | .9 (90) |
| Seafood | 1.3 (65) | 1.3 (65) | 1.3 (65) |
| Meat | 2.8 (56) | 3.4 (68) | 3.2 (64) |
| Dairy | 1.3 (65) | 1.8 (90) | 1.6 (80) |
| Sweets | 2 (66.7) | 2.6 (86.7) | 2.4 (80) |
| Oils & fats | 1.8 (90) | 1.9 (95) | 1.9 (95) |
| Spices, condiments & beverages | 4.3 (53.8) | 4.2 (52.5) | 4.2 (52.5) |
| Total mean availability of food items | 28 (43.8) | 40 (62.5) | 36 (56.3) |

Table 13 highlights the difference in availability of 'fresh produce' food items between rural and urban locations. Across every 'fresh produce' food group there was less availability of items, except for garlic and white potato, in rural locations.

Table 13. Total mean availability of fresh produce food items across urban and rural locations

| Fresh produce | Urban n (%) | Rural n (%) | Total n (%) |
|------------------------------------|----------------|----------------|----------------|
| <i>White roots and tubers</i> | | | |
| White potato | 8 (88.9) | 4 (100) | 12 (92.3) |
| Taro | 5 (55.6) | 2 (50) | 7 (53.9) |
| Cassava | 4 (44.4) | - | 4 (30.8) |
| <i>Vitamin A rich vegetables</i> | | | |
| Sweet potato (orange) | 4 (44.4) | - | 4 (30.8) |
| Pumpkin | 5 (55.6) | 1 (25) | 6 (46.2) |
| Carrot | 5 (55.6) | 1 (25) | 6 (46.2) |
| <i>Dark leafy green vegetables</i> | | | |
| Bele | 4 (44.4) | - | 4 (30.8) |
| Moringa leaves | - | - | - |
| Tubua/Amaranthus | 5 (55.6) | - | 5 (38.5) |
| Rourou | 4 (44.4) | 1 (25) | 5 (38.5) |
| Ota | 1 (11.1) | 1 (25) | 2 (15.4) |
| English cabbage | 5 (55.6) | - | 5 (38.5) |
| Chinese cabbage | 5 (55.6) | - | 5 (38.5) |
| <i>Other vegetables</i> | | | |
| Celery | 5 (55.6) | 1 (25) | 6 (46.2) |
| Maize | 2 (22.2) | - | 2 (15.4) |
| Tomato | 6 (66.7) | - | 6 (46.2) |
| Cucumber | 5 (55.6) | 1 (25) | 6 (46.2) |
| Eggplant | 5 (55.6) | - | 5 (38.5) |
| Long green bean | 5 (55.6) | - | 5 (38.5) |
| Okra | 4 (44.4) | - | 4 (30.8) |
| Garlic | 9 (100) | 4 (100) | 13 (100) |
| Onion | 8 (88.9) | 3 (75) | 11 (84.6) |
| Ginger | 5 (55.6) | 2 (50) | 7 (53.9) |
| <i>Vitamin A rich fruits</i> | | | |
| Pawpaw | 5 (55.6) | 1 (25) | 6 (46.2) |
| Watermelon | 5 (55.6) | - | 5 (38.5) |
| Mango | 4 (44.4) | 1 (25) | 5 (38.5) |
| <i>Other fruits</i> | | | |
| Banana | 6 (66.7) | 2 (50) | 8 (61.5) |
| Pineapple | 5 (55.6) | 1 (25) | 6 (46.2) |
| Green/immature coconut | - | - | - |
| Brown coconut | 5 (55.6) | 1 (25) | 6 (46.2) |

The majority of food items with the highest availability (Table 14) were processed and imported. The majority of food items with the least availability were fresh or minimally processed.

Table 14. Highest and least available food items

| Food items with highest availability | | Food items with least availability | |
|--------------------------------------|-----------------------|------------------------------------|-----------------------|
| Food Item | Availability n (%) | Food Item | Availability n (%) |
| Garlic | 13 (100) | Moringa leaves | 0 |
| Breakfast/cabin crackers | 13 (100) | Green coconut | 0 |
| White flour | 13 (100) | Pork chops | 0 |
| White rice | 13 (100) | Lemon leaf tea | 0 |
| Packet noodles | 13 (100) | Lemon grass tea | 0 |
| Tinned tuna | 13 (100) | Low fat dairy yoghurt | 1 (7.7) |
| Tinned mackerel | 13 (100) | Low fat dairy milk | 1 (7.7) |
| Dried milk powder | 13 (100) | Maize | 2 (15.4) |
| Brown sugar | 13 (100) | Ota | 2 (15.4) |
| Soya bean oil | 13 (100) | Wholemeal bread | 2 (15.4) |
| White potato | 12 (92.3) | Pappadams | 2 (15.4) |
| Canned beef | 12 (92.3) | Brown rice | 3 (23.1) |
| Eggs | 12 (92.3) | Dried chickpeas | 3 (23.1) |
| Soy sauce | 12 (92.3) | Sweet potato | 4 (30.8) |
| Iodised salt | 12 (92.3) | Bele | 4 (30.8) |
| Onion | 11 (84.6) | Cassava | 4 (30.8) |
| Oats | 11 (84.6) | Okra | 4 (30.8) |
| Whole chicken | 11 (84.6) | Fresh reef fish | 4 (30.8) |
| Dried yellow split peas | 11 (84.6) | Eggplant | 5 (38.5) |
| Full fat dairy milk (liquid) | 11 (84.6) | Tubua/amaranthus | 5 (38.5) |
| Margarine | 11 (84.6) | Rourou | 5 (38.5) |
| Black tea | 11 (84.6) | Mango | 5 (38.5) |
| Weet-Bix | 10 (76.9) | Chinese cabbage | 5 (38.5) |
| Lamb sausages | 10 (76.9) | English cabbage | 5 (38.5) |
| Milo powder | 9 (69.2) | Watermelon | 5 (38.5) |
| Jam | 9 (69.2) | Long green beans | 5 (38.5) |
| Dried blue peas | 8 (61.5) | Fenugreek seeds | 5 (38.5) |

The availability of key food staples and their less processed or recommended alternative were identified and compared. Higher processed or full fat food staples had higher availability compared to their less processed or low-fat options/alternatives (Table 15). There was less availability of less processed or low-fat options in rural locations.

Table 15. Comparison of identified key food item availability by urban and rural locations

| Food Item - Availability | Urban n = 9 (%) | Rural n = 4 (%) | Total n = 13 (%) |
|--|--------------------|--------------------|---------------------|
| Wholemeal flour* | 7 (77.8) | 0 | 7 (53.9) |
| White flour | 9 (100) | 4 (100) | 13 (100) |
| Wholemeal bread * | 2 (22.2) | 0 | 2 (15.4) |
| White bread | 5 (55.6) | 2 (50) | 7 (53.9) |
| Brown rice* | 2 (22.2) | 1 (25) | 3 (28.1) |
| White rice | 9 (100) | 4 (100) | 13 (100) |
| Fresh reef fish* | 3 (33.3) | 1 (25) | 4 (30.8) |
| Tinned fish (tuna or mackerel) | 9 (100) | 4 (100) | 13 (100) |
| Meat (lamb pieces, lamb chops, lamb neck, pork chops)* | 7 (77.8) | 2 (50) | 9 (69.2) |
| Chicken (whole, thigh, drumsticks)* | 8 (88.9) | 3 (75) | 11 (84.6) |
| Processed meat (canned beef, sausages) | 9 (100) | 3 (75) | 12 (92.3) |
| Dairy milk (fresh or long life)* | 8 (88.9) | 3 (75) | 11 (84.6) |
| Dried dairy milk powder | 9 (100) | 4 (100) | 13 (100) |
| Low fat plain dairy yoghurt | 1 (11.1) | 0 | 1 (7.7) |
| Full fat plain dairy yoghurt | 7 (77.8) | 1 (25) | 8 (61.5) |
| Low fat dairy milk | 1 (11.1) | 0 | 1 (7.7) |
| Full fat dairy milk | 8 (88.9) | 3 (75) | 11 (84.6) |

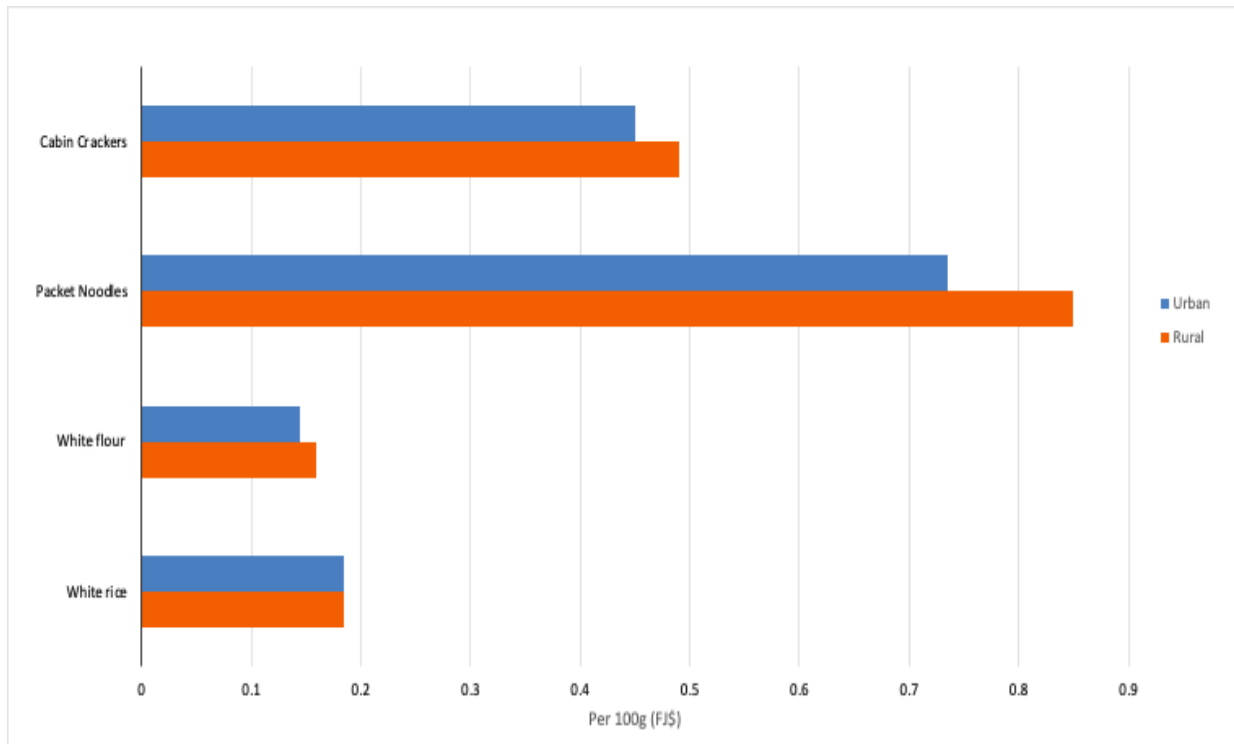
**Indicates less processed option*

Food Price

Grains

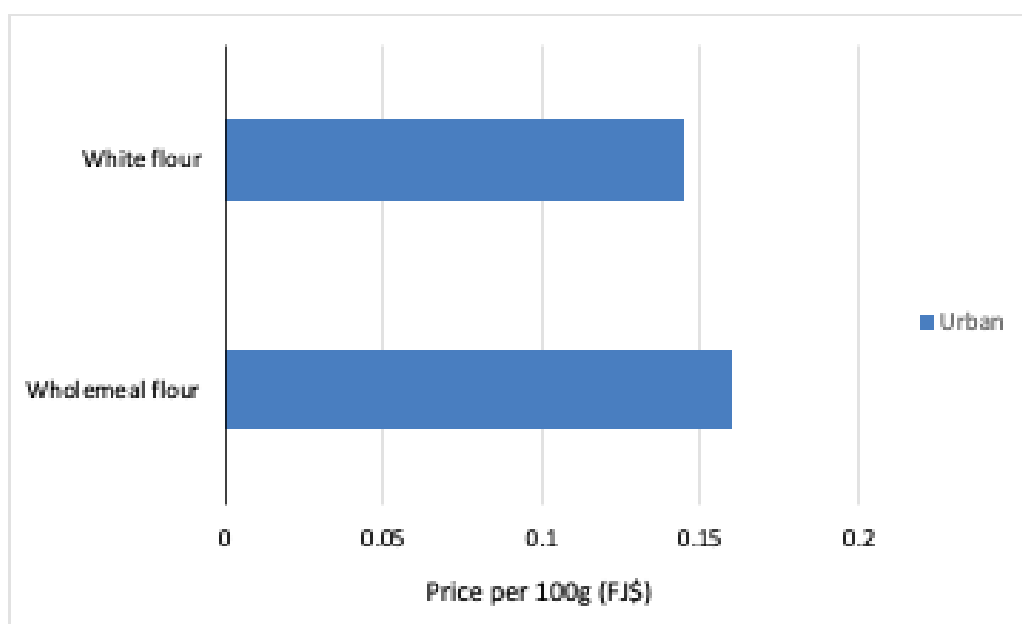
The price of the selected grain food items was comparable in price for both rural and urban locations (Figure 11). Packet noodles were the most expensive food item, (Figure 11) as well as one of the most available food items (100 percent availability, Table 14).

Figure 11. Median prices of grain food items from rural and urban locations



White flour was slightly more affordable than wholemeal flour (Figure 12), however, this could be due to white flour being available in a range of sizes, rather than a difference in price. The price of white and brown rice was unable to be compared, due to nil availability of brown rice across most stores (Table 14).

Figure 12. Median price of white and wholemeal flour from urban locations



Meat/Meat Alternatives

Prices for meat/meat alternative food items were comparable in rural and urban areas (Figure 13). The most affordable sources of meat/meat alternatives from urban locations were dried legumes/pulses and reef fish. Tinned beef was the second most expensive source of meat/meat alternatives from urban locations (Figure 13), and one of the most available food items (Table 14). Fresh reef fish was more affordable than tinned fish (Figure 13), however, fresh reef fish had a lower availability than tinned fish (Table 14) in the locations sampled.

Dairy

Dried milk powder was more expensive than liquid milk powder (Figure 14). Full fat and low-fat milk options were unable to be compared, due to nil availability of low-fat milk across most stores sampled (Table 14).

Spices and Condiments

Figure 15 highlights that iodised salt and soy sauce were the most affordable food items from spices and condiments from urban locations. These food items were comparable in price for rural versus urban and both had high availability (Tables 12 and 14.)

Figure 13. Median prices of meat/meat alternatives from rural and urban locations

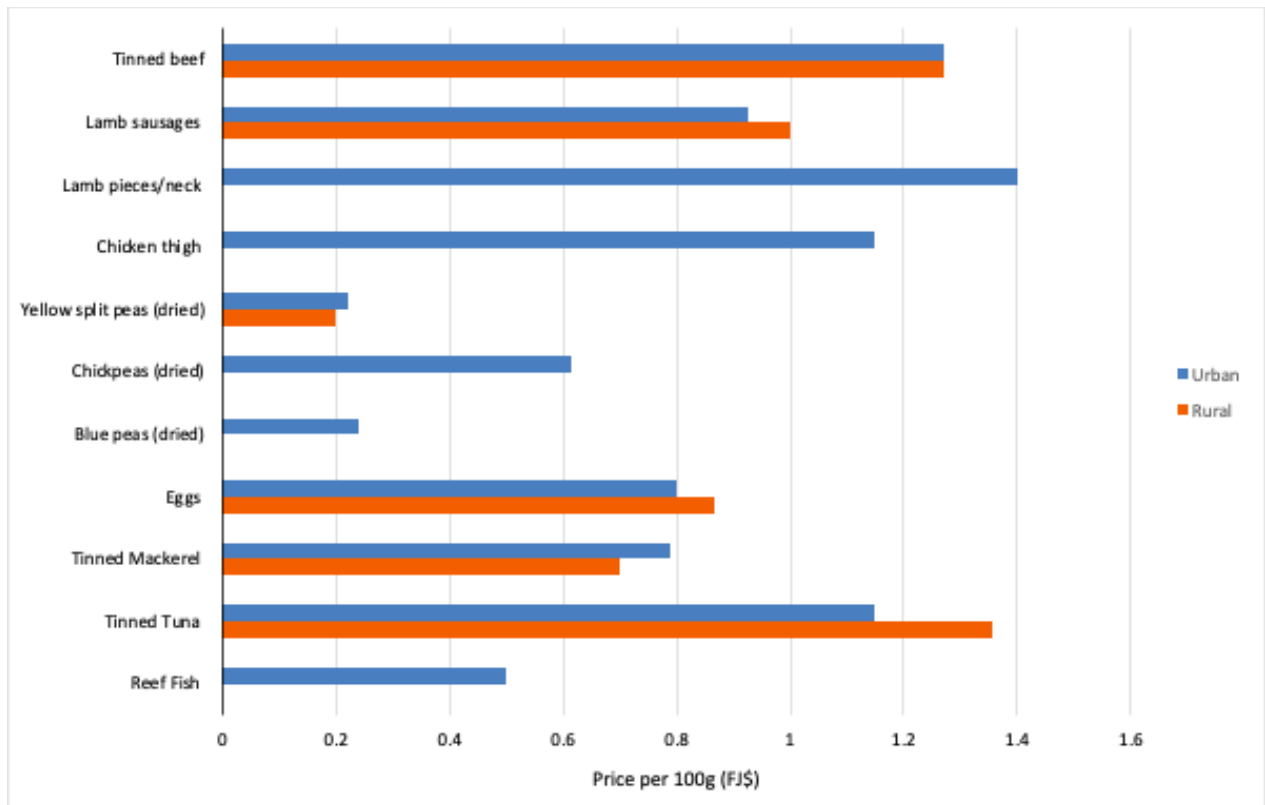


Figure 14. Median price of liquid milk and dried milk powder from rural and urban locations

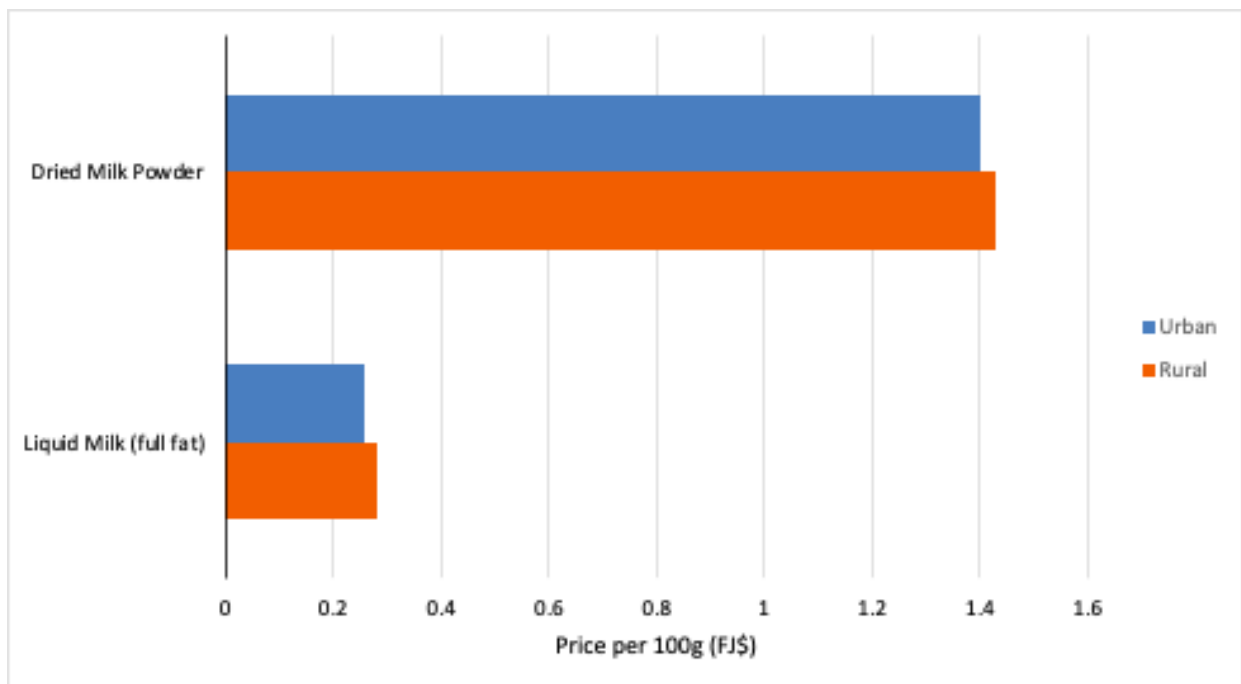
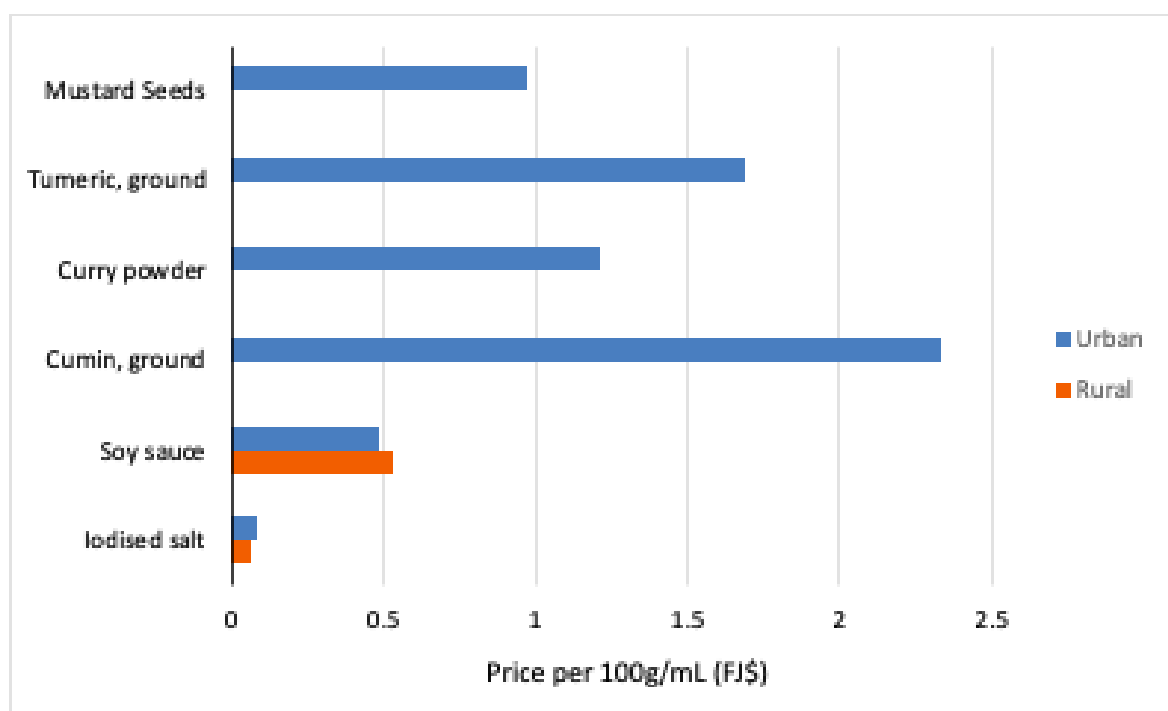


Figure 15. Median prices of spices and condiments from rural and urban locations



Dietary diversity and food behaviours

Participant characteristics

During the data collection period, 508 individuals were approached to participate in the dietary diversity and food behaviours survey, of which 467 (92 percent) consented to participate. Most data were collected at urban locations (80 percent). The majority of participants (69 percent) normally live in the community in which they were interviewed. Characteristics reported included sex, age (years), usual living location (rural; urban), household occupants and household income (Table 16).

Household income and composition

Of those who reported total household income (n=384), over half (55.5 percent) reported earning less than 5000 FJ\$ annually. Total household size (n=432) ranged from 1 – 21, with a median household size of five. The most common household sizes were four members (20.4 percent), five members (19 percent), three members (14.6 percent), two members (10.9 percent) and six members (10.4 percent) (Table 16).

The number of adults (including self) living in the home ranged from 1-15, with the most common response of two (28.8 percent of households). The number of children between five and 17 years ranged from zero to 12, with the most common response zero (37.5 percent) followed by one (25.3

percent) and two (22.1 percent). Most participants reported nil children under five years of age usually live in the home (64.7 percent), with one child under five years of age the most frequently reported (19.5 percent) (Table 16).

Table 16. Descriptive statistics for respondents (DDS)

| Variable | n (%) |
|--|------------|
| Respondent characteristics | |
| Sex [#] | |
| Female | 245 (52.6) |
| Male | 220 (47.2) |
| Age (years) ranged from 18-91 years (n=457; median 39 years) | |
| 18-24 | 54 (11.6) |
| 25-34 | 116 (24.8) |
| 35-44 | 99 (21.2) |
| 45-64 | 163 (34.9) |
| 65 years and older | 35 (7.5) |
| Household characteristics | |
| Usual living location* | |
| Rural (total) | 165 (36.5) |
| <i>Viti Levu</i> | 56 (12.4) |
| <i>Vanua Levu</i> | 109 (24.1) |
| Urban (total) | 287 (63.5) |
| <i>Viti Levu</i> | 224 (49.6) |
| <i>Vanua Levu</i> | 63 (13.9) |
| Household occupants: adults living in household | |
| 1-2 | 160 (34.3) |
| 3-4 | 222 (47.5) |
| 5-6 | 63 (13.5) |
| ≥ 7 | 22 (4.7) |
| Household occupants: children 5-17 years living in household | |
| 0 | 175 (37.5) |
| 1 | 118 (25.3) |
| 2 | 103 (22.1) |
| ≥ 3 | 71 (15.2) |
| Household occupants: children < 5 years living in household | |
| 0 | 302 (64.7) |
| 1 | 91 (19.5) |
| 2 | 29 (6.2) |
| ≥ 3 | 45 (9.6) |
| Gross annual household income (FJ\$) [^] | |
| Higher than 5000 | 171 (36.7) |
| Lower than 5000 | 213 (45.7) |
| Prefer not to say | 82 (17.6) |

One participant preferred not to say.

[^] One participant did not answer this question.

* Fifteen missing responses for usual living location.

Dietary Intake

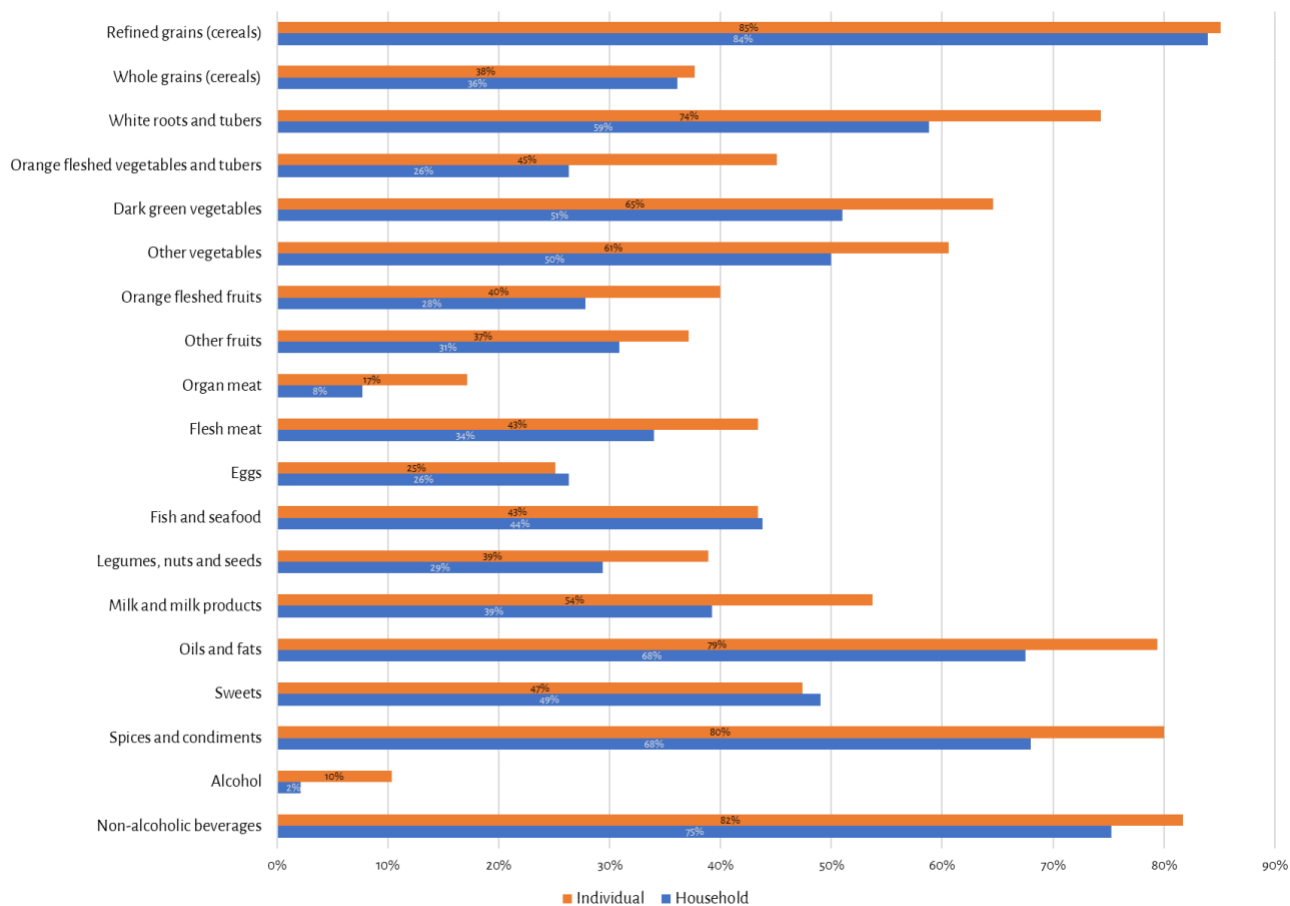
Dietary data were collected from 369 participants and classified into food groups (Table 17). Proportions of intake per food group at household and individual levels are presented in Figure 16. Recorded foods were aggregated into food groups per the FAO guidelines for measuring household and individual dietary diversity and dietary diversity scores were calculated at household (HDDS) and individual levels (IDDS) (for full method see Appendix V) (FAO, 2011a). If the participant was responsible for meal preparation, data were recorded at the household level (n = 194); otherwise recorded at the individual level (n = 175). If the day prior was reported as a celebration or feast day, dietary diversity data were not collected (18.7 percent). It was noted if foods were consumed outside of the home during the period of recall, however foods eaten outside of the home were not recorded. At the household level, 13.1 percent reported foods were consumed outside of the home. At the individual level, 31.4 percent reported foods were consumed outside of the home.

Table 17. Dietary diversity questionnaire food groups and example food items

| Question | Food Group | Example food items |
|----------|--------------------------------------|---|
| 1 | Refined Grains (cereals) | White rice, refined wheat or foods made from these (bread, noodles) |
| 2 | Wholegrains (cereals) | Brown rice, oats, corn/maize, whole grain products |
| 3 | White roots and tubers | White potato, white cassava, taro, plantains |
| 4 | Orange fleshed vegetables and tubers | Pumpkin, carrot, squash, sweet potato |
| 5 | Dark green vegetables | Amaranth/tubua, bele, rourou, ota, spinach |
| 6 | Other vegetables | Tomato, eggplant, beans, cucumber, okra |
| 7 | Orange fleshed fruits | Ripe mango, ripe papaya |
| 8 | Other fruits | Ripe banana, apple, watermelon, citrus, pineapple, passionfruit |
| 9 | Organ meat | Liver, kidney, heart or other organ meats or blood-based foods |
| 10 | Flesh meat | Beef, pork, lamb, mutton, chicken, goat, duck |
| 11 | Eggs | From chicken, duck, guinea fowl, etc |
| 12 | Fish and seafood | Fresh or tinned fish, mussels, prawns, eels, crab, octopus |
| 13 | Legumes, nuts and seeds | Dried/canned chickpeas, split peas, beans, peas, lentils, peanuts |
| 14 | Milk and milk products | Milk, cheese, yoghurt, milk products |
| 15 | Oils and fats | Vegetable oil, ghee, butter, coconut cream |
| 16 | Sweets | Sugar, honey, sweetened soda, juices, Milo, cookies, buns, cakes, etc |
| 17 | Spices and condiments | Spices (pepper, salt, curry), ginger, garlic, sauces (soy, hot sauce) |
| 18 | Alcohol | Beer, wine |
| 19 | Non-alcoholic beverages | Tea, coffee, kava |

Food groups from the questionnaire were aggregated to derive household and individual dietary diversity scores (for full method see Appendix V).

Figure 16. Consumption of foods as reported at household and individual levels



Household dietary diversity scores

Overall mean HDDS for both rural and urban locations was 6.52 (SD 2.48) (range 1-12, with 1 being the lowest score). A higher proportion of females (76.7 percent) were responsible for household meal preparation compared to males (23.3 percent). The mean HDDS was similar in both rural and urban locations. For urban locations (n=133) the mean HDDS was 6.52 (\pm 2.598) and rural (n=55) 6.55 (\pm 2.267). Scores were not normally distributed and ranged from 1-12 for urban locations and 2-12 for rural locations.

Individual dietary diversity scores

Mean IDDS was 4.90 (SD 2.82) (range 1-9; with one being the lowest score). A higher proportion of males provided individual dietary data (68.6 percent) than females (31.4 percent). The mean IDDS was

slightly higher for those usually living in rural locations, (n=62) 5.19 (\pm 2.534). Mean IDDS for individuals residing in urban locations (n=108) was 4.81 (\pm 2.124). Scores were not normally distributed and ranged from 1-9 for urban locations and 2-9 for rural locations.

Indicators of micronutrient consumption

Following the FAO guidelines, selected food groups (see table 17 above) were used as indicators of consumption of vitamin A and haem-iron rich foods at both the individual (n=175) and household (n=194) levels (Table 18).

Table 18. Food groups as indicators of vitamin A and haem-iron consumption at individual and household levels

| Indicator | Individuals (%) | Household (%) |
|---|-----------------|---------------|
| Plant foods rich in vitamin A (orange fleshed vegetables and tubers, dark green leafy vegetables, or orange fleshed fruits) | 78.3 | 66.5 |
| Vitamin A rich animal source foods (organ meat, eggs or milk and milk products) | 71.5 | 51.0 |
| Either a plant or animal source of vitamin A (orange fleshed vegetables and tubers or dark green leafy vegetables or orange fleshed fruits or organ meat, or eggs, or milk and milk products) | 86.9 | 78.9 |
| Haem-iron rich food groups (organ meat, flesh meat or fish) | 65.1 | 66.0 |

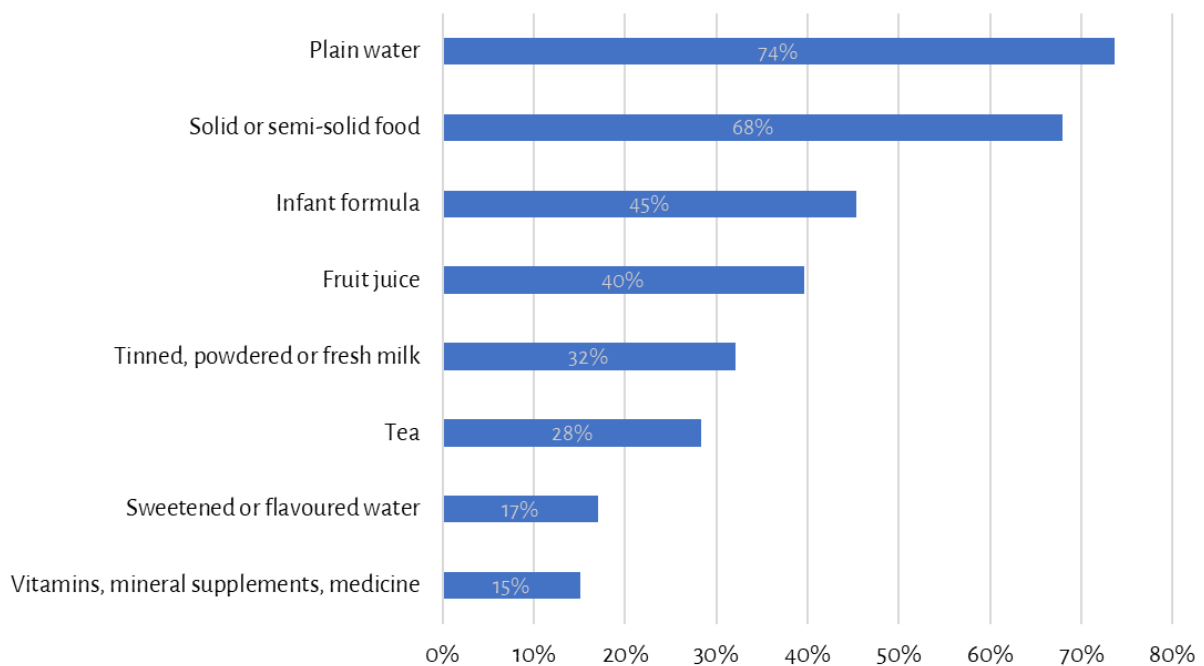
Child and infant feeding practices

On the day surveyed, 208 participants answered the question “do you have any children aged two years or under that usually live in your home?” of which 148 indicated no (71.2 percent). Of those who indicated yes (n=60), seven reported two children two years or under usually lived in the home.

Of those who indicated they had children aged two years or under that usually live in their home, 52 (86.6 percent) stated the child had been breastfed at some stage, whereas eight indicated the child had never been breastfed. Of those who indicated the child had been breastfed, 36 (69.2 percent) indicated the child had been breastfed in the last 24 hours.

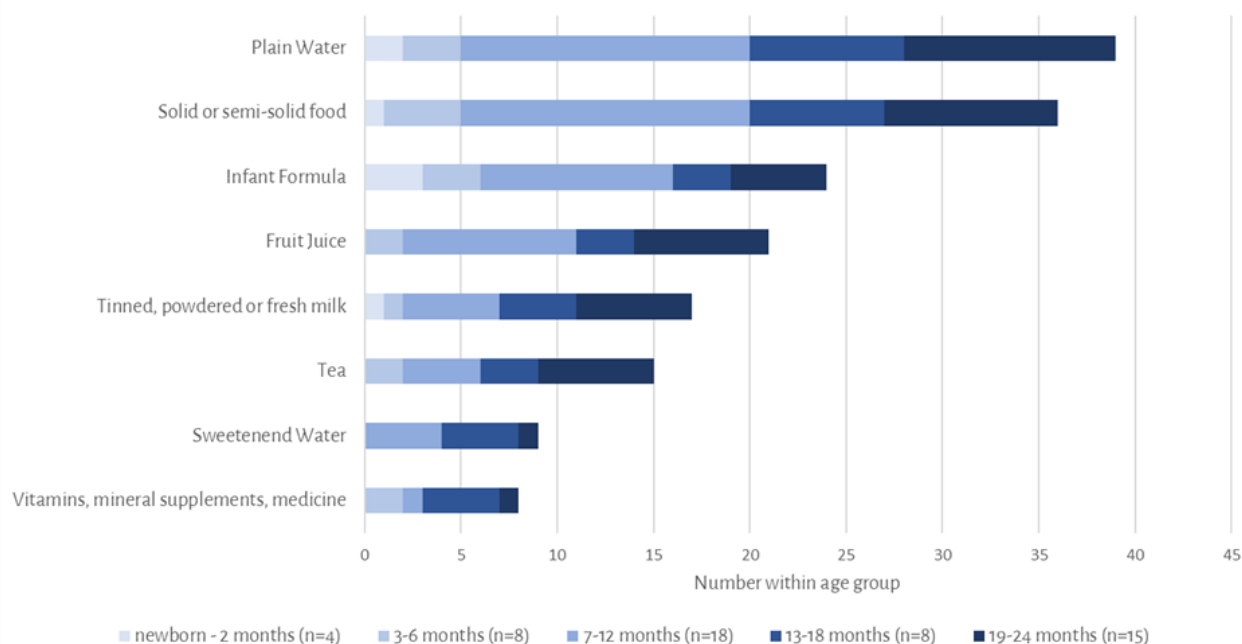
Responses to the question “since this time yesterday, did the child receive any of the following?: vitamins, minerals, supplements or medicines; plain water; sweetened or flavoured water; fruit juice; tea; infant formula; tinned, powdered or fresh milk; solid or semi-solid foods”, were provided by 53 participants (88.3 percent). The highest consumed items across all ages were plain water (73.6 percent) and solid or semi-solid foods (67.9 percent) (Figure 17).

Figure 17. Proportion of children (aged newborn – 24 months) who had consumed item in previous 24 hours



Apart from sweetened water, children aged three months and greater had consumed all items. Proportions varied and plain water was the highest reported consumed item across all ages and 100 percent of those aged 13-18-month-old were reported to have consumed plain water in the previous 24 hours. Tea was consumed in all ages except in the newborn-2 months category. Infant formula consumption in the previous 24 hours was highest in the 7-12-month-old age group (Figure 18).

Figure 18. Number of children aged newborn – 24 months within each age group who had consumed item in previous 24 hours



Growing and purchasing food

Most participants reported growing some of their own food (n=384; 82.2 percent). The five most frequently reported items were; cassava (62 percent), eggplant (54 percent), bele (49 percent), beans (34 percent) and taro (34 percent). Kava (yaqona) was mentioned by 16 participants (4 percent) (Table 19).

The most common outlets for purchasing foods varied, with fresh fruit and vegetables purchased from fruit and vegetable markets by just over half of the participants surveyed (55.4 percent overall; 62.9 percent in urban and 43.6 percent in rural locations). Over half of the participants also reported purchasing starchy vegetables from fruit and vegetable markets (56.9 percent overall; 68.1 percent in urban and 38.4 percent in rural locations). For those in urban locations 26.4 percent reported street stall as the most common outlet for the purchase of seafood/fish, whereas the highest response for those in rural locations was “I do not buy this food” (35.4 percent). Supermarkets were the most common outlet for purchasing eggs (55.5 percent overall; 54.4 percent in urban and 57.6 percent in rural locations), and meats (85.1 percent overall; 89 percent in urban and 78.2 percent in rural locations).

Table 19. Own food production categorised by food groups

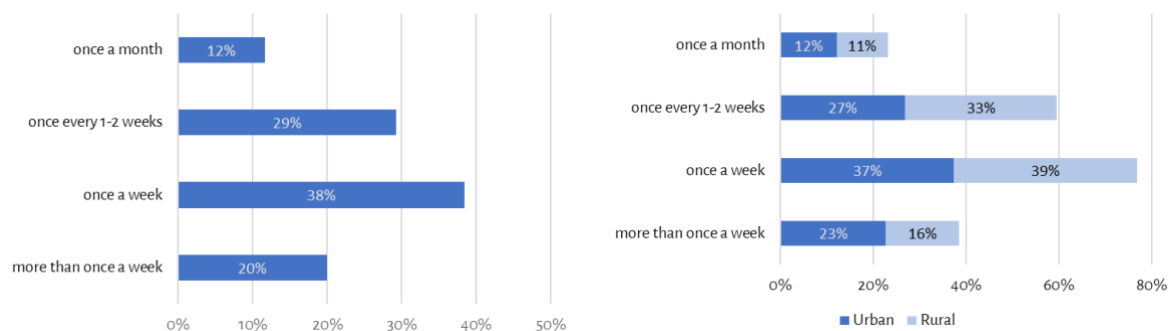
| Food Group | Foods grown |
|--------------------------------------|---|
| Wholegrains (cereals) | Corn, rice |
| White roots and tubers | Cassava, taro, vudi, yam, breadfruit, plantain, root crops |
| Orange fleshed vegetables and tubers | Sweet potato, pumpkin, carrot |
| Dark green leafy vegetables | Bele, cabbage, rourou, tubua, moringa, ota |
| Other vegetables | Eggplant, bean, chilli, tomato, okra, cucumber, lettuce, capsicum, bitter gourd, jackfruit, radish, cauliflower, spring onion, watercress, celery |
| Orange fleshed fruits | Pawpaw, mango |
| Other fruits | Banana, pineapple, lemon, coconut, kavika, passionfruit, avocado, guava, pomegranate, watermelon, lime |
| Organ meat | Nil |
| Flesh meat | Nil |
| Eggs | Eggs |
| Fish and seafood | Nil |
| Legumes, nuts and seeds | Peanuts, peas |
| Dairy products | Nil |
| Oils and fats | Nil |
| High sugar foods and drinks | Sugar cane |
| Spices and condiments | Coriander, mint, basil, ginger, curry leaves, garlic, sage, turmeric |
| Alcohol | Nil |
| Non-alcoholic beverages | Kava |

When participants were asked about sourcing foods, most agreed/strongly agreed with the following statements (with a similar level of agreement between rural and urban participants):

- *It is easy to buy fresh fruits and vegetables in my community/neighbourhood* (82.1 percent)
- *The fresh produce in my community /neighbourhood is of high quality* (89 percent)
- *There is a large selection of fresh fruits and vegetables in my community/neighbourhood* (84.3 percent)
- *Fruits and vegetables are sold at a reasonable price in my community/neighbourhood* (80.6 percent)

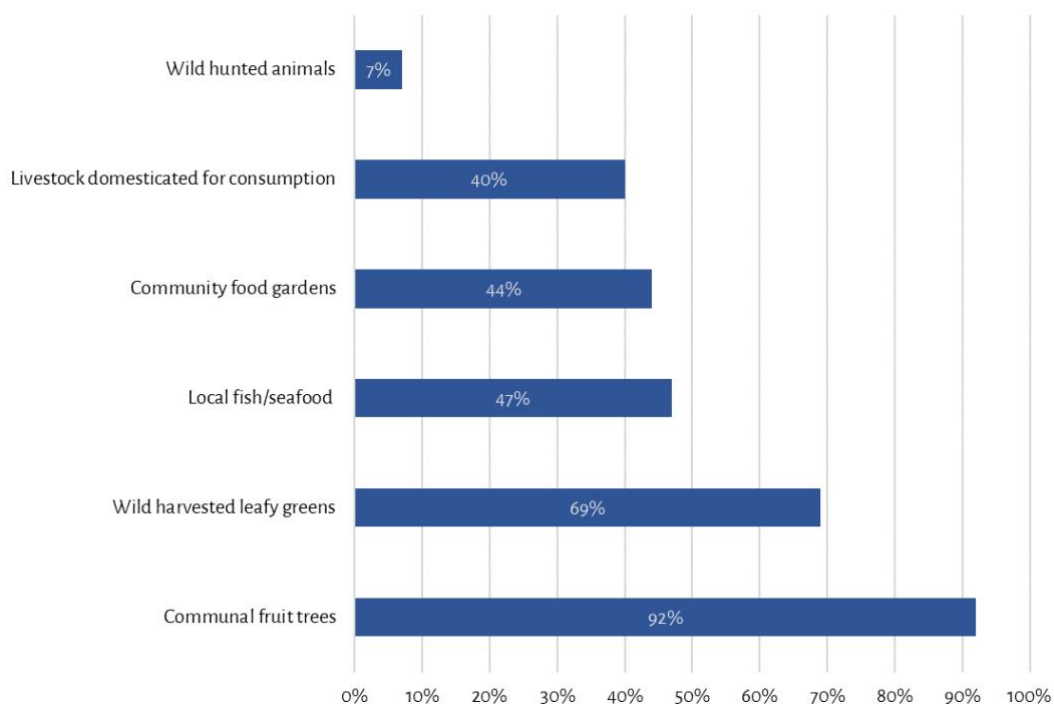
Participants reported shopping for food once a week (38.4 percent) or every 1-2 weeks (29.2 percent) as the most reported food shopping frequencies (Figure 19). Reported shopping frequency was similar for participants who lived in both rural and urban locations (Figure 19).

Figure 19. Reported frequency of shopping by whole sample and by location



Most participants (91.8 percent) reported access to communal fruit trees and wild harvested leafy greens (69.1 percent). Similar proportions reported access to livestock domesticated for consumption (e.g. cows, pigs, chickens) and free local fish/seafood from local rivers/ocean. Slightly less reported access to community food gardens (44.2 percent) and few reported access to wild hunted animals (6.6 percent) such as pigs (Figure 20).

Figure 20. Food access



Influences on food choice

Health

Factors related to the prevention of chronic disease (fibre/roughage) and appearance (skin, teeth, etc.) were ranked less important compared to food keeping one healthy or the nutritional composition of the food (Figure 21).

Convenience

Factors related to purchase and preparation of food was very important to most participants, with easy preparation and simple to cook rating as most important (Figure 22).

Price

Price as an influence on food choice was ranked the most important of all factors. Only 14 of 462 participants considered cost factors as not at all important (Figure 23).

Natural content

Overall, a higher proportion reported food containing natural ingredients was more important than the use of additives and artificial ingredients (Figure 24).

Mood

Factors related to mood, such as the role of food in keeping awake/alert, relaxed, helping to cope with life or improve mood, were considered very important for approximately half of respondents (Figure 25). Food as a factor to help cope with stress was considered not important at all for 19 percent.

Sensory appeal

Factors related to smell, taste, texture and appearance were only ranked not important at all by very few participants. The most important factor was for food to taste good (Figure 26).

Familiarity

Familiarity of foods rated highly overall with nil participants ranking 'familiarity' or 'is what I usually eat' as not important at all. A small percentage (5 percent) considered it not important at all that food is like that eaten when a child (Figure 27).

Weight control

Factors related to weight control were ranked less important than other concepts but ranked higher than mood (Figure 28).

Ethical concerns

Items related to environmental and political issues were overall ranked the least important in this sample (Figure 29).

Figure 21. Perceived importance of health factors influencing food choice in Fijian adults

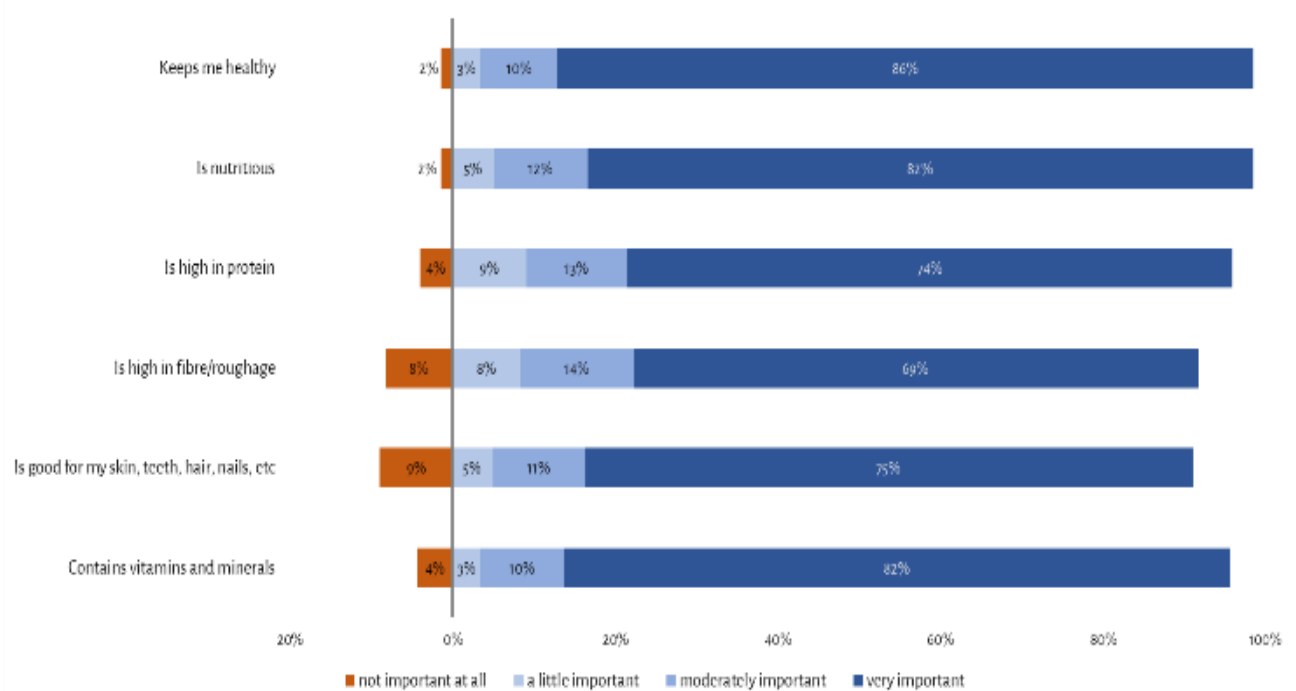


Figure 22. Perceived importance of convenience factors influencing food choice in Fijian adults

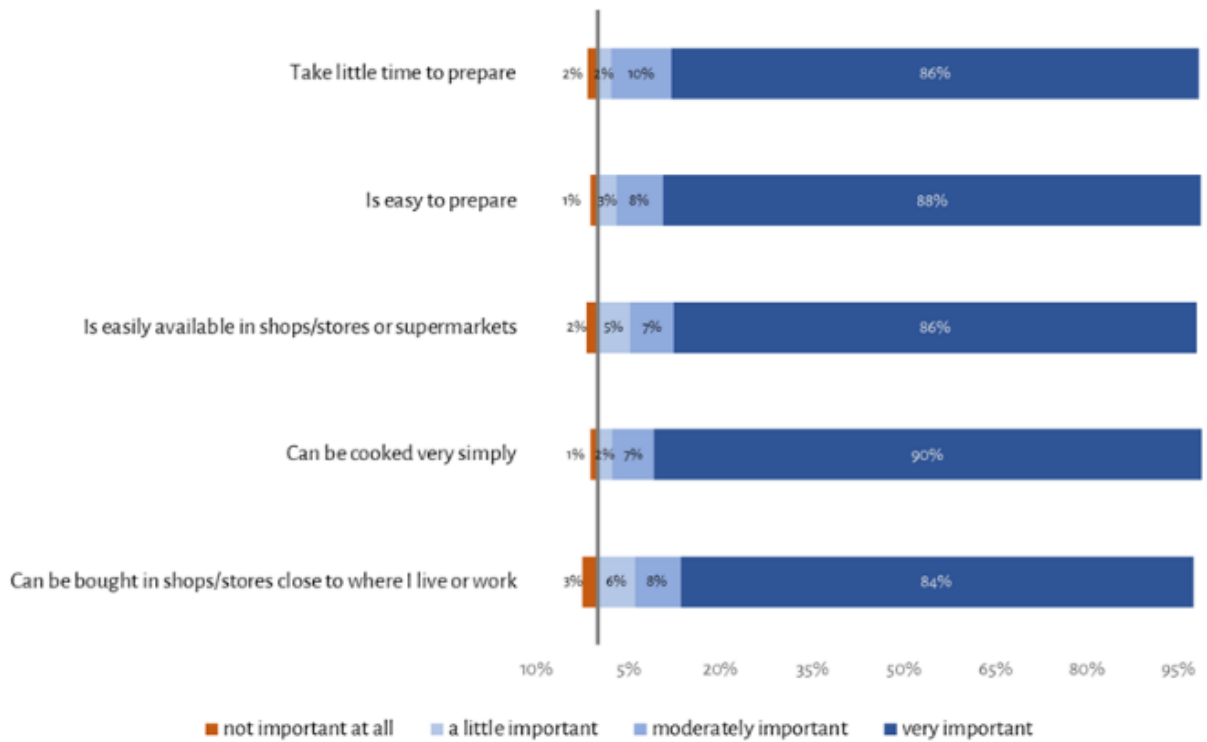


Figure 23. Perceived importance of price as a factor influencing food choice in Fijian adults

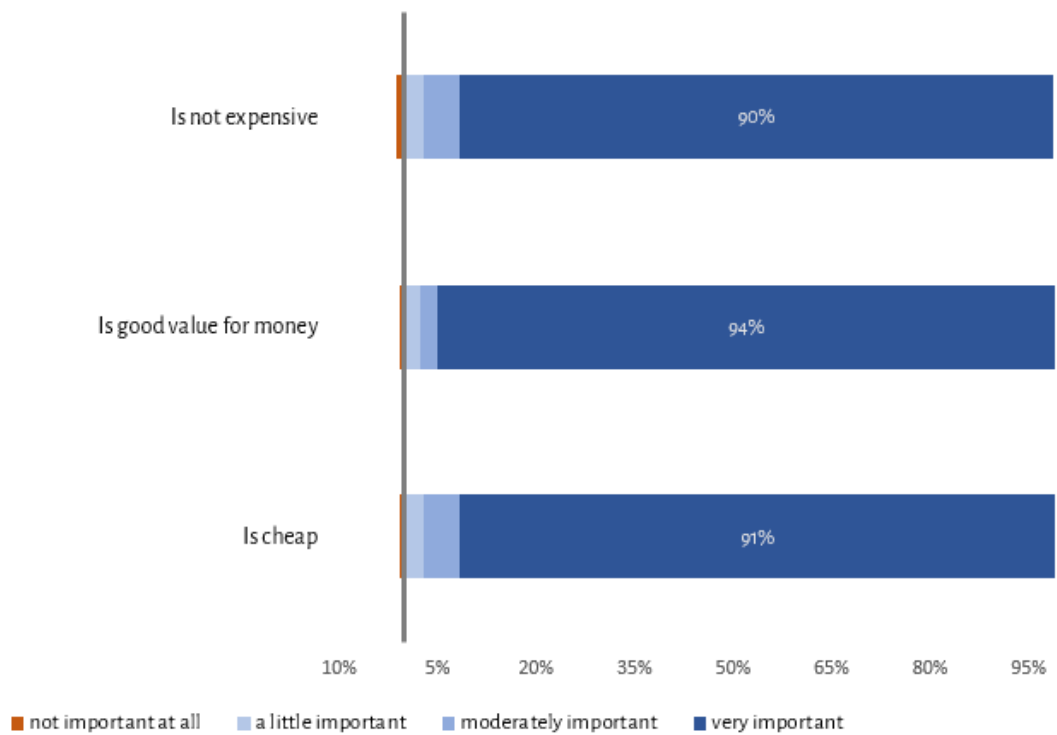


Figure 24. Perceived importance of natural content factors influencing food choice in Fijian adults

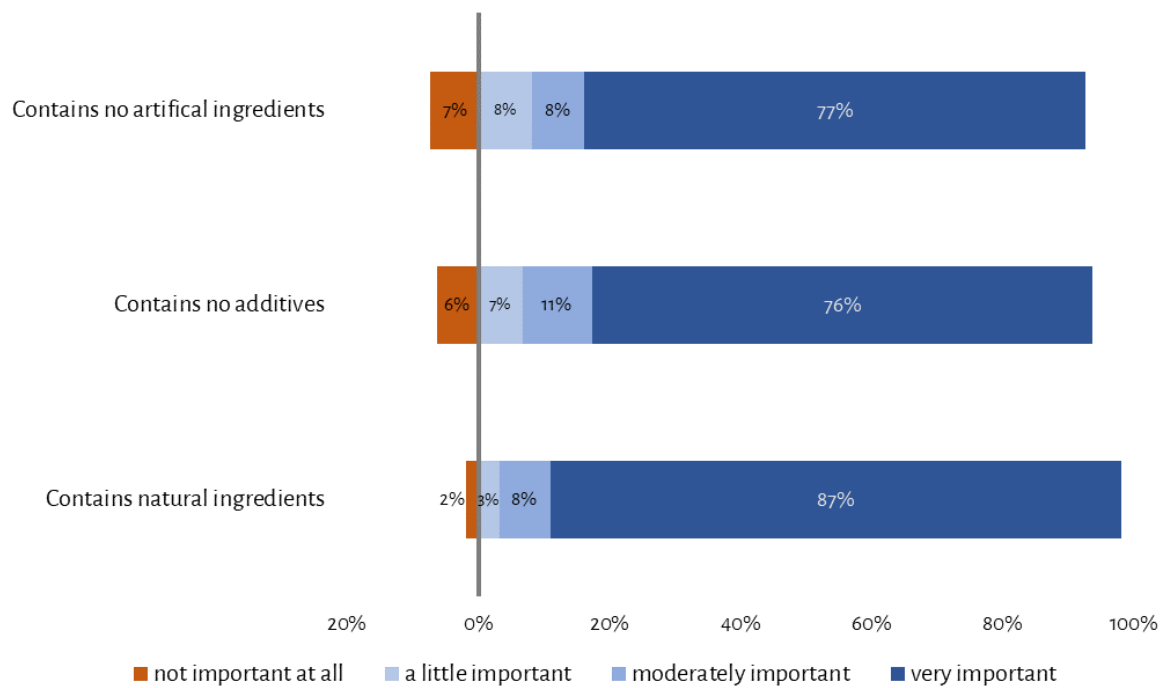


Figure 25. Perceived importance of mood influencing food choice in Fijian adults

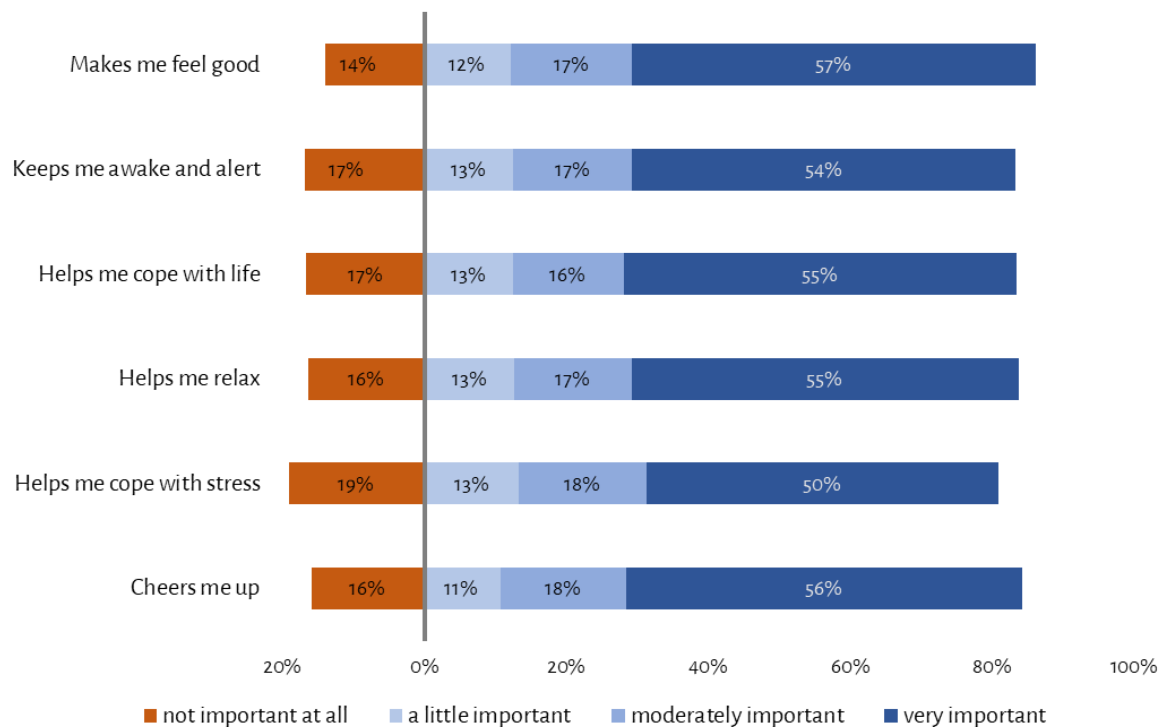


Figure 26. Perceived importance of sensory appeal factors influencing food choice in Fijian adults

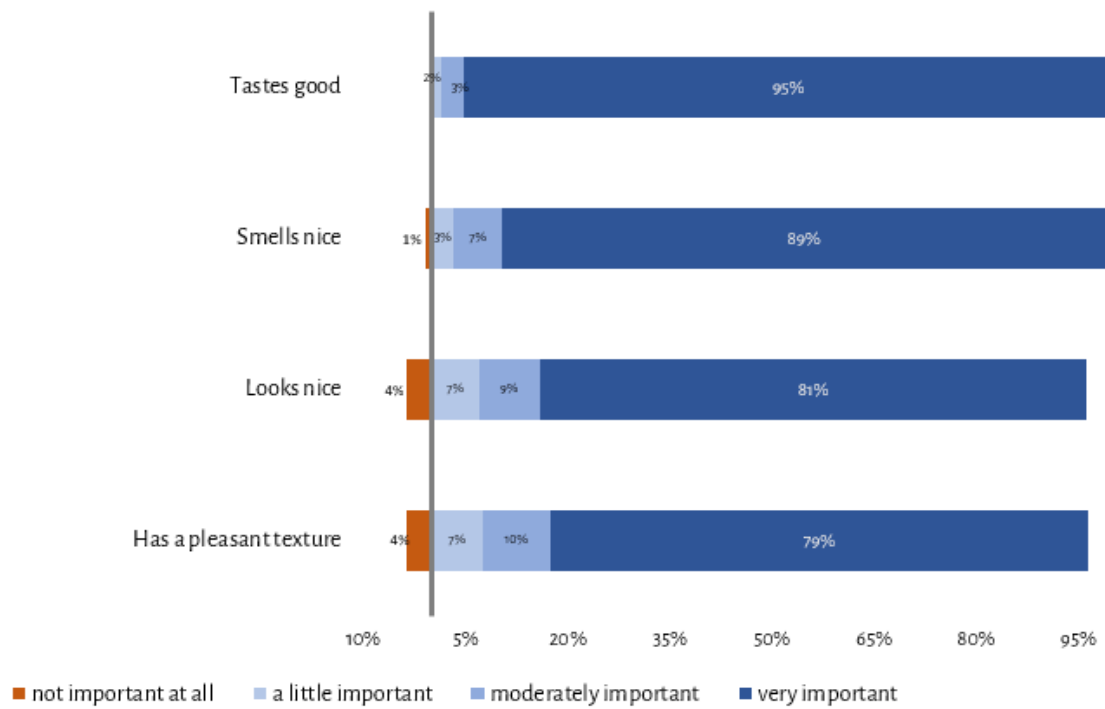


Figure 27. Perceived importance of familiarity as a factor influencing food choice in Fijian adults

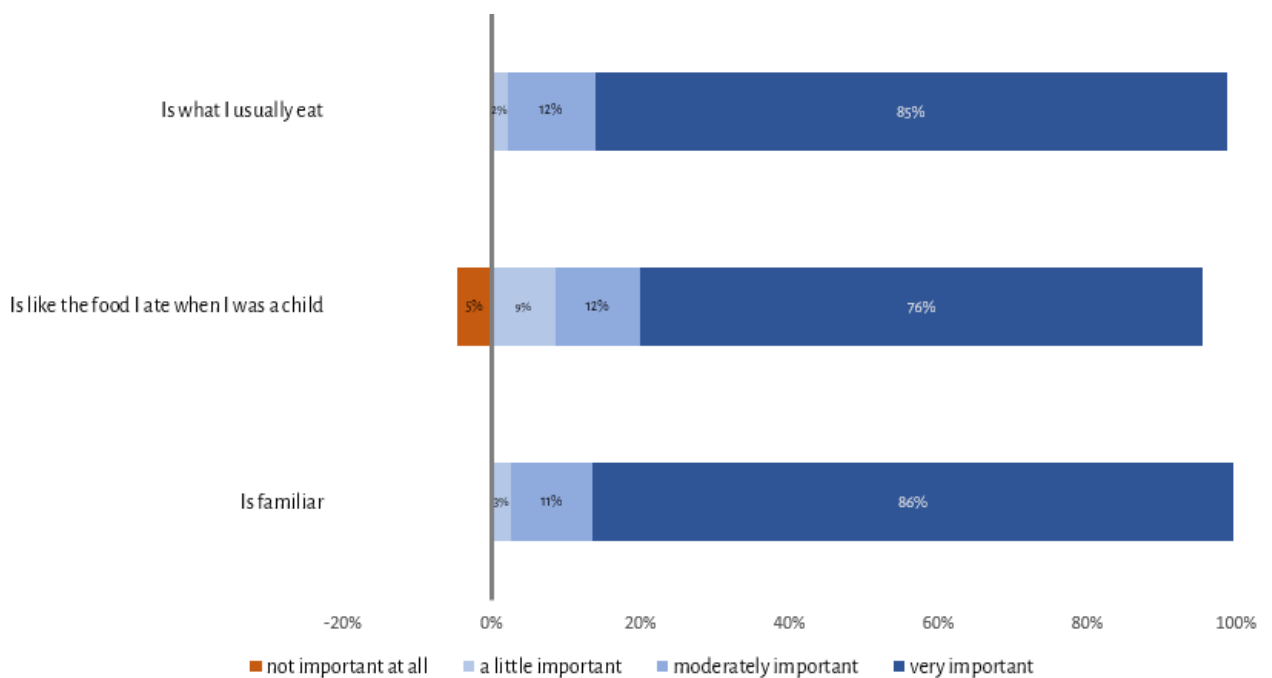


Figure 28. Perceived importance of weight control as a factor influencing food choice in Fijian adults

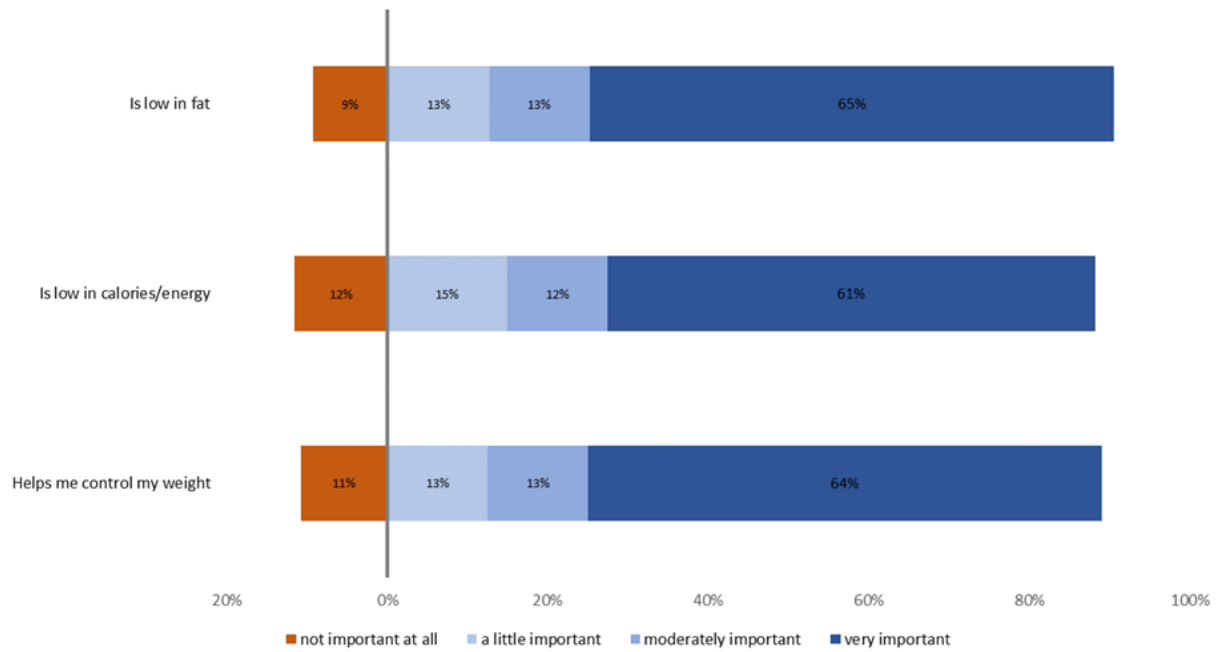
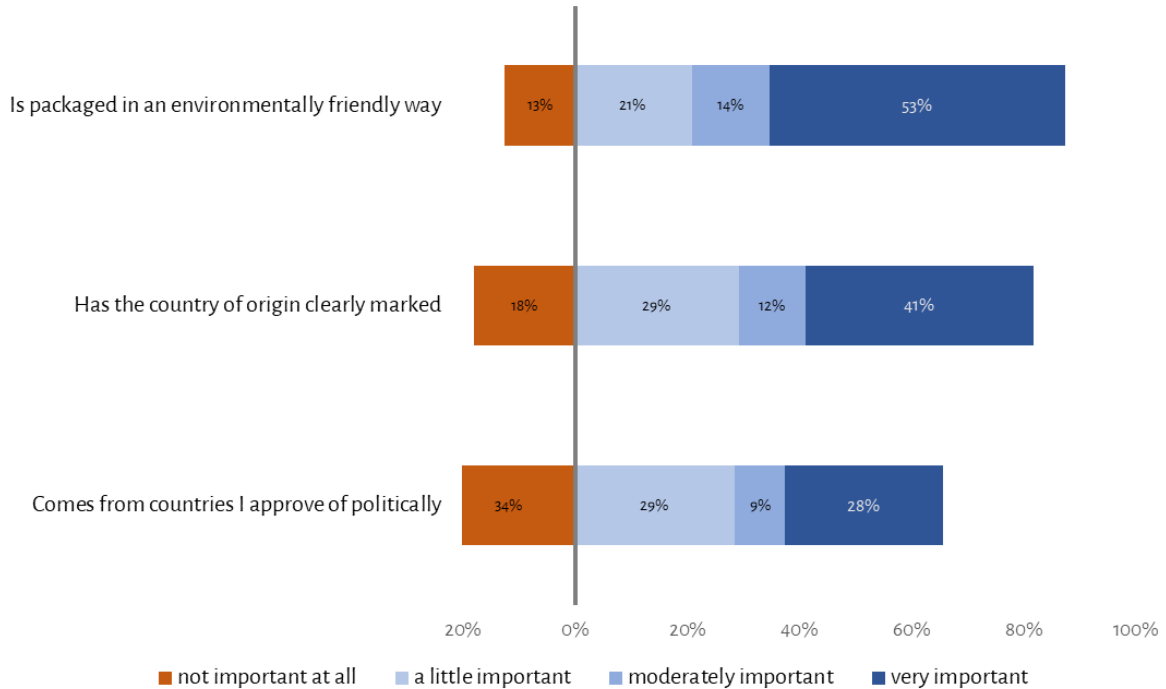


Figure 29. Perceived importance of ethical concerns as a factor influencing food choice in Fijian adults



Food behaviours and food literacy

Participant characteristics

During the data collection period 72 individuals attempted the online survey, of which 63 individuals who completed all or most of the questions were included for data analysis. At the time of survey completion, the majority of participants had full time employment (90.5 percent; n=57) and a university qualification (85.7 percent; n=54), representing a small subset of the Fijian population. Other characteristics reported included, sex, age (years), ethnicity, marital status, usual living location (province) and number of household occupants (Table 20).

Sourcing and storing food

More than half of respondents (60 percent) sourced fish and seafood from the fish market. Most (74 percent) usually travel to the store where they buy most of their food in a private car compared to 11 percent who take a taxi, 10 percent who walk and 5 percent use a public bus. If participants were to walk to the store where they buy most of their food from 41 percent could walk there within 20 minutes, 50 percent would take between 20 minutes and one hour and 9 percent would take over an hour.

When asked which appliances respondents have in their home to cook or store food, 92 percent (n=58) had a refrigerator, 70 percent (n=44) had a freezer, 57 percent (n=36) had a microwave, 92 percent (n=58) had a stove, 11 percent (n=7) had a wood stove, 71 percent (n=45) had an oven and 54 percent had a variety of other bench top appliances (e.g., toaster, electric grill, rice cooker, sandwich press). The major/main method of storing foods that spoil quickly (perishable foods) was a refrigerator 85.5 percent (n=53), compared to 12.9 percent (n=8) whose main method was to use a freezer and 1.6 percent (n=1) who used the benchtop.

Eating food away from home

During the previous day to survey completion over half (57.1 percent) of respondents had eaten something outside/away from home. For 61 percent the most common place to eat out was a sit-down restaurant, followed by a fast-food restaurant (34 percent). Once a week, 37 percent of respondents eat a meal at a sit-down restaurant, 32 percent eat a meal at a fast-food restaurant, 11 percent eat a meal at market stall and 10 percent eat a meal at a roadside vendor. Less than 10 percent eat a meal at a sit-down restaurant or fast-food restaurant three to five times a week. No participants reported eating out every day. When eating out at the restaurant/takeaway outlet that respondents go to most often, 75 percent agreed that it is important to them to be able to make a healthy food choice, 43 percent of respondents agreed that it is hard to find a healthy option and 70

percent agreed that it costs more to buy the healthy options. Additionally, 80 percent reported that the restaurant/takeaway outlet did not provide nutrition information on a menu board or the menu.

Table 20. Descriptive statistics for respondents: food behaviours and literacy survey

| Variable | n (%) |
|---|--------------|
| Sex | |
| Female | 37 (58.7) |
| Male | 26 (41.3) |
| Age (years) | |
| 18 to 24 years | 3 (4.8) |
| 25 to 34 years | 15 (23.8) |
| 35 to 44 years | 21 (33.3) |
| 45 to 64 years | 19 (30.2) |
| 65 years and older | 5 (7.9) |
| Ethnicity | |
| iTaukei | 36 (57.1) |
| Indo-Fijian | 5 (7.9) |
| European | 8 (12.7) |
| Samoaan | 2 (3.2) |
| Mixed ethnicity | 7 (11) |
| Unspecified (not enough detail) | 5 (7.9) |
| Highest level of education | |
| Did not attend school | 1 (1.6) |
| Secondary school | 3 (4.8) |
| Technical school/trade completed | 3 (4.8) |
| Bachelor's degree/college completed | 20 (31.8) |
| Post graduate degree completed | 34 (54) |
| Prefer not to say | 2 (3.2) |
| Current employment status | |
| Full-time employment (35 hrs a week or more year-round) | 57 (90.5) |
| Part time employment | 2 (3.2) |
| Student | 1 (1.6) |
| Retired | 2 (3.2) |
| Unemployed, actively seeking employment | 1 (1.6) |
| Marital status | |
| Currently married | 41 (65.1) |
| Never married | 12 (19.1) |
| Divorced | 2 (3.2) |
| Widowed | 4 (6.4) |
| Separated | 1 (1.6) |
| Cohabiting | 1 (1.6) |
| Prefer not to say | 2 (3.2) |
| Province | |
| Ba | 3 (4.8) |
| Kadavu | 1 (1.6) |
| Lau | 1 (1.6) |
| Nadroga/Navosa | 1 (1.6) |
| Naitasiri | 9 (14.3) |
| Rewa | 43 (68.3) |
| Serua | 1 (1.6) |
| Tailevu | 4 (6.4) |
| Household occupants | |
| 1-2 | 14 (22.2) |
| 3-4 | 17 (27) |
| 5-6 | 14 (22.2) |
| 7-8 | 11 (17.5) |
| ≥9 | 7 (11.1) |

Food safety and hygiene

When asked about food safety and hygiene, 54 percent of participants reported they always or most of the time thaw meat at room temperature, 36 percent sometimes did this and only 9 percent never or rarely. Almost half (46 percent) strongly agreed/agreed that cooked foods can be stored at room temperature overnight whereas 53 percent strongly disagreed/disagreed. The majority (92 percent) agreed that hands should always be washed with soap before preparing food.

Food and health

When it came to the relationship between food and health, most (93 percent) agreed that food has an impact on health, whereas 7 percent disagreed. The majority also agreed that regularly eating processed foods that are high in salt and fat is harmful for their health, whereas 5 percent disagreed. One quarter (25 percent) of participants always plan to include healthy food when deciding what to eat, while 43 percent only plan most of the time, 26 percent sometimes, and 7 percent never or rarely plan. Most (84 percent) agreed that it is important to eat without distractions if you are eating with friends or family.

Food labelling

When asked about use of the nutrition information panel when making food choices, 2 percent of participants stated they always use the nutrition information panel to make food choices, while 33 percent use it most of the time, 41 percent sometimes and nearly one quarter (24 percent) of participants never or rarely use the nutrition information panel.

Food imports and pricing*Food imports*

Fluctuations of annual food import quantities for the selected food items between 2000 and 2018 are highlighted in Figures 30 and 31. Between 2002 and 2007, the annual import quantity of brown rice was higher than white rice, however, this changed between 2008 to 2018, with the annual import quantity of white rice exceeding brown rice (Figure 30).

Between 2004 and 2015, the annual import quantity of full fat milk was higher than skimmed milk, however, since 2016 the annual import quantity of skimmed milk has exceeded full fat milk (Figure 31).

Food Price Inflation

Over the last 19 years (2001-2020), food price inflation has fluctuated, although has predominately remained a positive value (FAO, 2020a). Food price deflation occurred monthly between March 2017 to February 2018 (Figure 32) and most recently between January 2020 to June 2020 (Figure 33). FAOSTAT food price inflation data is unavailable past July 2020.

Figure 30. Annual import quantity of rice

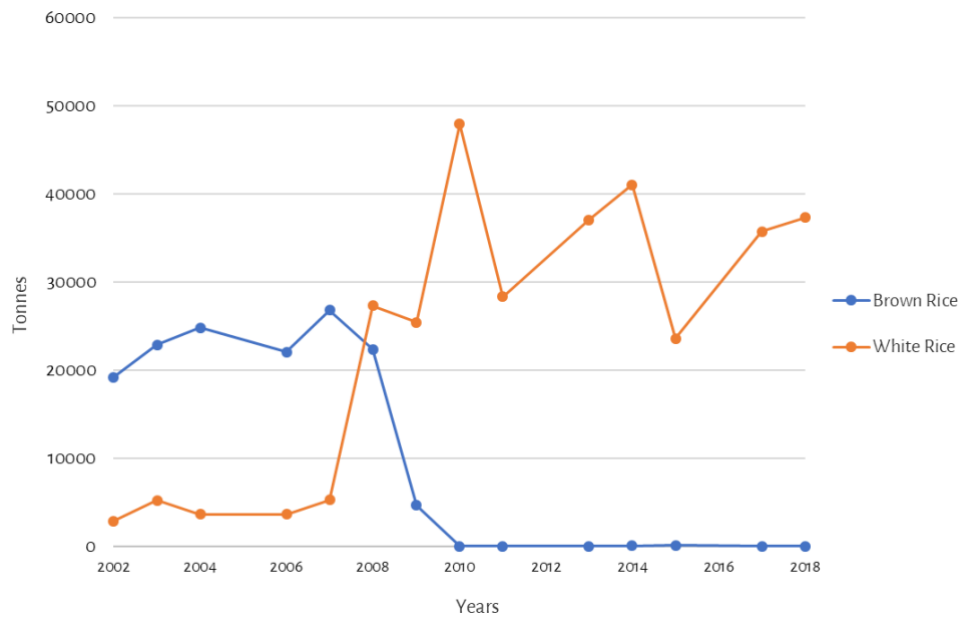


Figure 31. Annual import quantity of milk

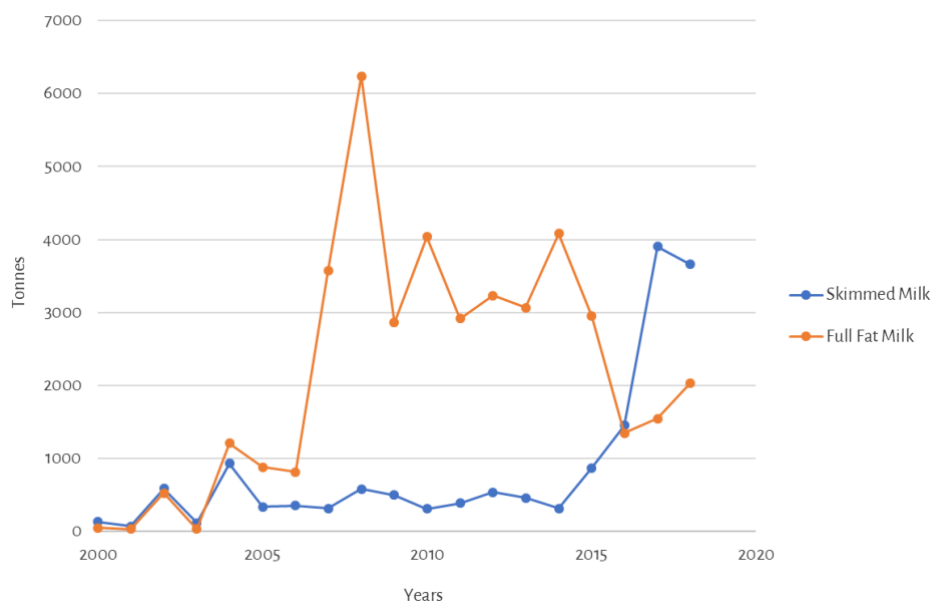


Figure 32. Monthly food price inflation from February 2017 to February 2018

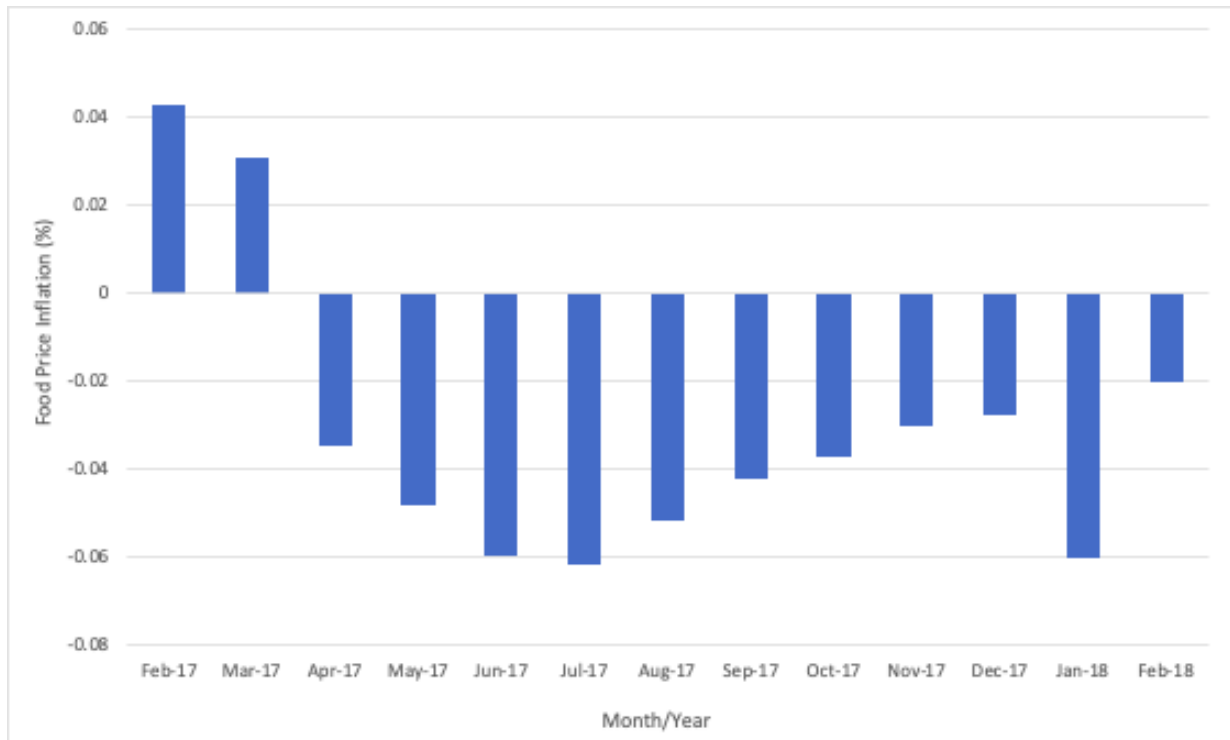
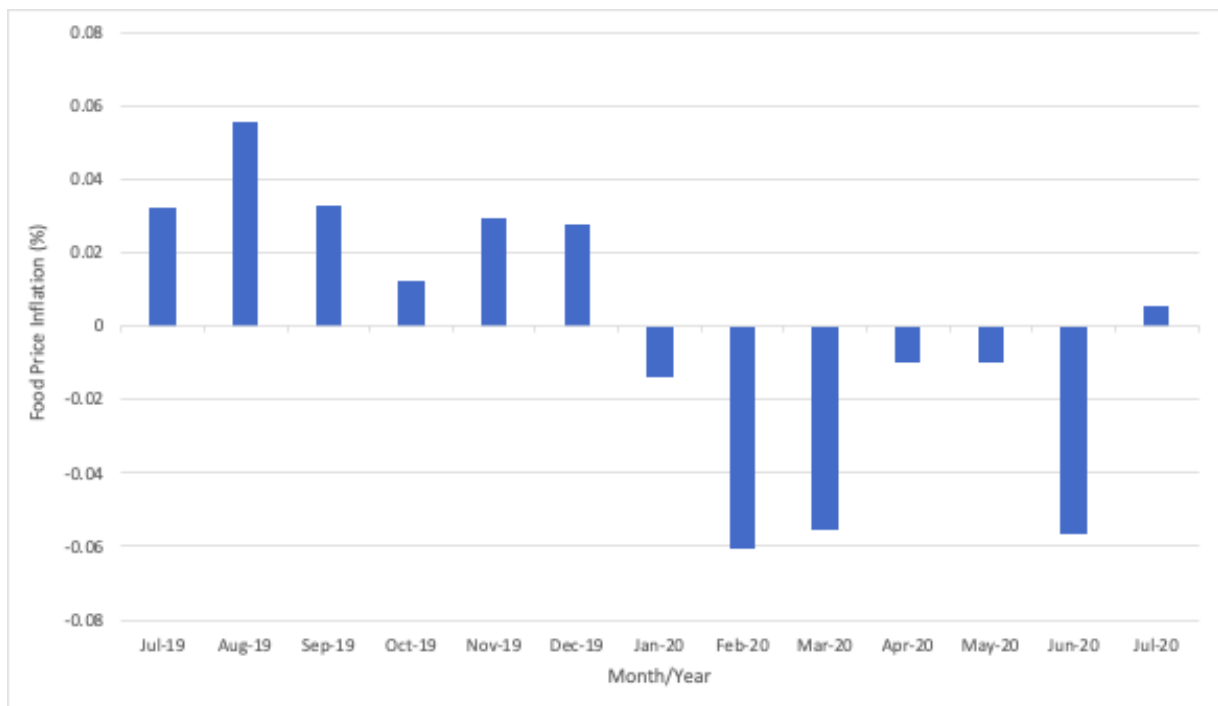


Figure 33. Monthly food price inflation from July 2019 to July 2020



COVID-19

COVID-19 and the impact it has had on food systems and food behaviours was purposely included in several of the data collection methods. There were also comments that related to COVID-19 included in other data sets.

Small holder horticultural farmers, market vendors and consumers

The complementary report (Underhill *et al.*, 2020) presents findings from Pacific Island smallholder horticultural farmers, market vendors and consumers in Tonga, Fiji and Samoa, over a five-month period (July to November 2020). Fijian farmers in the complementary COVID-19 study reported that there were issues in sourcing seed and planting materials, with Viti Levu farmers more likely to report an impact on production (Underhill *et al.*, 2020). Vendors in Fiji noted challenges in sourcing product, and that consumers, although seen in lower levels than pre-COVID-19, purchased less product. This reduced demand was likely due to increased market supply from semi-subsistent farmers and home gardens, sourcing home grown produce and/ or the use of informal trade networks (Underhill *et al.*, 2020).

Interestingly smallholder farmers and market vendors in Fiji noted that post-harvest loss increased as a result of COVID-19 (Underhill *et al.*, 2020). COVID-19 has had an impact on domestic markets as almost all (96.8 percent) market vendors reported making less income (Underhill *et al.*, 2020), and consumers (64 percent) reporting that it was difficult to purchase fresh fruit and vegetables during COVID-19, due to increased pricing, travel restrictions, less variety (possibly due to less imported product), and decreased freshness and quality (Underhill *et al.*, 2020).

Dietary changes as a result of COVID-19 were reported. Some farmers (10 percent), market vendors (15.3 percent) and consumers (18.8 percent) indicated that they had reduced their consumption of fruit and vegetables, with farmers reporting more consumption of more processed or tinned meat (4.0 percent of farmers), eggs (2.7 percent) and wholegrain breads and brown rice (2.7 percent), whereas market vendors reported consuming more fish (4.6 percent of market vendors), eggs (3.7 percent), milk and milk products (2.3 percent) and biscuits and cakes (2.3 percent) and consumers more eggs (13.4 percent of consumers), and white breads, or white rice, or pasta (8.0 percent) (Underhill *et al.*, 2020). Almost 19 percent of Fijian women in the study reported decreased consumption of fruit and vegetables as a result of COVID-19 impacts, as compared to 12.1 percent of males. This warrants further investigation, but may be due to redirection of these food items to children or other family members (Underhill *et al.*, 2020).

School food environments

Ten participants who completed the school food assessment interviews provided comments that related to COVID-19. This included two comments that due to COVID-19, food gardens were no longer in use in the school. There were three comments that schools had provided a lunch meal in response to COVID-19. One participant saw positive aspects to COVID-19; *'...as students and people in general are returning back to traditional food sources. People have adapted to situations and students are learning to plant their food as is evident during lunch hours'* (SF23). One participant reported that parents are less strict regarding food and nutrition, while another talked about changes in students' lunches; *'COVID-19 has really affected the student's lunches where healthy meals are more expensive compared to cheap meals that are unbalanced'* (SF12). One participant also noted that a proposed canteen building had been placed on hold due to COVID-19 restrictions affecting grants.

Dietary diversity and food behaviours survey

COVID-19 was mentioned by eleven participants as having a negative impact on income during participation in this survey:

- *Due to COVID not able to sell as much* (P98)
- *Hard times due loss of job from COVID 19* (P176)
- *Difficult in adjusting to unemployment due to COVID and affording good quality nutritious food* (P176)
- *Unemployed due to COVID* (P189)
- *COVID has affected the eating habits in terms of lack of income* (P373)
- *Main bread winner of the family (husband) lost his job due to COVID 19* (P388)
- *More mindful of cost of food due to COVID, will look to shop where food is on special prices* (P401)
- *Loss of job due to COVID 19* (P444)
- *Family income has dropped due to COVID 19. Husbands salary and time has been deducted* (P445)
- *COVID has affected hours of work, hence less pay* (P453)
- *Pandemic affected* (P225)

COVID-19 impact on food behaviours

Fifty participants who completed the online survey on dietary behaviour provided answers to questions about the impact of COVID-19 on food consumption. It is important to note that this participant group was not representative of the Fijian population (refer to participant characteristics on page 62). The food categories used within this survey were based on the Pacific Guidelines for Healthy Living (Public Health Division of the Pacific Community, 2018).

Changes to consumption of protective foods indicate that participants have consumed increased amounts of fresh varieties of fruits and vegetables since COVID-19 measures/lockdown have been in place (Figure 34). Changes to consumption of energy foods were less than 25 percent and therefore considered negligible (Figure 35). Participants reported increasing their consumption of fresh fish, vegetarian alternatives, and legumes, pulses and dhal since COVID-19 measures/lockdown were out in place, whereas consumption of processed meat with visible fat and/or sausages reportedly decreased (Figure 36). Some respondents reported less consumption of tinned fish (20 percent) and other processed or canned meats (24 percent). Respondents reported a decrease of more than 40 percent for consumption of all foods and or beverages high in fat, salt and/or sugar (Figure 37). Worthy changes to other drinks were indicated, with a higher proportion of respondents drinking more water and non-sugared beverages and fewer alcoholic beverages than before the COVID-19 measures/lockdown (Figure 38).

Figure 34. Proportion of respondents who ate more or less of food items from the ‘protective’ food group since COVID-19 measures/lockdowns have been in place

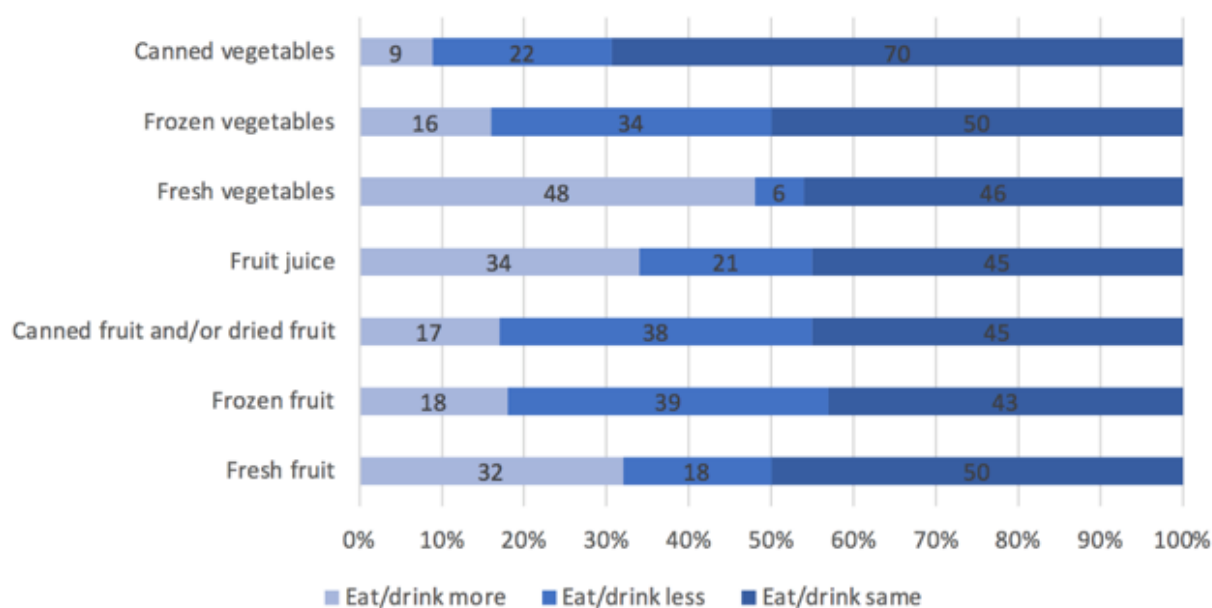


Figure 35. Proportion of respondents who ate more or less of food items from the ‘energy’ food group since COVID-19 measures/lockdowns have been in place

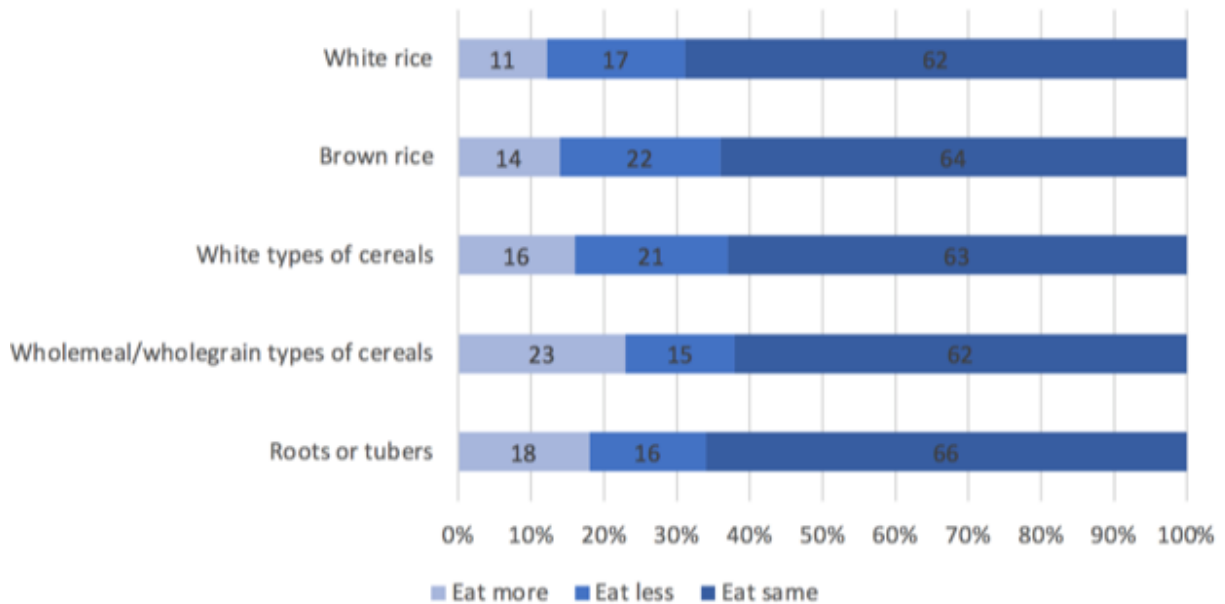


Figure 36. Proportion of respondents who ate more or less of food items from the ‘bodybuilding’ food group since COVID-19 measures/lockdowns have been in place

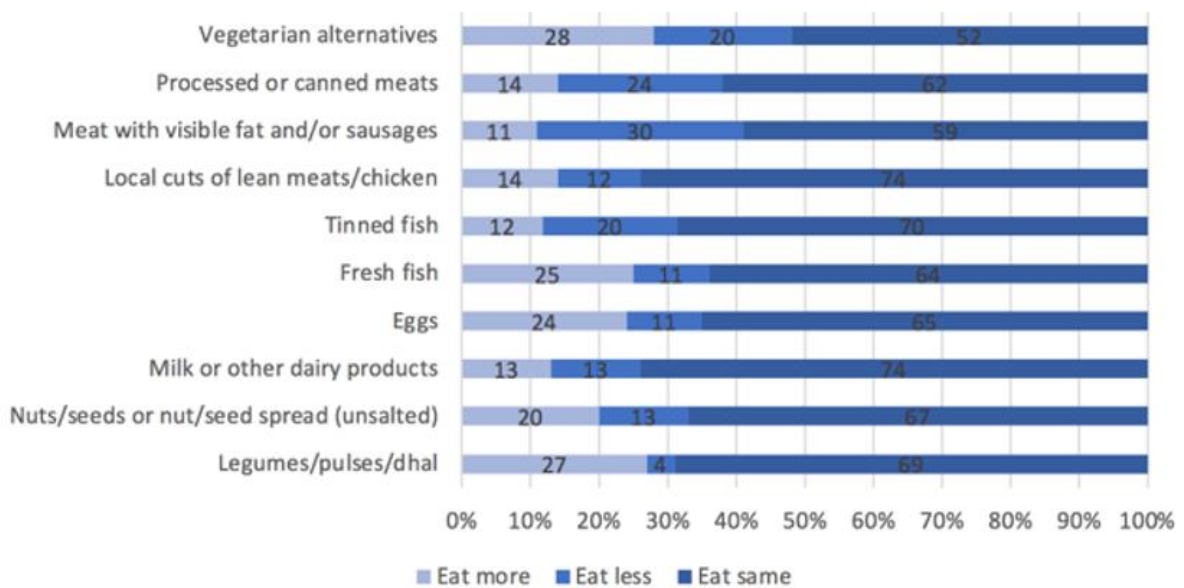


Figure 37. Proportion of respondents who ate more or less of food items that are high in salt, fat and/or sugar since COVID-19 measures/lockdowns have been in place

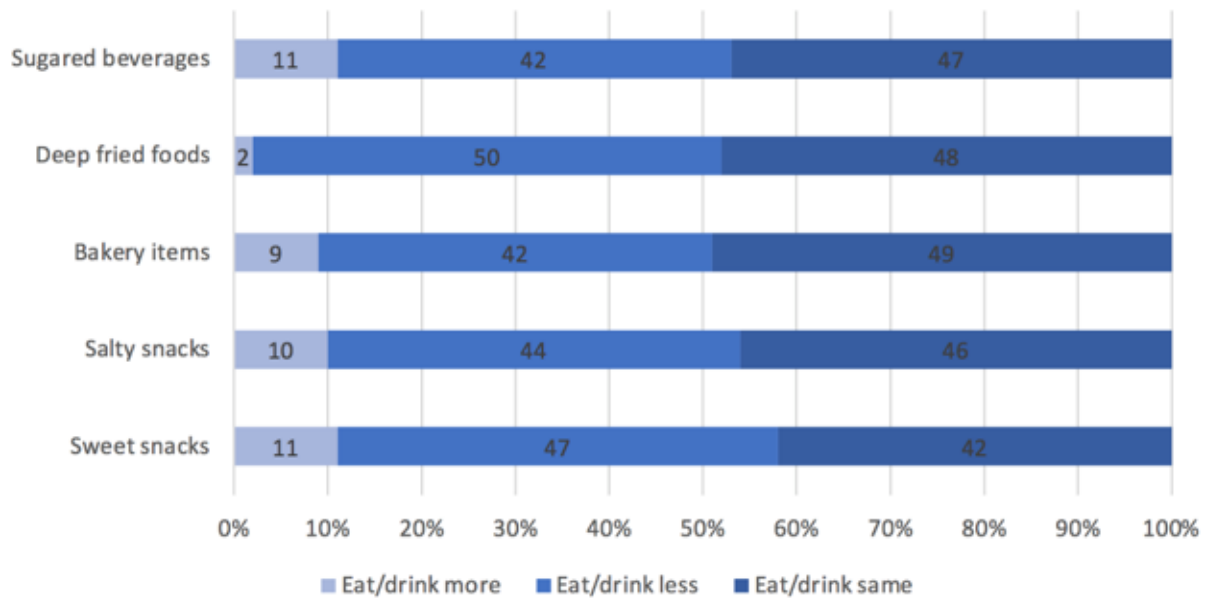
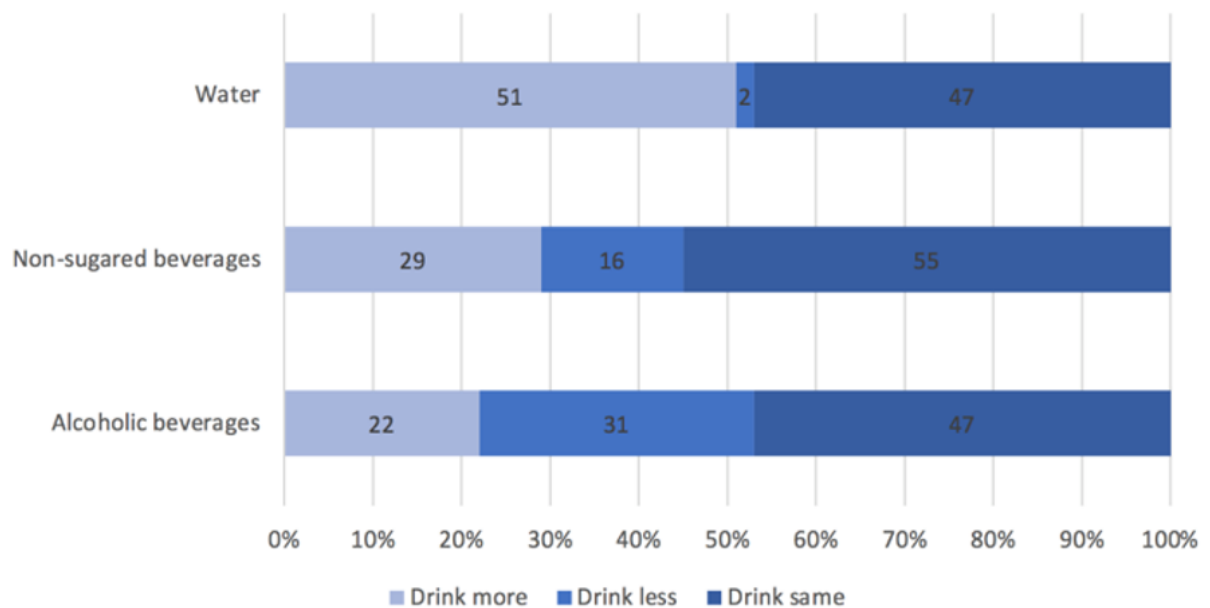


Figure 38. Proportion of respondents who consumed drinks more or less since COVID-19 measures/lockdowns have been in place



The policy landscape

Part One. Policy context

International guiding documents

At the World Health Assembly in 2013, UN Member States endorsed the **NCD Global Monitoring Framework** (WHO, 2013b). The Framework comprises nine Voluntary Global Targets to be achieved by 2025 under the **WHO Global Action Plan for Prevention and Control of NCDs (2013-2020)**(WHO, 2013a).

In 2014, at the Joint Forum Economic and Pacific Health Ministers Meeting, ministers endorsed the **Pacific NCD Roadmap** (World Bank, 2014). The Roadmap includes a set of recommended interventions that can be implemented by PICs to address NCDs and achieve the Voluntary Global Targets. Ministers agreed to report on progress against the Roadmap, for which the **Pacific Monitoring Alliance for NCD Action (MANA) Pacific NCD Dashboard** has been established (Tolley *et al.*, 2016). The Dashboard for Fiji is currently maintained by Pacific Community (SPC).

Also in 2014, at the Second International Conference on Nutrition (ICN2), governments endorsed the **Rome Declaration on Nutrition**, pledging to eradicate hunger and prevent malnutrition in all its forms (FAO and WHO, 2014a). Guided by a Framework for Action, governments committed to ‘enhance sustainable food systems by developing coherent public policies from production to consumption and across relevant sectors to provide year-round access to food that meets people’s nutrition needs and promote safe and diversified healthy diets’.

In 2015, UN Member States, committed to achieving 17 **Sustainable Development Goals (SDGs)** as part of the **2030 Agenda for Sustainable Development** (UN General Assembly, 2015). This includes a target under SDG 2 Zero Hunger to ‘end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round’.

Whole-of-government guiding documents

The **Constitution of the Republic of Fiji** (2013) provides the country’s legal framework, and binds the State to take ‘reasonable measures within its available resources to achieve the progressive realisation of the right of every person to be free from hunger [and] to have adequate food of acceptable quality’ (Government of Fiji, 2013). It also prescribes that ‘Every child has the right to basic nutrition’.

The **20-Year National Development Plan (NDP)** (2017-2036) outlines the Fijian government's long-term strategic vision, including how it will deliver on the SDGs (Government of Fiji, 2017a). The NDP describes two national strategic priorities intended to be reinforcing: inclusive socio-economic development; and to become a regional hub of trade and business. It includes associated national development targets which align to SDGs. 'Food and nutrition security' is included in the NDP as a focus area for achieving socio-economic development. Increasing local food production is considered the primary means to achieve this, with a single associated target for food sourced domestically to comprise 42 percent of total food available by 2021, a 10 percent increase from 2015. This is not an indicator of food consumption however, and no other targets relating to nutrition or SDG 2 are included. The NDP does however contain targets for cross-cutting SDGs that contribute to nutrition, in the areas of water and sanitation, education, maternal and child health, and economic growth.

To deliver the NDP, a five-year development plan has been prepared for 29 individual government sectors, contained within the **5-Year Development Plan** (2017-2021) (Government of Fiji, 2017a). 'Food and nutrition security' is included as a standalone sector in the Plan, with the goal that 'Every Fijian has access to adequate food of acceptable quality and nutritional value'. Policy priorities for the sector for the five-year period are: i) develop a national food and nutrition security policy or framework; ii) raise more awareness on the importance of food and nutrition security; and iii) encourage the better implementation of food and nutrition security priorities in agriculture and fisheries and other sectors. Key performance indicators for the sector relate to: increased local food production; reduced intake of carbohydrate-rich foods; increased intake of protein-rich foods; and improved maternal and child health outcomes, several aligned to SDG 2. Elsewhere the Plan details policy priorities and strategies to address underlying causes and challenges to nutrition and food security, such as social inclusion and access to services.

Each ministry is to align its their strategic plans and policies to the 5-Year & 20-Year NDP and SDGs. Monitoring of the NDP and SDGs is the responsibility of the Ministry of Economy (MOEC).

Sector-specific guiding documents

[Agriculture \(including crops, livestock, fisheries and aquaculture, forestry\)](#)

The **Ministry of Agriculture (MOAG) 5-Year Strategic Development Plan (SDP) (2019-2023)** intends to support the national development targets in two main ways: 'a holistic approach to managing food security and resilient food systems'; and 'strengthening the transition of smallholder farmers to commercial level' (Government of Fiji, 2019a). The first of five strategic priorities for the Ministry

detailed in the SDP is ‘to improve food and nutrition security for all Fijians’. This shall be achieved by improving production and access to local, safe and nutritious food for communities; increasing adoption of local food gardens by schools and demand for diverse, nutritious and safe food; increasing production of resilient, safe and nutritious food in rural and urban communities; and a strong multi-sector approach supported by a Food and Nutrition Security Policy. Targets relate to the provision of materials and technical support to establish ‘nutrient-rich gardens’ leading to the production and consumption of nutrient-rich foods by recipient households and schools. Targets are also included for the implementation of a food and nutrition security framework and related capacity building activities. The Ministry’s additional strategic priorities are to: increase farmer household income for sustainable livelihoods; increase adoption of sustainable resource management and climate smart agriculture; establish and improve commercial agriculture; and improve quality public sector performance and service delivery. Each seeks to strengthen the production of food in Fiji, whether that be for domestic or international markets. For rural households, there is a risk that the Ministry’s encouragement of commercial agriculture, and promotion of household gardens to improve food and nutrition security may be incoherent. The SDP would benefit from more defined targets relating to the consumption of nutrient-rich foods, the inclusion of nutrition-sensitive measures to translate production into consumption, and measures to foster the diversification of food production for the domestic market. A monitoring and evaluation framework for the Plan has recently been established with assistance from the FAO. A **Costed Operational Plan (COP) (2020-2021)**, which guides the SDP’s implementation, acknowledges the impact of COVID-19 in ‘bringing the importance of agriculture to the forefront’ (Government of Fiji, 2020d). The COP continues to deliver on each of the Ministry’s five strategic priorities, yet endeavours to accelerate activities relating to household food and nutrition security and commercial agriculture.

The **draft Fiji Policy on Food and Nutrition Security** is a deliverable of the MOAG’s SDP. It was prepared in 2017 with assistance from the FAO/FIRST programme and has been awaiting formal approval since this time. A whole-of-government policy, it is co-owned by the MOAG and MOHMS, and has five implementation partner ministries (MOWCPA, MOEHA, MOITT, MOYS and MOFISH). Taking a food system approach, the draft Policy provides a national framework to ensure ‘the availability, accessibility and affordability of safe and nutritious food for every Fijian’, and is fundamental to the multisectoral coordination of actions to address food and nutrition security in Fiji. It has three strategic priorities, which have been informed by learnings from delivering the Ministry of Health and Medical Services’ (MOHMS) preceding National Food and Nutrition Policy (2008) and Fiji Plan of Action for Nutrition (2010-2014). They include a more holistic technical focus (with both supply and demand side

interventions); improved multi-sectoral coordination of national food security and nutrition action; and increasing investment in identifying and scaling up food and nutrition security promoting best-practice interventions. The draft Policy is operationalised by the **draft Fiji Plan of Action for Food and Nutrition Security**, which details a comprehensive suite of policies and initiatives to deliver on the Policy's objectives. It currently hinges on budget approval during a difficult economic climate, which has required its actions to be scaled back. As such it will rely on the commitment of implementing ministries, as well as contributions from donors, to support its delivery.

The **Ministry of Fisheries (MOFISH) Strategic Development Plan (2019-2029)** defines strategic priorities for each of its offshore fisheries, coastal fisheries and aquaculture portfolios (Government of Fiji, 2019c). The appropriate management of fish species so as to maximise food security is identified as a cross-cutting theme of the SDP. No references are made however to improving nutrition or fish consumption. The coastal fisheries portfolio seeks to provide food security, in addition to local employment, for coastal communities. This shall be achieved through marine protection and marine aquaculture initiatives. The aquaculture portfolio seeks to scale up the production of specific fish species for local and export markets, though it does not articulate whether this is for food security, employment and/or economic purposes. The offshore fisheries portfolio is openly economy driven. It includes among its aims to be a regional hub for processing, which may facilitate domestic access to affordable canned fish and have positive as well as negative impacts on nutrition. An Operational Plan for 2020-2021 is not publicly available.

The **Ministry of Forestry (MOFOR) Strategic Development Plan (2017-2030)** endeavours to achieve sustainable forest management, by balancing 'the preservation of natural resources while facilitating economic growth' (Government of Fiji, 2017c). The SDP makes no reference to nutrition or food security, overlooking the opportunity, for example, to integrate the planting of traditional nutrient-rich foods into re-forestation activities. Strategies contained under the goal 'to establish sustainable life cycle management of forest resources in Fiji' may foster sustainable food production and access.

Overall, the agriculture sector in Fiji – encompassing crops, livestock, fisheries and aquaculture, and forestry – would benefit from a sector-wide strategy that encourages integrated farming systems and facilitates diverse and sustainable local food production.

Health

The **Ministry of Health and Medical Services (MOHMS) Strategic Plan (2020-2025)** outlines three strategic priorities for the sector and associated targets (Government of Fiji, 2020e). The first priority,

'Reform public health services to provide a population-based approach for diseases and the climate crises', includes targets to reduce the prevalence of NCDs and to reduce the rate of obesity among school children. This shall be achieved through an integrated population-based approach to disease prevention, which includes nutrition, though no specific actions or targets relating to nutrition are included. There is a target under this priority to strengthen health regulations, including the Food Safety Act, which may improve compliance with existing regulations which promote nutrition. An Operational Plan for 2020-2021 is not publicly available.

The National Food and Nutrition Centre (NFNC) is a division of the MOHMS. In the absence of a revised policy and action plan being approved, the **National Food and Nutrition Policy (2008)** and **Fiji Plan of Action for Nutrition (2009-2014)** continue to define the NFNC's role and strategic priorities (Government of Fiji, 2008; Government of Fiji, 2010a). The documents present nine policy priorities which the NFNC is responsible to manage: promote and sustain household food security; improve national nutritional status; protect consumers through improved quality and safety of food and water; improve nutritional status of the socio-economically disadvantaged and the groups that are nutritionally vulnerable; nutrition policy for schools; promote healthy diets and lifestyle; establish and promote nutrition surveillance and monitoring system; and strengthen collaboration with development partners. The Policy and Plan will be superseded by the Food and Nutrition Security Policy and its Plan of Action when formally approved.

The MOHMS's lapsed **NCDs Strategic Plan (2015-2019)** is planned for review (Government of Fiji, 2015b). The Plan defined strategies, responsibilities and targets for addressing key areas in the prevention and treatment of NCDs, including diet. Following initial consultations in early 2020, the Plan's review was paused due to COVID-19. It is now pending the Ministry's appointment to the vacated role of NCD Advisor, who will lead the review.

Education

The **Ministry of Education, Heritage and Arts (MOEHA) Strategic Plan (2019-2023)** contains no goals or outcomes related to improving nutrition, food security or health more broadly (Government of Fiji, 2019b). The Ministry's goals for the five-year period relate to structural reform, policy review and partnership. The later may present avenues for those seeking to improve nutrition to engage with the education sector. An Operational Plan for the 2020-2021 period has not been formally approved.

The **Fiji School Health Policy (2016)** co-owned by the MOHMS and MOEHA, aims to ‘institutionalise wellness in all schools in Fiji through an enabling environment and multi-sectoral partnership to ensure that children achieve their optimal growth and development’ (Government of Fiji, 2016a). The Policy defines the roles of the two ministries in governing, implementing and monitoring school health programs, including those relating to nutrition.

Environment and climate

The **Fiji National Adaptation Plan (2018)**, prepared by the MOEC which oversees Fiji’s climate change portfolio, details 160 adaptation measures to be prioritised across government over five-years to address climate change, as informed by the **Fiji National Climate Change Policy (2018-2030)** (Government of Fiji, 2018f; Government of Fiji, 2018b). Food and nutrition security is one of five sectoral priorities for adaptation, with the Plan detailing 23 associated actions for the agriculture and fisheries sectors to ‘transform and re-orientate the agricultural system to support food production without degrading resources.’ Food and nutrition security is also supported by actions detailed elsewhere in the Plan under the themes of health, human settlement, infrastructure, and biodiversity and the natural environment. The Plan is complimented by a Monitoring and Evaluation Framework.

The **Ministry of Waterways and Environment’s Strategic Plan (2020-2024)** presents separate strategic objectives for its Department of Waterways and Department of Environment (Government of Fiji, 2020f). Neither nutrition or food security are specifically referenced among the Department of Waterways’ objectives, though each objective supports food production and availability, either by improving access to water in rural areas for agriculture, or improving waterway management to avoid erosion, flooding and fish stock depletion. Nutrition and food security are also not referenced among the Department of Environment’s objectives. By delivering on their objectives however - which relate to regulating, addressing and raising awareness of environmental risks such as chemical use, pollution and biodiversity loss - the Department supports sustainable food production and availability.

The **National Biodiversity Strategy and Action Plan for Fiji (2020-2025)** was recently launched by the Department of Environment and contains a comprehensive set of actions and targets under the goal to conserve and sustainably use Fiji’s biodiversity, and to maintain the ecological systems that support it (Government of Fiji, 2020g). It acknowledges the role of biosecurity in providing food security and includes a range of actions to promote sustainable agricultural production, forestry, fishing practices and natural resource management to ‘secure food provision in changing local climatic conditions’.

Trade

The **Ministry of Industry, Trade and Tourism's (MOITT) Strategic Plan (2018-2023)** (now known as the Ministry of Commerce, Trade, Tourism and Transport (MOCTTT)) presents strategic priorities for the three sectors aligned to the vision of 'a brighter economic future for all' (Government of Fiji, 2018d). The Plan makes no reference to nutrition or food security. Despite this, activities contained influence the type and price of food available in Fiji, and in doing so affect nutrition and food security. Strategic priorities include 'to promote the production and consumption of Fijian made goods and services'. This has the potential to foster the production and consumption of healthy nutrient-rich agricultural products, as well as of unhealthy highly processed foods made by local manufacturers. There is an emphasis in the Plan on exports, with a strategic priority 'to improve market access for Fijian Made goods and services in international markets', though outcomes include strengthened domestic market linkages also. Nutrition and food security rely on nutrient-rich foods produced being available in local markets and not prioritised for export. Another strategic priority, 'to improve investment and business climate, and ease of doing business', may increase investment in and assist to scale-up local agricultural production, though is more likely to be directed towards the local manufacturing of highly processed foods. This priority can also create barriers to policies seeking to control the manufacturing, importation and retail of unhealthy foods.

The **Fijian Trade Policy Framework (2015-2025)** is 'the guiding document towards any future agreements between Fiji and her trading partners' (Government of Fiji, 2015a). According to the Framework, Fiji is committed to trade liberalisation in recognition it is limited in what it can produce and has an outward-looking export strategy with the vision for exports to be the key driver of Fiji's economic growth. Reflected in the sector's Strategic Plan, policy objectives include attracting foreign investment. They also include achieving greater market access for Fijian exports, which may increase the likelihood of agreements that reduce barriers to trade and allow for the increased availability and affordability of healthy and unhealthy foods. The Framework contains no policy recommendations to ensure trade agreements support nutrition and food security. It simply recommends that were trade measures to be introduced that address public health concerns, they should be consistent with international obligations. A mid-term review of the Framework is currently underway by the reshuffled MOCTTT to ensure it reflects the current trade environment.

Women and youth

The **Fiji National Gender Policy (2014)**, overseen by the Ministry of Women, Children and Poverty Alleviation (MOWCPA), provides a framework to achieve 'the realisation of all policies designed to

promote gender equality in Fiji' (Government of Fiji, 2014). Though not a goal of the policy, removing gender inequality supports women and girls to be food and nutrition secure. The policy contains a specific recommendation for gender-sensitive policies, plans and strategies that promote gender equality in agriculture and rural development sectors. This supports women and girls to participate in food production and determining food availability. It also contains recommendations that support women to breastfeed. A National Women's Plan of Action (2010-2019) has lapsed (Government of Fiji, 2010b). Efforts are currently focused on developing a National Action Plan to Prevent Violence Against all Women and Girls, with consultation underway. There are indications that a Strategic Framework for the sector is planned for though this could not be confirmed. The MOWCPA is the only ministry with a gender-specific policy. The MOAG, with support from the FAO, is currently reviewing evidence from the 2020 Agriculture Census on the role of gender in agriculture. This evidence will be used by to inform a new policy in 2021 that will seek to address the underlying causes of gender inequality in the agriculture sector.

The **Ministry of Youth and Sports (MOYS) Strategic Development Plan (2019-2023)** contains no priorities or targets specific to nutrition.(Government of Fiji, 2018e) It does contain some measures to promote health and wellbeing though these are namely through sports-related initiatives, and includes agriculture among an extensive list of training activities to encourage youth participation. A **National Youth Policy** is currently in development by the Ministry.

Infrastructure

In the Ministry of Infrastructure, Transport, Disaster Management and Meteorological Service (MOITDMS) Strategic Development Plan (2019-2022) (recently reshuffled to form the MOIMS and MOCTTT), the Ministry reflects on its important role in the food system: 'Farm to market is the engine for rural development (Government of Fiji, 2019d). Even though enhancement of agricultural productivity may lie with the Ministry for Agriculture, and market development may belong to the Ministry for Rural and Maritime Development, the responsibility for providing the infrastructure – be it roads or shipping – belongs to this Ministry.'. While improving coordination of efforts with other ministries is cited as a focus of the SDP, it does not contain strategies to align with the aforementioned ministries in supporting market access. The Plan does acknowledge the role several ministry divisions have in supporting food and nutrition security as an NDP priority. This includes the Departments of Transport and Government Shipping Services in providing transport services (both now part of the MOCTTT); the Department of Water and Sewerage in providing water and sanitation services; and the National Disaster Management Office and Fiji Metrological Services in providing weather monitoring systems.

A 10-Year Resilient Strategic Plan is being developed by the recently reshuffled Ministry of Rural and Maritime Development and Disaster Management with support from the United Nations Development Program (UNDP) (United Nations Development Program (UNDP), 2020). It will act as a guiding document for all ministerial activities and ‘ensure that rural and maritime communities in Fiji are productive, progressive, safe and resilient’. It is not known if nutrition or food security are considerations.

Economy and the impact of COVID-19

Fiji’s National Budget for the 2020-2021 fiscal year acknowledges the ‘devastating impact’ of the COVID-19 pandemic on its economy which is ‘projected to contract by 21.7 percent’ largely due to the downturn in tourism (Government of Fiji, 2020b). The Budget focuses on supporting afflicted businesses, namely those in the tourism industry, and on improving the ease of doing business so to revive economic activity. Consequently there is likely to be resistance to new policy measures that impose restrictions on business activities, such as on the sale of unhealthy foods. The Budget provides for streamlined administrative processes to attract private sector investment and foreign direct investment. As discussed, this may carry a risk of increased domestic capacity for unhealthy food production. It also contains tariff reductions to both healthy and unhealthy imported foods. Agricultural production is anticipated to be increased through ‘higher than expected subsistence activities and increased support from Government for commercial farming’.

Part Two. Policy measures

Food production

Food production systems are ‘essential to ensure that safe, sufficient, diversified and nutritious food is available and affordable for the entire population’ (FAO, 2018).

Nutritional diversity of agricultural production

Per their SDP, the MOAG is committed to scaling up commercial agricultural production in Fiji for both crops and livestock (Government of Fiji, 2019a). This has been given greater emphasis by the Ministry’s ‘Agriculture Response Package for COVID-19’, which focuses the Ministry’s efforts on a suite of initiatives to ‘expand medium and large scale agricultural production’ (Government of Fiji, 2020i; Government of Fiji, 2020a). Three initiatives focus on livestock and increasing the production of beef, goats, sheep and dairy to achieve self-sufficiency and import substitution. They include distributing fencing materials to encourage farmers to expand livestock holdings from small subsistence-level to medium commercial-level; establishing new breeds of cattle, goats and sheep to replace low-yielding bloodlines; and ‘revamping’ Fiji’s dairy industry. Two initiatives relate to crops, the first being to supply seedlings to farmers committed to establishing a fruit orchard (six fruits are available). The other is to incentivise farmers to establish large commercial-level ventures for selected high-demand commodities (such as rice, root crops and pulses) by providing planting materials, technical support, securing land where necessary, and undertaking certain infrastructure work. While targets have been defined there is limited information publicly available on the reach of these initiatives to date.

These initiatives to ‘expand agricultural production’ include a diverse range of healthy nutrient-rich foods and harmonise with the Ministry’s priority to improve food and nutrition security. There is however a particular emphasis on expanding rice production. The Fijian government is actively encouraging rice production for household consumption and is committed to achieving self-sufficiency to reduce their dependency on imports. Rice, while contributing to food security, is a non-traditional food and lacks the nutritional value of local, traditional root crops especially when milled. Initiatives relating to rice production are also included in the Agriculture Response Package for COVID-19 under the banner of improving ‘food and nutrition security’. They involve the distribution of rice seeds and milling machinery to farmers and rural villages, who should allocate land to producing rice for household consumption. While this could detract from the production and ultimately consumption of more nutrient-rich foods, there are several other initiatives under this banner that support the diversification of foods produced by farmers for household consumption. The Farm Support Package

initiative for example supplies farmers with materials to plant foods such as tomatoes and sweet potato that provide short-term food security, while the Household Long-Term Food Security initiative supplies materials to plant foods such as coconut and breadfruit for long-term food security. In addition, the Village Nutrition Security initiative provides villages with fruit tree seedlings ‘to complement their nutritional requirement’ as well as technical support to establish and maintain fruiting. Lastly, interested households are eligible to receive small chicks, which they are to establish for long-term food and nutrition security. Again, while targets have been defined and distribution is known to have occurred, more information is needed on the reach of these initiatives to date.

Sustainable intensification of agricultural production

In addition to increasing commercial agricultural production and improving food and nutrition security, the MOAG is committed to ‘improving the adoption of sustainable resource management and climate-smart agriculture’ (Government of Fiji, 2019a). The Ministry has a strong value for organic farming and is taking steps to both reduce the use of synthetic chemicals in agriculture and increase the use of organic practices. A national organic policy is in development by the MOAG and MOCTTT, with support from the SPC. Policies and legislation are also under review and in development by the MOAG to tighten the use of fertilisers and pesticides. Two harmful pesticides, paraquat and imidacloprid, were banned in 2019. Commercial farmers have expressed concerns about the further tightening of synthetic chemical use without suitable alternatives. Currently, limits on the use of chemicals for food production are defined in the Food Safety Regulations 2019 under the Food Safety Act 2003. Due to staffing and resource limitations however, monitoring food products, soil and water for chemical use is unable to be undertaken widely, routinely and reliably. The monitoring and enforcement of biosecurity standards for exports is better resourced but also limited by laboratory testing capabilities.

To deliver on their commitment to sustainable agriculture, the MOAG will need to appropriately manage their simultaneous pursuit of farm mechanisation per their SDP. There are also concerns agricultural practices, such as chemical use and mechanisation, are damaging waterways which impacts fisheries and therefore nutrition and food security among some communities. The Ministry for Waterways and Environment and the Ministry for Agriculture share the same leadership which, while encouraging synergies between department policies, may create potential conflicts of interest in policy making. The Environmental Management Act 2005 is the primary legislation ensuring the sustainability of natural resources. It was most recently updated in 2020 banning the use of plastic bags (Government of Fiji). The Act prescribes a framework for managing environmentally harmful activities, whereby an environmental impact assessment is to be undertaken before any development activity can commence.

Adherence to the framework is however a challenge. A National Environmental Council was established by the Act to coordinate associated policies and activities, its status however was not able to be determined.

To ensure the conservation of land and water resources, the Land Conservation and Improvement Act 1953 established a Land Conservation Board. Its responsibilities include 'general supervision' over land and water resources, stimulating public interest in the conservation of land and water resources, and providing advice to governments on legislative changes necessary to conserve land and water resources. The Board's status was not able to be determined however and appears inactive. Land tenure policies in Fiji, examined in this report under 2.5.2, foster short-term land tenure arrangements, which may not only discourage farmers from sustainable agricultural practices, but actively encourage resource depletion.

There is no specific legislation in place in Fiji relating to coastal fisheries or aquaculture, only offshore fisheries per the Offshore Fisheries Management Decree 2012. Such legislation has been pursued for several years though proven challenging. As such legislation is developed there are opportunities to ensure nutrition and food security are duly considered. Fishing is otherwise regulated by the Fisheries Act (Cap 158).

There is a room to improve coordination between government departments responsible for the agriculture sector (Agriculture, Fisheries and Forestry). For example, the MOFOR is also providing fruit tree seedlings to rural villages, through this is not undertaken in consultation with the MOAG (nor included in their SDP). Improved cooperation between departments is required to encourage sustainable rural land use and integrated farming practices. Practices such as agroforestry and integrated rice-aquaculture farming support the both diversification of diets and sustainability of agricultural production.

The Foundation for Rural Integrated Enterprises and Development (FRIEND) is an advocate for diversified and sustainable agriculture in Fiji. They promote a '9x9' backyard gardening technique to rural communities, that uses nine different varieties of nine different crops including fruits, vegetables and herbs (Foundation for Rural Integrated Enterprises and Development (FRIEND), 2020a). They promote nutrition, sustainable agricultural practices, and use of indigenous crops in their programs. They lack resources however to deliver programs at scale.

Biodiversity and biofortification

As discussed, the Department of Environment has recently released a Biodiversity Strategy and Action Plan (2020-2025), aligned to the Aichi Biodiversity Targets to which the Fijian government has committed (Government of Fiji, 2020g). It includes an ambitious action to ‘establish diverse agricultural systems, using indigenous knowledge of specific crop and livestock varieties, maintaining genetic diversity of crops and livestock and conserving diverse agricultural landscapes to secure food provision in changing local climatic conditions’. The Plan lays out an implementation mechanism, overseen by the National Environment Council.

The MOAG is undertaking research to strengthen and revitalise traditional food crops, and their COP has a target for 12 indigenous crops to be available for distribution to farmers this financial year (Government of Fiji, 2020d). Such a measure assists to protect biodiversity amidst efforts to scale-up and intensify agricultural production.

The MOAG and SPC have invested in the research, development and release of seeds and tissue culture materials to produce climate-resilient staple crops and, through the Seeds for Life Project, are establishing a system to produce quality vegetable seeds suited to the Fijian climate and soils that previously relied on importation (Pacific Community (SPC), 2020; Government of Fiji, 2019a). These two initiatives support food security and nutrition ensuring the availability of planting materials to produce fruits and vegetables in a crisis. While planting materials include nutrient-rich varieties, these initiatives have not endeavoured to specifically improve the nutrient content of planting materials and foods. Among a list of planned research and development programs in the MOAG’s SDP there are none that involve biofortification, and no biofortification activities were identified across agencies interviewed (Government of Fiji, 2019a). To improve the nutritional value of foods produced and available in Fiji there are opportunities to integrate biofortification measures into research and development activities currently focused on climate resilience and yield. Opportunities include but are not limited to the iron-biofortification of sweet potato or rice, and the amino acid and protein biofortification of cassava. SPC is considering more nutrition-sensitive agriculture initiatives, which may include biofortification, in their forward planning.

Urban and periurban agriculture

Increased production of nutrient-rich foods in urban communities is an outcome of the MOAG’s SDP under the priority to improve food and nutrition security (Government of Fiji, 2019a). This is to be achieved through the distribution of backyard gardening packages to households in urban and peri-

urban areas. As part of the Ministry's Agriculture Response Package for COVID-19, this activity was scaled up with all households in urban and peri-urban areas in all four divisions able to access packs of vegetable seeds and encouraged to establish home gardens (Government of Fiji, 2020a; Government of Fiji, 2020i). Packs have also been provided to some schools, churches and businesses where staff are impacted by COVID-19. In some but not all cases packs have been complimented by the provision of planting materials and a 'Grow Your Own Food' guide (Government of Fiji, 2017b). A number of two-day Grow Your Own Food training events have also been delivered by the NFNC in urban and peri-urban communities. The Grow Your Own Food guide and training include nutrition education and provide advice on vertical and container gardening for those with limited land availability. Demonstration gardens have been established at the NFNC in Suva, and by dietitians at hospitals and health centres in some urban and peri-urban areas where the community can observe urban gardening practices.

There is some but limited space for communal gardening in urban areas. Town Planning Schemes for Suva, Lautoka and Nadi are currently being reviewed by the Ministry of Local Government which will inform land use planning in these areas. This may include provisions for urban gardens, though it is not known if this is a consideration.

Technical support for agricultural production

MOAG extension officers are responsible for providing proven technical support to farmers for agricultural production. This includes subsistence, semi-commercial and commercial farmers. Extension officers assist in the implementation of policies and initiatives, such as the distribution of planting materials, and facilitate farmer training. Due to a lack of staff and resources, extension officers are often unable to meet farmers' demands for technical advice however which can impact productivity and their adoption of sustainable agricultural practices. Recognising this the MOAG is planning to 'revamp the way it delivers services to farmers' and a more decentralised 'flattened' approach to service delivery is planned (Government of Fiji, 2019a).

Another avenue for farmers seeking technical support is the Fiji Crop and Livestock Council (FCLC). The FCLC is the peak industry body for crop and livestock producers in Fiji and reports to the MOAG. Farmers, both subsistence and commercial, can register as members of the Council at no cost. They are then connected to commodity-specific farmer associations aligned to their interests established under the umbrella of the FCLC. This provides farmers with a platform to input into policy development, as well as to network and share information with farmers producing the same commodities. Training may be arranged for members by farmers associations or the FCLC and delivered by members or technical

specialists. A priority of the FCLC is supporting farmers to navigate the range of services and inputs available to them which they report is a barrier to access. The FCLC has a small number of staff limiting its reach and the services it can provide.

The Pacific Island Farmers Organisation Network (PIFON) is an umbrella organisation for national farmer organisations in the Pacific region, including the FCLC. Based in Fiji, PIFON aims to facilitate the sharing of information and expertise between farmers organisations in the region, to support income generation and sustainable production. In addition to facilitating farmer-to-farmer exchange, PIFON also provides training, conducts research and engages in policy advocacy.

Agriculture Shows are an additional avenue through which farmers can access technical advice and information about services. Representatives from government departments and the private sector convene annually in each division to share information and resources with farming communities. A range of additional training and support is available to farmers from government departments, non-government agencies, technical organisations and the private sector. Such training and support is often unable to be delivered at scale and lacks coordination between agencies.

Post-harvest handling, storage and processing

Food production systems are 'essential to ensure that safe, sufficient, diversified and nutritious food is available and affordable for the entire population' (FAO, 2018).

Post-harvest handling and transport

Measures to improve the post-harvest handling, storage and treatment of food to avoid food and nutrient loss are widely reported to need strengthening. Responsibilities for supporting food quality post-harvest rests with multiple government departments and lacks coordination. Fiji's geography and climate also provide innate challenges to reducing food and nutrient loss post-harvest.

The Food Safety Regulations 2009 prescribe standards to ensure the appropriate handling, storage, packaging and transportation of food to reduce spoilage and product deterioration. Environmental health officers from the MOHMS and municipal councils are responsible for enforcing the Regulations, however lack staff and resources to monitor compliance, particularly in rural areas.

Transportation services are costly and infrequent, requiring farmers to rely on middlemen to transport their produce. Responsibility for the 'equitable and affordable fare schedules of Public Services

Vehicles' lies with the Land Transport Authority per the Land Transport Act 1998. Health and agricultural authorities have concerns transportation does not adequately comply with the Food Safety Regulations, exposing produce to the elements and promoting food and nutrient loss.

For farmers that commit to pursuing selected commercial agriculture ventures, the MOAG has allocated budget to provide farm access roads. Responsibility for Fiji's road network is however vested in the Fiji Roads Authority, established under the Ministry for Infrastructure by the Fiji Roads Authority Act 2012. Their functions include the planning, construction and maintenance of all roads, bridges, jetties. The Fiji Transport Infrastructure Investment Project, co-funded by the World Bank and Asian Development Bank, is supporting the Fijian government to upgrade land and maritime transport infrastructure to improve access to markets, as well as to employment opportunities and social services (World Bank, 2016). The Project, being implemented by the Fiji Roads Authority, experienced a series of delays due to staff capacity limitations in its initial phases, and has recently been extended (World Bank, 2020). The Department of Transport is responsible 'to better manage transport planning, monitor policy and development in the transport sector' (Government of Fiji, 2020j). Recognising the importance of transportation for market linkages, the Department of Transport, together with the Department of Government Shipping Services, was relocated in 2020 from the MOITDMS to the MOCTTT.

To maximise revenue for farmers engaged in fisheries and aquaculture, the MOFISH has constructed ice plants among coastal and maritime communities. These provide ice which local farmers can purchase at a subsidised price, and reduce the cost of travelling to purchase ice elsewhere. The initiative also reduces fish spoilage, reduces food loss, and improves fish availability. The initiative is costly however, and not able to be delivered in some areas. In certain cases solar-powered freezers have been provided as an 'interim solution'.

Processing and fortification

The Food Safety Regulations 2009 also prescribe standards for food processing, some of which specifically promote nutrition. The Regulations mandate the universal fortification of certain staples with essential micronutrients. This includes the fortification of salt with iodine, and of wheat flour with iron, zinc, folic acid and other B-group vitamins. There are no requirements for the fortification of other staples such as rice, or for other micronutrients such as vitamin A or vitamin D.

The Food Safety Regulations also apply a limit to the fat content of canned corn beef, canned luncheon meat, and sausage. With the exception of infant formula and milk products, there are no other limits in

Fiji on the amount of trans fat, saturated fat, salt or sugar a product can contain. Product reformulation to reduce salt, trans fat and saturated fat is recommended by the WHO internationally as a key area of intervention to reduce unhealthy diets for the prevention and control of NCDs (WHO, 2017). Regulatory measures were pursued by the MOHMS previously that would have required food manufacturers to meet World Health Organization (WHO) targets for the reformulation of trans fat, saturated fat, salt and sugar. The measures were opposed by the Ministry for Industry however, considered unfeasible due to the financial burden to food manufacturers. Efforts are ongoing by the MOHMS and WHO to engage local food manufacturers in voluntary reformulation targets. There are no activities underway relating to reformulation in restaurants or fast food outlets.

As previously acknowledged, environmental health officers from the MOHMS and municipal councils lack staff and resources to monitor compliance with the Regulations. They specifically report challenges monitoring compliance with nutrition-related Regulations, due to a lack of technical skills in this area. Domestic product testing capabilities are also limited, which impacts not only the monitoring of compliance by authorities, but the ability for local food processors and manufacturers to confirm compliance in product development.

Food preservation is undertaken at community level for value-adding, to reduce waste and for disaster preparedness. A lack of technical skill was reported as a barrier to providing training on nutrition-sensitive food processing and preservation techniques. Methods taught typically involve the addition of sugar and salt, though there are some efforts to promote sun or solar drying. There is an opportunity for food preservation and value-adding community-level food processing activities to be more nutrition-sensitive.

Food trade and marketing

Food trade, which can have both positive and negative impact, 'serves to bring food to consumers from the locations where it is produced and processed' and 'operates at multiple levels' (FAO, 2018). Food trade encompasses food marketing, being the elements around 'the physical sale of food and its promotion' which influences the food that people buy (FAO, 2018).

Domestic markets for agricultural products

The MOCTTT is committed to improving market access for locally produced foods in domestic, regional and international markets. Per the Fiji Trade Policy Framework, an Agriculture Sub-Committee has been established, tasked with enhancing greater market linkages for agricultural products in domestic and

international markets (Government of Fiji, 2015a). The MOHMS is not currently represented. Both the MOCTTT and the private sector in Fiji are more invested in international export markets than domestic markets, given their economic value. Measures to establish domestic market linkages for agricultural products have previously concentrated on the tourism sector given its large market share and high imports bill, though due to COVID-19 are no longer prioritised.

A principal measure to create market linkages for agricultural products in Fiji is the formation of the Agricultural Marketing Authority (AMA), established under the MOAG by the Agricultural Marketing Authority Act 2004. Per the Act, the AMA is responsible to 'assist the producers of agro-produce on marketing of their produce or products; identify markets for and to facilitate and develop marketing of agro-produce; and purchase and sell and export and import agro-produce or import agro-input'. The AMA purchase produce from farmers directly and provides them with a contract enabling them to access credit and financial services. The AMA source markets for the produce, avoiding farmers from doing this individually. The AMA purchases a large amount of fresh nutrient-rich produce from small-scale farmers to supply local markets across Fiji. They are also establishing their own food processing activities using the purchased produce. While food processing may reduce food loss, it may also reduce the supply of fresh foods that would otherwise be available for consumption.

In addition to the AMA, Fiji has a number of large food processors, manufacturers and supermarkets who have long-standing relationships with local producers, from whom they purchase fresh produce. Producers can also supply fresh produce to markets operated by municipal councils.

Markets for Change is a women's economic empowerment initiative currently being implemented by UN Women in 13 out of 15 municipal markets in Fiji. The program involves making physical infrastructure improvements to market structures to provide greater shelter and protection for market vendors and their products, and to improve access to clean water, sanitation and hygiene. Following six years of advocacy, the program also involves a review of municipal council market bylaws. No standards relating to nutrition are proposed in this review, such as how cooked food is prepared. The program offers extensive training and capacity development to market vendors in business management, financial literacy, leadership, nutrition and sustainable food production. Vendors are supported to establish or join market vendor associations, a forum to advocate for issues such as fee setting and market maintenance.

A target within their Strategic Plan, the MOCTTT is providing infrastructure to establish 'standardised roadside market stalls' outside of urban areas in Fiji's two major islands (Government of Fiji, 2018d). Originally proposed to create economic opportunities and improve the safety of informal roadside market activities, the initiative was prioritised by COVID-19 as travel restrictions limited access to urban markets. Primarily selling fresh fruits, vegetables, animal products and cooked local foods, the market stalls increase access to healthy nutrient-rich foods in participating villages and create shorter supply chains reducing food loss. To expand and sustain the initiative, in July 2020 the MOCTTT launched a public-private partnership program. By contributing funding, private sector partners will be provided with a panel on market stalls for advertising. There are no restrictions proposed to the advertising of unhealthy foods. No expressions of interest from the private sector have yet been received.

In terms of food waste, unsold fresh produce in some supermarkets is provided to staff or collected for use in animal feed. Market bylaws currently require that any unsold fresh produce is removed, though this is one of several regulations proposed to change in the current bylaw review.

Food trade and pricing

Fiji is a member of the World Trade Organization (WTO) and as such obliged to facilitate free trade and avoid measures that discriminate against imported goods. Fiji is also a member of several regional trade agreements, including the Melanesian Spearhead Group (MSG) Trade Agreement and Pacific Islands Countries Trade Agreement (PICTA), both requiring signatories to remove tariffs and other trade barriers on imports. These agreements have the potential to promote a nutritious and diversified diet by, for example, increasing the availability and affordability of imported fruits and vegetables unable to be produced domestically. At the same time however they can undesirably increase the availability and affordability of unhealthy highly processed foods unable to be produced domestically or produced internationally at a lower cost.

The Fijian government – with encouragement from the MOHMS, the WHO and Fiji National University (FNU) – has taken some steps to control the importation of unhealthy foods. In 2000, Fiji introduced a ban on the supply of mutton flaps, being high in saturated fat and low in nutritional value. In 2012, the fiscal import duty on palm oil was raised from 15 percent to 32 percent, the highest level allowed for by the WTO (Coriakula *et al.*, 2018). In 2018 the fiscal import duty on 'sweetened and carbonated drinks' was also raised to 32 percent (or FJD 2 per litre, whichever is greater), on top of an existing import excise duty of 15 percent (Government of Fiji, 2018a). Biscuits, instant noodles and some animal

products also attract a fiscal import duty of 32 percent, though this is not believed to be for health purposes but rather to support domestic industries.

The Fijian government has also taken steps to support the importation of healthy foods. In 2018, the fiscal import duty was removed on a range of fruits and vegetables such as apples and carrots 'to ensure affordability of healthy foods, promote combatting of NCDs and encourage importation to complement local food supply' (Government of Fiji, 2018a).

In 2020, 'bold taxation and customs tariff reductions' were introduced to lessen the economic impact of COVID-19, namely on the tourism industry (Government of Fiji, 2020b). These measures have mixed implications for nutrition. Import excise duties were removed on biscuits, confectionary, potato chips and a range of sweetening agents. Fiscal duty remaining on some imported vegetables was reduced (to support local producers a fiscal import duty remains on some fruits and vegetables produced domestically). Fiscal duties were reduced on a range of imported machinery, including for agricultural purposes.

Mechanisms are in place to promote joint analysis between the trade, health and agriculture sectors on trade agreements. Specifically a cross-government Trade Development Committee is convened by the MOCTTT as the need arises, where representatives from the MOAG and MOHMS can provide input on trade agreements and related matters. The MOCTTT also consults separately with the private sector, who are known to be well organised and have a high degree of influence over decision making. The Ministry ultimately weighs health concerns together with economic concerns and their WTO obligations when finalising trade decisions.

In terms of fiscal changes, the budget sub-committee seeks submissions each year from government departments, as well as undertakes consultation with the private sector and community groups. The MOHMS has had success in some but not all cases where they have submitted recommendations for tax adjustments accompanied by evidence (Coriakula *et al.*, 2018). Opportunities remain to increase tariffs on foods high in trans fat, saturated fat, salt and sugar, and to expand tariffs on sweetened carbonated drinks to other sugar-sweetened drink categories. Effective taxation on sugar-sweetened drinks, and measures to eliminate industrial trans fats from the food chain, are among the most effective intervention areas to reduce unhealthy diets for the prevention and control of NCDs (WHO, 2017).

Price ceilings are set by the Fijian Competition and Consumer Commission (FCCC) to maintain the affordability of food items considered to be basic necessities. Items include rice, canned tuna, baby milk and sugar, for example. No fresh food products are included. A value-added-tax (VAT) of 9 percent applies to goods and services including all food products. The Fijian government resisted requests to reduce the VAT on food items such as rice and flour, considered to be basic necessities, in the 2020-2021 National Budget.

Food marketing and advertising

Outside of schools, there are currently no policy measures to control the physical sale in Fiji of foods high in trans fat, saturated fat, salt or sugar. Municipal council zoning policies have been found to neither limit the density of fast food outlets or require the availability of retail spaces selling fruits and vegetables. The MOHMS has approached the Suva City Council to review zoning policies. This activity is not expected to progress however as the economic impact of COVID-19 has seen the government relax, rather than tighten, zoning restrictions on businesses. No policy measures to limit portion sizes were identified, a key international policy recommendation to reduce energy intake and obesity (WHO, 2017). There are no nutrition standards for public food procurement, such as in hospitals. Some hospitals and health services have established gardens, though the amount of food they produce is not sufficient to supply patient meals, and gardens are instead used by dietitians for nutrition education programs. Policy measures to establish a supportive environment in public institutions (such as hospitals, schools and workplaces) that enable the provision of healthy food options are recommended globally for the prevention and control of NCDs (WHO, 2017).

Several efforts have been made to address the promotion of unhealthy foods. The Marketing Controls (Foods for Infants and Young Children) Regulations 2010 prohibits the advertising and promotion of nutritional substances for infants and young children, such as infant formula. Such policy measures that promote and support exclusive breastfeeding are recommended globally for the prevention and control of NCDs (WHO, 2017). Officers responsible for monitoring and enforcing these Regulations however report them to be of low priority compared with other responsibilities, and to lack technical knowledge necessary to assess compliance. The Food Safety Regulations 2009 require that wherever certain high-fat canned meat products and poultry tails are displayed for sale, they should be accompanied by a shelf notice advising the product 'is high in fat. For a healthy diet eat less.' Those responsible for ensuring compliance with this requirement however were not confident it was actively monitored. New regulations to control the marketing of foods and non-alcohol drinks to children have been drafted by the MOHMS with assistance from the WHO, though have been awaiting formal approval for several

years. Their delay is considered owing to government concerns about its impacts on the private sector, confirmed to now be heightened by COVID-19. The draft regulations seek to reduce the impact on children of marketing of products high in trans fat, saturated fat, salt and sugar, per international WHO recommendations to address unhealthy diets for the prevention of NCDs (WHO, 2017; WHO, 2010). They include measures restricting how such foods can be sold, advertised and promoted, including through sponsorship of children's activities (school sporting events in Fiji are currently sponsored by sugar-sweetened drink and instant noodle manufacturers). The policy's advancement may benefit from a narrower, potentially step-wise approach to controlling marketing, that is more palatable for the private sector and MOCTTT yet still impactful. Given challenges reported to monitoring and enforcing existing marketing regulations, it will be necessary to ensure adequate resources are allocated to foster compliance.

The Fijian Made campaign is a long-running initiative of the MOCTTT, embedded within their Strategic Plan. The campaign aims to support local industries by marketing products and services produced in Fiji to both domestic and international consumers. Eligible products receive an emblem to display identifying them as locally grown or made, and products and campaign messages are then promoted on social media and billboards. The campaign heavily promotes the consumption of locally grown fruits, vegetables and animal products for health as well as economic and environmental benefits. It does however also promote the consumption of unhealthy locally manufactured products such as biscuits and sugar-sweetened drinks.

Food labelling

The Food Safety Regulations 2009 and Amendments define food labelling requirements for Fiji based on the Codex Alimentarius. All pre-packaged food (except single ingredient foods) are to be labelled with a list of ingredients in descending order of weight. Nutrient content labelling is required on all pre-packaged food, declaring the amount of energy, protein, fat, trans fat, sugar, sodium and carbohydrate present, and other nutrients for which a nutrition claim is made. Conditions for making nutrition claims, health claims, and nutrient content claims are included, such as for labelling a product low in fat. Country of origin is to be declared for imported foods, and all mandatory information is to be in English.

There are several challenges to monitoring compliance with nutrition labelling requirements. The first is the capacity of local laboratories who are unable to analyse food composition at a detailed level. Those responsible for surveillance and monitoring also require further technical knowledge to assess compliance with nutrition labelling requirements. Due to staffing and resource limitations, monitoring

is primarily undertaken in response to a consumer complaint. Consumers are not usually able to identify false and misleading nutrition labelling however reducing the likelihood of identifying non-compliant products. For small-to-medium sized food processors and manufacturers, the cost to test samples to fulfil nutrition labelling requirements can be a barrier to compliance. Systems to ensure compliance with labelling requirements need to be strengthened before policy measures relying on nutrition labelling information can be introduced, such as reformulation targets and restrictions on the sale of sugar-sweetened drinks.

In 2016, due to 'trade interference', all prohibitions in the Marketing Controls (Foods for Infants and Young Children) Regulations 2010 that related to labelling of nutritional substances for infants and young children were revoked by the Food Safety (Amendment) Regulations 2016.

Nutrition labelling – and front-of-pack nutrition labelling in particular – are among key global recommendations for reducing unhealthy diets and addressing NCDs (WHO, 2017). Fiji does not have a front-of-pack nutrition labelling system, a policy measure to provide clear information on the nutritional content of packaged food. Were a system to be considered, interest has been expressed by large food manufacturers in adopting the Food Standards Australia New Zealand Health Star Rating system, given their requirement to comply with the system for export and their trust in the rigor of its development process compared with domestic capabilities.

Consumer demand, food preparation and preferences

There is an explicit link between consumers and the food system. The food system and food environment stimulate consumer demands and shift food preferences (FAO, 2018).

Nutrition education and behaviour change communication

The Food and Health Guidelines for Fiji 2018 comprise a set of nationally endorsed dietary guidelines, adapted from Pacific guidelines prepared by SPC (Government of Fiji, 2018c). They provide simple advice on dietary patterns that support good health, including to consume a variety of foods from the three food groups in each meal, and to choose and prepare foods and drinks with less salt, sugar, fat and oil. They specifically encourage the consumption of local fruits and vegetables and provide advice on home gardening. They also include guidance on infant and young child feeding. The Guidelines receive criticism however for presenting some highly processed foods, such as instant noodles and crackers, as part of a healthy diet.

The Guidelines are currently made use of by dietitians, nurses and community health workers, who provide nutrition counselling to patients and communities. A program of work is planned by the NFNC in 2021 to raise awareness of the Guidelines and encourage their use among other sectors including agriculture, education, women and youth. This activity will also involve gathering input on translating the Guidelines into iTaukei and Hindi (they are currently only available in English), and whether further adaptation is necessary following recent revision of the Pacific guidelines (changes are anticipated to lifestyle advice only) (Pacific Community (SPC), 2018).

The NFNC is responsible for developing and disseminating food and nutrition information. As funding allows, they develop materials such as posters and fact sheets that support the community to understand and apply the Food and Health Guidelines. These are available from the NFNC and dietitians stationed in divisional and sub-divisional hospitals. The NFNC also conducts awareness campaigns in print and broadcast media to coincide with national events such as World Food Day. Owing to the economic impact of COVID-19, the NFNC's budget for the current financial year has been reduced by 90 percent, so awareness activities now rely on donor support. As such, the NFNC is making increasing use of its Facebook platform to communicate about its activities and provide nutrition education. Behaviour change communication and mass media campaigns on healthy diets are among key interventions recommended internationally to prevent and control NCDs, as are nutrition education and counselling (WHO, 2017).

The NFNC partners with the MOAG to provide a two-day Grow Your Own Food training to urban and rural community groups. The training includes guidance not only on how to grow nutrient-rich foods, but on the prevention of NCDs and other dietary practices per the Food and Health Guidelines. The training is provided by the NFNC upon the request of a community group or the MOAG. It is usually attended by women's groups, youth groups and/or small scale farmers, however rarely by commercial farmers. The NFNC is limited in its capacity to keep up with the demand for such training, with only three staff. The NFNC has developed the capacity of dietitians and community health workers to deliver the training, and they can support the NFNC by providing abbreviated training in their divisions. MOAG extension workers attend the Grow Your Own Food training when it's conducted in their division and will occasionally deliver the training themselves, though are known to omit nutrition modules. On occasion the NFNC also provides nutrition education to farmers at the invitation of the FCLC, and at Agriculture Field Days. This includes encouraging farmers to reserve commercial agriculture land for growing nutrient-rich food for their household's consumption.

The NFNC has an interest in providing nutrition education to those engaged in aquaculture. The MOFISH aims to develop aquaculture in areas where diets lack diversity and communities risk protein deficiency. Aquaculture programs however focus on income generation over fish consumption. The NFNC currently lack the resources for this however and the MOFISH has not requested it.

The My KanaFiji app is available to encourage and support Fijians to adopt healthy eating habits and practice sustainable home gardening. The app incorporates the Grow Your Own Food training and the Food and Health Guidelines and was developed in partnership between the NFNC and University of the South Pacific (USP).

UN Women's Markets for Change Program includes a nutrition education component to support female market vendors understand the nutritional value of locally grown foods, and to discourage them from spending generated income on less healthy imported products.

As part of the Promoting Nutritious Food Systems in the Pacific Islands project, FRIEND has produced a recipe book and provides cooking education to rural communities to engage them in using nutrient-rich local foods and healthy food preparation techniques (Foundation for Rural Integrated Enterprises and Development (FRIEND), 2020b). They lack resources however to scale up these activities. FRIEND also operate a restaurant dedicated to modelling the traditional use of local foods to prepare nutritious meals and offers cooking demonstrations.

Pacific Island Food Revolution is a communications-for-development program launched in 2019 encouraging Pacific Islanders to 'revolutionise their diets' by moving away from imported highly processed foods and returning to their traditional diets of local nutrient-rich foods (Pacific Island Food Revolution, 2020). The program includes a popular reality television program broadcast in Fiji where local celebrity chefs and contestants prepare healthy meals using local food purchased from municipal markets. Viewers are encouraged to try the recipes themselves, available online. The program receives funding from the Australian and New Zealand Governments. In 2020 Pacific Kids Food Revolution was launched with the support of UNICEF (United Nations Children's Fund (UNICEF), 2020). It centres on a children's cooking show following similar principles to promote local nutrient-rich foods, with recipes 'attracting any child's taste buds'. The programs are complimented by social media activities and school teaching resources.

Social protection

In 2018, the Employment Relations (Budget Amendment) Act increased paid maternity leave from 84 days to 98 days. This supports the initiation of breastfeeding but may not be adequate to allow mothers to breastfeed exclusively for six months. The Act also introduced five days paid paternity leave, which enables fathers to engage in child caring responsibilities, and five days paid family care leave, which a worker can use to care for young children. Both measures were reduced to 2 days in 2020 due to COVID-19 for an undefined period of time. The Employment Relations Promulgation 2007 contains measures protecting workers from discrimination on the grounds of pregnancy and family responsibilities.

In 2020 a Memorandum of Understanding was signed between the MOAG, the AMA and the Fiji National Provident Fund (FNPF), allowing for farmers contracted by the AMA to become voluntary members of the FNPF, enabling them with access to social benefits in times of crises.

The MOWCPA administers programs that provide financial support to families in need, including the Poverty Benefit Scheme and the Care and Protection Allowance. Recipients of both programs also receive a food voucher of FJD 50 per household per month. Vouchers can be used at authorised food retail outlets to purchase food items considered to be basic necessities from a list approved by the FCCC, including rice, sugar and instant noodles. Vouchers, it is understood, are unable to be used to purchase fresh produce in markets. In some cases vouchers can be exchanged for cash at post offices. The Ministry also administers the Food Voucher Programme for Rural Pregnant Mothers. All women that attend rural health facilities regularly throughout their pregnancy receive a food voucher of FJD 50 per month for the nine months of their pregnancy and the first postnatal month (provided they are not already receiving social welfare assistance, or a civil servant). There is an opportunity for food voucher programs be reviewed for their nutritional adequacy.

School food and nutrition

In 2017, a revised Policy on Food and School Canteens was introduced by the MOEHA that required 'canteen operators, management, school heads and teachers to collaboratively engage towards the provision of healthy food and beverages in the school canteen and to promote a healthy food environment in the school'.(Government of Fiji, 2017e) The Policy contains a list of foods that are prohibited for sale in school canteens including sugar-sweetened drinks and processed snack foods. The policy is mandatory for all schools in Fiji, and dictates that compliance is to be monitored by school heads. The policy does not have an agreed reporting or enforcement framework, and as such compliance is considered low. The main barrier reported to implementation is the demand on canteen

operators to make a profit while competing with hawkers selling non-compliant foods. The policy is currently under review and will include measures to strengthen its implementation and monitoring, as well as make clearer its application to early childhood services.

The School Canteen Guidelines Summary, produced by the NFNC, provides operators with guidance to running a healthy school canteen. It is considered by some to operationalise the Policy, though this is not described by the Policy itself. The Guidelines are planned to be updated by a School Canteen Toolkit currently in development by the NFNC.

There are no nutrition standards for boarding school meals, and cooks lack training and resources to prepare diverse and nutritious meals. An officer from the MOEHA supports boarding schools to establish gardens and small farms to facilitate the inclusion of fruits, vegetables and animal source protein in school meals. They also review boarding school menus with technical support from the NFNC. The officer does not have budget for these activities and relies on the MOAG to provide planting materials (the MOAG's SDP includes a target for increased production of nutrient-rich foods by boarding schools for self-consumption (Government of Fiji, 2019a)). In early 2020 a school farm competition was piloted by the MOAG with select boarding schools who received planting materials and a Grow Your Own Food resource. This activity has however been paused since the temporary closure of boarding schools due to COVID-19. A deliverable in the MOAG's SDP to increase milk produced by boarding schools has not commenced (Government of Fiji, 2019a).

Per the Policy on distribution and storage of free milk, since 2015 the MOEHA has partnered with the private sector to provide year one students with a serve of milk and Weetbix daily (Government of Fiji, 2017d). Concerns are expressed about the program's delivery and the appropriateness of distributing imported foods with which students are not familiar. It is reported to have been paused due to the financial implications of COVID-19.

Food and nutrition is included in the MOEHA Healthy Living curriculum for students up to year 10. Thereafter students may elect to study Home Economics which includes a nutrition component, as well as Agricultural Science. Learning and teaching materials are available to accompany the curriculum, particularly in schools participating in the Health Promoting Schools Program, but the degree to which food and nutrition lessons are taught was not determined.

Since 2016 the WHO has funded MOEHA positions to deliver the Health Promoting Schools Program. Around one-third of schools currently participate in the program, which assists schools to create environments supportive of health and wellbeing. Schools that participate in the program receive support to comply with the Policy on Food and School Canteens and nutrition teaching materials. The program relies on donor support and has not yet been embedded in order to be sustained.

Food-system wide

Women's empowerment and gender equality

The MOAG's SDP includes the outcome to increase participation of women in the crop and livestock agriculture sector (Government of Fiji, 2019a). Despite their willingness, there is recognition that government institutions, sectors and settings in Fiji - such as those relating to agriculture - lack knowledge and resources on transformative gender mainstreaming to adequately consider and address the underlying causes of gender inequality and discrimination. Activities instead aim to address the symptoms of gender inequality, such as lack of access to services. In response, and to deliver on Fiji's national and international commitments to gender equality and women's empowerment, in 2020 the MOWCPA launched 'Gender Transformative Institutional Capacity Development', a two-year whole-of-government initiative to strengthen skills, resources and accountability mechanisms across government for gender equality (Government of Fiji, 2020c). The initiative will be undertaken with the MOAG, MOFISH and MOFOR in its first phase. The initiative will align with the development of a new gender in agriculture policy by the MOAG in 2021. The policy will be informed by results from the 2020 Agriculture Census, which for the first time collected information disaggregated by sex.

The Fijian Parliament has taken steps to mainstream gender issues in their legislative functions. The Parliament's Standing Orders require committees to 'ensure that full consideration will be given to the principle of gender equality so as to ensure all matters are considered with regard to the impact and benefit on both men and women equally' (Government of Fiji, 2016b). The Orders are accompanied by a Gender Toolkit to guide Members in gender scrutiny (United Nations Development Programme, 2017).

As part of their Markets for Change program, UN Women is developing the capacity of municipal councils to prepare gender responsive budgets and policies.

Land tenure

The majority of land in Fiji is native iTaukei land, which is held by mataqali or clans of iTaukei Fijians. The 2013 Fijian Constitution together with the iTaukei Land Trust Act 1940 prohibit the sale of iTaukei land, unless to the Fijian government thereby becoming Crown land. iTaukei land can otherwise be leased. Both agricultural and non-agricultural leases of iTaukei land are primarily administered and approved by the iTaukei Land Trust Board, as vested by the iTaukei Land Trust Act. There is no indication that food or nutrition security are considered by the Board. Agricultural leases are typically for a period of 30 years, the minimum provided for by the Agricultural Landlord and Tenant Act (Cap 270). This can discourage farmers who lease iTaukei land from investing in long-term or large-scale agricultural activities. Lease applications require proof of financial status which can be a barrier to securing agricultural land. For iTaukei land owners, decisions about the use of iTaukei land are made by the mataqali, and may or may not be in the interests of food or nutrition security. Remaining land is a combination of Crown land and freehold land. They are managed through separate systems, though both can be leased or sold for agricultural and non-agricultural purposes subject to conditions. Informal settlements occupy Crown land in urban areas.

The Forest Decree 1992 permits iTaukei Fijian land owners to exercise rights established by custom to 'hunt fish or collect wild fruits and vegetables' on native land (outside of reserves).

Food quality, safety and hygiene

The Food Safety Act 2003 and Food Safety Regulations 2009 and Amendments provide a legal framework that establishes minimum food safety requirements to protect public health, aligned to international standards. The Food Safety Regulations detail hygiene practices that food business operators shall ensure at all stages of food production, processing, handling, storage and distribution. They also define commodity standards, limits for chemical use, and minimum packaging and labelling requirements. The requirements apply to 'food imported into, or produced and processed in Fiji for domestic consumption or export'. As described previously, the MOHMS and municipal councils are responsible for monitoring and enforcing the Regulations, though have limited capacity to do so. Food safety issues are typically addressed following consumer complaints, and usually concern packaged foods; there is little monitoring of fresh produce. The Suva City Council has an initiative to grade food retailers based on food safety, but has not included nutrition benchmarks. Those involved in monitoring the Regulations report a need for improved mechanisms to inform businesses and consumers about food safety requirements. This is further motivated by the repeal of the Business Licensing Act, whereby to reduce the financial impact of COVID-19 commercial businesses are no longer required to purchase

a business license. This has lead businesses to incorrectly assume obligations, such as complying with Food Safety Regulations, no longer apply. Training on food safety is provided to market vendors participating in the Markets for Change program, and the NFNC and Consumer Council undertake some food safety awareness activities. Some aspects of food safety, such as chemical use, are also discussed with rural communities at Agriculture Field Days.

Monitoring of the food supply

The last Agriculture Census was conducted by the MOAG in early 2020. The Census was a deliverable in the Ministry's SDP and was previously undertaken in 2009 (Government of Fiji, 2019a). FAO contributed technical assistance to conduct the Census and to strengthen the Fiji Agriculture and Rural Statistics System, which lacked capacity to provide quality and timely agricultural information and evidence. The Census had nation-wide coverage and exceeded targets for the number of rural and peri-urban farming households surveyed. It collected information about farming households and activities and included two questions assessing food security over the previous 12 months. Results are currently being analysed and are intended to inform better planning across the cropping, livestock, fisheries, aquaculture and forestry sectors.

The NFNC is responsible for monitoring the food and nutrition situation in Fiji. The last National Nutrition Survey was conducted by the NFNC in 2014, with technical and budget support from several partners. The Survey collected anthropometric measurements and qualitative data on dietary intake in the previous 24 hours. It involved a robust sampling method however due to budget constraints only surveyed 1 percent of the population. The next Nutrition Survey is planned for 2024, though is not included in the MOHMS's SDP for the period. The draft Food and Nutrition Security Policy includes an action to establish a nutrition surveillance system, an undelivered action carried over from the 2008 Fiji Food and Nutrition Policy. The last Food Balance Sheet was prepared by the NFNC in 2010. This activity ceased due to the unavailability of subsistence-level production and consumption data. Compiled information on Fiji's food supply has not been available to inform policy since this time.

Identifying nutrition was not considered in the development of Fiji's existing food baskets, as part of this research project the University of the Sunshine Coast partnered with the NFNC to develop nutritionally adequate food baskets for various population groups. The baskets have been trialled by this research project and may be adapted by the NFNC as required for use. There is opportunity for them to be used to inform food distribution activities, including to review the nutritional adequacy of the food voucher scheme.

Food Composition Tables for the Pacific were last updated in 2004 (FAO, 2004). Their revision would provide more accurate information about the nutritional value of the food supply to inform policy.

The FCCC actively monitors the prices of food sold in supermarkets and retail stores, while the MOAG's Statistics Unit actively monitors the prices of foods in markets. The Fiji Bureau of Statistics also monitors food prices (together with other goods and services) and release Consumer Price Index data monthly for urban areas.

Based on interviews with academics and a review of the literature, there is no ongoing monitoring of the food environment in Fiji. Additionally, there is a lack of research in the area of dietary intake and behaviours, consumer interactions with the food environment, nutrition education and drivers of food choice, with little consistency between methods and involvement of population sub-groups (i.e. ethnic groups).

Part Three. Capacity for policy effectiveness

Policy development and review

The process of policy development and review in Fiji is **enabled** by the government having clearly defined long-term strategic priorities per the NDP, as well as within sector-specific plans such as the MOAG's SDP (Government of Fiji, 2017a; Government of Fiji, 2019a). As examined previously, these guiding documents support the development of policies that address nutrition and food security, being a whole-of-government priority, though there are some competing priorities and points of incoherence that may deter this. Policy development and review is further enabled by the government's drive for quality improvement and innovation, which encourages bold policy thinking.

Ministry **policy units** consider themselves to be 'strong', with good leadership and low staff turnover. Policy officers feel relatively well equipped to prepare **Ministry-level policies** and policy documents and to navigate internal approvals processes, with procedures in place to inform this. They are particularly confident to ensure new policies align with ministry, sector and whole-of-government priorities.

Policy officers actively collaborate with senior colleagues responsible for operations or implementation, who prepare the policy's technical content. It is acknowledged however **implementation staff** are located in separate divisions of the Ministry and even buildings to policy officers which can obstruct their communication. Implementation staff also have limited time for policy development and review given their competing responsibilities.

Policy units however are under resourced; **budget** constraints mean units are smaller than desired. As such, policy officers work reactively and prioritise high-level requests for **new policy development**; little time and priority is given or available for reviewing and evaluating the impact of existing policies, for assessing need, or for **strategic planning**. This creates challenges for donors who require this information to inform funding decisions. New policies are often not harmonised with existing policies, due in some cases to policies being produced with urgency.

Policy officers often have technical backgrounds such as in agriculture, nutrition or environment, but not policy or legal **qualifications**. They have a desire for more upskilling in policy development, from brief writing to gender mainstreaming. While confident to prepare ministry-level policies for internal approval, policy officers lack the expertise and time to prepare or review **larger policies**, legislation or strategic planning documents that require stronger technical skills, advanced policy expertise,

multisectoral coordination and cabinet approvals. Such policy documents typically require the funding and recruitment of technical consultants by donors and ministries. Short-term consultants can lack contextual knowledge and local relationships which impedes the policies they develop. The FAO, WHO, UNICEF and SPC provide extensive **technical support** to policy units to develop and review policy, legislation and strategic plans. With regional and country offices in Fiji, the proximity of government policy officers to technical specialists in these agencies is considered an asset by both parties.

In terms of **evidence** for policy making, local universities including the FNU and the USP are valued by policy officers for their provision of evidence and literature to inform food, nutrition and NCD prevention policies. The FAO has invested extensively in establishing the statistics, monitoring and evaluation capabilities of the MOAG, which are now considered to be well-resourced and to have close relationships with policy officers with whom they share a division.

The processes for navigating **cabinet approval** of policies are less clear and consistent than those for internal approval. There are 'bottlenecks' as policies require vetting by the Attorney General and MOEC. COVID-19 has created particular delays for policies to receive budget approval, with the MOEC focused on economic recovery. Consultants that may have assisted policy formulation avoid engaging heavily in policy approval processes to ensure government ownership. It is common for policies to experience delays of several years in being formally accepted, during which time engagement with partners needs to be maintained, and restructuring can occur affecting the governance and delivery mechanisms planned for.

It is a requirement that all policies to be approved by cabinet have undergone **consultation**, including with the private sector as relevant. It can be challenging however for consultants and policy officers to consult or simply convene with stakeholders, particularly government stakeholders, as hierarchies are highly respected and permission is usually required from senior staff before engaging. This creates barriers and delays to consultation and policy progression, as well as to general information sharing. **Staff changes**, particularly among senior leadership, also create delays as time is required to re-engage new staff, and policy concepts may no longer be favoured.

Following consultation, consultants and policy officers may need to **make changes to policies** they are developing to accommodate the needs of stakeholders. This can be overlooked as it may delay the policy's development, or not align with a desired policy option. Consequently policies are developed that, despite undertaking consultation, may be considered (either by stakeholders, the Attorney

General and/or cabinet) to have not understood or considered the concerns of stakeholders adequately. This delays the policy's approval or, if approved, can see the policy revoked or not be implemented. Policies developed to reflect international best-practice, but which are not adequately contextualised, are of particular concern for stakeholders involved in their delivery.

*'don't start with a gold standard that even advanced economies have not been able to adopt'
'government has to work with industry in making sensible recommendations'*

Recognising the challenges to governments such as Fiji to developing NCD prevention policies and legislation, SPC is finalising a new NCD Legislation Framework, intended as a practical resource to guide Pacific governments through this process.

Policy implementation

Amidst the pressure to finalise policy, particularly to secure budget approval, policy officers admit to reducing policy **implementation budgets** to minimum levels. Others admit to giving only limited consideration to the budget for policy implementation from the start of the policy's development. This places a burden on implementation staff to find the budget and resources to implement new policies and initiatives within their existing allocations.

*'how the resources are allocated or how much resources are needed
should be tackled at a later stage, when the policies are actually implemented'
[the policy] doesn't necessarily need to be funded, just let them know it's happening'.*

Implementation staff are inadequately resourced to deliver the large number of policies and initiatives with which they are tasked. They face challenges finding **time** for policy implementation, which they need to deliver together with actions in operational plans, commitments to donors, and responding to needs arising at the request of both ministers and the community. Implementation staff lack time for addressing underlying issues and for multisectoral engagement in particular. Opportunities suggested by implementation staff to assist them better manage their workloads include making more information available to communities online, streamlining requests for support, and outsourcing or reassigning responsibility for the most resource-intensive activities.

*'we have to push resources to the limit'.
'we do the best we can with the resources we have'*

Unlike policy officers, there is a high degree of **staff** turnover among implementation staff, owing in part to the challenges of their role, and to the opportunities for technical staff outside of government that are higher paid. Delays in government recruitment processes and budget constraints mean staff numbers are inadequate. Remaining implementation staff lack **technical expertise** required to deliver certain responsibilities. Where training has been provided to assist their implementation of a policy or initiative, such as training agriculture extension offices in nutrition, it is not widely utilised however as it is not considered core business amidst competing priorities.

While senior implementation staff provide input on policy development, there are inadequate mechanisms and clear responsibility for **communicating new policies** among middle- and junior-level implementation staff. They can then lack ownership of and value for the policy or initiative. This deteriorates further when there is a change in ministry leadership and a policy is no longer championed. Policies can also be difficult for implementation staff to interpret and understand. This occurs when new and existing policies and initiatives are not harmonised, and when they contain extensive and complex technical requirements. Implementation staff have a strong desire for policies developed and reviewed to be simplified and above all more feasible and realistic. Efforts to consolidate, harmonise and prioritise policies and initiatives are valued, such as those of the MOAG to prioritise key initiatives for implementation in response to COVID-19.

Policies and initiatives are not delivered in **coordination** with other ministries or agencies. Agriculture Field Days are one of few examples of collaboration across agencies. Implementation staff experience the same barriers to communication and information sharing with other ministries as policy officers. Improved cooperation may assist audiences such as farmers and schools navigate and access technical support and services more easily. District Officers may play an important role in facilitating this.

There are some existing mechanisms to facilitate the **reach** of policy implementation, for example through public health dietitians and agriculture extension officers. Staffing and resource limitations mean there are gaps in reach however. Fiji's **geography** also creates innate challenges, such as the cost and frequency of inter-island transport and impeded internet connectivity. Recognising the need to strengthen and improve the reach of implementation and service delivery, both the MOHMS and MOAG are pursuing further decentralising.

Strong weather events such as cyclones can cause policy implementation to be delayed or abandoned to focus on **disaster** preparedness or recovery. This can also be a cause for delays in policy development.

Another mechanism the Fijian government is pursuing to strengthen implementation and service delivery is public private **partnerships**. A new Public Private Partnership Policy was released by the MOEC in 2019, and an Implementation Guideline finalised in 2020 (Government of Fiji, 2019e; Government of Fiji, 2020h). The Policy creates greater opportunities for the public sector to contribute funds and resources to deliver government services and programs and may create opportunities to improve policy implementation. There is the potential however for such partnerships to facilitate the marketing of unhealthy foods where they are signed with food processors and manufacturers. Inhibiting the effectiveness of government partnerships is its procurement process. Contracts are required to be re-tendered annually, which obstructs consistent project implementation and contributes to project underspend.

Policy monitoring and enforcement

As previously described, the Food Safety Regulations, together with the Marketing Controls (Foods for Infants and Young Children) Regulations, prescribe a wide range of requirements that affect nutrition. Due to staffing and resource limitations, those mandated as responsible for their monitoring and enforcement, the MOHMS's Food Unit, have limited capacity to undertake the **surveillance** required. Recognising this, the MOHMS extended this authority to municipal councils. Municipal councils however also lack capacity in terms of staffing and resource limitations and training to undertake the surveillance required. As such, a reactive monitoring system has evolved whereby staff from the MOHMS and municipal council conduct monitoring in response to complaints they receive either from the public or the Consumer Council. The Consumer Council undertake some proactive surveillance of compliance with the Regulations as part of their role to protect consumers, though are not authorised to enforce them. This approach, while imperfect, can be considered a good use of limited resources. It could be enhanced by streamlining the reporting of complaints to avoid duplication.

Where non-compliance is suspected, the MOAG's laboratory is mandated to provide **testing or analysis** services. They however lack an adequate number of suitably qualified staff and equipment to complete testing within required timeframes and to the necessary standard. Alternative testing facilities are available at the USP laboratory though demand a sizable fee. While internationally accredited, the USP laboratory may in some instances produce results that may not be considered reliable (for example due to the delayed arrival of an international order of basic items needed to perform tests) and does not

have the expertise or equipment to undertake certain analysis. Such limitations of domestic testing capabilities not only impact on the monitoring of foods and materials such as soils for their policy compliance by authorities but create barriers for the private sector wanting to analyse products to achieve or confirm compliance with domestic and international standards. For these reasons, product importers are requested by the MOHMS to have their products tested and to demonstrate compliance before arrival.

In terms of enforcement, when a non-compliant product is identified the Regulations do not allow for the issuing of a direct infringement notice. This requires cases of non-compliance to go through the judicial system where the burden of proof is on the state. This is a costly and time-consuming exercise, which deters authorities from pursuing it.

There is not an adequate number of staff to suitably monitor, enforce or test products to ensure compliance with the Regulations. Similar to implementation staff, this is due to budget constraints in the respective departments and challenges to the retainment and recruitment of technical staff who are able to pursue work opportunities outside of government. Staff also require further technical skills to interpret and monitor the Regulations, particularly requirements relating to nutrition, having primarily environmental health backgrounds. They also prioritise other responsibilities, namely monitoring products for export given the economic implications of non-compliance for the Fijian government. More recently they have had to prioritise COVID-19 compliance monitoring activities.

There are many stakeholders involved in monitoring, enforcing and testing compliance with the Regulations, including those in biosecurity and customs. There is a desire among them for better information sharing and coordination of efforts. The Food Safety Act 2003 prescribes that a Food Safety Advisory Committee be formed to advise the Central Board of Health (established by the MOHMS) on matters relating to the Act, though this has not been initiated. Establishing this Committee may provide the many stakeholders involved monitoring and enforcing the Food Safety Regulations a forum to share information, contribute technical expertise, and collectively evaluate matters arising.

There are two additional factors that affect capacity to monitor and enforce not only the Food Safety Regulations 2009 and The Marketing Controls (Foods for Infants and Young Children) Regulations 2010, but other policies impacting nutrition as well. The first is community relationships. Authorities responsible for policy enforcement can find it challenging to act on suspected or established cases of non-compliance when the offender is known to them. A prominent example is fisheries wardens that

resist enforcing compliance among their communities with an unpopular policy requiring licences for fishing in coastal waterways. The second factor is policy complexity. Authorities responsible for monitoring and enforcement (and testing as relevant) feel 'overwhelmed' by the nature of policy requirements and have a desire for them to be simplified and narrowed.

While under resourced, the Regulations are buoyed by the clear delineation of responsibilities for monitoring and enforcement. In contrast, there is a lack of awareness and agreement among staff from both the MOEHA and MOHMS as to who is responsible for monitoring the Policy on Food and School Canteens. (Government of Fiji, 2017e) This is unlikely to be resolved while the Policy lacks ownership within the MOEHA and is without an accountability and reporting mechanism.

Given challenges to policy monitoring and enforcement, incentives may provide a more effective option of achieving policy compliance.

With regards to reporting mechanisms, the MOAG is the only Ministry identified to have a monitoring and evaluation framework in place to track the delivery of its COP, measure progress towards its SDP targets, and enable informed reporting on the reach and impact of its policies and initiatives. The framework was established with support from FAO/FIRST programme and involved building the capacity of staff in the collection of data, analysis and reporting. The framework is relatively new and, while there is confidence in the capacity of staff to maintain it, its sustainability and application by the Ministry have not yet been fully demonstrated

Research and collaboration

The desk review of research publications identified a significant number of publications across food, nutrition, food systems and policy areas. Publications from 2016 onwards are presented in Appendix VIII.

Three senior academics, aligned to a Fijian based University, participated in an exploratory semi-structured interview. Interviews went from 45 minutes to 120 minutes and were conducted via Zoom. The key themes from the interviews are presented in Table 21.

Table 21. Collaboration key themes

| In thinking about collaboration, | |
|--|---|
| What works well | <ul style="list-style-type: none"> • Fijian Universities and Research Centres are recognised for excellence within Fiji, and regionally • Current collaborations with trusted partners • Complementarity and added value • Working relationships with Ministry of Health and Ministry of Education, Heritage and Arts • Partnership between universities, private sector, NGOs and governments. (where local universities complement the research capacity of private sector, NGOs and governments). • Understanding of own limitations • Student involvement in research activities/aligning research in research programs to priorities • Use of secondary data |
| Collaboration works well when... | <ul style="list-style-type: none"> • Partnerships are based on trust, mutual respect and a common/clear understanding of what needs to be achieved/responsibilities • There is transparency • There is a willingness to learn • Research questions are specific and clearly articulated • Partners understand each other's systems, and are involved from the start of a project • Collaborators think 'outside of the box' • There is sufficient and sustainable resourcing, especially funds |
| To develop collaborative projects/work, starting steps include | <ul style="list-style-type: none"> • Looking for expertise to complement what is already available • Working with collaborators during the project development phase • Invitations from partners with funding opportunities, or working alongside partners to develop application for funding • Agreements (e.g. Memorandum Of Understanding) |
| Setting research priorities | <ul style="list-style-type: none"> • Projects are aligned to National priorities (Medical Research Agenda), University priorities, School research agenda, SPC, WHO (done at planning/application stage) • Alignment to food systems used and needed • Needs a sectoral approach • Need a multi-cross-sectoral approach. The whole funding, operational approaches between development partners, governments are strongly sectoral, but research and household priorities prompt the need for inter-intradisciplinary, systemic approach |
| The researchers/Institutions | <ul style="list-style-type: none"> • Policy makers value the evidence that is being generated • Better understanding of the decision-making context is required |

| | |
|--|---|
| <p>role in evidence production/translation to policy</p> | <ul style="list-style-type: none"> • Many lens', but often the economic lens is prioritised • Enough evidence exists, but this not always accessible • Evidence can be provided to sectors, but it often stays within that sector • Purposeful use of research findings (to Ministries) has led to policy development, this needs to be planned for from project initiation, and can take time • Research findings are important for teaching, sometimes there is not enough with Pacific context • Good expertise in this area, but could benefit from assistance with biostatistics |
| <p>Challenges</p> | <ul style="list-style-type: none"> • Agriculture is commodity focused • Sectors are not working together • Different organisations have different systems (these can cause time delays) • Structural changes in an organisation can lead to difficulties in gaining approvals • Younger researchers need encouragement to collaborate • Partnerships take time to develop and be embraced • Consultants often develop policy, but may lack context or understanding of the lens' required • More funding is needed to support research, research will not progress if there is no funding • Academics need time to write publications, this can be difficult in current workloads • Funding required for publication in some journals • Fiji does not have specific funding for nutrition available • Some of the research that is needed isn't what major funders are looking for (e.g. fundamental research is needed, but funders often want innovative/different research projects) • Very little resources available and infighting over resources. • Funding time, most focus on development, but little funds are allocated for research |
| <p>Dissemination</p> | <ul style="list-style-type: none"> • Publications, workshops, conferences, symposiums, webinars, briefs, reports, newspaper • Sharing with participants • Curriculums, training tools, policy briefs and through awareness sessions with different communities |
| <p>Other</p> | <ul style="list-style-type: none"> • Transformational change is needed • More collaboration and dissemination is needed to prevent the |

FUTURE ACTIONS

The aim of this work was to; (i) collate evidence-based data and information of nutritional and health outcomes and dietary patterns in Fiji, (ii) develop a better understanding of the food retail environment in Fiji, including food accessibility, the retail food environment around schools and priority vulnerable groups, (iii) provide a detailed understanding of the multisector policy landscape and how this impacts dietary behaviour in Fiji, and (iv) define a road-map to outline opportunities for future research and actions to inform a comprehensive and evidence-based approach to preventing overweight, obesity and NCDs. While COVID-19 affected the project activities and timeline, the scale of this work is significant and was conducted across Viti Levu and Vanua Levu.

The aim of this report is to provide evidence and information to facilitate and enhance policy dialogue in various forums, to produce recommendations and a roadmap for policy change to prevent overweight, obesity and NCDs in Fiji.

The next step in this work is to undertake policy dialogue with key stakeholders. This is planned for 2021. The policy dialogue will be based on the following questions (FAO, 2018), but with these questions adapted to the participants involved in the dialogue:

- How can each domain of the food system be coordinated to better contribute to healthy diets in order to prevent all forms of malnutrition, in particular overweight and obesity as well as DR-NCDs?
- What changes in the food system are needed?
- What are the policy options that would positively impact people's diets?
- What is the best way to actually bring about policy change?

The policy dialogue workshop will identify current coordination and multi-stakeholder mechanisms, key entry points for policy dialogue and change and advocate for policy change. Research is needed to provide evidence for policy and monitoring of policy change implications. To date, collaboration appears to work well, with established partnerships with Fijian and International partners. However, initial discussions suggest that more multi sector engagement would be of use and should be better supported. To this end, the policy dialogue workshop will also include discussion on research and evidence for food systems policy. This work will be used to develop a roadmap at country-level to raise level of awareness and inform next steps for acting on food systems in the context of healthy diets in Fiji.

Key limitations

The authors acknowledge there were several limitations to this work. Changes were required to data collection methods due to COVID-19. Data were only collected from two main islands and are not necessarily representative of the entire country. Dietary diversity data was a one-time measure and may not be an accurate account of long-term dietary intake. Reported foods grown may also be reflective of seasonality.

Rural locations were underrepresented in the FHFB as out of the selected 15 areas, six areas were rural and nine areas were urban. Additionally, two of the rural areas did not have a food store, resulting in four rural areas and nine urban areas. However, this does indicate that access to food outlets is more limited in rural locations compared to urban.

The results relating to food behaviours highlight that markets as the most common spot to buy fresh fruits and vegetables, however, only four out of the 13 surveyed food stores were markets. Additionally, two areas noted a market available, though it was not open on the day of data collection. The limited food item availability for fresh fruits and vegetables may be underrepresented in the survey data.

Survey data was only collected from stores within the defined radius for each location. It is possible that other food outlets/stores could be available within very close proximity to a location but just outside of the defined radius. Therefore, potentially altering availability status of food outlets and food items from food baskets.

This work was unable to account for availability of fresh produce from individual and communal food gardens and trees. While data on home gardening was collected, the results do not include the availability of fresh produce from individual or communal gardens and trees, and therefore the availability of fresh produce may be underreported.

The demographics of participants who completed the online survey are of a particular subgroup and do not reflect the diversity of demographics in Fiji. For example, 86 percent of respondents had a bachelor or post graduate university qualification, 91 percent of respondents worked full time and only a small proportion (8 percent) of respondents were of Indo-Fijian ethnicity, with the majority (57 percent) being iTaukei or other (35 percent). This suggests that these findings are not representative of the general Fijian population.

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APPENDICES

Appendix I. GIS mapping of food outlets

The GIS survey was undertaken between 25th February and 6th May 2020. The survey design involved visiting individual fresh food outlets on Viti Levu and Vanua Levu Islands, Fiji. The survey was observation-based, with enumerators recording the type of food outlet (supermarkets, shops, road-side vendor stall, cluster markets and municipal), GIS location, type of product available for sale (fruits, vegetables, root), number of product types, and consumer accessibility (road access, available parking, proximity to bus stop). Data was recorded using a tablet incorporating KoboToolBox survey software™ (Harvard Humanitarian Initiative, Cambridge, USA). The survey was undertaken during business hours with food outlets that were closed or no longer in commercial use not recorded.

The survey of food outlets Viti Levu Island was undertaken between 25 February and 21 March 2020, immediately prior to COVID-19 local travel restrictions being imposed in Fiji. The survey in Vanua Levu Island were undertaken in May 2020, following the cessation of local COVID-19 travel restrictions. A total of 1185 commercial outlets (i.e. shops, supermarkets, municipal markets and road-side vendors) were surveyed, including 505 shops, 278 fixed road-side stalls, 179 mobile road-side stalls, 137 supermarkets, 63 cluster road-side markets, and 19 municipal markets.

Given the timing of the survey on Vanua Levu Island, we cannot discount the possibility of some level of COVID-19 impact on the number and type of outlets selling fresh fruits and vegetables in Vanua Levu

Food accessibility was analysed at the division and province-level and includes the most recent socio-demographic data. Data on private vehicle ownership at the province level, is associated with 2007 household income and expenditure survey. To allow contemporary comparison with 2018 population data, vehicle ownership was adjusted proportional to the increase in vehicle ownership using National private vehicle registrations for 2007 and 2018 (FBS, 2007, FBS 2019). While this assumes a consistent increase in vehicle ownership across all provinces, calculated total vehicle ownership accounted for 99.1 percent actual vehicle registrations.

Appendix II. Method: School food environment assessment

A list of all Fijian primary and secondary schools included in phase 1 and 2 of the Health Promoting School project (WHO; MOHMS; MOEHA – accredited at Bronze level or above)(WHO et al., 2016-2019) was obtained. In this list, schools were pre classified into nine education districts (Ba/Tavua, Bua/Macuata, Cakaudrove, Eastern, Lautoka/Yasawa, Nadroga, Nausori, Suva and Ra), and seven location descriptions (city metropolitan, city suburban, town, peri-urban, rural, remote and very remote).

Stratified sampling was used to identify the schools to be included in data collection. Based on travel and time constraints, the research team randomly selected 50 percent of the schools to be sampled. As the Eastern education district includes all small islands, this education division (n= 23) and two schools with an unknown location description were removed from the initial data set prior to sampling selection. This reduced the total number of available schools from 204 to 179.

To ensure there was representation from each location description, the sampling was based on a proportion of each location description. An excel spreadsheet was used to group all schools (by name) in the seven location description categories. The pre-defined number of schools for each location description was identified, and the corresponding number, randomly chosen from the spreadsheet.

A 400m zone was drawn from the main school locations, using an online program Maps and Directions (Draw Radius Map | Measure Circle Area on Map | Map Radius Calculator (mapsdirections.info)). During November 2020, enumerators walked systematically through the 400m zone, and recorded the following information for all food outlets:

- Date, time; GPS location of the food outlet
- Type of food outlet (check one only): Supermarket (supermarket store, multiple cash registers); Corner store (small store, walk-in, 1 register); Street stall (non-permanent venue); Restaurant; Fast food outlet (designed for purchase of prepared food to be eaten in store/taken away); Other (please specify).
- Are these foods available for purchase? (yes/no): Fresh fruit; Fresh vegetables; Canned/dried fruit; Canned/dried vegetables; Freshly made fruit juice; Water; Sugar sweetened beverages (e.g. Coca cola); 'Diet' versions of sugar sweetened beverages (e.g. diet coke); Fresh coconut (to drink); Fruit juice (pre-packaged); Chocolate; Lollies/Candy/Confectionary; Chips/Potato chips (e.g. packet of chips); Fried beans; Indian sweets and savouries; Hot chips or fries; Fried

food (i.e. fried chicken); Noodles; Roti and curry; Cream buns/bread; Starchy foods (i.e. taro, cassava); Premade meals (e.g. sandwiches, burgers, curry); Breads (white) and Breads (wholegrain).

Enumerators requested permission from each of the schools included in the project to undertake an interview with a school representative. The interview included questions related to use of nutrition/food policy; school garden use; food production activities; gardening and curriculum linked activities, the provision of food in the school (i.e. school meals); tuckshop/canteen use; student use of outside food sources; and allowed for an open response to the question; would you like to make any further comments on school food environments.

The food environments of 88 schools were assessed, representing 43 percent of the schools with World Health Organization (WHO) Health Promoting Schools (HPS) accreditation (2016 – 2019) (WHO et al., 2016-2019). Schools were within eight of the nine education districts: Suva (n= 21), Nausori (n= 14), Lautoka/Yasawa/Nadi (n= 12), Ba-Tavua (n= 12), Bua/Macuata (n= 9), Ra (n= 8), Cakaudrove (n= 6) and Nadroga (n= 6). Eighty-four (95.5 percent) of the schools provided consent to take part in an interviewer administered survey. Reasons for non-participation included representatives not available to invite, or permission not granted.

Data was downloaded from KoboToolBox survey software™ (Harvard Humanitarian Initiative, Cambridge, USA), cleaned, coded and uploaded into Excel and SPSS files. Data were categorised and is presented descriptively. It is not feasible to provide heat maps for individual schools, given the number of school zones (n= 88) included in this project. COVID-19 related responses to the open question used in the interview were identified and collated. These are presented in key themes, with example quotes.

Appendix III. Method: Local environment mapping for food availability

To map the retail environment of selected neighbourhoods, local, trained enumerators collected information on the types of food outlets (places where food was available for purchase), and types of food available within these outlets, within a pre-determined 500m zone of each location (Table 2), during November 2020.

Enumerators were provided with a pre-defined 500 metre radius zone in which to collect data for each location. The 500m zone was drawn around a central point of the community, using an online program Maps and Directions (Draw Radius Map | Measure Circle Area on Map | Map Radius Calculator (mapsdirections.info)).

During November 2020, enumerators systematically walked through the 500m zone recording all locations where food was available for purchase on KoboToolBox survey software™ (Harvard Humanitarian Initiative, Cambridge, USA). For each location where food was available for purchase, the following information was recorded:

- Date, time and GPS location of the food outlet
- Type of food outlet (check one only): Supermarket (supermarket store, multiple cash registers); Corner store (small store, walk-in, 1 register); Street stall (non-permanent venue); Restaurant; Fast food outlet (designed for purchase of prepared food to be eaten in store/taken away); Other (please specify).
- Are these foods available for purchase? (yes/no): Fresh fruit; Fresh vegetables; Canned/dried fruit; Canned/dried vegetables; Freshly made fruit juice; Milk, cheese, or yoghurt; Lean meats/chicken; Canned/processed meats; Fresh fish/seafood; Lentils/dhal; Starchy foods (i.e. taro, cassava); Breads, pasta, rice (white); Breads, pasta, rice (wholegrain); Water; Sugar sweetened beverages (e.g. Coca cola); 'Diet' versions of sugar sweetened beverages (e.g. diet coke); Fresh coconut (to drink); Fruit juice (pre-packaged); Chocolate; Lollies/Candy/Confectionary; Chips/Potato chips (e.g. packet of chips); Fried beans; Indian sweets and savouries, and Premade meals (e.g. sandwiches, burgers, noodles, curry and roti, fried foods, hot chips).

Selected local food environments were mapped across Viti Levu and Vanua Levu (Figure 4), resulting in the inclusion of 284 food outlets in total. This included: restaurants (n= 92), fast food outlets (n= 62), corner stores (n= 53), supermarkets (n= 18), canteens (n= 16), street stalls (n= 15), bakeries (n= 13),

coffee carts/café/tea shops (n= 6), bus stands (n= 5) and seafood/fish markets (n= 2). Two outlets were not recorded/unknown (n= 1) or other (n= 1 cinema).

Data was downloaded from KoboToolBox survey software™ (Harvard Humanitarian Initiative, Cambridge, USA), cleaned, coded and uploaded into Excel and SPSS files. Frequency of outlet type was calculated and presented by food item. Mapline (Mapline, Pleasant Grove, UT, <https://mapline.com/>) was used to develop heat maps, indicating the density of food items, within the categories of:

- Fruit (fresh fruit, frozen fruit, canned/dried fruit, freshly made fruit juice),
- Vegetables (fresh vegetables, frozen vegetables, canned/dried vegetables),
- Bodybuilding foods (Milk, cheese, or yoghurt; Lean meats/chicken; Fresh fish/seafood, Nuts, Lentils/dhal, Eggs),
- Energy foods (Starchy foods (i.e. taro, cassava); Breads, pasta, rice (white); Breads, pasta, rice (wholegrain/brown), and
- Discretionary (Sugar sweetened beverages (e.g. Coca cola); 'Diet' versions of sugar sweetened beverages (e.g. diet coke); Fruit juice (pre-packaged); Fried foods; Chocolate; Lollies/Candy/Confectionary; Chips/Potato chips (e.g. packet of chips); Fried beans; Indian sweets and savouries) in each location.

The intensity of availability with a 500m radius is indicated by increasing colour (through to red being highest).

Appendix IV. Method: Fiji Healthy Food Basket

The Fiji Healthy Food Basket (FHFB) assessment is a cross-sectional survey of the costs and availability of basic food items that promote healthy food choices. This includes a variety of basic foods that meet nutrition requirements and recommendations for the reference family for one fortnight. The development of the FHFB survey tool was based on methodology used for healthy food baskets developed for Australian contexts (Palermo and Wilson, 2007), with modifications to reflect the food environment for a Fijian context, and significant input from the NFNC and FAO.

Four sample households were included to allow for varying geographical locations, dietary behaviours and nutritional needs across four major population groups in Fiji. Each sample household reflects the nutritional needs of a family of five. The composition of this reference family was determined by ascertaining the most common age and sex characteristics and reflected to represent the most typical household size in Fiji. This was determined by accessing data from the Fiji Bureau of Statistics, the Household Income and Expenditure Surveys (HIES), national census data and through consultation with the NFNC in Fiji.

The four sample households/reference families are:

- Urban Indo-Fijian: 2 adults (male and female 35 – 45 years), 1 teenager (male, 15 years), 2 children (male 10 years, female 5 years).
- Rural Indo-Fijian: 2 adults (male and female 35 – 45 years), 1 teenager (male, 15 years), 2 children (male 10 years, female 5 years).
- Urban iTaukei: 2 adults (male and female 35 – 45 years), 1 teenager (male, 15 years), 2 children (male 10 years, female 5 years).
- Rural iTaukei: 2 adults (male and female 35 – 45 years), 1 teenager (male, 15 years), 2 children (male 10 years, female 5 years).

A 14-day menu plan that reflects nutrient adequacy, while including variation for availability and common food choices has been constructed for each sample household. The selection of food items included in each menu was informed by 'The food and health guidelines for Fiji' (National Food and Nutrition Centre, 2013) and 'Pacific guidelines for healthy living' (Public Health Division of the Pacific Community, 2018), along with data representing the most consumed food items (Schultz et al., 2007). The nutritional requirements are based off 'FAO/WHO Human Vitamin & Mineral Requirements' (WHO and FAO, 2004) and compared against the 'Nutrient Reference Values for Australia and New Zealand'

(National Health and Medical Research Council (Australia) and Ministry of Health (New Zealand), 2017)
. Each 14-day menu plan informs the foods that are included in the FHFB survey and meet at least 90 percent of nutrient and energy requirements for each individual in all four sample households/reference families.

List of food items from the rural iTaukei food basket:

- Cucumber
- Eggplant
- Carrot
- Pumpkin
- Long green bean
- Tomato
- Ota/fern
- English cabbage
- Chinese cabbage
- Moringa leaves
- Tubua/amaranthus
- Bele
- Rou rou
- Maize
- Ginger
- Garlic
- Onion
- Dalo/taro
- Cassava
- White potato
- Watermelon
- Mango
- Banana
- Pawpaw
- Pineapple
- Young green coconut (for coconut water and flesh)
- Brown coconut (for coconut milk)
- Dried yellow split peas
- Reef fish
- Tinned tuna
- Tinned mackerel
- Chicken (thigh, whole, drumsticks)
- Lamb sausages
- Lamb (pieces, neck, chops)
- Canned beef
- Milk (dried milk powder, full fat dairy milk)
- White bread
- Breakfast /cabin crackers
- Flour (roti flour, white flour, wholemeal flour)
- White rice
- Packet noodles
- Milo powder
- Brown sugar
- Iodised salt
- Soy sauce
- Margarine
- Soya bean oil
- Jam
- Lemongrass tea (loose leaf)
- Black tea (loose leaf)
- Lemon leaf tea (loose leaf)

List of food items from the urban iTaukei food basket:

- Cucumber
- Eggplant
- Carrot
- Pumpkin
- Celery
- Tomato
- Ota
- English cabbage
- Chinese cabbage
- Tubua/amaranthus
- Bele
- Rou rou
- Maize
- Ginger
- Garlic
- Onion
- Dalo/taro
- Cassava
- White potato
- Watermelon
- Mango
- Banana
- Pawpaw
- Pineapple
- Young green coconut (coconut water and flesh)
- Brown coconut (coconut milk)
- Dried yellow split peas
- Eggs
- Reef fish
- Tinned tuna
- Tinned mackerel
- Chicken (thigh, whole, drumsticks)
- Lamb sausages
- Lamb (neck, pieces, chops)
- Pork chops
- Canned beef
- Milk (dried milk powder, full fat dairy milk)
- White bread
- Oats
- Flour (roti flour, white flour, wholemeal flour)
- White rice
- Packet noodles
- Weet-bix
- Milo powder
- Brown sugar
- Iodised salt
- Margarine
- Soya bean oil
- Jam
- Black tea (loose leaf)

List of food items from the urban Indo-Fijian food basket:

- Maize
- Cucumber
- Eggplant
- Carrot
- Pumpkin
- Celery
- Long green bean
- Tomato

- Okra
- Chinese cabbage
- Moringa leaves
- Tubua/amaranthus
- Bele
- Garlic
- Ginger
- Onion
- Cassava
- White potato
- Sweet potato
- Watermelon
- Mango
- Banana
- Pawpaw
- Pineapple
- Young green coconut (coconut water and flesh)
- Brown coconut (coconut milk)
- Dried blue peas
- Dried yellow split peas
- Eggs
- Reef fish
- Tinned mackerel
- Chicken (whole, drumstick, thigh)
- Lamb sausages
- Plain full fat dairy yoghurt
- Milk (milk powder, full fat dairy milk)
- White bread
- Flour (roti flour, white flour, wholemeal flour)
- White rice
- Pappadams
- Packet noodles
- Weet-bix
- Milo powder
- Brown sugar
- Iodised salt
- Soy sauce
- Margarine
- Soya bean oil
- Mustard seeds
- Cumin seeds
- Fenugreek seeds
- Jam
- Black tea (loose leaf)

List of food items from the rural Indo-Fijian food basket:

- Cucumber
- Eggplant
- Carrot
- Pumpkin
- Long green bean
- Tomato
- Okra
- Chinese cabbage
- Moringa leaves
- Tubua/amaranthus
- Bele
- Maize
- Ginger
- Garlic
- Onion
- White potato
- Sweet potato
- Watermelon

- Mango
- Banana
- Pawpaw
- Pineapple
- Young green coconut (coconut water and flesh)
- Brown coconut (coconut milk)
- Dried chickpeas
- Dried yellow split peas
- Eggs
- Reef fish
- Tinned mackerel
- Chicken (thigh, whole, drumsticks)
- Lamb (pieces, neck)
- Plain full fat dairy yoghurt
- Milk (milk powder, full fat dairy milk)
- White bread
- Flour (roti flour, white flour, wholemeal flour)
- White rice
- Pappadams
- Milo powder
- Brown sugar
- Iodised salt
- Margarine
- Soya bean oil
- Mustard seeds
- Cumin powder
- Fenugreek seeds
- Black tea (loose leaf)

Data was collected in 5 locations during November 2020. Each of the 5 locations included 3 areas (15 total), and within each area, 1 store (15 total) was randomly selected for data collection (i.e. 1 store in Suva City, 1 store in Lami, 1 store in Valelevu, a total of three stores for the Suva location). Food stores were unavailable in two areas (Lomawai and Nadroumai), resulting in 13 areas/food stores included in the analysis. Local, trained enumerators visited the randomly chosen store and requested permission to record the food item price and availability for each of the FHFB items in KoboToolBox survey software™ (Harvard Humanitarian Initiative, Cambridge, USA).

The analysis provides an overview of the availability of food items in the FHFB and price of selected FHFB food items, based on geographical location. The availability and price of FHFB food items was analysed using descriptive statistics in excel, including mean, median and proportions.

Appendix V. Method: Dietary diversity and food behaviours

A survey was conducted to gain an understanding of dietary diversity, food behaviours, influences on food choice and child/infant feeding practices. The survey was completed upon consent at the place of invitation and consisted of five sections:

- Participant characteristics (8 questions)
- Dietary intake at either household or individual level (24-hour recall)
- Feeding practices of children under 2 years of age (5 questions)
- Influences on food choice (9 questions)
- Sourcing of food (6 questions)

The survey took place for the first time in 2020 across the month of November (9 – 20). Incentives to participate were not offered and potential participants were approached in both rural and urban areas of Vitilevu and Vanua Levu (see areas table 2). As chief investigators were unable to travel to Fiji per COVID-19 restrictions, data were collected via trained enumerators and surveys deployed via mobile survey software KoboToolBox survey software™ (Harvard Humanitarian Initiative, Cambridge, USA). A protocol document was provided for enumerators which outlined the process and used images to show how to complete the KoboToolBox survey software™ (Harvard Humanitarian Initiative, Cambridge, USA) form.

During the data collection period, 508 individuals were approached to participate in the dietary diversity and food behaviours survey, of which 467 (92 percent) consented to participate. Most data were collected at urban locations (80 percent). Majority (69 percent) normally live in the community in which they were interviewed.

The dataset was downloaded from KoboToolBox survey software™ (Harvard Humanitarian Initiative, Cambridge, USA), into Microsoft Excel and exported to SPSS for descriptive statistical analysis.

Dietary diversity

Dietary data were collected and dietary diversity scores calculated using the method outlined in the Food and Agriculture Organization of the United Nations (FAO) guidelines for measuring household and individual dietary diversity (FAO, 2011a). The HDDS is a continuous score which can range from 0 to 12 based on whether the household consumed any of the following 12 food groups in the past 24 hours: (i) cereals; (ii) white tubers and roots; (iii) vegetables; (iv) fruits; (v) meat; (vi) eggs; (vii) fish and other seafood; (viii) legumes, nuts and seeds; (ix) milk and milk products; (x) oils and fats; (xi) sweets; (xii) spices,

condiments and beverages. Sixteen food item questions were asked and as per the guidelines to calculate the HDDS, question items were combined to derive a maximum HDDS score of 12 (see table 22).

The IDDS is a continuous score which can range from 0 to 9 based on whether the individual consumed any of the following 9 food groups in the past 24 hours: (i) starchy staples; (ii) dark green leafy vegetables; (iii) other vitamin A rich fruits and vegetables; (iv) other fruits and vegetables; (v) organ meat; (vi) meat and fish; (vii) eggs; (viii) legumes, nuts and seeds; (ix) milk and milk products. Sixteen food item questions were asked and as per the guidelines to calculate the IDDS, question items were combined to derive a maximum IDDS score of 9 (see table 22).

Table 22. Aggregation of food groups from questionnaire to derive household dietary diversity and individual dietary diversity food groups for use in total dietary diversity score calculations

| Household Dietary Diversity Scoring | | Individual Dietary Diversity Scoring | |
|-------------------------------------|----------------------------------|--------------------------------------|--|
| Questions | Household Food Group | Questions | Individual Food Group |
| 1, 2 | Cereals | 1,2,3 | Starchy staples |
| 3 | White tubers and roots | 5 | Dark green leafy vegetables |
| 4,5,6 | Vegetables | 4,7 | Other vitamin A rich fruits and vegetables |
| 7,8 | Fruits | 6,8 | Other fruits and vegetables |
| 9,10 | Meat | 9 | Organ meat |
| 11 | Eggs | 10,12 | Meat and fish |
| 12 | Fish and seafood | 11 | Eggs |
| 13 | Legumes, nuts and seeds | 13 | Legumes, nuts and seeds |
| 14 | Milk and milk products | 14 | Milk and milk products |
| 15 | Oils and fats | | |
| 16 | Sweets | | |
| 17, 19 | Spices, condiments and beverages | | |

Influences on food choice and food purchasing behaviours

To examine influences on food choice, participants were asked to identify the level of importance (on a scale of not at all important to very important) they place on nine factors that assess influences on food choice. The pre-determined factors were grouped into: (i) health; (ii) mood; (iii) convenience; (iv) sensory appeal; (v) natural content; (vi) price; (vii) weight control; (viii) familiarity and (ix) ethical concern. These factors are based on the Food Choice Questionnaire tool (FCQ) (Stephoe et al., 1995). Food purchasing

behaviours were investigated using a series of questions asking about access and availability to fresh fruits and vegetables, frequency of shopping for food and sources of food items. These questions were adapted from the NEMS- P Perceived Nutrition Environment Survey (Green and Glanz, 2015).

Child and infant feeding practices

If the participant indicated there were any children aged 2 years and under that usually live in their home, they were asked to answer a series of questions adapted from previous work (Flood et al., 2005), including; how old the child was (in weeks/months); if the child had ever been breastfed (breastfed included fed at the breast or fed expressed breastmilk); in the previous day, had the child received any of the following: (i) vitamins, mineral supplements, medicine; (ii) plain water; (iii) sweetened or flavoured water; (iv) fruit juice; (v) tea; (vi) infant formula; (vii) tinned powdered or fresh milk; (viii) solid or semi-solid and what age was the child first given solid food regularly (provided in weeks/months, or no solids yet).

Appendix VI. Method: Online survey - eating away from home, food literacy and the impact of COVID-19 on food consumption

In addition to the DDS interviews, an additional online survey aiming to explore dietary behaviours in Fijians, with a specific focus on eating away from home, food literacy and drivers of food choice was used. The online survey deployed using Qualtrics XM Survey Software included 51 questions and was open to any resident Fijian aged 18 years and over between August 31 and November 30, 2020. The survey link was shared with local contacts and snowball sampling used for recruitment.

The survey contained questions on the following:

- demographics (n= 9 questions)
- food access (n= 6 questions), food environment (home & neighbourhood) (n= 12 questions), adapted from the NEMS-P Perceived Nutrition Environment Survey (Green and Glanz, 2015)
- food literacy (n= 10 questions), adapted from existing food literacy surveys (Poelman et al., 2018; Begley et al., 2019)
- Covid 19 (impact on food accessibility and food consumption)(n= 8 questions)

During the data collection period 72 individuals attempted the online survey, of which 63 individuals who completed all or most of the questions were included for data analysis.

The survey data was downloaded from Qualtrics XM Survey Software, cleaned, coded and uploaded to a Microsoft Excel file. Answers were categorised in Excel and analysed using descriptive statistics (proportions).

A cut off value to determine worthy changes in COVID-19 consumption changes was used whereby any differences in consumption of certain food items greater than 25 percent were considered as worthy changes, all other changes to consumption were considered negligible.

Appendix VII. Questionnaire and capacity assessment tool

1. What are the main policy documents that govern or guide [insert]?
 - 1.1. Are the policy documents related? And do they relate to national or international policy documents?
 - 1.2. To what extent are the policy documents utilised? And has this been impacted by COVID-19?
2. What policy measures (policies, legislation or related initiatives) does [insert] have in place or planning that have the potential to support Fijians to have a healthy diet?
 - 2.1. To what extent are the policy measures monitored and enforced?
3. What policy measures does [insert] have in place or planning that have potential to unintentionally support Fijians to have an unhealthy diet?
4. Has [insert]'s work in any of these policy areas changed over time?
 - 4.1. If yes, how have they changed and what has influenced this? Consider COVID-19.
5. In your view, what gaps are there across government in policy measures to support Fijians to have a healthy diet?
6. In your view, what new or unutilised opportunities are there for the government to support Fijians to have a healthy diet?
 - 6.1. With regards to the policy measures you have identified that have potential to support Fijians to have a healthy diet:
7. Are there sources of funding available within government to support this work? Is this adequate?
8. Are there materials and equipment required for this work, and are these adequate?

9. Is there adequate personnel required for this work located within [insert] and other departments or organisations involved?
- 9.1. Do personnel have the technical skills (qualifications, training) required for this work?
- 9.2. Do personnel have access to and/or an understanding of procedures and protocols required for this work?
- 9.3. Do personnel have access to a suitable issues management and information sharing pathway?
10. To what extent does [insert] and other departments or organisations involved in this work communicate and share information?
11. What are the key strengths [insert] and other departments or organisations involved have that support this work?
12. What are the key challenges faced by [insert] and other departments or organisations involved to supporting this work?
13. Is there any other information that you would like to share about policy work to support Fijians to have a healthy diet?

Appendix VIII. List of organisations interviewed

Biosecurity Authority of Fiji
Consumer Council of Fiji
Fiji Crop and Livestock Council
Flour Mills of Fiji
Food and Agriculture Organization
International Fund for Agricultural Development
Ministry of Agriculture
Ministry of Commerce, Trade, Tourism and Transport
Ministry of Education, Heritage and Arts
Ministry of Fisheries
Ministry of Forestry
Ministry of Health and Medical Services
Ministry of Infrastructure and Meteorological Services
Ministry of Women, Children and Poverty Alleviation
Ministry of Youth and Sports
National Food and Nutrition Centre
Suva City Council
The Foundation for Rural Integrated Enterprises and Development (FRIEND)
Pacific Community (SPC)
University of the South Pacific
UN Women
World Health Organization, Fiji

A small number of additional organisations were approached for interview but did not participate.

Appendix VIII. Method: Academic interviews

This activity aimed to explore recent (within the previous 5 years), current and planned research activities with relevance to food systems, health, food security and policy in Fiji. As this was exploratory in nature and is to be expanded on with the policy dialogue workshops to be held once COVID-19 travel restrictions are removed, two activities were used to identify research in this area and investigate collaboration in academia.

A desk review was undertaken in November 2020 to identify projects and publications relevant to food systems and health in Fiji. Three key researchers were approached to take part in the initial interview in December 2020. The semi-structured interview focused on collaboration in research, using the following questions for guidance;

Thinking about research collaborations in Fiji (related to food systems and health),

- What works well? Why is this the case?
- What enables collaboration? Why?
- Are there any barriers to collaboration with Fijian based and external stakeholders? If yes, how could these barriers be overcome?
- How are research priorities decided?
- What do you see as your, and your Institutions role in evidence production in this area?
- Has research (evidence) to date been used to develop related policy, why/why not?
- Is there research expertise in Fiji to undertake research needed in this area?
- Is there adequate funding to support research in this area in Fiji?
- How do you disseminate your research?
- Do you have any other comments about research collaborations/direction in Fiji?

The interviewer recorded notes throughout the interview and returned these to the participants for validation. Key themes were identified and presented.

The collective findings will be used as a prompt for a session at the policy dialogue workshop (when this can be held, dependent on COVID-19). This will contribute to development of road-map to inform future research needs to inform a comprehensive and science-based approach to preventing overweight, obesity and diet-related non-communicable diseases

Appendix X. Recent publications related to food, nutrition, food systems and policy in Fiji

2020

- Bell, C., Latu, C., Coriakula, J., Waqa, G., Snowdon, W., & Moodie, M. (2020). Fruit and vegetable import duty reduction in Fiji to prevent obesity and non-communicable diseases: a case study. *Public Health Nutrition*, 23(1), 181-188.
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