FOOD SECURITY IN VANUATU

2019–2020 NSDP Baseline Survey

VNSO
VANUATU NATIONAL STATISTICS OFFICE
BUREAU NATIONAL DES STATISTIQUES

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FOREWORD

Vanuatu implemented its fourth collection of household income and expenditure information as the core component of the National Sustainable Development Plan (NSDP) Baseline Survey during the 12-month period from February 2019 to February 2020. The survey intended to provide baseline statistics for the Vanuatu NSDP, including key information on national food security and nutrition. Vanuatu was among the first Pacific Island countries to implement the Food Insecurity Experience Scale (FIES) as part of the expanded Household Income and Expenditure Survey (HIES), which is in line with the latest international standards on measuring food security.

The food security of the people of Vanuatu is a priority of the Government. The first goal under the Environment Pillar of the National Sustainable Development Plan (NSDP) 2016-2030 envisions, "a nation that ensures our food and nutrition security needs are adequately met for all people through increasing sustainable food production systems and improving household production." As our population grows, so does the demand for food. Growth in agricultural productivity must meet or exceed the rate of population growth in order for Vanuatu to have a future that is food secure. It is the responsibility of the government to enhance agricultural production, improve traditional agricultural practices, and promote consumption of local foods.

The data collected from the NSDP Baseline Survey yielded good quality data that is useful for informing policy on food security in Vanuatu. The Food Security analysis report presents the analysis of key Sustainable Development Goal (SDG) indicators 2.1.1—prevalence of undernourishment—and indicator 2.1.2—prevalence of moderate to severe food insecurity. These indicators help track national progress at ensuring access to safe, nutritious and sufficient food all year round for all people. This report shines a light on those in our society that are experiencing hunger. Our culture promotes giving to others but it does not allow for people to easily ask others for help when in need. As a community, we need to look after our neighbors and share food when we have abundance.

The Government of Vanuatu and the Ministry of Finance and Economic Management are proud to publish this Food Security Report and remain committed to producing quality food security statistics available for all users. It is with great pride we release these findings after several years of preparation, fieldwork, and analysis. Enjoy.

REPUBLIC OF VANUATU
MINISTRY OF FINANCE & ECONOMIC MANAGEMENT
MINISTER
REPUBLIQUE DE VANUATU

Hon. Johnny Koanapo RASOU
Minister of Finance and Economic Management
Republic of Vanuatu

ACKNOWLEDGEMENTS

The 2019-2020 NSDP Baseline Survey is an expanded Household Income and Expenditure Survey that collected data critical for informing national economic, social and environmental policy. Despite the critical nature of this collection, funding a survey of this nature in Vanuatu has always been difficult. The Vanuatu National Statistics Office and Government of Vanuatu would like to acknowledge the tremendous financial support offered through the India-UN Development Partnership Fund, contributing two-thirds of the total cost of collection.

The survey team benefitted from ongoing support provided by our key regional technical partners at the Statistics for Development Division of the Pacific Community (SPC). The VNSO would like to acknowledge SPC for their role in assisting with survey methodology, questionnaire programming and data processing, specifically by the late Mr. Pierre Wong, Mr. Bertrand Buffiere, Mr. Toga Raikoti, Mr. Luis de la Rua, and Mr. Michael Sharp.

The VNSO would like to acknowledge the great support of the Department of Strategic Policy, Planning and Aid Coordination at the Ministry of the Prime Minister that assisted with questionnaire review and promotion of the survey. This partnership has enabled us to produce a significant number of key NSDP indicators for monitoring and evaluation as we continue to gauge progress against our national priorities.

The VNSO would also like to acknowledge all government and non-government agencies that supported the questionnaire review process and provided data needs and justifications for changes. We benefitted from suggestions and modifications to questions from agencies in all sectors and worked closely with DSPPAC Sector Analysts to ensure the data collected is useful for policy. The VNSO is committed to working with you all in the coming years to put this data to use for you.

This report was prepared by Nathalie Troubat, a food security and nutrition analysis, on behalf of the United Nations Food and Agriculture Organization and SPC. The analysis was co-funded by the Australian Government through the Australian Centre for International Agricultural Research (ACIAR) projects FIS/2016/300 and FIS/2018/155 and by the FAO Technical Cooperation Program project TCP/SAP/3705.

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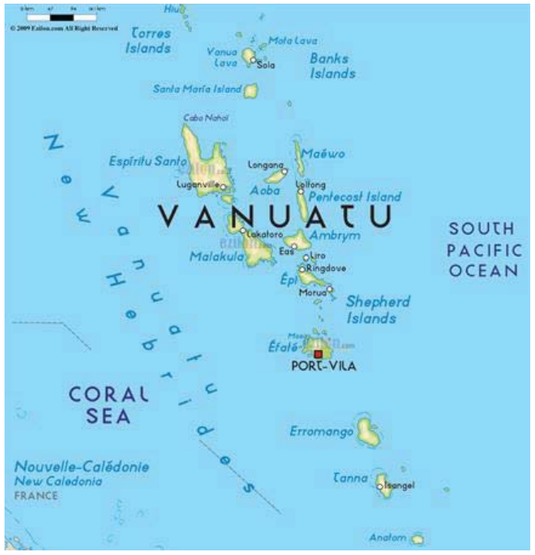
ACRONYMS AND ABBREVIATIONS

AME	adult male equivalent
FBS	food balance sheets
CV	coefficient of variation
DEC	average dietary energy consumption
DES	dietary energy supply
FAFH	food away from home
FIES	Food Insecurity Experience Scale
GIFT	Global Individual Food consumption data Tool
HH	household
HIES	Household Income and Expenditure Survey
MDER	minimum dietary energy requirement
NCDs	non-communicable diseases
NSDP	National Sustainable Development Plan
PICTs	Pacific Island countries and territories
PNDB	Pacific Nutrient Data Base
PoU	prevalence of undernourishment
RE	vitamin A expressed in retinol equivalent
SDG	Sustainable Development Goal
SDG 2.1.1	Prevalence of undernourishment
SDG 2.1.2	Prevalence of moderate or severe food insecurity based on the FIES
SPC	The Pacific Community
UNU	United Nations University
VNSO	Vanuatu National Statistics Office
VUV	Vanuatu vatu
WB	The World Bank
WHO	World Health Organization

EXECUTIVE SUMMARY



The analysis of the food data collected in the 2019 National Sustainable Development Plan (NSDP) Baseline Survey finds that a Ni-Vanuatu consumes on average 2760 kcal/capita/day. Despite this high level of dietary energy consumption, one in 12 Ni-Vanuatu still does not have access to enough dietary energy to meet the dietary energy needed for a healthy life and to perform a light level of physical activity. This prevalence is the consequence of disparities that can be observed within the population in terms of accessing dietary energy.

Important differences can be observed between regions, with the urban region of Shefa and Sanma showing the highest levels of average dietary energy consumption and the rural regions of Tafea and Torba having the lowest levels. Disparities in access to dietary energy can also be observed within different population groups, but income (proxied by total expenditure) is the main factor of inequality, as households belonging to the highest quintile of expenditure consume more than twice the amount of dietary energy than less prosperous households.

With an average contribution from fats, proteins and carbohydrates to the dietary energy consumption of 23 percent, 10 percent and 67 percent, respectively, the diet is rich in fats and too low in proteins, even if within the WHO/FAO/UNU[1] recommended norms for a balanced diet. Energy-dense foods contribute to around 80 percent of the average dietary energy consumed, protein-dense foods contribute 10 percent and protective foods rich in essential vitamins, such as fruits and vegetables, contribute 8 percent of the average dietary energy.

The diet in appearance seems relatively diverse, as more than 30 food products contribute to 90 percent of the dietary energy consumed; however only seven products provide more than 50 percent of the dietary energy consumed; rice alone brings 20 percent of the energy. Households consume on average 160 g/capita/day of rice, followed by 140 g/capita/day of cooking banana, 130 g/capita/day of kumara and 120 g/capita/day of cabbage. Well behind are fish and meat products, with an average quantity consumed of 70 g/capita/day and 66 g/capita/day respectively. Even lower in the rankings are milk and milk products with an average daily consumption of 6 g/capita/day.

Cabbage is consumed by 95 percent of households, followed by rice, which is accessed by 93 percent of households. Salt is accessed by 89 percent and sugar by 80 percent of households. Chicken and fish are accessed by only 40 percent of the households. Less than 10 percent of households have access to liquid milk and 13 percent to powdered milk, which are rich sources of calcium.

1 Based on the WHO/FAO/UNU expert consultation (2003) to reach a balanced diet, proteins, fats and carbohydrates should contribute respectively 10-15%, 15-30% and 55-75% to the dietary energy consumption.

With an average cost of VUV 5 per 100 g, "coconut brown", "banana cooking boiled" and "breadfruit" are the least expensive food products, followed by cabbage with an average price of VUV 7 per 100 g. It costs less than VUV 20 to acquire 100 g of rice, bread and sugar, which is almost the same amount needed to acquire 100 g of reef fish. However, rice remains a less expensive source of energy than fish as it costs VUV 56 to acquire 1 000 kcal from rice compared to VUV 242 to get 1 000 kcal from reef fish.

On average a Ni-Vanuatu spends VUV 400 per day to acquire food, which corresponds to around 60 percent of the total expenditure. More than 50 percent of the dietary energy consumed is acquired through cash-based purchases, while 39 percent is sourced through own production. A small amount, 4 percent of the dietary energy, is received for free, or consumed away from home. Less wealthy households rely strongly on own account production, as about 60 percent of the dietary energy they consume is sourced from their own production.

For cereals, 94 percent of the amount consumed is purchased while more than 75 percent of roots/tubers/plantain, fruits and vegetables are own produced. More than 60 percent of the dietary energy consumed from meat and fish is purchased.

Nutrient adequacy as defined by the ratio of the quantity of essential nutrients available for consumption to the average requirements is reached for vitamin A, vitamin B1, vitamin B2, vitamin B12 and vitamin C, but this is mainly due to the very high consumption of cabbage which is the main source of vitamins available for consumption. In turn, nutrient adequacy is not reached for calcium, due to the limited consumption of calcium dense products like milk or cheese. The very low consumption of iron of animal origin, for which absorption by the body is higher, translates to a high level of iron deficiency, reflected by the high prevalence of anaemia among children and women (27 percent and 22 percent respectively).[2]

Overall, these results tend to indicate a diet that is unbalanced, with a high proportion of energy-dense foods to limit such as rice, sugar and oil and a low proportion of body building foods to choose from, such as low-fat meat and low-fat dairy products. Consumption of protective foods like fruits and vegetables is high, as an average Ni-Vanuatu consumes more than 500 g per day of fruits and vegetables, which is higher than the 400 g/capita/day recommended by WHO. However, the choice seems limited, as cabbage, banana, papaya and breadfruit alone contribute 50 percent of these quantities. As such, the typical Ni-Vanuatu diet does not seem to be diversified at national level, and is even less so for some population groups of Ni-Vanuatu in particular.

This is further confirmed by the analysis of the food insecurity experience scale that shows that around 21 percent of people in Vanuatu experience moderate food insecurity, which means these people do not experience hunger, but they do not have regular access to safe and nutritious foods, thus putting them at greater risk of various forms of malnutrition and poor health than the food secure population.

Further analysis of the diet of food insecure households reveals important differences in the cost of 1 000 kcal accessed by food insecure households compared with food secure households, pointing to a higher level of dietary energy consumed and a diet composed of less nutritious foods. The higher level of dietary energy consumption observed among the food insecure can increase the probability of members of these households being overweight or obese and exposed to non-communicable diseases.

Note from the author: Even if the results from the survey are consistent with the overall food security status of the country, they need to be treated and interpreted with caution. The survey was not designed to conduct an in-depth analysis of food consumption and dietary patterns. The food data presented some imperfections, such that levels or indicators need to be interpreted as reflecting survey trends rather than recorded facts. It is only through anthropometric data and individual food consumption surveys that the nutritional status of individuals can be properly informed.

2 Vanuatu Demographic and Health Survey 2013.

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INTRODUCTION

Vanuatu is composed of 83 islands in the Pacific, of which 65 are inhabited by around 280 000 people. Port Vila, on the island of Efate, is the capital, and the provinces of Malampa, Penama, Sanma, Shefa, Tafea and Torba constitute Vanuatu.

On 4 December 2020, Vanuatu graduated from the category of Least Developed Countries (LDCs).[3] This is a remarkable achievement considering the inherent economic difficulties with which Vanuatu is confronted due to its geography and remote location and, above all, its high exposure to frequent natural disasters, mainly in the form of violent cyclones. These latter impair not only the economic and social development of Vanuatu but also agriculture, fishing and tourism, which are the main sources of livelihood for Ni-Vanuatu.

Tourism represents 19.3 percent of the country's GDP. Even if only 13 percent of the land is presently being farmed,[4] agriculture (mainly small-scale) is the main source of living for about two-thirds of the population and makes up 80 percent of exports. Agriculture provides for local consumption as well as for export. Most island families grow food in their gardens, and food shortages are rare. Papayas, pineapples, mangoes, plantains, and sweet potatoes are abundant through much of the year. Production of copra and kava create substantial revenue. Many farmers have been abandoning cultivation of food crops and instead use earnings from kava cultivation to buy food. Copra was the most important cash crop, responsible for over 4.4 percent of the export earnings in 2018. Fish is also a pillar in Vanuatu's life, as more than 70 percent of households in Vanuatu have free access to a beach to collect seafood by diving or fishing.[5] Frozen fish fillets alone contributed to 55 percent of the total export earnings of Vanuatu in 2018.[6]

Despite agricultural exports being an important source of revenue, Vanuatu remains a net importer of food, and in 2018 food products contributed to more than 23 percent of the total imports compared with 6 percent in 2010. Poultry meat, baked goods and processed fish, which contributed to around 1.2 percent of the total value of imports in 2010, increased their share to 7.5 percent in 2018. Rice, which was contributing 1.1 percent of the value of total imports in 2010, saw this share falling drastically to 0.28 percent in 2018. The trade pattern tends to point towards a switch from traditional foods to ultra-processed foods, rich in fats and sugar.

Vanuatu is experiencing a dietary transition that has been observed in most Pacific Islands over the last twenty years. Unfortunately, apart from the Demographic and Health Survey conducted in 2013 in Vanuatu that contains a wealth of very useful indicators on nutrition, no more recent data exists to inform on the current status of the state of food security and consumption in Vanuatu.

In 2019, the Vanuatu National Statistics Office (VNSO) conducted the National Sustainable Development Plan (NSDP) Baseline Survey to inform not only the socioeconomic situation of the country, but also to provide input to the NSDP monitoring and evaluation and to the monitoring of progress towards achieving the SDGs. The NSDP Baseline Survey is an expanded Household Income and Expenditure Survey with a comprehensive module aiming to collect information on the food consumption of the population. The NSDP also includes for the first time the Food Insecurity Experience Scale (FIES), which collects the data needed to inform the SDG 2.1.2 on the prevalence of moderate or severe food insecurity.

3 See UN News webpage: https://news.un.org/en/story/2020/12/1079252
4 SPC PAFPnet: https://pafpnet.spc.int/policy-bank/countries/vanuatu
5 NSDP Baseline Survey 2019–2020.
6 Observatory of Economic complexity: https://oec.world/en/profile/country/vut/

This report presents the analysis of the food consumption and the FIES data collected in the NSDP Baseline Survey. The main purpose of this analysis is to provide some useful statistics on the food consumption patterns of the population that can be used to better inform on dietary transition in the Pacific and, particularly, in Vanuatu.

At the time of the survey, Vanuatu's economy was gradually recovering from the extensive damage caused in 2015 by the devastating cyclone Pam.[7] The country's reconstruction efforts were starting to yield positive results, but at the time this report was drafted, Vanuatu was further hit in March 2020 by the violent cyclone Harold and has been facing the global COVID-19 pandemic. It can be anticipated that some of the trends presented in this report will be affected by these recent events. To this extent the report will provide valuable information in identifying groups of population most at risk of being food insecure and will provide a baseline for further assessments of the impact of cyclone Harold and COVID-19 on food consumption patterns.

The first section of this report discusses SDG Target 2.1. The second section will present the main features of the food consumption in Vanuatu in terms of dietary energy consumption and food expenditure, cost of food or sources of acquisition of food products. The third section will further zoom in on the composition of the diet in terms of products consumed. The fourth section will present the consumption of essential nutrients and finally the last section will focus further on the dietary patterns of the food insecure people.

The analysis was performed using ADePT-FSM[8] software, which produced more than 50 output tables[9] with disaggregation levels going up to the tenth percentile of expenditure. As not all indicators or disaggregation levels are relevant, only the most meaningful trends and groups of population are analysed.

7 On Friday 13 March 2015, Cyclone Pam tore through the island nation of Vanuatu with devastating force, claiming lives and destroying homes, hospitals and crops. Thousands were displaced from their homes and 50%–90% of infrastructure was destroyed, with the remoter islands suffering the worst damage.
8 ADePT-FSM is a free downloadable software developed by World Bank and FAO to analyse food data collected in the Household Income and Expenditure Survey and derive indicators of food consumption by population groups. The software can be downloaded at: http://www.fao.org/economic/ess/ess-fs/fs-methods/adept-fsn/en/
9 For more information on output tables see "Analyzing food security using household survey data", FAO/WB. 2014 (http://www.fao.org/economic/ess/ess-fs/fs-methods/householdsurvey/en/#.XtTC3W5uI2w) and "Optimizing the use of ADePT-FSM for nutrient analysis" – ADePT-FSM V3. FAO. 2018. http://www.fao.org/fileadmin/templates/ess/foodsecurity/Optimizing_the_use_of_ADePT_FSM_for_nutrient_analysis.pdf

I. SDG TARGET 2.1 AND VANUATU[10]

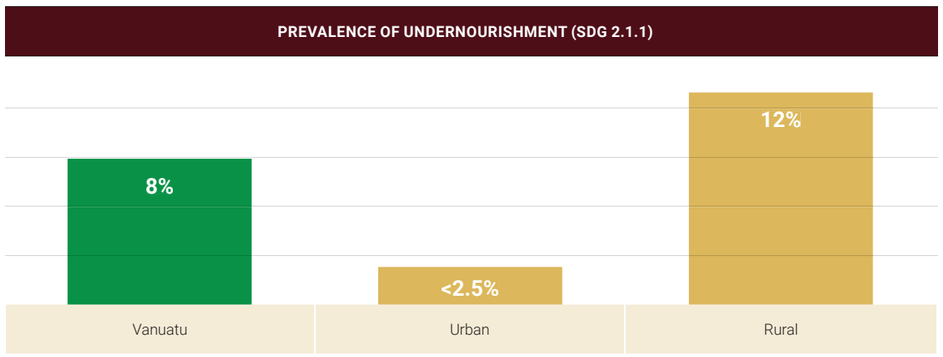
Vanuatu adopted SDG 2.1.1 and 2.1.2 as indicators to monitor Target 2.1 on ending hunger and food insecurity. At the time that Vanuatu presented its Voluntary National Review,[11] only information on SDG 2.1.1 (prevalence of undernourishment) was available and it was based on FAO estimates. The NSDP Baseline Survey, in collecting both food insecurity experience scale and food data, will provide a great opportunity for Vanuatu to report on SDG 2.1.2 (prevalence of moderate or severe food insecurity based on the food insecurity experience scale [FIES]) and will provide background information needed to estimate and update the SDG 2.1.1 indicator.

a. SDG 2.1.1 - Prevalence of undernourishment

The prevalence of undernourishment or percentage of the population whose dietary energy intake is lower than the amount of energy needed to be in good health and have an active life, has been regularly monitored by FAO and reported yearly in the State of Food Security and Nutrition in the World.[12] The prevalence of undernourishment has been used to monitor and report on global hunger back to 2000 with the Millennium Development Goals and has been endorsed in September 2015 as Sustainable Development Goal 2.1.1. In order to provide a comparable estimate over time and across countries, for global monitoring, the prevalence of undernourishment is based on the Dietary Energy Supply compiled by FAO in the Food Balance Sheets.

However, whenever food data are collected in a large-scale representative national survey, it is possible to derive the average amount of energy consumed in the country together with the indicator of dispersion of the dietary energy consumption within the population (see Methodological Annex 2.1).

Figure 1 **Percentage of people undernourished in Vanuatu**



10 This assessment does not include potential impact of the cyclone Harold nor the COVID19 pandemic.
11 During the High Level Political Forum at the UN Headquarters in New York on Wednesday 17th July 2019.
12 The FAO State of Food Security and Nutrition in the World: http://www.fao.org/state-of-food-security-nutrition/en/

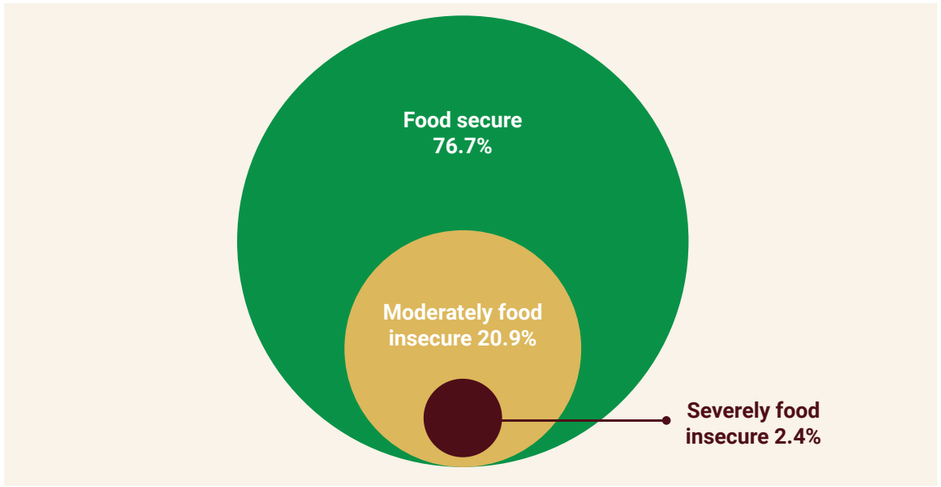
Based on the food consumption data collected in the 2019 NSDP Baseline Survey, around one person in 12 was undernourished in Vanuatu in 2019[13], [14] with a margin of error around the prevalence of 2.5 percentage points. This means that around 24 000 people are experiencing hunger in Vanuatu. Undernourishment is lower in urban areas (less than 2.5 percent) than in rural areas (around 12 percent) and this is due to the higher level of dietary energy consumption observed in urban areas than in rural areas and the more equal access to dietary energy across urban areas than across rural areas, as shown by the coefficient of variation (respectively 22 percent and 33 percent).

b. SDG 2.1.2 – The prevalence of moderate or severe food insecurity based on the FIES

The Food Insecurity Experience Scale (FIES) is composed of eight dichotomous questions asking respondents to report on their experience in accessing enough and/or nutritious food with respect to their resources. The scale has been adopted to monitor progress towards SDG 2.1 through the SDG 2.1.2 indicator of the prevalence of moderate or severe food insecurity based on the FIES. The FIES was included by VNSO in their 2019 NSDP Baseline Survey. This is the first time the FIES was included in a national representative survey in Vanuatu. Food insecurity as measured by this indicator refers to limited access to food, at the level of individuals or households, due to lack of money or other resources[15] (more detail in the Methodological Annex 2.2).

The analysis of the FIES finds that around 2.4 percent of Ni-Vanuatu (a little more than 7 000 individuals[16]) were exposed to severe levels of food insecurity in 2019, implying reductions in the quantity of food consumed to the extent that they have possibly experienced hunger.[17]

Figure 2 **Prevalence of food insecurity in Vanuatu based on the FIES (% of individuals)**



13 This estimate reflects only the situation in Vanuatu in 2019.
14 This estimate is close to the FAO estimate based on a lower estimate of the Dietary Energy Supply of 2600 kcal/capita/day in 2015/17 from the Food Balance Sheet and a lower coefficient of variation of 28%. See SOFI 2020: http://www.fao.org/publications/sofi/2020/en
15 Note that the FIES module introduced in the NSDP baseline survey asks respondent to report on their experience in accessing food with respect to "lack of money, lack of access to natural resources or other environmental factors".
16 Based on reference population of 295 495 individuals in Vanuatu.
17 This estimate is slightly lower than the estimate of the prevalence of undernourishment. Both are a measure of severe food insecurity but compared with the prevalence of undernourishment, the prevalence of severe food insecurity based on the FIES is a direct measure of people's access to a sufficient quantity of food, and it complements the information provided by the prevalence of undernourishment, which is only an indirect measure of lack of access to dietary energy.

A broader look at the extent of food insecurity beyond severe levels and hunger reveals that an additional 61 700 individuals have experienced food insecurity at moderate levels (about 20.9 percent of the population). This implies that these additional people did not have regular access to safe and nutritious foods, even if they were not necessarily suffering from hunger, thus putting them at greater risk of various forms of malnutrition and poor health than the food secure population. This percentage is further confirmed by the 16 percent of households who had the feeling that the members of their household do not have sufficient access to healthy local foods.[18]

Food insecurity is higher in rural areas, as around 27 percent of Ni-Vanuatu (a little less than 58 800 individuals[19]) are moderately or severely food insecure; 3 percent (around 6 530 individuals) have experienced hunger. In urban areas, "only" 13 percent of Ni-Vanuatu (a little more than 10 000 individuals) are food insecure and less than 1 percent of Ni-Vanuatu living in urban areas have experienced hunger.

Table 1 Prevalence of food insecurity based on the FIES at regional level (% of individuals)

	VANUATU (%)	RURAL (%)	URBAN (%)
Moderately or Severely food insecure	23.3 (±2.2)	27.0 (±2.7)	12.9 (±3.5)
Severely food insecure	2.4 (±0.7)	3.0 (±1.0)	0.8 (±0.7)
Size of the sample	4549	3427	1122

Note: Margin of error into bracket with a design effect of 2 and confidence level of 90%

18 In the section on food security, the first question households were asked was "do you feel the members of your household have sufficient access to or supply of healthy local foods (yes/no)?"

19 Based on reference population in urban and rural areas of respectively 77 745 and 217 750 individuals.

II. BASIC FEATURES OF THE FOOD CONSUMPTION BY POPULATION GROUPS

The following categories[20] of the population are analysed in this report:

- National
- Quintile of per capita total household expenditure (used as proxy for income)
- Gender of the head of the household
- Composition of the household in terms of number of children less than 14 years old present in the household (0 child, 1 child, 2 children and more than 3 children)
- Education level of the head of the household (pre and primary school, junior secondary school, senior post-secondary/university/technical and other)
- The household is involved in agriculture activities (yes/no)
- The household is involved in fishing activities (yes/no)
- The household is involved in livestock activities (yes/no)
- The household is engaged in handicraft activities (yes/no)
- The household receives remittances from another household (yes/no)
- The household has access to a safe drinking water source (yes/no)[21]
- Level of severity of food security based on the FIES[22] (food secure or mildly food insecure and moderately or severely food insecure)
- Urban/rural
- Province/region

In addition to these groups we also looked at the ethnicity, marital status, age, and type of activity of the household head, or whether the household is involved in aquaculture activities and whether the household has access to a private toilet. Except for ethnicity (for which the sample was unbalanced, with 99 percent of the household sampled being Melanesian), the other population groups also revealed some differences that are shown/discussed in some sections when relevant, but to avoid the reader being overloaded, the tables attached to this report do not include the results for these groups.[23]

In addition to the above population groups, indicators are also provided for each food product and by food groups following the FAO/WHO Global Individual Food consumption data (GIFT) Tool.[24]

Household Income and Expenditure Surveys are designed to collect information at the level of the household, and therefore only total amount of food consumed by the household is reported, from which it is not possible to infer intra-household food allocation; for this reason, all the indicators are expressed

20 Categories were selected based on their relevancy and possibility of being disaggregated at a level allowing for reliable estimates.

21 A categorical variable was created from the question "what is the main source of water used by this household for drinking?". Whenever the source of drinking water is "protected private or public well/tank, piped water, public tap or bottled water", the categorical variable is allocated the value of 1 referring to "safe drinking water" and whenever the source of drinking water is from unprotected tank/well, surface or ground water" the value of 0 was allocated and the variable refers to "non safe drinking source".

22 See section 5 for the creation of the food secure and food insecurity classes.

23 Results for these groups are available upon request to VNSO.

24 The food products were grouped according to FAO nutrition experts who developed the GIFT platform http://www.fao.org/gift-individual-food-consumption/data-and-indicator/en/ developed from the FoodEx2 classification. FoodEx2 is a comprehensive food classification and description system aimed at covering the need to describe food in data collections across different food safety domains https://efsa.onlinelibrary.wiley.com/doi/pdf/10.2903/sp.efsa.2015.EN-804.

in per capita per day and do not consider the age and sex of the individuals. Further, due to measurement error around the food consumption estimate associated with survey design and processing (see Annex 1 for limitation and challenges when analysing the food data collected in the NSDP Baseline Survey), the analysis is performed for representative groups of people and not a single household or individual. The unit of measurement are kcal, grams, VUV and percentage.

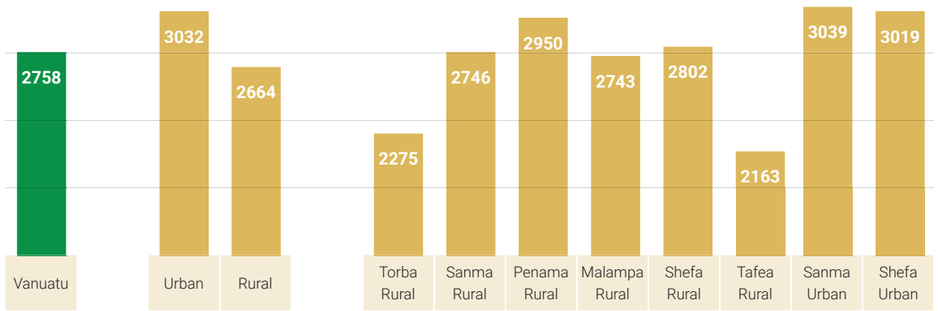
Finally, as already mentioned, it is only through individual intake surveys that it is possible to infer the food consumption of individuals. Food data collected in the 2019 NSDP Baseline Survey does not substitute for such surveys and they are – at best – an approximation of the amount of food that is available to the household to be consumed over a certain reference period. Therefore, results presented below reflect only a pattern and whenever the term consumption is used it does not refer to actual intake.

a. Dietary energy consumption

On average a Ni-Vanuatu consumes 2760 kcal per day (ADePT table 34). This amount of dietary energy consumption (DEC) is not equally distributed among the population, which reflects the coexistence of overweight/obesity (people consuming an amount of dietary energy higher than what is needed to be in good health) and undernourished people (people having access to less dietary energy than the minimum required to maintain a normal, active and healthy life).

The main differences can be observed between urban and rural populations, with the rural population consuming, on average, 350 kcal per capita per day less than people living in urban areas. The rural regions of Torba and Tafea show the lowest level of DEC while the urban regions of Sanma and Shefa exhibit the highest level of DEC.[25]

Figure 3 Average dietary energy consumption by region



Households headed by a female consume on average 100 kcal/capita/day more than households headed by a male. Around 40 percent of female headed households are located in urban areas, whereas only 17 percent of male headed households are in urban areas. Of the women who are heading a household, 60 percent are not working and are taking care of the household or the family, compared with less than 30 percent of the male headed households. One out of three of the women heading a household is less than 32 years old and one out of five is not married or is a widow. Almost one out of two female headed households belong to the fourth and fifth expenditure quintile compared with 36 percent of male headed households.

25 Note that the level of consumption in Tafea and Torba is suffering from under-reporting due to difficulties encountered by enumerators during data collection for 30% of the households in Torba and 50% of households in Tafea. Therefore results are not representative of the "true" level of consumption in these regions and need to be apprehend with caution.

Figure 4 Average dietary energy consumption by demographic characteristics of the household

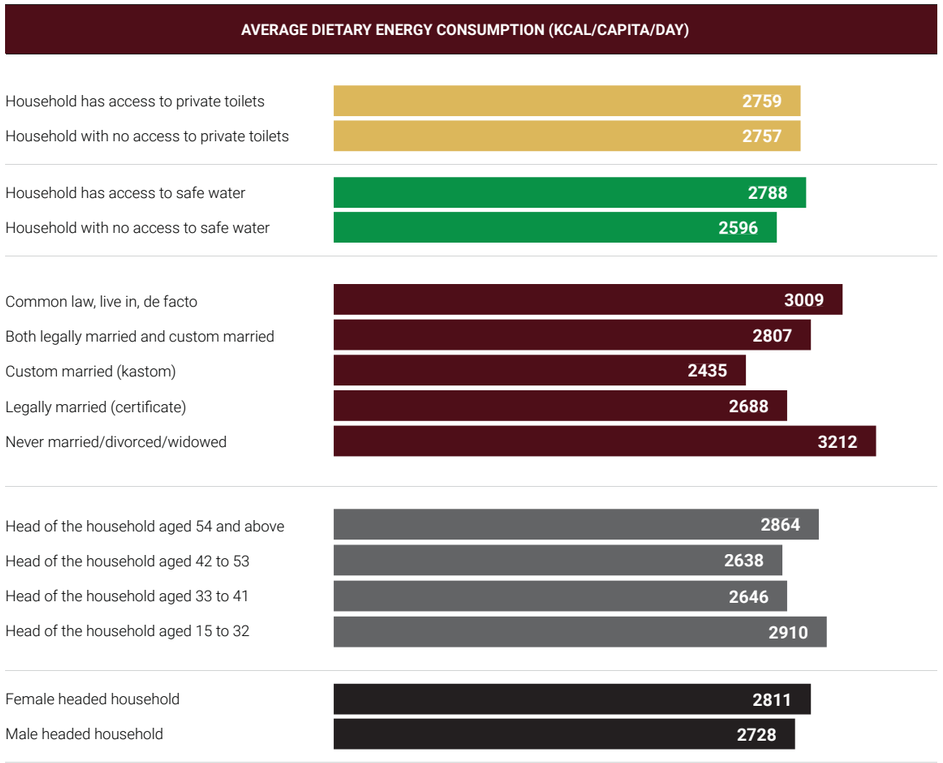
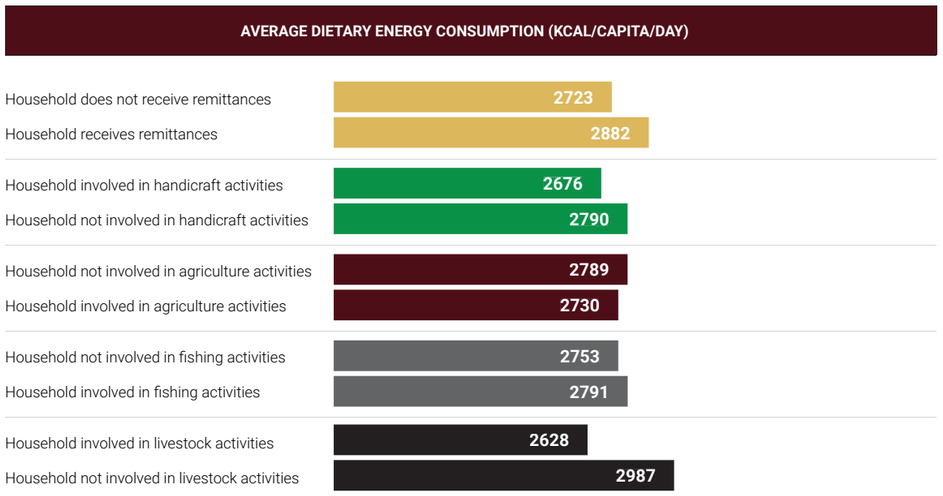


Figure 5 Average dietary energy consumption by demographic characteristics of the household



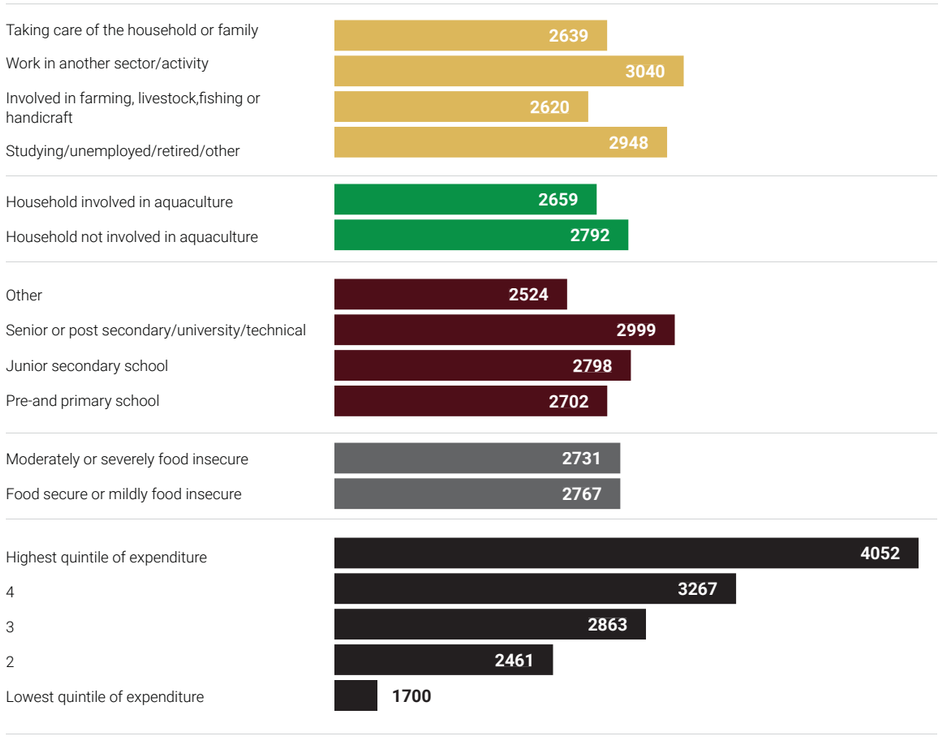
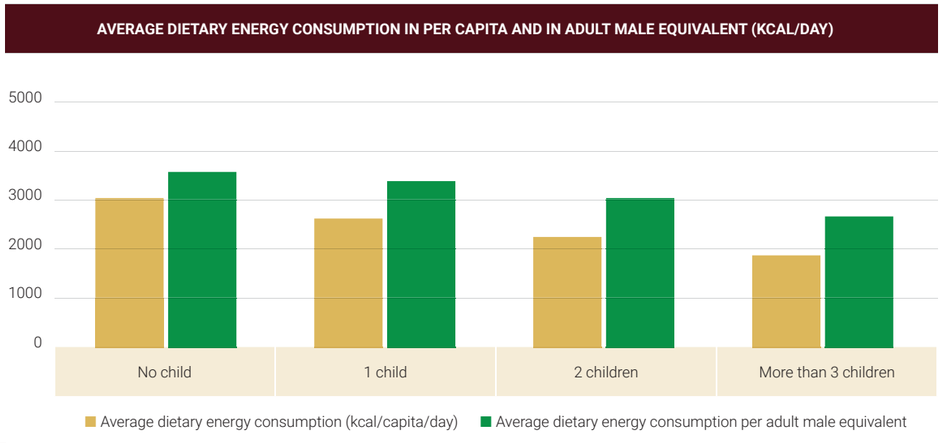


Figure 6 **Difference in DEC between households with no child and with children, expressed in per capita and in adult male equivalent**



Female-headed households are not that different from male-headed households in terms of size or number of children, but the higher the number of children, the lower the amount of calories per capita available for consumption within the household. Households with no children consume around 1500 kcal/capita/day more than households with more than three children.[26] However, when we look at the difference expressed in adult male equivalent, the gap is still important but less dramatic, with a difference of less than 1 000 kcal in adult male equivalent per day.

26 It cannot be excluded that within households with no child, a huge amount of dietary energy available for consumption is not consumed but wasted.

Another demographic characteristic that affect the dietary energy consumption is age, as households whose head is aged 33 to 53 tend to consume less than younger or older households. Marital status of the head of the household also seems to affect the DEC, as households whose head is not married or is widowed tend to have a higher DEC than households whose head is living with someone as a couple.

Based on the 2019 NSDP Baseline Survey, more than 16 percent of households still do not have access to a safe source of drinking water, and 31 percent do not have private toilet facilities. Households with no access to a safe drinking water source are consuming on average 200 kcal/capita/day less than households having access to a safe drinking water source. These households also reflect the huge disparities that exist in the DEC due to socioeconomic characteristics of the households. This is because more than 30 percent of the households with poor access to safe drinking water belong to the first expenditure quintile, which is also the quintile consuming on average an amount of dietary energy much lower than the minimum amount of energy[27] required to maintain a normal, active and healthy life.[28] Conversely, the richer the household the higher the amount of dietary energy that is accessed, with households belonging to the highest quintile of expenditure consuming at least twice as much as those belonging to the first quintile.[29] Households whose head has a high level of education also tend to access a higher amount of dietary energy than households with lower levels of education – this trend is also reflected in the higher amount of energy consumed by households whose head is not involved in aquaculture, agriculture, livestock or handicraft activities. There does not seem to be much difference in the average dietary energy consumption of households involved in fishing activities (13 percent of the households) compared with those not involved in fishing. Households who receive remittances (23 percent of the households) consume on average 150 kcal/capita/day more than those who do not receive remittances. Finally, a very slight difference can be observed in the DEC between households who are food secure compared with those who are experiencing moderate to severe levels of food insecurity.

To assess which characteristic most affects the average DEC, we performed a simple linear regression linking the log of average DEC to log of income and all the regional, demographic and socioeconomic characteristics of the households. Controlling for total expenditure allows the capture of the real effects of the household characteristics on the DEC and it also removes part of the variability that exists within the population groups. The regression confirms most of the trends described above, with the most significant impact being observed with the income level of the household, its geographic location, the number of children[30] (the larger the household the lower the DEC), the age of the head of the household (the older, the lower the DEC), whether the household is involved in agriculture, fishing or aquaculture activities, or whether the household has access to a private toilet. No significant difference was shown between households involved in livestock or handicraft activities, even if the negative value of the respective parameters tends to confirm a slightly lower DEC for households involved in these activities. Among households receiving remittances, or having access to safe water, the parameter is positive but not that significant. Surprising is the negative value of the parameter associated with the level of education that shows lower DEC is associated with a higher level of education, in contrast with the average DEC observed for these groups, pointing towards a lot of variability withing these groups. The same is observed for female headed households, which on average show a higher DEC than male headed households but for which the negative value of the parameter and its low significance points towards large inequalities in accessing DEC among female headed households. The same trend is observed among food insecure households. The activity of the head of the household does not seem to significantly affect the DEC (see results of the regression in Annex 3).

27 Based on a minimum dietary energy requirement of 1720 kcal/capita/day for Vanuatu.

28 Note that this does not mean that all individuals living in the first expenditure quintile are undernourished, as the prevalence of undernourishment is not based on a headcount approach, but the probability of finding one individual undernourished in a household belonging to the first expenditure quintile is higher than the probability of finding one individual undernourished living in a household belonging to the highest quintile of expenditures.

29 It is important to remember that what is measured is the dietary energy available for consumption by the household members and not the actual amount of dietary energy consumed by each individual of the household. High amounts of dietary energy can reflect an important quantity of food that is wasted (food left on plate, food wasted during cooking, food given to pets, etc.) after having reached the household.

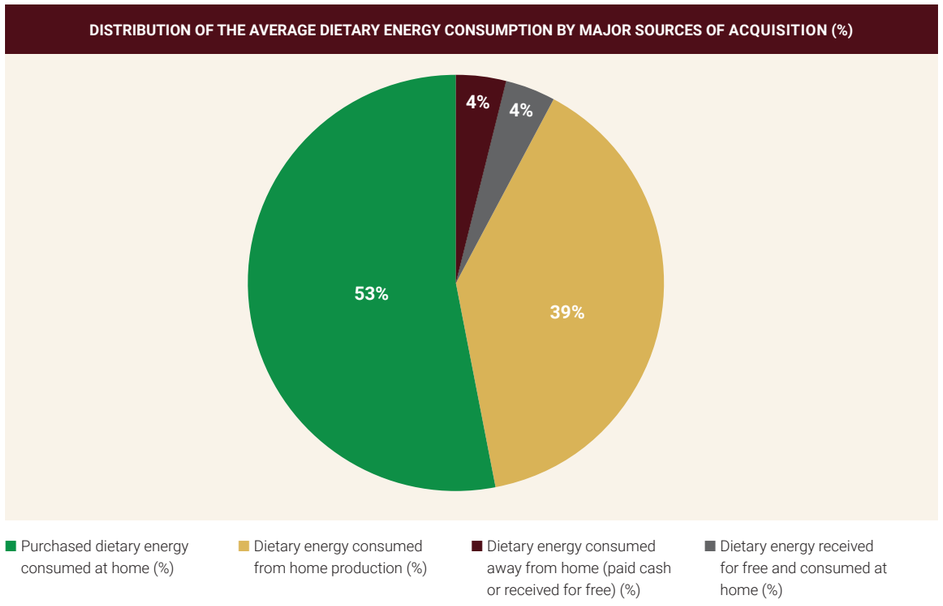
30 Note that the value of the parameter is slightly biased as children consume on average fewer calories than adults and to better capture the effect of number of children, the regression should have been performed on the DEC expressed in adult male equivalent.

b. Main sources of dietary energy consumption

More than half of the dietary energy consumed (DEC) on average per day by a Ni-Vanuatu is purchased and 40 percent comes from food that is own produced. Despite the inclusion of a specific survey module on food away from home, it seems that food away from home contributes only to 4 percent of the total DEC, and food received for free also contributes 4 percent of DEC (ADePT table 35).

These trends slightly differ when we look at geographic, demographic or socioeconomic characteristics of the households. More than 80 percent of the dietary energy consumed in the house in urban areas is purchased, and food consumed away from home contributes 8 percent of the energy consumed, while 50 percent of the dietary energy consumed in rural areas is own produced, and food received for free represents 5 percent of the energy consumed. The strong reliance of urban households on products acquired in cash make them more vulnerable to potential price hikes or market disruptions, while rural households who obtain a large portion of their dietary energy from their own production are more vulnerable to natural disasters, especially in the rural regions of Tafea, Torba and Malampa where reliance on own production is the highest. Penama is the rural region with the highest average DEC but it is also the region where 7 percent of the dietary energy consumed (around 200 kcal/capita/day) is received for free.

Figure 7 **Contribution of the main sources of acquisition to the average dietary energy consumed (%)**



Marital status of the head of the household or his/her age does not affect the sources of energy acquisition; however, more than 60 percent of the dietary energy consumed within households headed by women are sourced from purchases, while 49 percent of DEC consumed within male headed households is purchased and 43 percent is own produced. Interesting also is the higher contribution of DEC sourced from food away from home within female headed households than within male headed household (5 percent against 3 percent).

Households belonging to the highest quintile of expenditure purchase more than 70 percent of the dietary energy they consume and 6 percent is consumed away from home. Of the DEC consumed by households in the lowest quintile, 60 percent is own produced. High quintile households have a relatively high contribution of food received for free, which may be as a result of a broader involvement in church or community activities among these households. Not surprising is the larger contribution of own production to the average dietary energy consumed among all households involved in agriculture, fishing, livestock or aquaculture activities.

Finally, the higher the level of education, then the larger is the contribution of food purchased or food consumed away from home to the dietary energy consumption. This trend is fully consistent with the finding that 66 percent of the households whose head possessed a post-secondary or senior level of education also belong to the fourth and fifth expenditure quintile.

Figure 8 **Contribution of the main sources of acquisition to the average dietary energy by regions**

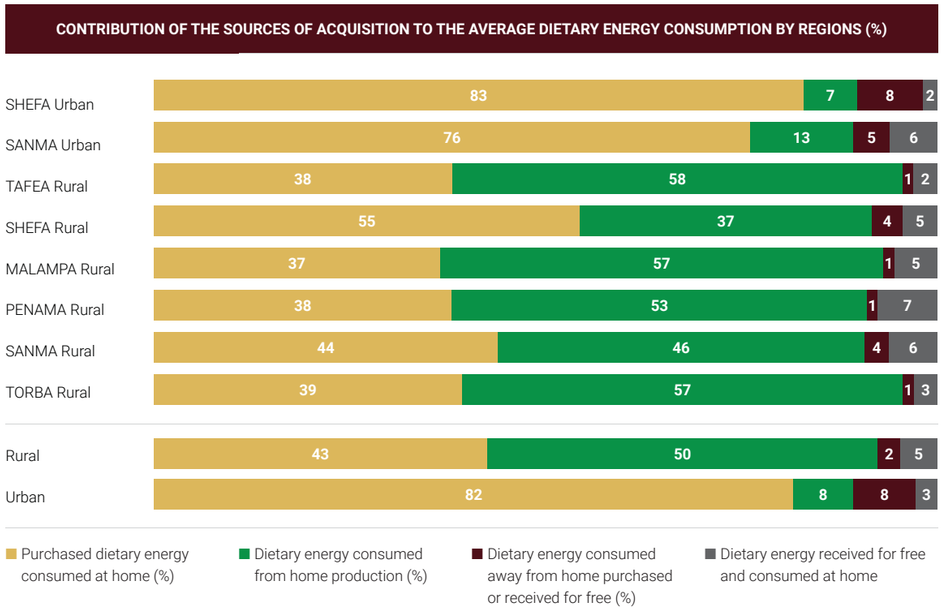


Figure 9 **Contribution of the main sources of acquisition to the dietary energy by demographic characteristics of the household**

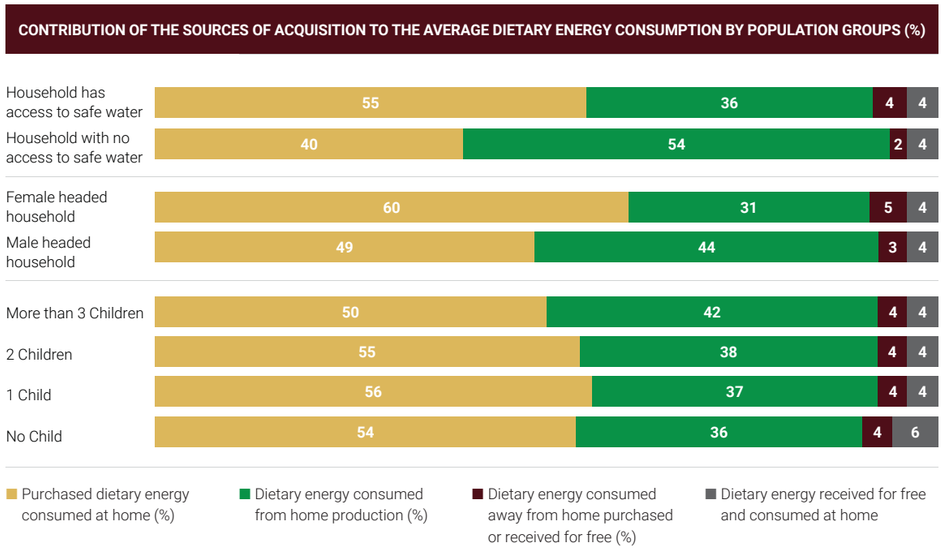
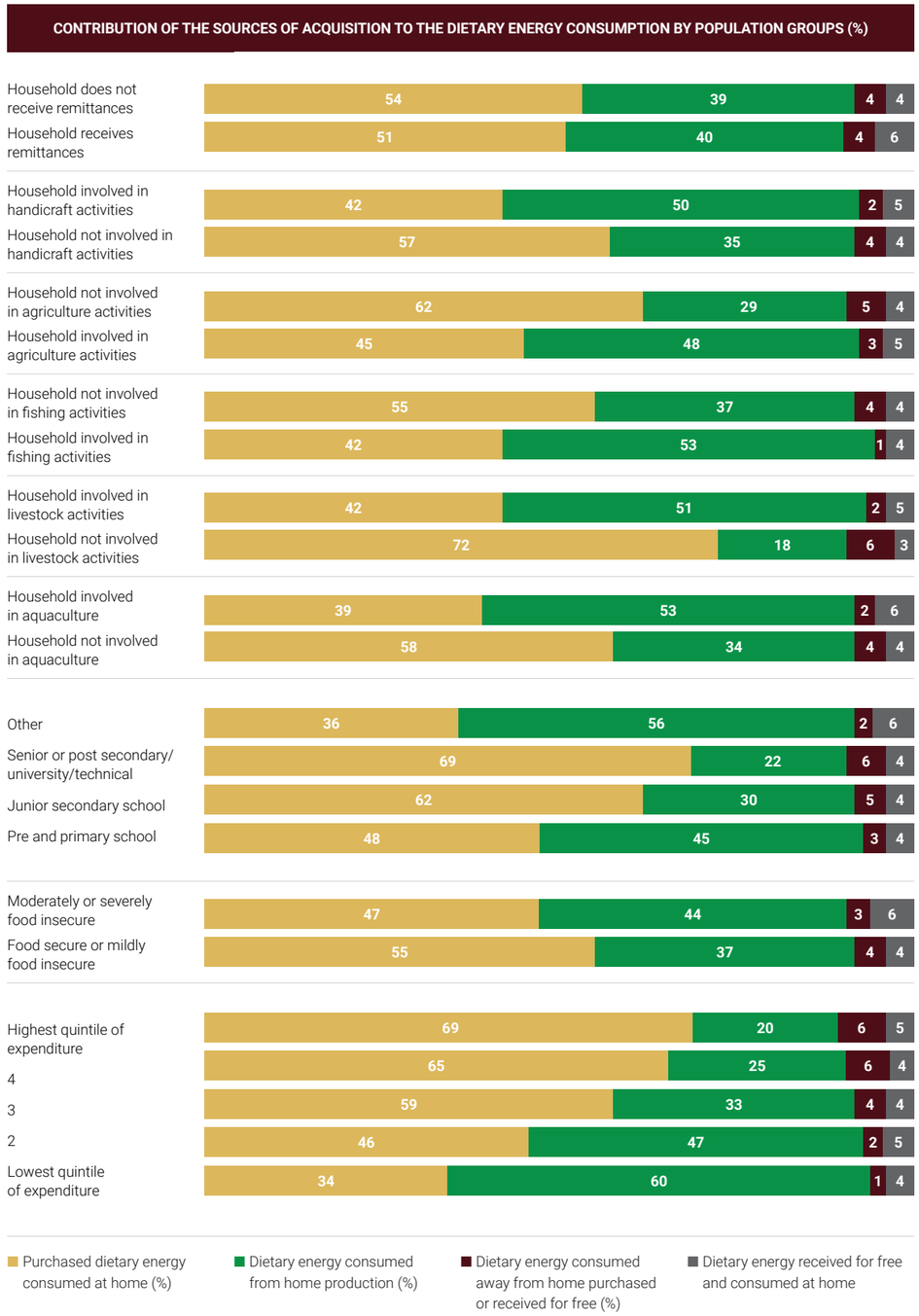


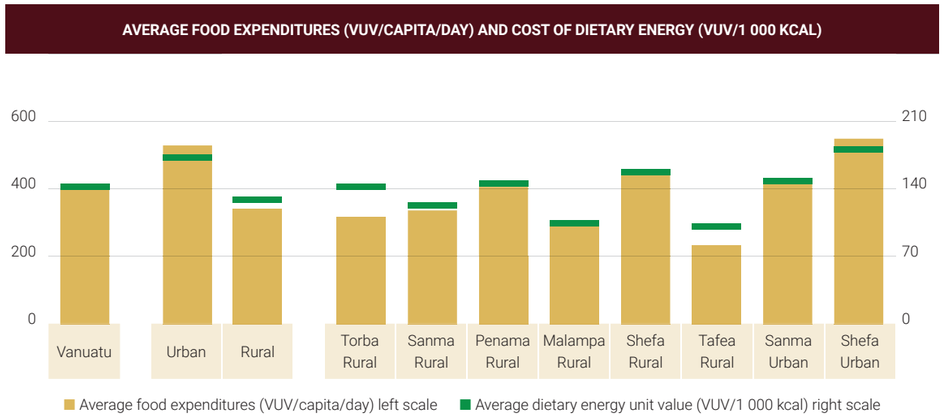
Figure 10 Contribution of the main sources of acquisition to the dietary energy by socio economic characteristics of the household



c. Cost of the dietary energy

To acquire the 2760 kcal consumed on average by a Ni-Vanuatu, a household spends on average VUV 400 per day, which means that it costs a little more than VUV 140 to acquire 1 000 kcal (ADePT table 34).

Figure 11 Regional disparities in the average food expenditure and cost of 1 000 kcal



Not all households spend this amount to acquire food and not all of them access the same quality of dietary energy consumed. Urban households spend around VUV 180 more on food than rural households and access more expensive calories, since an urban household spends 1.3 times the amount spent by rural households to acquire 1 000 kcal. But disparities can also be observed between the rural areas, as it costs less than VUV 110 to acquire 1 000 kcal in the rural Malampa and Tafea regions compared with VUV 160 in rural Shefa. Such a high difference in the cost of dietary energy reflects important disparities in the quality and variety of the dietary energy consumed: rural households access less expensive sources of energy from local energy dense foods such as coconut, cooking banana, taro and kumara compared with urban households that are consuming more expensive foods like rice, lunches taken away from home and crackers.

Disparities in the cost of dietary energy are also observed between households with different demographic or socioeconomic characteristics. Rich households spend around five times more on food than the least wealthy households and they access calories that are twice as expensive. Households not involved in livestock, aquaculture, agriculture or handicraft activities also access foods that are more expensive but less dense in energy than do households involved in these activities. However, this trend is not true for households engaged in fishing activities or receiving remittances, as the difference in dietary energy cost is minor. If food secure and food insecure households are accessing on average the same amount of dietary energy, food insecure households spend on average VUV 30 less to access 1 000 kcal than food secure households, which confirms that food insecure households are accessing less nutritious foods than food secure households (the difference in dietary pattern between food secure and food insecure households will be further discussed in Section V of this document).

Figure 12 **Average food expenditures and cost of 1 000 kcal by demographic characteristics of the household**

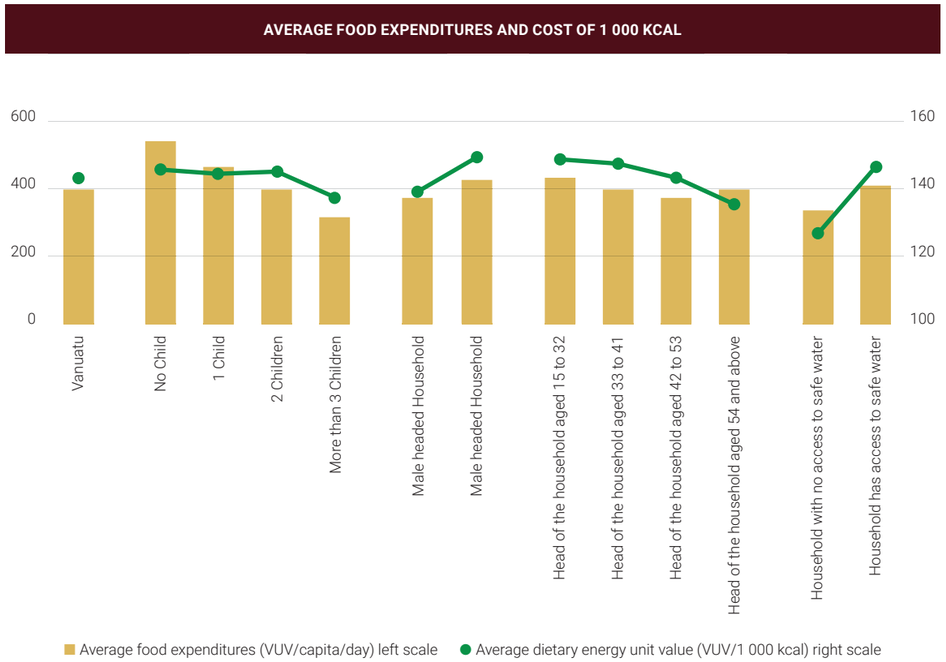
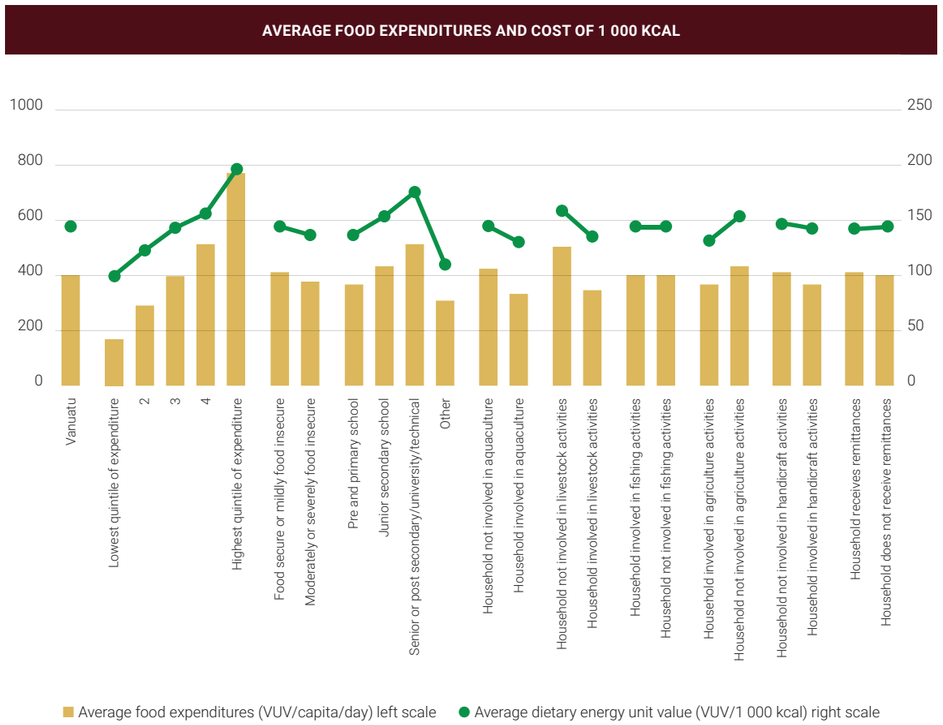


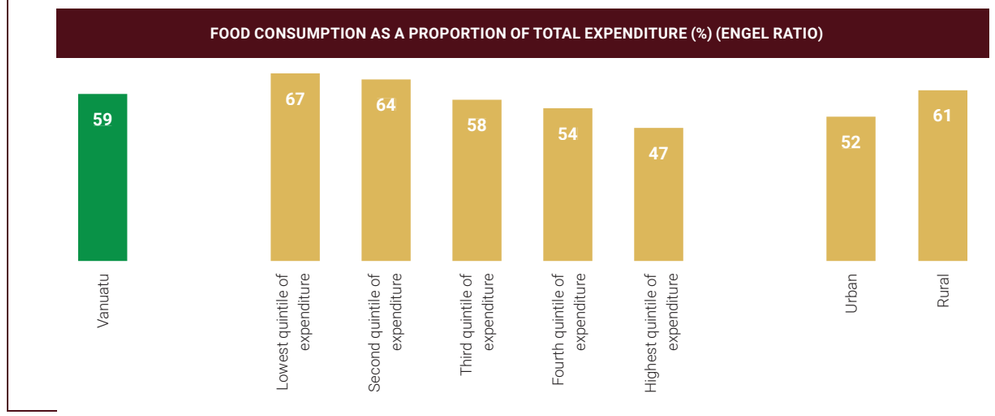
Figure 13 **Average food expenditures and cost of 1 000 kcal by socioeconomic characteristics of the household**



Compared with female headed households, male headed households spend around VUV 40 less to acquire 1 000 kcal, and households with no access to a safe source of drinking water also access calories that cost on average VUV 80 less than households with access to a safe source of drinking water. This trend is also consistent with the fact that 31 percent of households with no access to a safe source of drinking water also belong to the lowest quintile of expenditures.

Expenditure on food accounts for around 60 percent of total household consumption expenditure (ADePT table 36). Households in the lowest quintile of expenditure allocate around 70 percent of their expenditure to food. Comparatively, households in the highest quintile (most wealthy 20 percent of the population) allocate less than 50 percent of the budget to food. Rural households also tend to devote a larger part of their budget to food than do urban households.

Figure 14 **Food consumption as a proportion of total expenditure**



III. COMPOSITION OF THE DIET OF A NI-VANUATU

a. Contribution of main food groups

To provide a broad overview of the main categories of food products consumed, products were categorised according to 19 food groups defined on the basis of their nutritional relevance, following the classifications used in the FAO/WHO Global Individual Food consumption data Tool (GIFT). In the case of Vanuatu, out of the 19 food groups, only 17 were covered by the food recall section of the NSDP Baseline Survey[31] and the group of "tobacco/kava" was added because of the important consumption of kava in Vanuatu and its potential negative impact on health. Around 151 food products were reported, of which three products referring to breakfast, lunch or dinner were consumed away from home. With more than 20 food products, the group of "vegetables" is the most diversified followed by the group of "beverages" (19 products), then "fruits" (17 food products) and "sweets and sugar" (16 food products). The groups of "eggs" and "foods for particular nutritional uses" are less diversified, being only represented by one food product. But not all households have consumed all the products reported in a group. For instance, only two products in the group of vegetables were consumed by at least one third of the households in the previous seven days; all the other vegetables were consumed by less than one household out of three. Conversely, of the six products contained in the groups of tubers, four are accessed by more than one household in three.

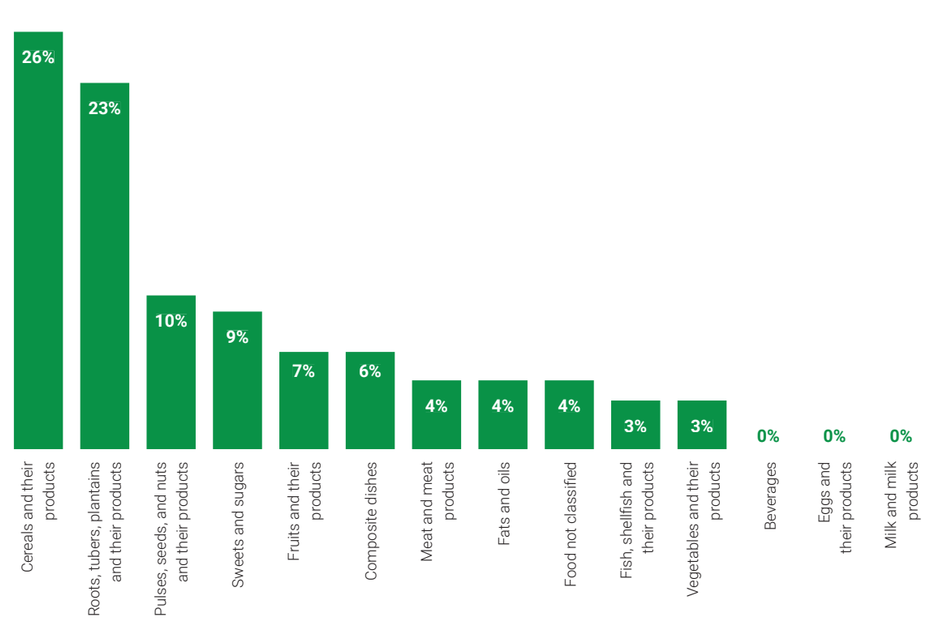
Table 2 **Number of products reported by food group**

FOOD GROUP	NUMBER OF FOOD PRODUCTS	NUMBER OF PRODUCTS ACCESSED BY AT LEAST ONE HOUSEHOLD IN THREE
Cereals and their products	7	3
Roots, tubers, plantains and their products	6	4
Pulses, seeds and nuts and their products	5	1
Milk and milk products	7	0
Eggs and their products	1	3
Fish, shellfish and their products	9	2
Meat and meat products	9	3
Vegetables and their products	21	2
Fruits and their products	17	5
Fats and oils	5	1
Sweets and sugars	16	2
Spices and condiments	7	1
Beverages	19	0
Foods for particular nutritional uses	1	0
Food not classified (food consumed away from home)	5	0
Composite dishes	11	2
Savoury snacks	2	0
Tobacco/kava*	3	2
TOTAL	**151**	**31**

** Even if kava brings energy when chewed, it is not considered as food. Tobacco does not bring energy and is not considered food. These products are considered to be toxic.*

Half of these 18 food groups bring 90 percent of the dietary energy consumed, and "cereals" and "roots/tubers/plantains" bring half of this dietary energy (ADePT table 40). The group of "pulses/seeds/nuts" is the third main source of dietary energy, contributing 10 percent of the dietary energy consumed and mainly in the form of brown coconut.[32] Protein rich animal foods contribute to no more than 7 percent of the dietary energy consumed. With an average edible quantity consumed of 540 g/capita/day, the consumption of fruits and vegetables in Vanuatu is well above the 400 g/capita/day recommended by WHO as one of the 25 indicators of its Global Action Plan for the Prevention and Control of Noncommunicable diseases.[33]

Figure 15 **Average dietary energy consumption by food groups**



31 None of the food products belonging to the groups of "insects, grubs and their products" and "food additive" were collected in the food recall section of the questionnaire.

32 In the GIFT classification, coconut brown is classified within group of pulses/seeds and nuts.

33 World Health Organization 2013. *Global action plan for the prevention and control of noncommunicable diseases 2013–2020.* Geneva: WHO.

b. Main food products consumed

Out of the 151 products collected in the food recall section of the 2019 NSDP Baseline Survey, 19 food products contribute to 80 percent of the dietary energy consumed. With an average daily consumption of 160 grams per capita, rice is the main provider of energy with one calorie out of five consumed coming from rice (ADePT table 49). Cooking banana and kumara are the second and third most consumed products with an average edible[34] quantity consumed of around 140 g/capita/day and 135 g/capita/day, respectively; together they contribute 11.5 percent of the total dietary energy consumed. Because of its high energy content (more than 400 kcal per 100 grams per edible product) brown coconut is the second source of dietary energy, contributing 8 percent of the average dietary energy consumed for an average quantity consumed slightly higher than 50 g/capita/day. With an average consumption of 30 g/capita/day and 20 g/capita/day respectively, chicken and beef are the most consumed meat products; however they contribute together less than 3 percent of the dietary energy consumed. Reef fish is the most consumed fish product in terms of quantity, with an average consumption slightly higher than 30 g/capita/day, but it contributes only 1 percent of the average dietary energy consumed.

Table 3 Average consumption of products contributing to 80 percent of the average dietary energy consumption

	AVERAGE QUANTITY AS PURCHASED (G/CAPITA/DAY)	AVERAGE EDIBLE QUANTITY CONSUMED (G/CAPITA/DAY	CONTRIBUTION TO THE TOTAL DEC(%)
Rice, not further specified	163	163	20.0
Coconut, brown	111	54	7.8
Banana, cooking, raw	221	144	6.6
Kumara / sweet potato	149	135	4.9
Taro, common	132	119	4.8
Crackers, all others	30	30	4.7
Cassava / tapioca / manioc	78	73	4.0
Laplap (grated cassava, cooked)	62	62	3.4
Lunch away from home	n/a	n/a	3.2
Oil, cooking	9	9	3.0
Banana, cooking, boiled	66	66	2.7
Yam, not further specified	81	70	2.3
Sugar, not further specified	16	16	2.3
Chicken, not further specified	41	30	2.2
Bread, loaf, all others	24	24	2.1
Bread, loaf, not further specified	24	24	2.1
Flour, not further specified	12	12	1.5
Cabbage, slippery bush	123	123	1.4
Banana	50	33	1.4
Beef, not further specified	23	21	1.2
Fruit, not further specified	56	38	1.0
Butter, not further specified	4	4	1.0
Breadfruit	33	26	1.0
Papaya	100	70	0.9
Nuts, not further specified	6	4	0.8
Avocado	13	9	0.7
Cake, not further specified	5	5	0.6
Tuna canned, not further specified	12	11	0.6

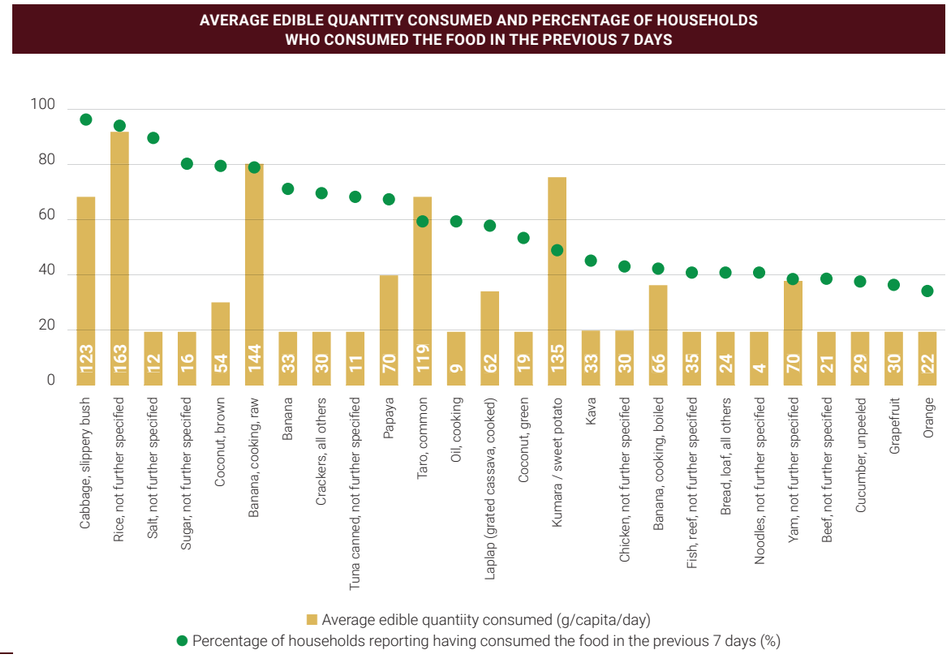
Note. n/a indicates the that the data were not available

34 Edible quantity refers to the food after the non-edible portion (skin, bones, seeds, etc) has been removed. More than half of the coconut and one third of cooking banana are not edible, while only 9% of kumara is non-edible and 100% of rice is edible.

c. Main products accessed by households

The percentage of households who reported having consumed the food during the previous 7 days is a good indicator not only of consumer preference but also of product availability and accessibility. In fact, if 21 grams of beef are consumed on average per day per capita in Vanuatu, not all Ni-Vanuatu are consuming beef. Indeed only 39 percent of households reported that they consumed beef during the previous 7 days. Conversely, if cabbage (slippery, bush), because of its low dietary energy content,[35] contributes only to 1 percent of the average DEC it is also the most consumed food as 95 percent of households reported having consumed cabbage during the previous 7 days, with an average edible quantity of 120 g/capita/day. Rice is the second most consumed food, with 93 percent of the households consuming it. Almost 90 percent of households consume salt, with an average quantity of 12 grams[36] per day, which is well above the recommended daily portion for salt of 5 grams per adult per day (WHO 2013). With an average consumption of 16 g/capita/day, raw sugar is the fourth most consumed food, accessed by 80 percent of the households. Almost 70 percent of households consume canned tuna while only 40 percent of households consume fresh reef fish. Even if kava is not categorised as food, it is consumed by 45 percent of households, with an average consumption of 33 g/capita/day; the importance of this product in the consumption of households should be monitored because of its potential negative impact on health.

Figure 16 Products consumed by more than one third of the households in the previous 7 days and edible quantities consumed



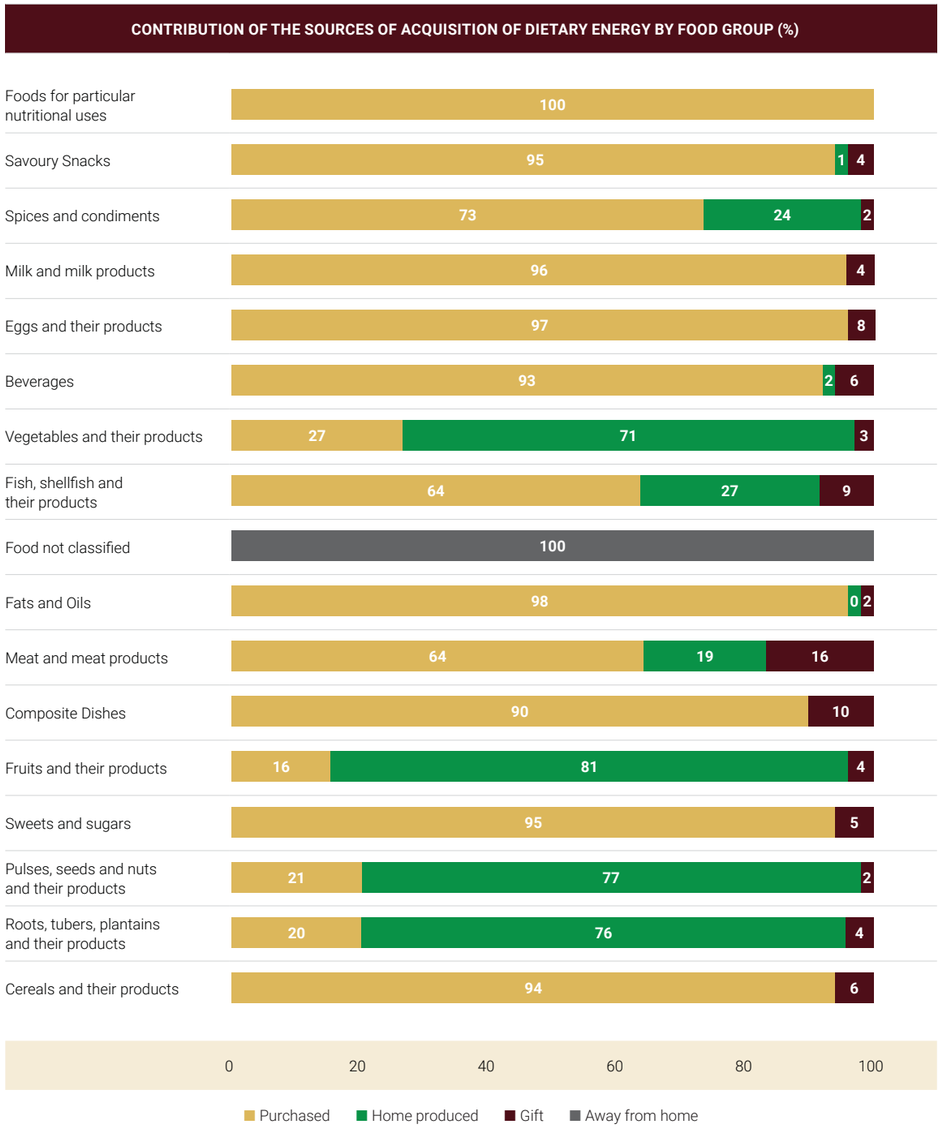
35 . 100 grams of edible cabbage (slippery bush) brings 32 kcal.

36 Salt is not easy to report, and it is believed that the quantities consumed were slightly overreported in the food recall section of the questionnaire.

d. Source of acquisition of the food product

More than 90 percent of the dietary energy consumed from cereals, sweets and sugar, beverages, snacks, milk and eggs are purchased, while 75 percent of roots and tubers and nuts consumed are own produced. The same pattern can also be observed for fruits and vegetables, from which 80 percent and 70 percent respectively of the dietary energy consumed are own produced (ADePT table 48). Despite important involvement of households in livestock activities (62 percent of households), less than 20 percent of the dietary energy consumed from meat comes from own production and 16 percent is received for free from other households or community; 96 percent of the milk consumed is purchased. There is a similar trend for fish products, where most of the fish consumed is purchased and almost one tenth of dietary energy consumed is received as a gift. Ten percent of the dietary energy from a composite dish (mainly laplap, grated) is also received as a gift while the rest is purchased.

Figure 17 **Sources of acquisition of dietary energy by food group (%)**



When further zooming in on the main food products that compose the groups, cabbage, which is the main vegetable consumed, is mostly sourced from own production; 78 percent of the households who consumed cabbages obtained it from their own production. Rice, which is the main cereal consumed, is mostly acquired through cash purchases. Canned tuna fish, which is consumed by 68 percent of the households, is mainly purchased, while reef fish is mainly sourced from household fishing activities and 16 percent is received for free from other households. More than 75 percent of the chicken, consumed by the 43 percent of households who consumed it, is purchased and the rest is own produced. Only 39 percent of households consumed beef, with an average consumption of 20 g/capita/day, and 21 percent of households received the beef for free. Less than one household out of three consumes eggs, with an average edible quantity of 8 g/capita/day and 96 percent of these households purchase the eggs. Almost one household out of three consumes lunch away from home, bringing on average 90 kcal/capita/day, and 30 percent of the households who had lunch away from home received it for free. Most of the households who had dinner or breakfast outside the home (respectively 7 percent and 6 percent) received the meal for free.

Table 4 **Sources of acquisition of the food product consumed by at least 30 percent of the households**

			Percentage of HH accessing the food			
FOOD GROUP	FOOD PRODUCT	TOTAL	CASH	HOME PROD.	GIFT	AVERAGE EDIBLE QUANTITY (G/CAPITA/DAY)
Vegetables and their products	Cabbage, slippery bush	95	20	78	2	123
Cereals and their products	Rice, not further specified	93	92	0	8	163
Spices and condiments	Salt, not further specified	89	97	0	3	12
Sweets and sugars	Sugar, not further specified	80	96	0	4	16
Pulses, seeds and nuts	Coconut, brown	79	16	82	2	54
Roots, tubers, plantains and their products	Banana, cooking, raw	78	11	86	3	144
Fruits and their products	Banana	71	16	80	4	33
Sweets and sugars	Crackers, all others	69	95	0	5	30
Fish, shellfish and their products	Tuna canned, not further specified	68	93	3	5	11
Fruits and their products	Papaya	67	12	86	1	70
Roots, tubers, plantains	Taro, common	59	15	79	6	119
Fats and oils	Oil, cooking	59	98	0	2	9
Composite dishes	Laplap (grated cassava, cooked)	58	85	0	15	62
Fruits and their products	Coconut, green	53	15	82	2	19
Roots, tubers, plantains	Kumara / sweet potato	49	33	63	4	135
Tobacco/kava	Kava	45	100	0	0	33

Meat and meat products	Chicken, not further specified	43	76	17	7	30
Composite dishes	Banana, cooking, boiled	42	93	0	7	66
Tobacco/kava	Tobacco	41	100	0	0	0
Fish, shellfish and their products	Fish, reef, not further specified	41	30	54	16	35
Cereals and their products	Bread, loaf, all others	41	94	0	6	24
Cereals and their products	Noodles, not further specified	41	95	0	5	4
Roots, tubers, plantains and their products	Yam, not further specified	39	13	77	10	70
Meat and meat products	Beef, not further specified	39	70	9	21	21
Vegetables and their products	Cucumber, unpeeled	38	44	50	6	29
Fruits and their products	Grapefruit	37	9	85	6	30
Fruits and their products	Orange	34	11	85	4	22
Fish, shellfish and their products	Mackerel, canned	33	94	2	4	7
Fruits and their products	Fruit, not further specified	32	8	87	5	38
Food not classified	Lunch away from home	32	70	0	30	n/a
Roots, tubers, plantains	Cassava / tapioca / manioc	32	11	84	5	73
Eggs and their products	Egg, chicken, fresh	31	96	0	4	8

e. Cost of food[37]

Of the 30 food products contributing 90 percent of the dietary energy consumed, brown coconut is the least expensive source of dietary energy, with an average cost of VUV 26 per 1 000 kcal, and canned tuna is the most expensive, with an average cost of VUV 440 per 1 000 kcal (ADePT table 49). To acquire 1 000 kcal from rice, which is also the main source of dietary energy, it costs around VUV 56; however, rice remains quite an expensive product, as 100 grams of rice costs four times as much as 100 grams of coconut and accounts for more than 8 percent of the total expenditure on food. Due to its poor energetic content, cabbage is an expensive source of dietary energy; however, with an average price of VUV 7 per 100 grams it remains the cheapest vegetable.

37 To account for the small dispersion observed in the price of some products, the values presented in this section refer to the median price.

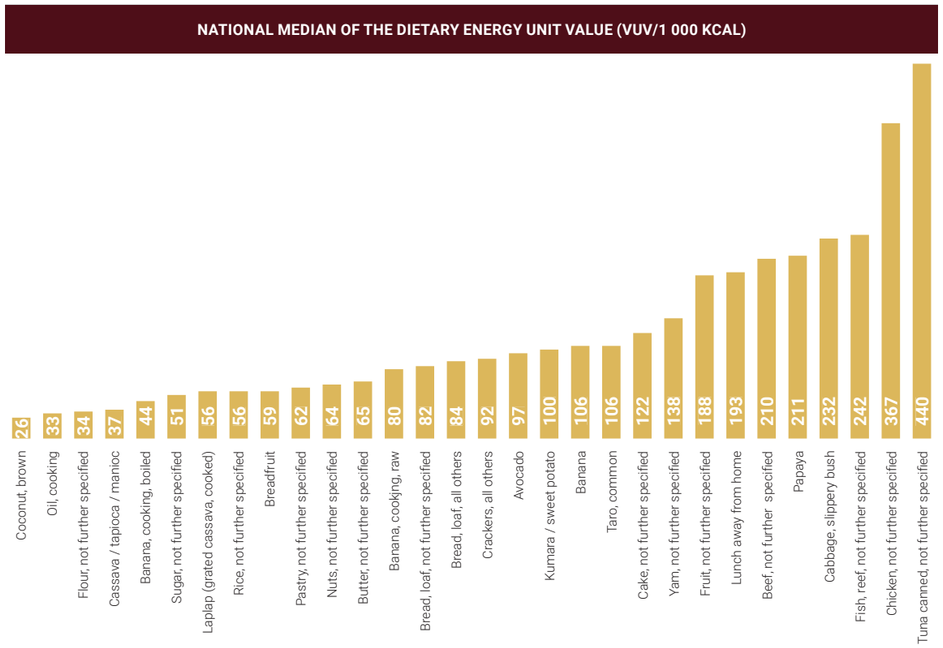
Table 5 **Cost of 1 000 kcal and of 100 grams of the food products contributing 90 percent of the average dietary energy consumption**

	MEDIAN DIETARY ENERGY UNIT VALUE (VUV/ 1 000 KCAL)	MEDIAN UNIT PRICE (VUV/100 GRAMS*)	CONTRIBUTION TO THE AVERAGE DEC (%)	CONTRIBUTION TO THE FOOD EXPENDITURES (%)
Coconut, brown	25.7	5	8	1
Oil, cooking	33.3	30	3	1
Flour, not further specified	34.0	12	2	0
Cassava / tapioca / manioc	36.9	5	4	1
Banana, cooking, boiled	44.4	5	3	1
Sugar, not further specified	50.8	20	2	1
Laplap (grated cassava, cooked)	55.7	10	3	1
Rice, not further specified	56.2	19	20	8
Breadfruit	58.8	5	1	0
Pastry, not further specified	61.9	27	1	0
Nuts, not further specified	64.0	24	1	0
Butter, not further specified	65.2	48	1	0
Banana, cooking, raw	80.3	7	7	3
Bread, loaf, not further specified	82.2	19	2	1
Bread, loaf, all others	83.6	20	2	1
Crackers, all others	92.4	40	5	3
Avocado	97.2	15	1	0
Kumara / sweet potato	100.2	9	5	3
Banana	105.5	8	1	1
Taro, common	105.6	10	5	3
Cake, not further specified	122.1	43	1	1
Yam, not further specified	137.6	11	2	3
Fruit, not further specified	188.4	10	1	1
Lunch away from home	192.9	200	3	4
Beef, not further specified	209.8	30	1	2
Papaya	211.1	5	1	1
Cabbage, slippery bush	232.2	7	1	3
Fish, reef, not further specified	241.8	19	1	4
Chicken, not further specified	367.0	55	2	6
Tuna canned, not further specified	439.9	58	1	2

** price per meal in case of breakfast, lunch and dinner consumed away from home*

With an average cost of VUV 240 per 1 000 kcal, fresh reef fish is another expensive source of dietary energy and is also an expensive food product, making up 4 percent of the household food expenditure. Reef fish is, however, less expensive than chicken (chicken is among the 30 food products contributing to 90 percent of the average DEC), which is not only the most expensive source of dietary energy, with an average cost of VUV 370 per 1 000 kcal, but also among the most expensive food products with an average cost of VUV 55 per 100 grams and making up 6 percent of the total food expenditure. With an average cost of VUV 200 per meal, lunch consumed away from home makes up 4 percent of the total food expenditure.

Figure 18 **Difference in the cost to obtain 1 000 kcal from each product**



IV. CONSUMPTION PATTERN OF ESSENTIAL NUTRIENTS

Essential nutrients are composites that the body cannot produce or cannot produce in sufficient quantity to survive, grow, and reproduce. While there are many essential nutrients, they can be broken into two categories: macronutrients and micronutrients.

Macronutrients (protein, carbohydrates, fibre and fats) are eaten in large amounts and include the primary building blocks of the diet and they provide the body with energy. Vitamins and minerals are micronutrients, and small doses are usually sufficient.

For a healthy diet it is important to eat a variety of foods rich in these essential nutrients, and for a balanced diet it is important to eat quantities of each of these foods within acceptable limits.

a. Macronutrients contribution to the diet of a Ni-Vanuatu

In terms of contribution of macronutrients to the average dietary energy consumed, the diet is relatively low in proteins and high in fats, even if it is within the WHO/FAO/UNU norms for a balanced diet[38] (ADePT table 37).

Box 1 **Essential macronutrients**

Carbohydrates are critical to the function of the body. They are broken down into glucose, which is the primary source of fuel for the body and brain. Not only do they provide energy for the body, but they also help stabilise blood sugar levels and preserve muscle mass by preventing the breakdown of proteins for energy. Whole grains, fruits and vegetables are considered healthy carbohydrates.

Fibre is an indigestible form of carbohydrate. It is not an essential nutrient and therefore an inadequate amount does not result in biochemical or clinical symptoms of a deficiency. However, diets high in fibre have shown decreased risk for obesity, high cholesterol, and heart disease. Fruits, vegetables, and whole grain products all contain high amounts of fibre.

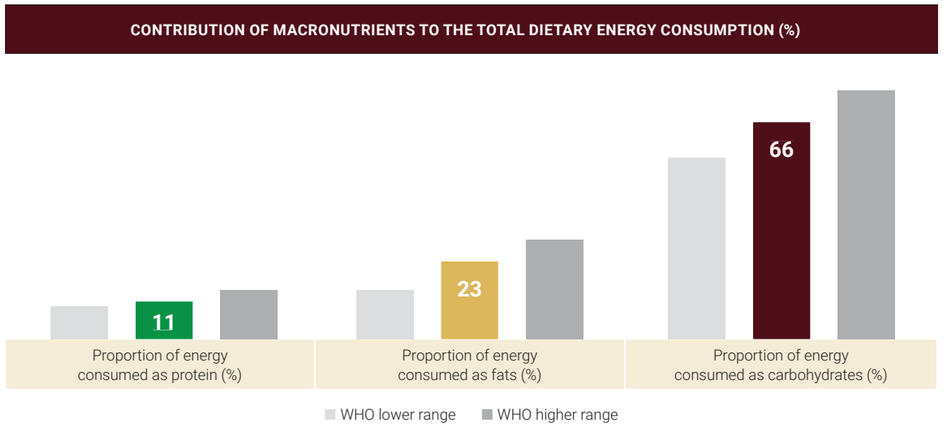
Proteins are critical to good health. From forming muscle to creating new enzymes and hormones, getting enough protein into the diet is key. Proteins are made up of building blocks called amino acids. There are 20 types of amino acids, all of which are important. While animal proteins provide adequate amounts of all essential amino acids, plant-based proteins are typically lacking in one or more. The best way to ensure adequate protein intake is to include a variety of protein foods in the diet, such as fish, meat, eggs, dairy, nuts and beans.

38 Diet, nutrition and the prevention of chronic diseases. Report of a joint WHO/FAO expert consultation. WHO technical report series 916. Geneva. WHO 2003.

Fat is an essential nutrient that provides energy, boosts the absorption of certain vitamins and helps protect your organs from damage. Some types of fat are better than others, however. Saturated fats for example, are a type of fat found in red meat, whole milk and other whole-milk-based dairy foods, cheese, coconut oil, and many commercially prepared baked goods and other foods. A diet rich in saturated fats can increase the risk of heart disease and they should be limited to less than 10 percent of the calories consumed per day. Unsaturated fats, on the other hand, can actually help protect the heart and aid in the prevention of heart disease. Healthy sources of fat include nuts, avocados, salmon, olive oil, flaxseed and nut butters.

To reach a balanced diet, WHO recommends that, on average, proteins contribute 10 percent to 15 percent of total dietary energy consumed, fats contribute 15 percent to 30 percent and carbohydrates contribute 55 percent to 75 percent.

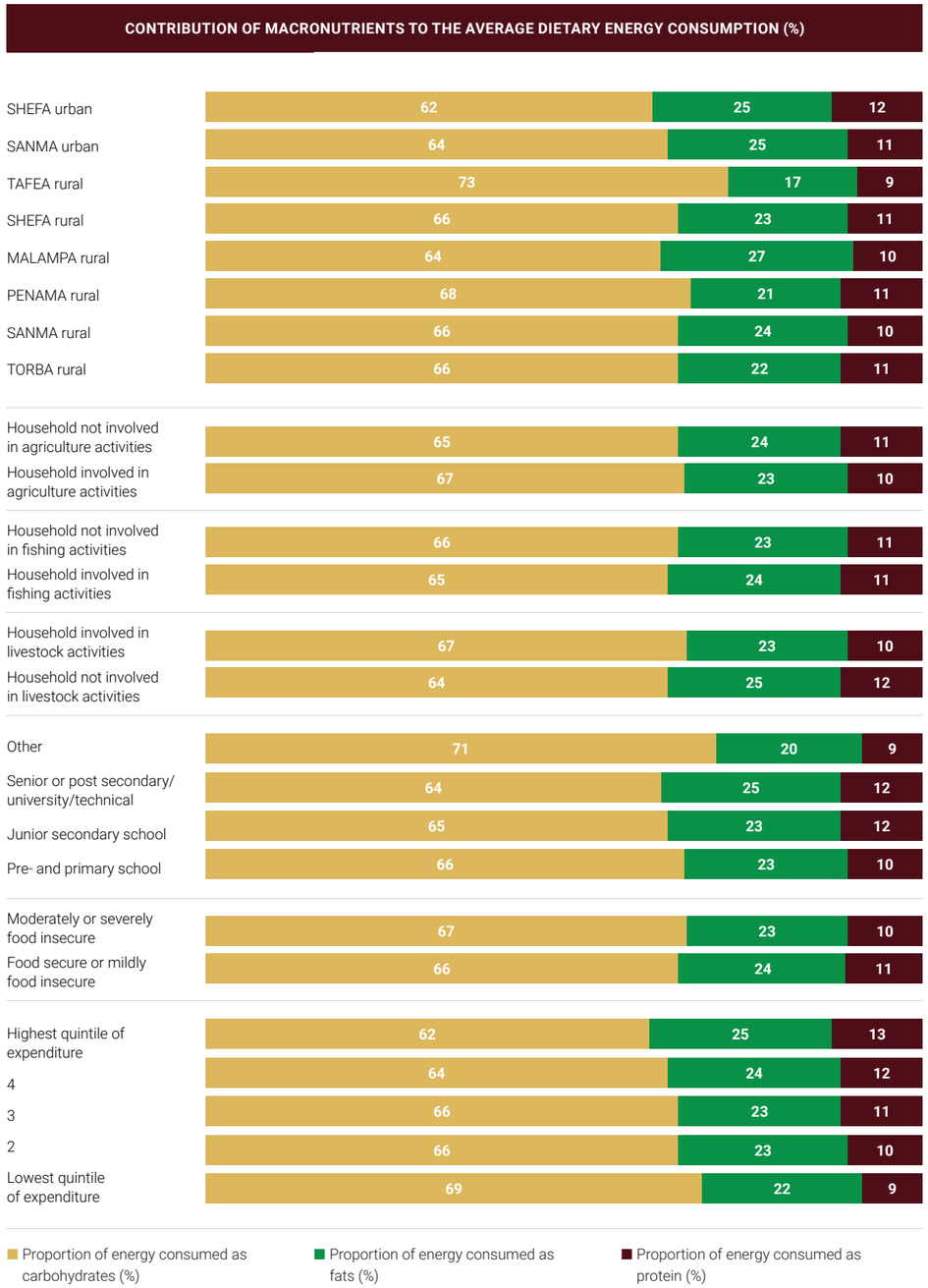
Figure 19 **Overall diet is low in proteins and rich in fats**



Proteins of animal origin contribute to less than one third to the total proteins in Vanuatu (ADePT table 41). Cereals are the main source of carbohydrates and the second source of proteins, with respective contributions of 34 percent and 24 percent to the total carbohydrates and proteins consumed (ADePT table 41). Roots and tubers are the second source of carbohydrates, contributing 33 percent. Fish is the second main source of proteins followed by meat, with respective shares of 16 percent and 14 percent. One third of fat consumed comes from brown coconut, and fats and oil provide 16 percent of the total fats consumed. With respective contributions of 10 percent and 8 percent to the total fat consumed, meat (through the consumption of chicken mainly) and sweets and sugar (mainly the consumption of crackers) are sources of fats that may need to be reduced, as fats from these products are usually saturated or trans fats which are considered unhealthy sources of fat.

If the diet at national level is relatively balanced with respect to the WHO/FAO/UNU norms, only 30 percent of the households have access to a balanced diet and the contribution of macronutrients to the average dietary energy consumed shows quite a different pattern within the population. One household in three belonging to the lowest quintile presents an unbalanced diet, while this share falls to only 11 percent among richer households (ADePT table 38). Households belonging to the lowest quintile of expenditure present a diet very poor in proteins, which is outside the WHO/FAO/UNU recommendations; conversely, low quintile households have a diet that is relatively rich in carbohydrates, while richer households consume more proteins but also have a diet that is very rich in fat, as 25 percent of the dietary energy consumed is in the form of fats. Of the richer households, 24 percent have a contribution of fats that is above the upper limit recommended by WHO/FAO/UNU (ADePT table 37).

Figure 20 **National disparities in the contribution of macronutrients to the average dietary energy consumption by population groups**



This pattern is very consistent with the level of education, as households whose head has a high level of education (these households also present the highest income) are also those consuming more fats and proteins than households who have a lower level of education. The share of proteins consumed by food insecure households is also lower than that consumed by food secure households. Households involved in agriculture or livestock activities exhibit the same dietary pattern. These households present a lower share of proteins and higher share of carbohydrates than households not involved in these activities and which in turn present higher shares of fats. In terms of geographic location, households living in urban areas, and Shefa in particular, tend to present a higher share of proteins and fats and a lower share of carbohydrates than rural households. Of concern is the high contribution of fats to the average dietary energy consumed in the region of rural Malampa, as 27 percent of dietary energy consumed in this region comes from fats. This is mainly due to a higher reporting of brown coconut consumption (105 edible grams/capita/day compared with a national average of 53 edible grams/capita/per day).

Even though dietary fibre is not an essential nutrient, a consumption of high fibre foods decreases constipation, lowers the risk of diabetes, heart disease and some forms of cancer. There is no determined average requirement for fibre, only population intake goals or adequate intake. And only when the mean consumption of fibre is higher than the adequate intake can it be said that the risk of fibre inadequacy is low. On average a Ni-Vanuatu consumes 31 grams of fibre a day which is much higher than the 25 grams of dietary fibre per day recommended by most authoritative institutions,[39] making Vanuatu a low risk of fibre inadequacy.

b. Apparent consumption of vitamins[40,41]

Vitamins help the body grow and function the way it should. There are five types of vitamins (A, B, C, D, E and K) and they have different jobs in the body, from helping resist infections to keeping the nerves healthy, and helping the body get energy from food, or helping blood to solidify properly. This report is looking at vitamins A, B1, B2, B12 and C.

i. Vitamin A

With an average quantity of vitamin A available for consumption greater than 2700 µg per day per capita (expressed in retinol equivalent), vitamin A consumption exceeds the requirements of 283 µg per capita per day by more than nine times (ADePT table 58).

Box 2 Vitamin A

Vitamin A is essential for health, supporting cell growth, immune function, foetal development and vision. According to the WHO, vitamin A deficiency is the leading cause of preventable blindness in children worldwide. It also increases the severity and risk of dying from infections like measles and diarrhoea, raises the risk of anaemia and death in pregnant women, and negatively impacts the foetus by slowing growth and development.

There are two forms of vitamin A found in food: **beta-carotene** (found in certain plant foods, such as sweet potatoes, kale and cabbage, especially those that are orange, red and yellow) and **retinol** (found in certain animal foods like egg yolks, salmon and organ meats).

39 Such as European Food Safety Authority (EFSA), United States Health and Medicine Division, World Cancer Research Fund International (WCRF)

40 Here we refer to the quantity of vitamins available for consumption by the household. Note that the content and quality of the vitamin is affected by the way the food is stored, prepared, processed, held warm or reheated and cooked and therefore there may be a considerable difference between the amount and quality of vitamins available for consumption and amount and quality of vitamins ingested.

41 This analysis excludes the potential contribution of food consumed away from home to the total amount of vitamins available for consumption.

Of the vitamin A consumed, 73 percent is supplied by cabbage (slippery bush), followed well behind by laplap which brings a bit less than 8 percent of the vitamin A available for consumption. Papaya, pumpkin and carrots are also rich in vitamin A, but in the case of Vanuatu their low consumption translates into a marginal contribution to the total amount of vitamin A available for consumption (ADePT table 70).

Figure 21 Main sources of vitamin A

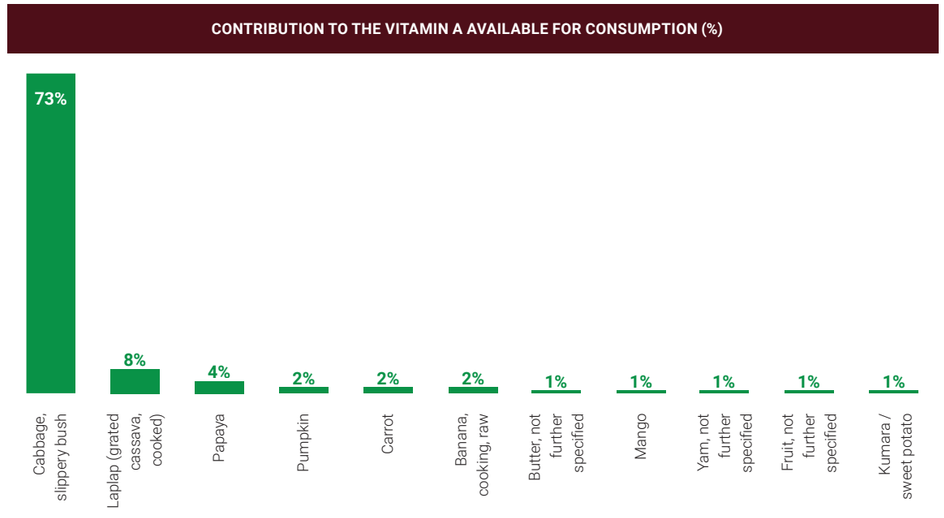
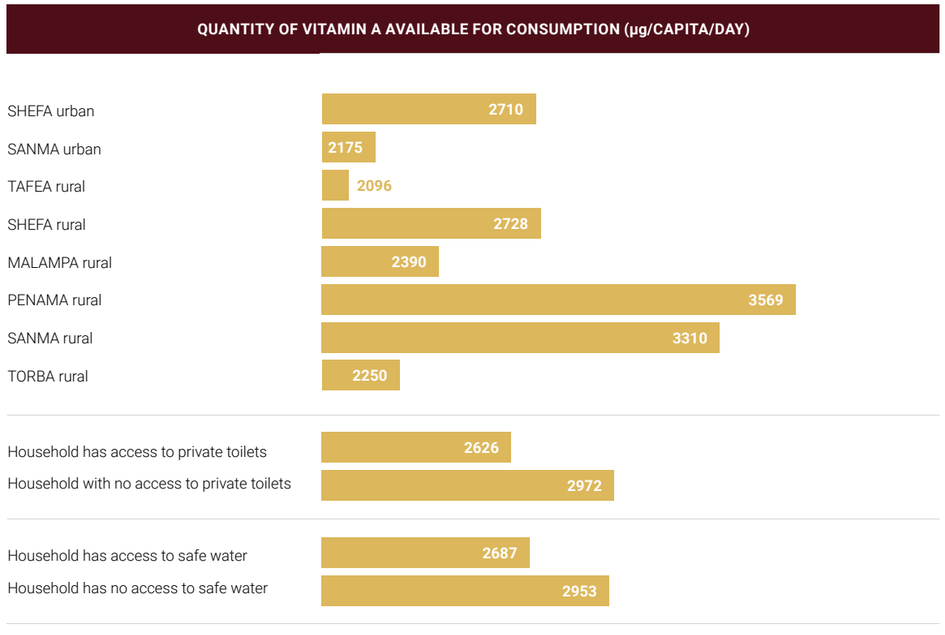


Figure 22 Vitamin A available for consumption by geographic and demographic characteristics of the households



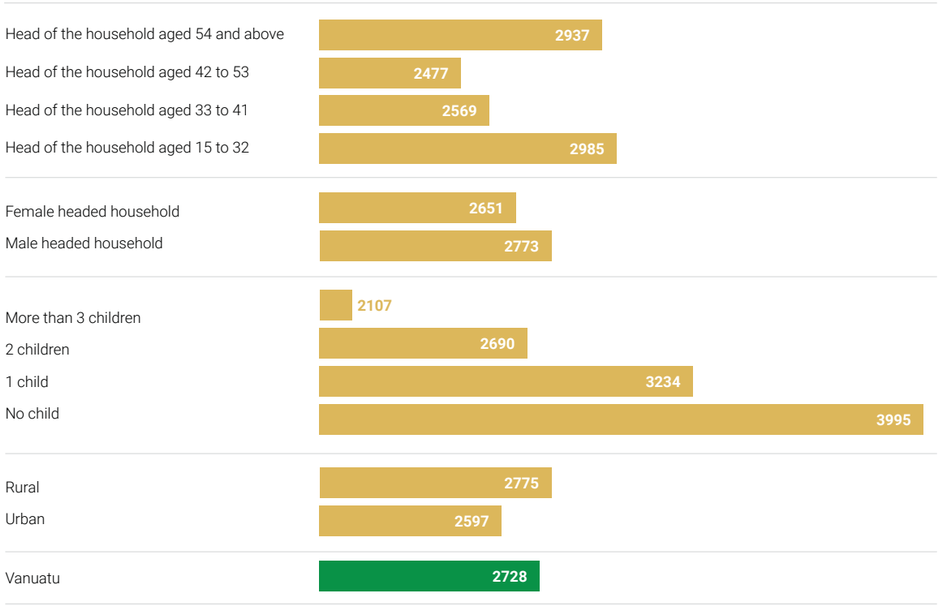
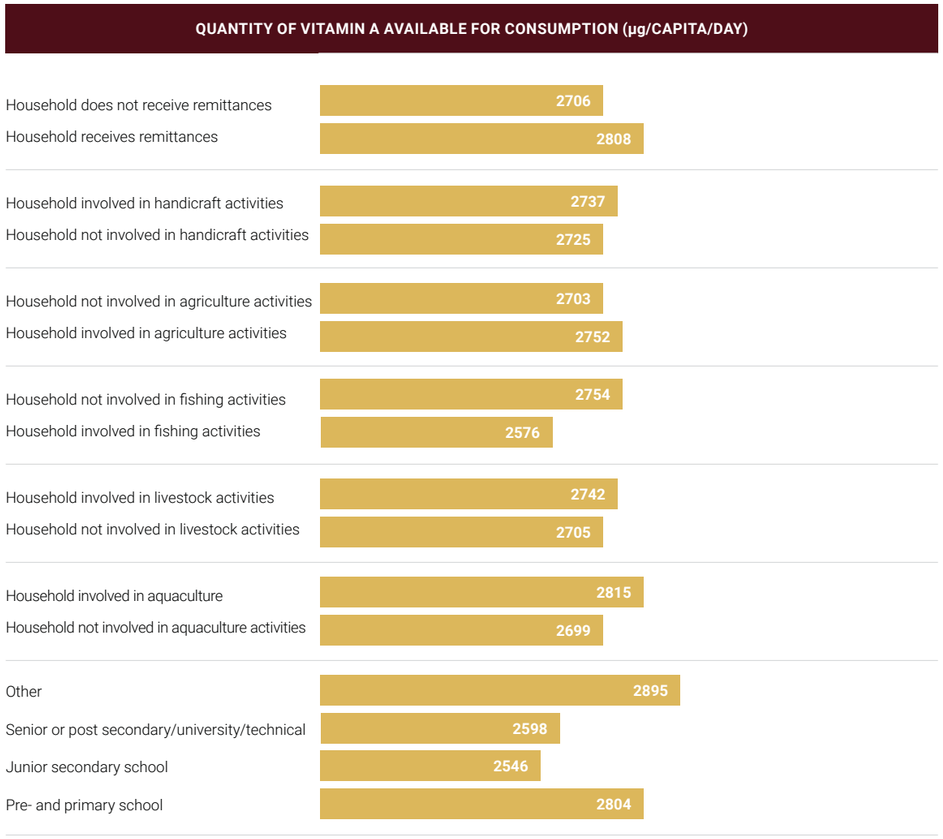
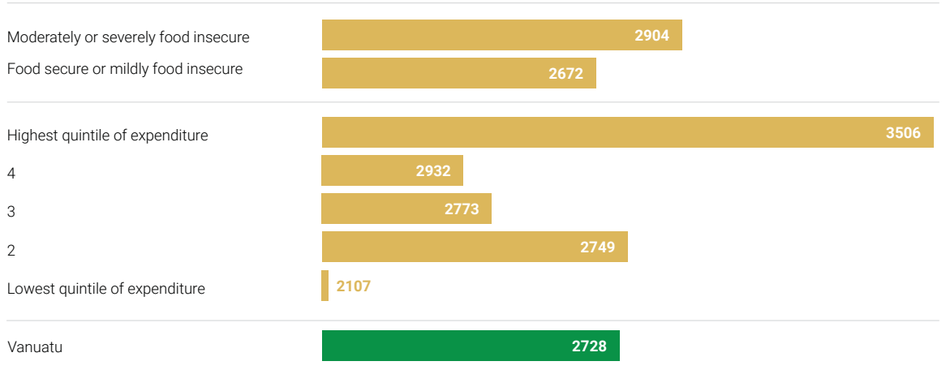


Figure 23 **Vitamin A available for consumption by socio economic characteristics of the households**





Adequacy, as measured by the ratio of quantity of vitamin A available to the average requirements, is reached for all population groups,[42] but still some disparities in the amount of vitamin A available can be observed at national and regional levels. The largest disparities are mainly observed at regional level or between households with different levels of income or size. In fact, households living in the rural regions of Penama or Sanma are accessing more vitamin A than households living in the urban regions of Shefa or Sanma. Households belonging to the lowest expenditure quintile are accessing a quantity of vitamin A less than 60 percent of what is accessed by richer households. Interesting is the higher quantity of vitamin A available for consumption among households with no access to safe drinking water compared with households with access to safe drinking water. If households clean the food products with an unsafe source of water, the quality of the vitamin available for consumption will be altered. Finally and not surprisingly, households involved in agriculture are accessing more vitamin A than households not involved in agriculture, this being the direct consequence of better access to own produced cabbage.

ii. Vitamin B group

Box 3 **B vitamins**

B vitamins are water soluble and therefore do not stay long in the body. After the body uses these vitamins, amounts left over leave the body through the urine. B vitamins are important for the metabolism of proteins. They offer the following health benefits:

- **Vitamin B1 (thiamine) helps to release energy from foods and is important in maintaining nervous system function.**
- **Vitamin B2 (riboflavin) helps to promote good vision and healthy skin and is also important in converting the amino acid tryptophan into niacin.**
- **Vitamin B12 helps in the formation of red blood cells and in the maintenance of the central nervous system.**

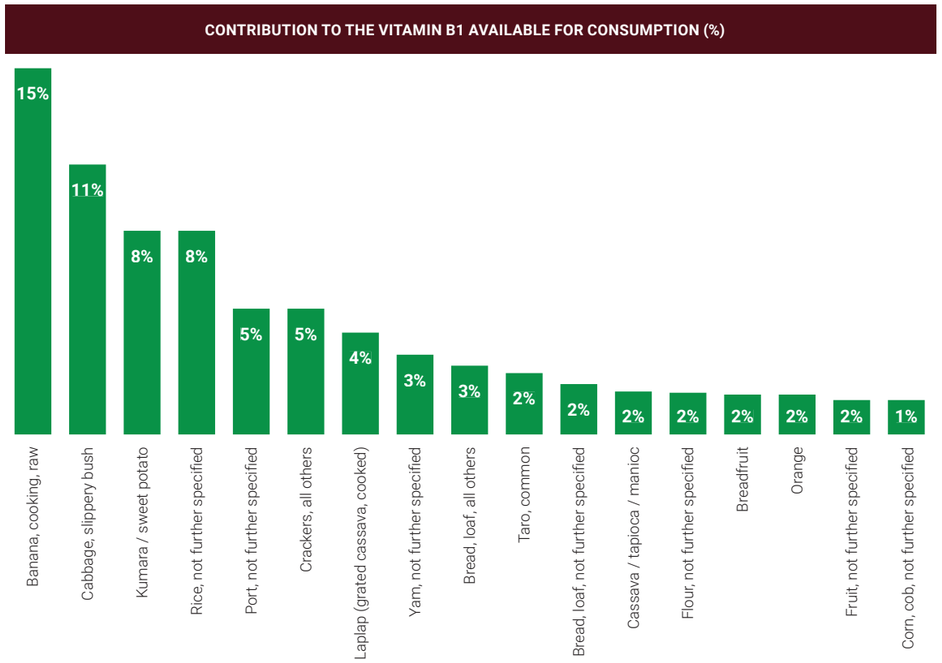
Apart from B12, the body cannot store these vitamins for long periods, so they have to be replenished regularly through food. **Foods rich in Vitamin B are meat, poultry,** seafood, eggs, dairy products and fortified cereals.

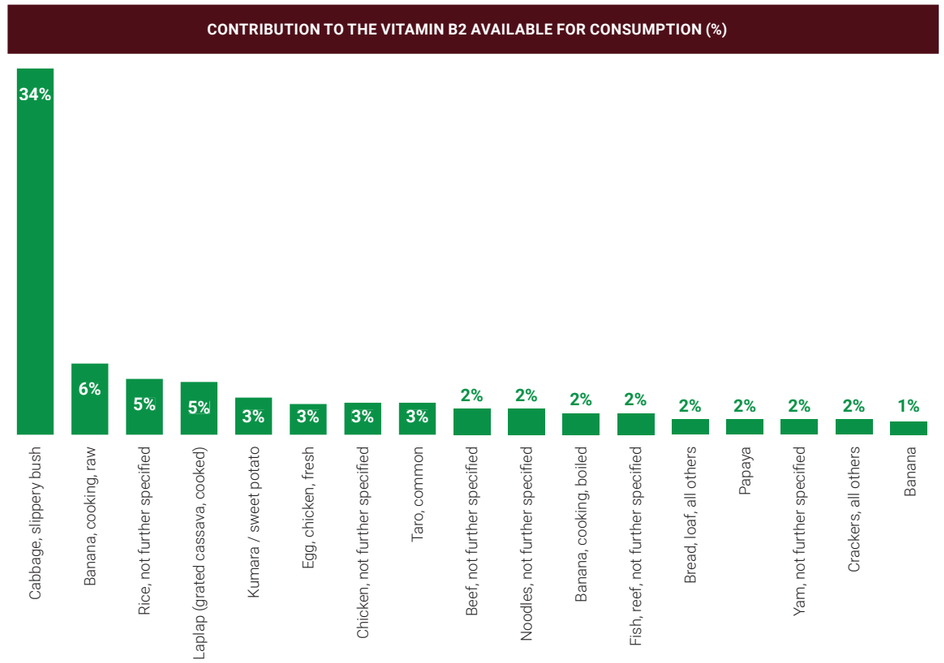
42 Adequacy for a population group does not mean that each individual belonging to that group receives and adequate amount of nutrient. This footnote also holds for next section on vitamin B1, B2, B12, C and calcium.

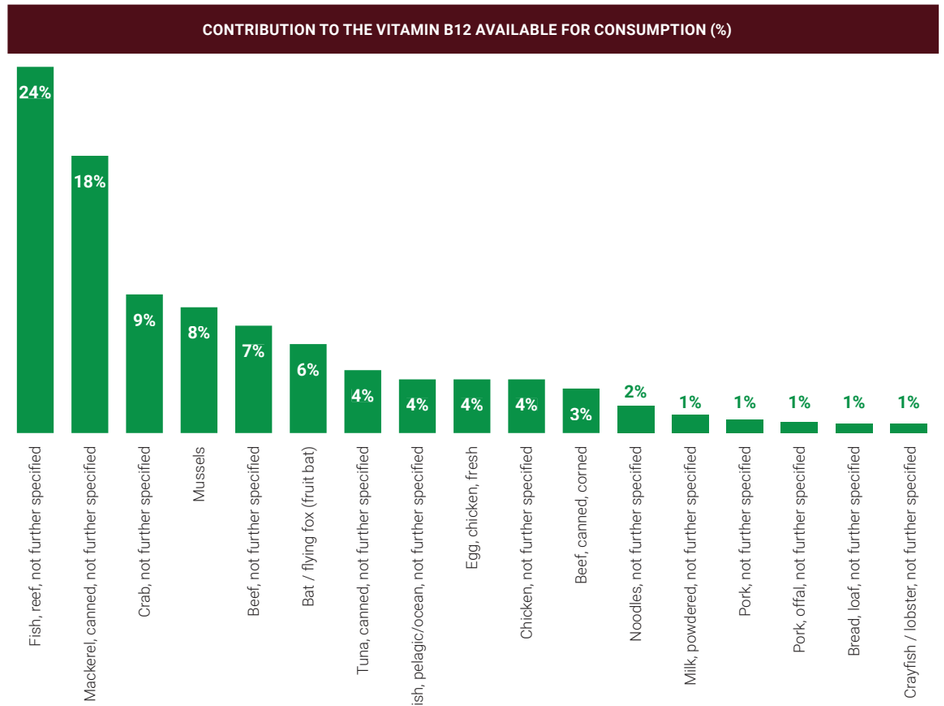
On average the daily quantities of vitamins B1, B2 and B12 available for consumption are 1.5 mg, 1.4 mg and 3.3 µg per capita respectively, and compared with the average requirements,[43] supply adequacy is met for all the three vitamins (100 percent or more being the target) (ADePT table 59).

Sources of vitamin B1 and B2 are more diversified than sources of vitamin B12. Roots, tubers and plantain (mainly through the consumption of cooking banana and kumara, with quantities consumed of 144 grams and 135 grams of edible product per capita per day respectively) contribute more than 30 percent of the vitamin B1 consumed, followed by vegetables (through the high consumption of 120 grams per capita per day of cabbage [slippery bush]) and cereals (through the high contribution of rice) (ADePT table 70). Almost 40 percent of the vitamin B2 available for consumption is sourced from vegetables, with cabbage bringing 34 percent of vitamin B2 followed (to a much lower extent) by cooking banana which provides only 6 percent of the vitamin B2 available for consumption. With a contribution of 5 percent to the total quantity available of vitamin B2, laplap also represents an important source of vitamin B2. Fish and fish products are the main provider of vitamin B12, contributing more than two thirds of the quantity of vitamin B12 available for consumption. Fresh fish brings around 24 percent of vitamin B12, followed by canned fish, which brings around 22 percent of vitamin B12.

Figure 24 Main sources of vitamin B



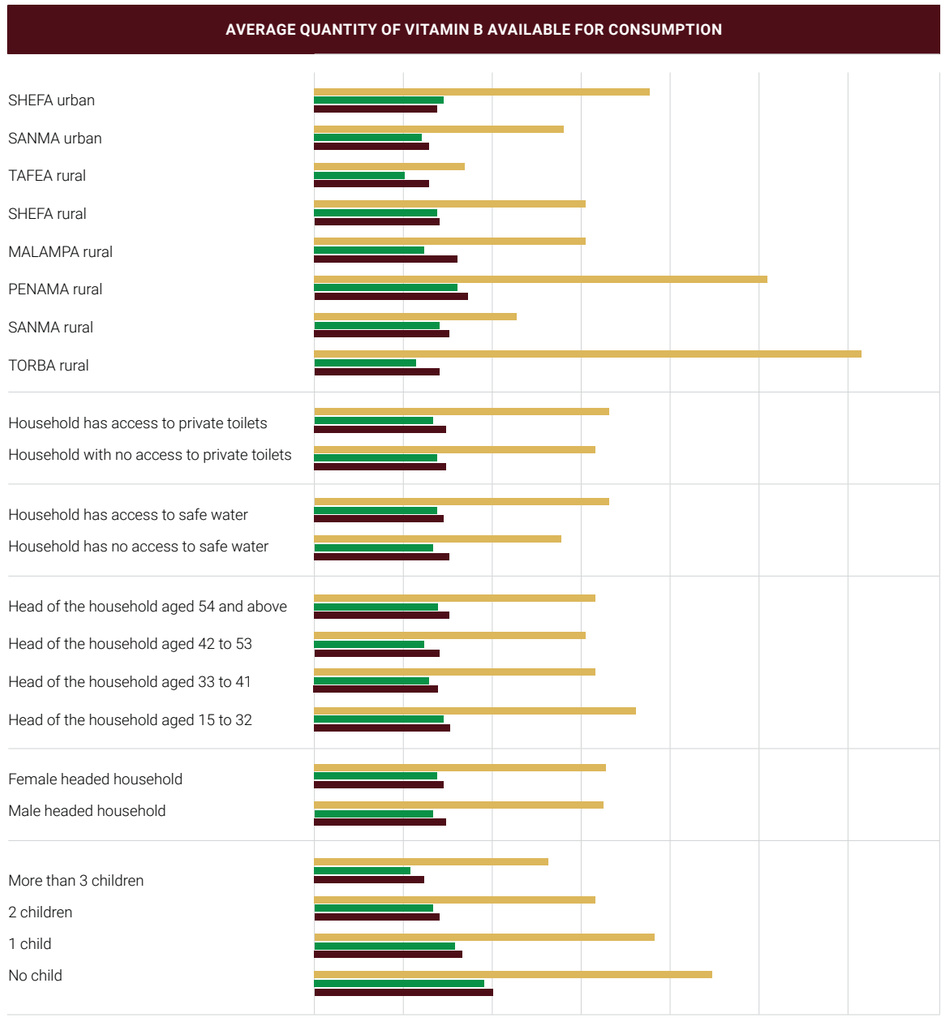




43 The source of the estimated average requirement used for vitamin B1, B2 and B12 is the FAO/WHO expert consultation on human vitamin and mineral requirements in human nutrition. Second Edition (2004)

Adequacy as measured by the ratio of vitamin B available for consumption to the average requirements is reached for the three B vitamins and for all population groups; however, some national disparities can be observed in terms of accessing vitamin B and the largest disparities are observed for vitamin B12. In fact, quantities of vitamin B12 available for consumption are five times higher within households belonging to the highest expenditure quintile than within households in the lowest expenditure quintile. This is the result of a much lower consumption of fish and fish products by households belonging to the first quintile than for households belonging to the fifth quintile (30 g/capita/day versus 120 g/capita/day). Not surprising is also the higher quantity of vitamin B12 available for consumption within households involved in fishing activities than for those not involved in such activities. Of note also is the higher quantity of vitamin B12 available for consumption in the rural regions of Penama and Torba due to higher consumption of crab and mussel in these regions than the national average. (Altogether, edible quantities of crabs and mussels[44] are 38 g/capita/day and 21 g/capita/day in the regions of Torba rural and Penama rural respectively compared with a bit less than 7 g/capita/day consumed on average in Vanuatu.)

Figure 25 **National disparities in quantity of vitamin B available for consumption by geographic and demographic characteristics of the household**



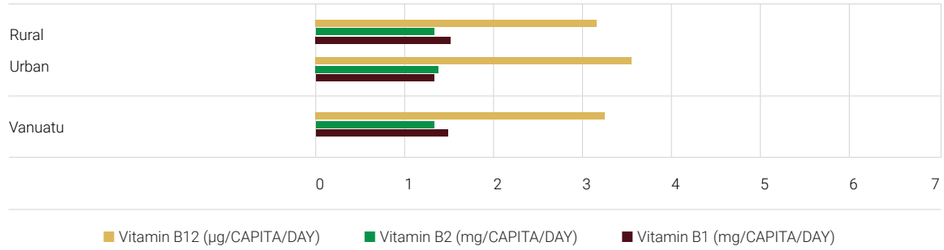
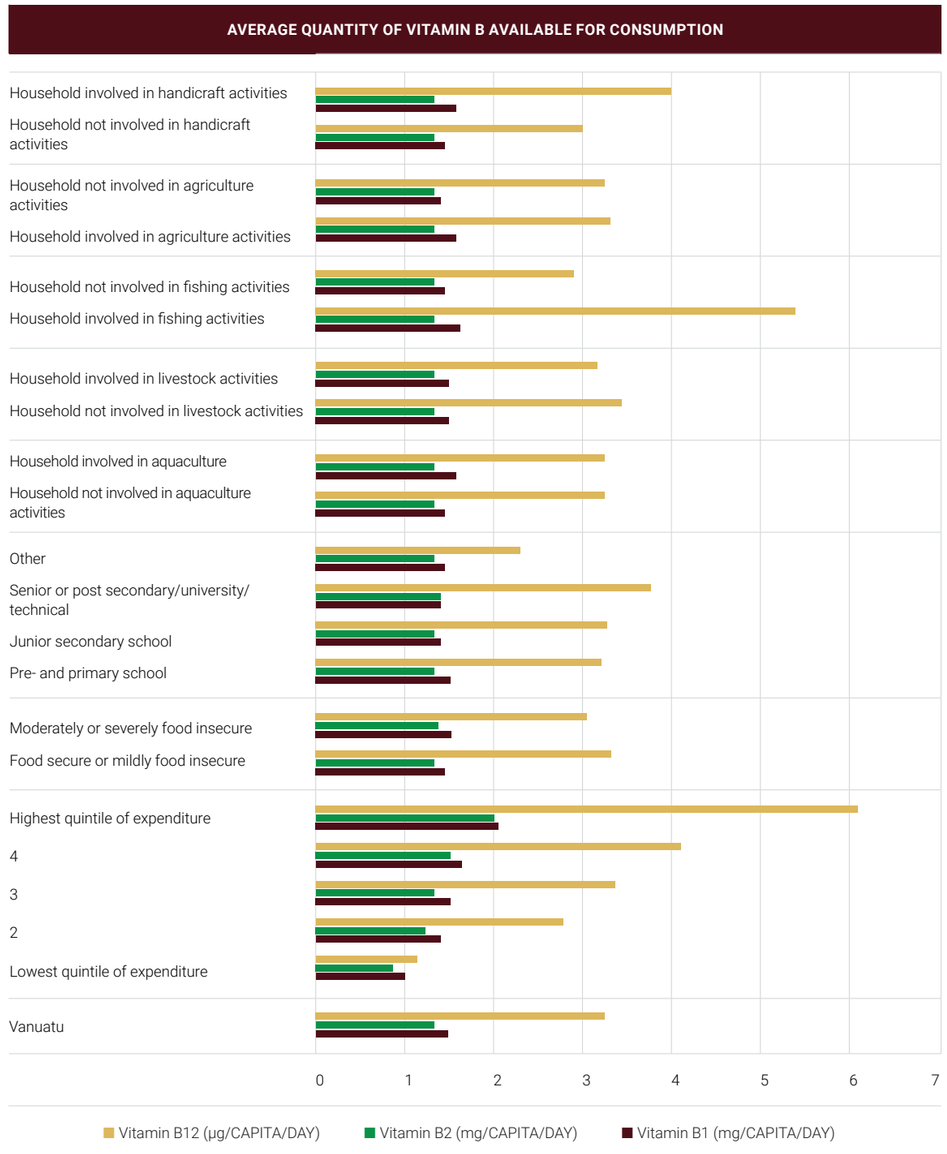


Figure 26 **National disparities in quantity of vitamin B available for consumption by socioeconomic characteristics of the household**



44 These food products are the richest in Vitamin B12 of the foods consumed in Vanuatu, with 100 grams of the edible portion of mussels and crab bringing respectively 16 µg and 6 µg of vitamin B12.

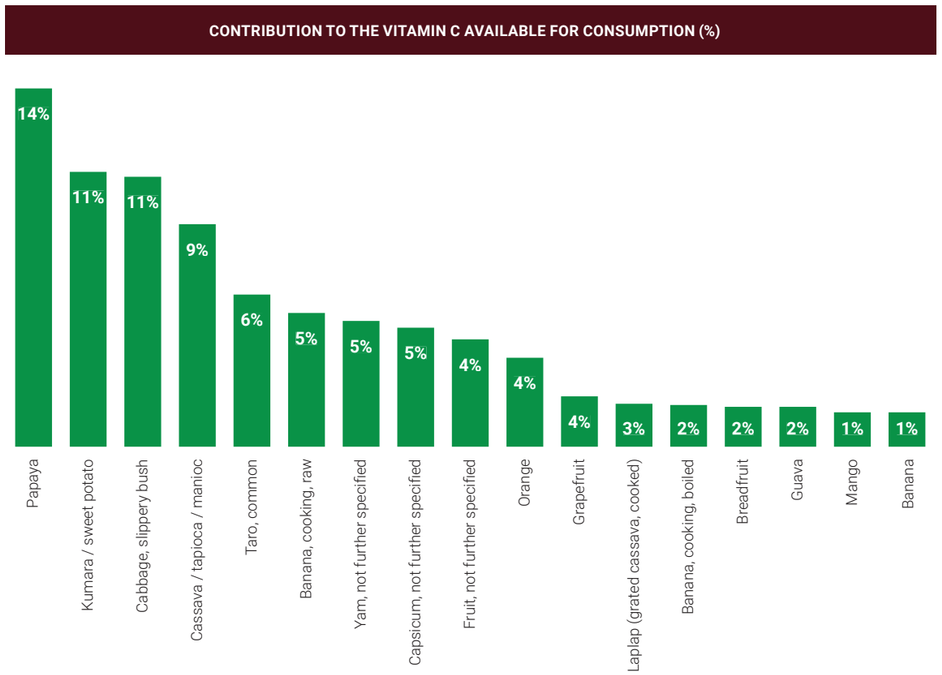
Box 4 Vitamin C

Vitamin C, or ascorbic acid, is a water-soluble vitamin. It is central to iron absorption and synthesis of collagen. It aids in wound healing and bone formation while improving overall immune function; for example, it is important for defence against infections such as common colds. Basically, vitamin C stimulates the immune system, it is an anti-allergic and antioxidant, it helps in the formation of "cement" for connective tissues, it heals wounds, maintains teeth and gum health, facilitates iron absorption and is necessary for eye health.

The richest natural sources of vitamin C are fruits and vegetables.

With an average quantity available for consumption of 300 mg/capita/day, vitamin C intake is well above the average national requirement of 34 mg/capita/day[45] (ADePT table 60). Sources of vitamin C are not very diversified as for the Vitamin B group, since the groups of "roots/tubers/plantains" and "fruits" alone bring more than 70 percent of the vitamin C available for consumption (ADePT table 70). With an average consumption of 70 g/capita/day of edible product, papaya is the main source of vitamin C, contributing 15 percent of the total amount of vitamin C available for consumption. Kumara and cabbage (slippery bush) are the second main source of vitamin C, each with an equal contribution of 11 percent.

Figure 27 Main sources of vitamin C



45 The source of the estimated average requirement used for vitamin C is the FAO/WHO expert consultation on human vitamin and mineral requirements in human nutrition. Second Edition (2004)

Figure 28 Average consumption and average requirement of vitamin C by geographic and demographic characteristics of the household

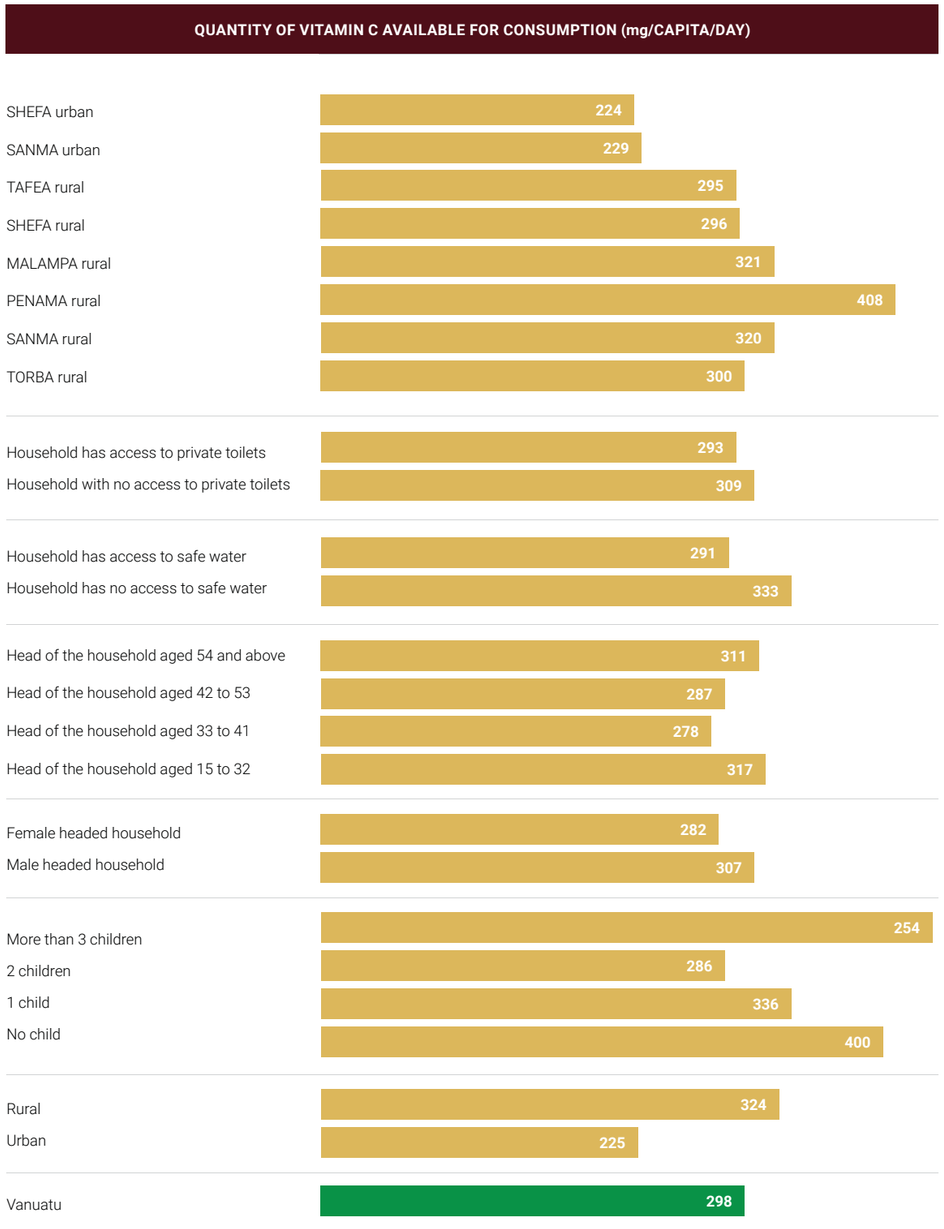
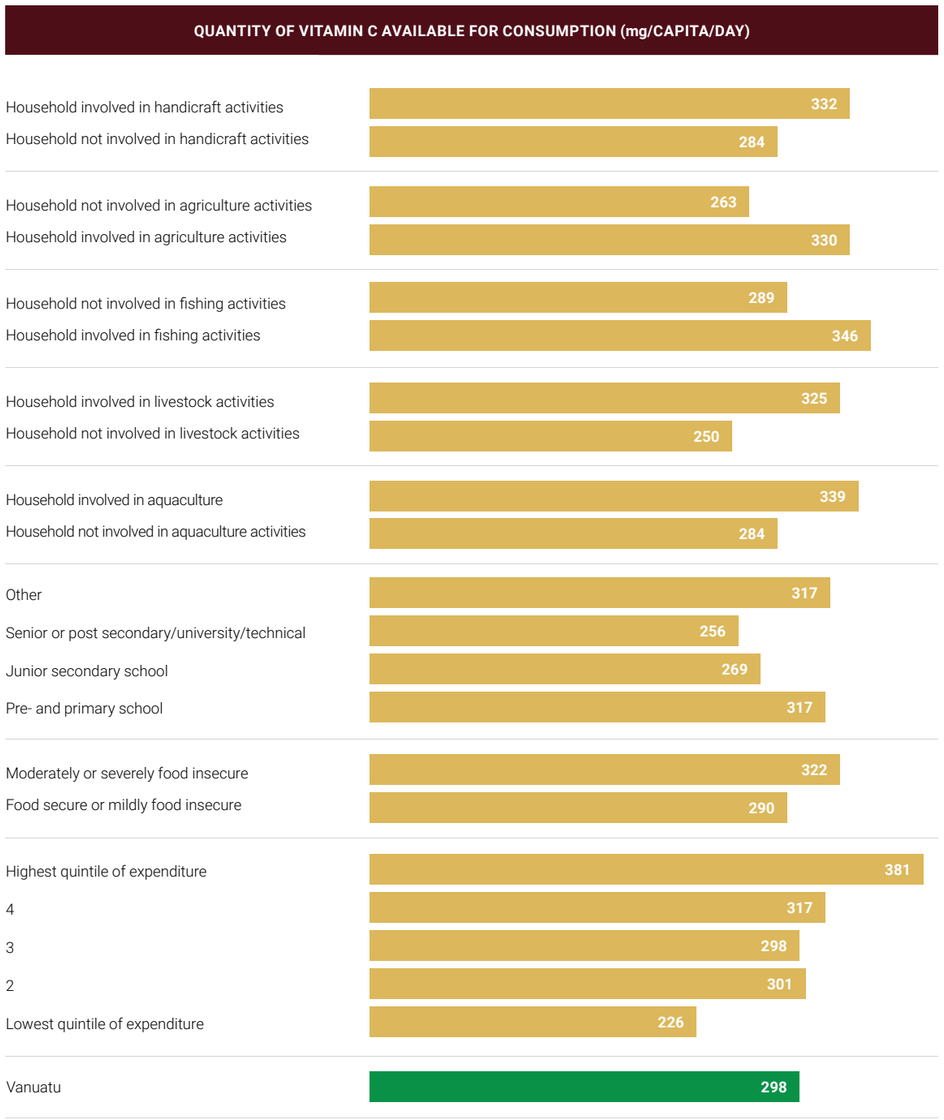


Figure 29 **Average consumption and average requirement of vitamin C by socioeconomic characteristics of the household**



Adequacy as expressed by the ratio of quantity of vitamin C available for consumption to the average requirements is reached for all population groups, but still some regional and national disparities can be observed, since not all households access the same quantity of vitamin C. Rural households, and in particular those of Penama have access to a higher quantity of vitamin C than do urban households overall. This is mainly due to better access to roots, tubers and fruits in rural areas than in urban areas. A huge dispersion in the amount of vitamin C available for consumption can be observed between households belonging to the first quintile of expenditure and those belonging to the last quintile but there is almost no difference between households belonging to the second, third and fourth quintile. Quantities of vitamin C available for consumption are much higher among households involved in agriculture, fishing, livestock and aquaculture activities than among households not involved in these activities.

c. Apparent consumption of essential minerals

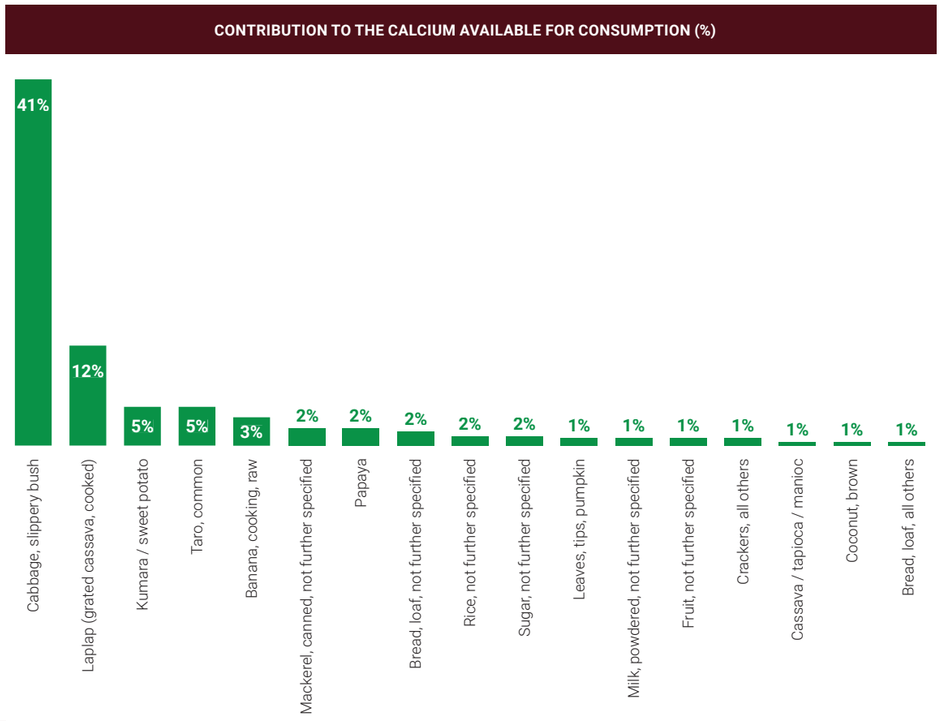
Minerals such as calcium and iron are essential nutrients found in many different types of plant- and animal-based foods. Calcium is a macro-mineral required in greater amounts than trace mineral such as iron. Both types of minerals support a wide variety of bodily functions, ranging from building and maintaining healthy bones and teeth to keeping the muscles, heart and brain working properly.

i. Calcium:

Box 5 **Calcium**

Most of the calcium in the body is found in the bones and its primary role is to ensure healthy bones and teeth. **The main foods rich in calcium are dairy products like milk, cheese and yoghurt. However, many non-dairy sources such as seafood, leafy greens, legumes, dried fruit and tofu are also high in calcium.** Foods such as cereal and flour can also be fortified in calcium.

Figure 30 **Main sources of calcium**

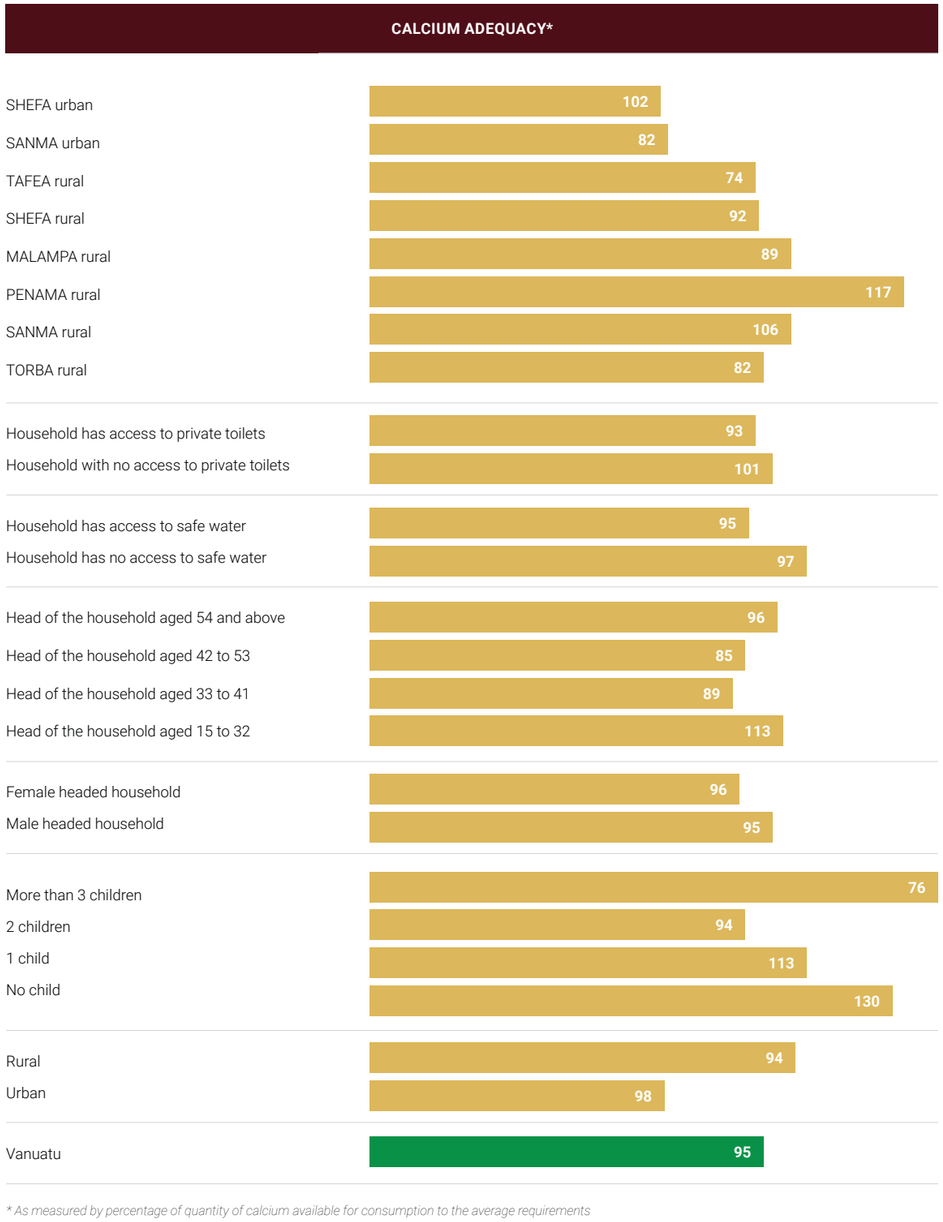


The average quantity of calcium available for consumption in Vanuatu is very close to the average requirement, with an average quantity available of 800 mg/capita/day against an average requirement of 840 mg/capita/day (ADePT table 60). The main source of calcium is of vegetable origin as "roots/tubers/

plantains" and vegetables contribute alone 60 percent of the calcium available for consumption (ADePT table 70). Milk products, which are some of the richest in calcium, contribute only 2 percent of the calcium available for consumption. Cabbage is the main source of calcium followed by laplap. Despite the very low quantity of powdered milk consumed (less than 1 g/capita/day) the calcium density of this product is so high that this product alone contributes to 1 percent of total calcium consumption.

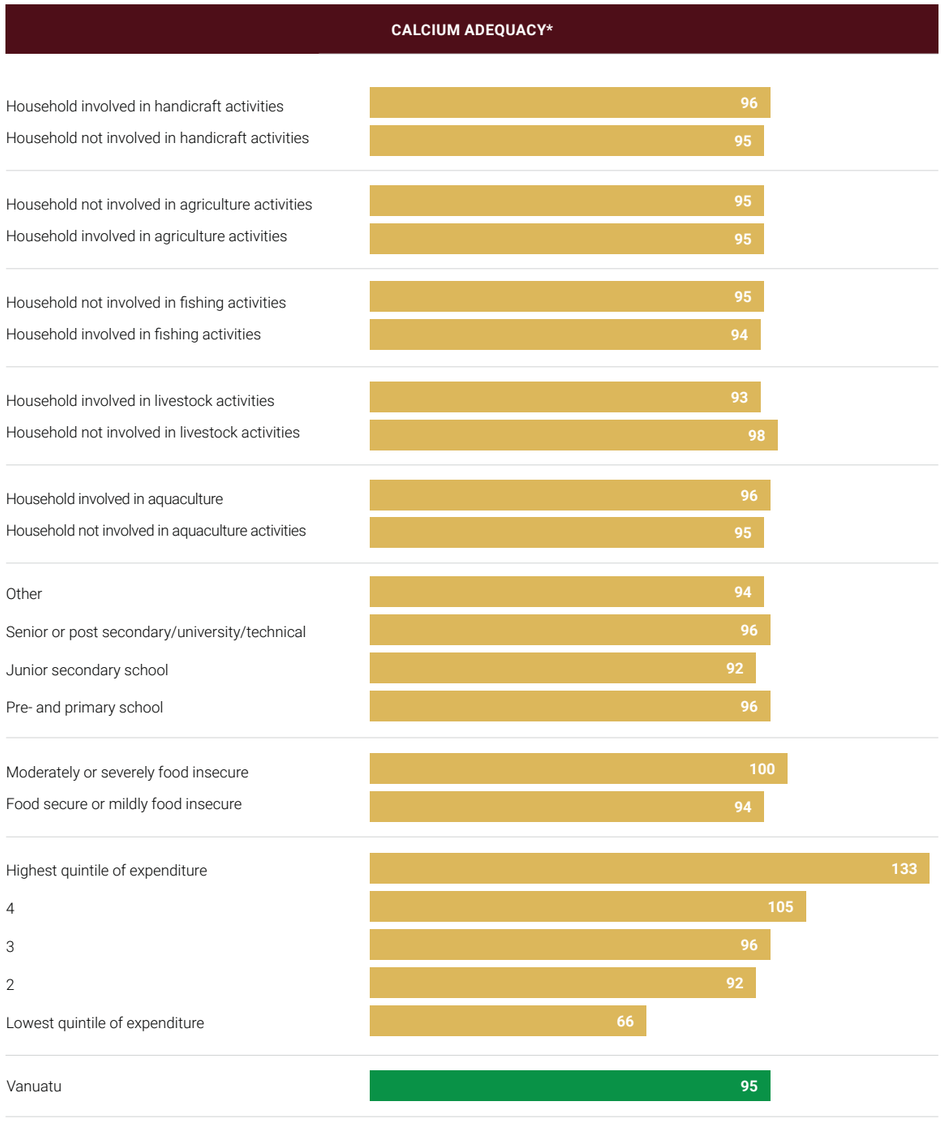
At a national level, calcium adequacy is almost reached (95 percent); however, the distribution of calcium is not homogenous within the population. In the region of Penama, adequacy is exceeded, with some other population groups also accessing a quantity of calcium well above their average requirements.

Figure 31 Distribution of calcium adequacy by regional and demographic characteristics of the households



** As measured by percentage of quantity of calcium available for consumption to the average requirements*

Figure 32 Distribution of calcium adequacy by socioeconomic characteristics of the household



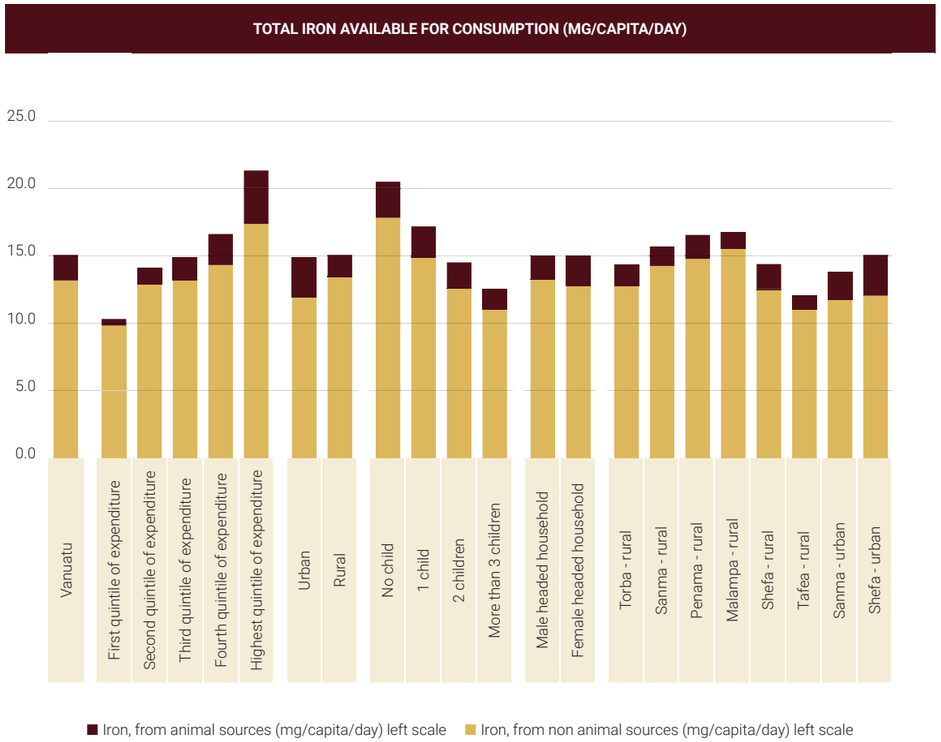
** As measured by percentage of quantity of calcium available for consumption to the average requirements*

ii. Iron:

Iron is one of the essential nutrients for the proper growth and development of the human body. The body cannot prepare iron on its own, so to maintain the amount of iron in the body, iron rich foods are eaten. Two different sources of iron are found: non-haem sources of iron mostly refer to vegetables like beans, turnips, leafy vegetables, pumpkins, and so on, along with other products like legumes, lentils, dairy products and tofu; haem sources of iron include lean meat, chicken liver, lamb, oysters, tuna fish, and so on.

Quantities of iron needed vary greatly by age and gender and are higher for women than for men. Children need on average 7 mg to 10 mg of iron per day, a male aged 19 to 99 years needs 8 mg of iron per day, while a woman aged 19 to 50 years needs more than 18 mg of iron a day, and older women will need only 8 mg a day.[46]

Figure 33 National disparities in the amount of iron available for consumption



In Vanuatu, the average quantity of iron available for consumption is equivalent to 15 mg per day, with iron from non-animal sources representing 88 percent of the total quantity of iron available for consumption (ADePT table 61). Large differences can be observed in the amount of iron available for consumption within the population. The biggest differences are among households with different levels of expenditure. The average quantity of iron available for consumption by richer households is twice the quantity accessed by households belonging to the first quintile of expenditure. And while only 5 percent of iron consumed by households belonging to the first quintile is of animal origin, this share reaches 20 percent for wealthier households. The amount of iron consumed in rural and urban areas overall is the same, but in urban areas iron from animal origin contributes a bit less than 20 percent of the total iron consumed compared with 10 percent in rural areas. The same trend can be observed at the level of the region. There is not much difference in the total quantity of iron available for consumption, but the main difference is in the contribution of iron of animal origin, which is much higher in urban Sanma or Shefa than in rural Sanma and Shefa. The quantity of iron from animal origin is also higher among female headed households. Huge differences can be observed in the total quantity of iron available between households with no child and households with children; however, there is no major difference in the contribution of animal iron despite a higher quantity being available for consumption.

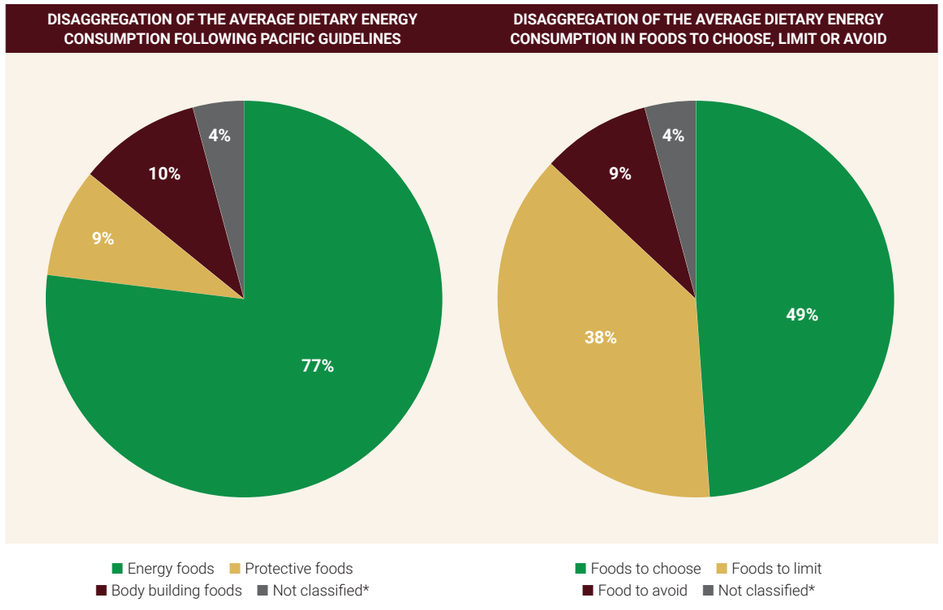
46 National Institute of Health, US Department of Health and Human Services: https://ods.od.nih.gov/factsheets/Iron-HealthProfessional/

d. Healthy diet following Pacific guidelines

As seen above, it is important to eat a wide variety of foods to access all the essential nutrients. It is not only important to have a diversified diet but also to eat these foods in proportions that lead to a healthy diet. In 2018 the Public Health Division of the Pacific Community (SPC) published guidelines for healthy living in the Pacific.[47] Its main purpose is to provide background information and guidance for healthy living. Following the recommendations from the guidelines, the food products collected in the 2019 NSDP Baseline Survey were categorised into three groups of foods recommended for a healthy diet. The groups are "energy foods", mainly composed of starch staples or food prepared with fats and sugar, "protective foods" mainly composed of vegetables and fruits, and "body building foods" mainly composed of protein-rich foods such as meat, beans, nuts and dairy products. These groups were further disaggregated into three categories: (i) foods to choose; (ii) foods to limit; and (iii) foods to avoid.

Following this food group classification, it was found that almost 80 percent of the average dietary energy consumed comes from energy foods like rice, brown coconut and cooking banana. Body building foods like chicken contribute to 10 percent of dietary energy consumed, and finally protective foods like cabbage, banana and papaya, which are rich in vitamins but poor in dietary energy, contribute 9 percent of the average dietary energy consumed. Looking at products to choose, limit or avoid, it can be seen that 38 percent of the average dietary energy consumed in Vanuatu is composed of foods to limit such as white rice, crackers, laplap, canned tuna or meat with visible fat, and less than 10 percent of dietary energy consumed comes from foods to avoid such as cooking oil, sugar and pastry.

Figure 34 Disaggregation of the average DEC according to the Pacific guidelines for healthy living



**Food not classified corresponds to food like spices, alcoholic beverages, lunch, breakfast and dinner consumed away from home*

Among the energy foods to choose, banana and kumara are the most consumed in terms of edible quantities. Cabbage and papaya are the most consumed foods among protective foods, and fresh fish is the main food consumed among the body building products from which to choose.

47 Pacific guidelines for healthy living – a handbook for health professionals and public educators. Public Health division of the Pacific Community. SPC. 2018

White rice is among the foods to limit because of its poor nutrient qualities compared with brown rice. It should be noted also that among the food products to avoid, cooking oil, sugar, butter and canned beef are consumed by more than 20 percent of the households; all the other food products are consumed by less than 20 percent of households in very negligible quantities.

Figure 35 **Distribution following the Pacific guidelines of the edible quantity of food products consumed by at least one household in three and contributing to at least 1 percent of the average DEC**

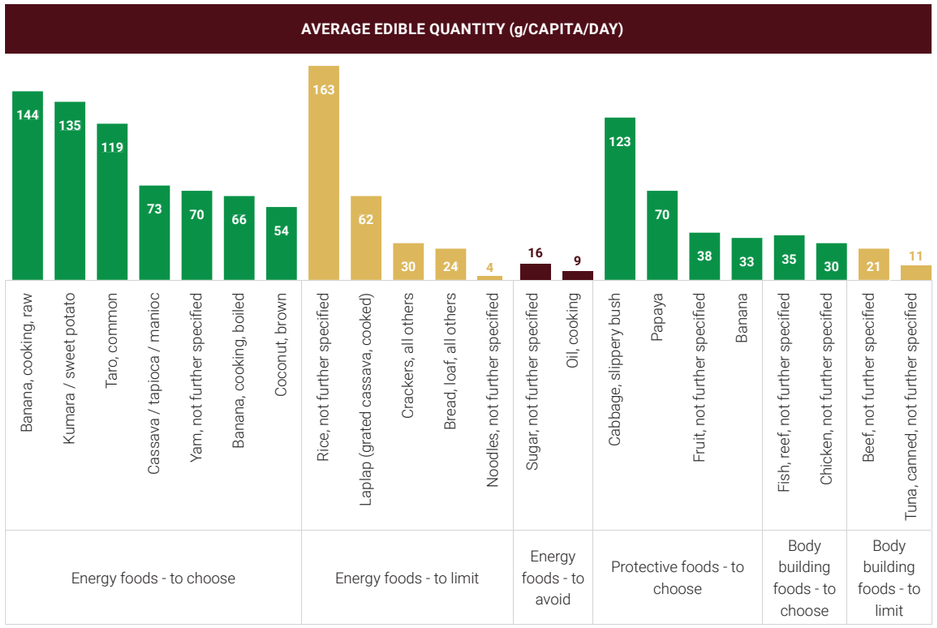


Figure 36 **Percentage of households consuming the food products that should be avoided**

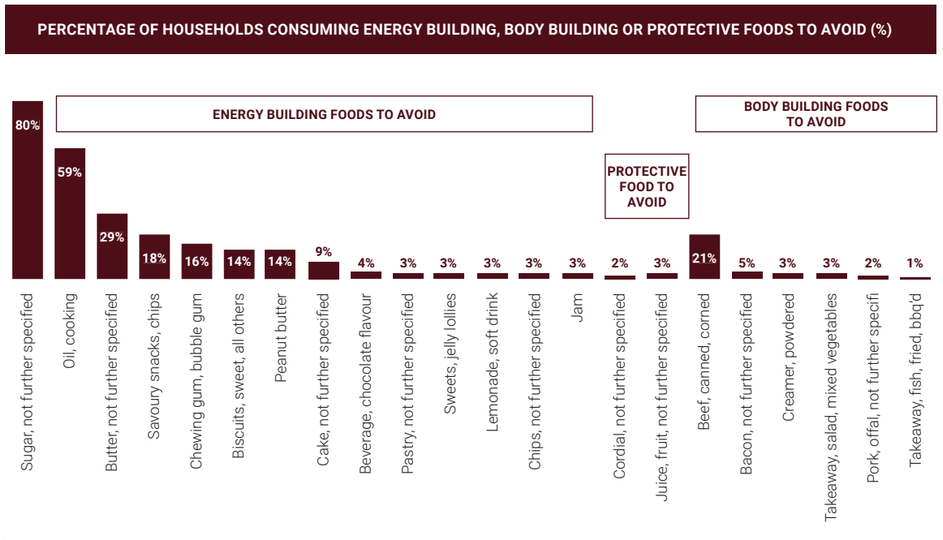


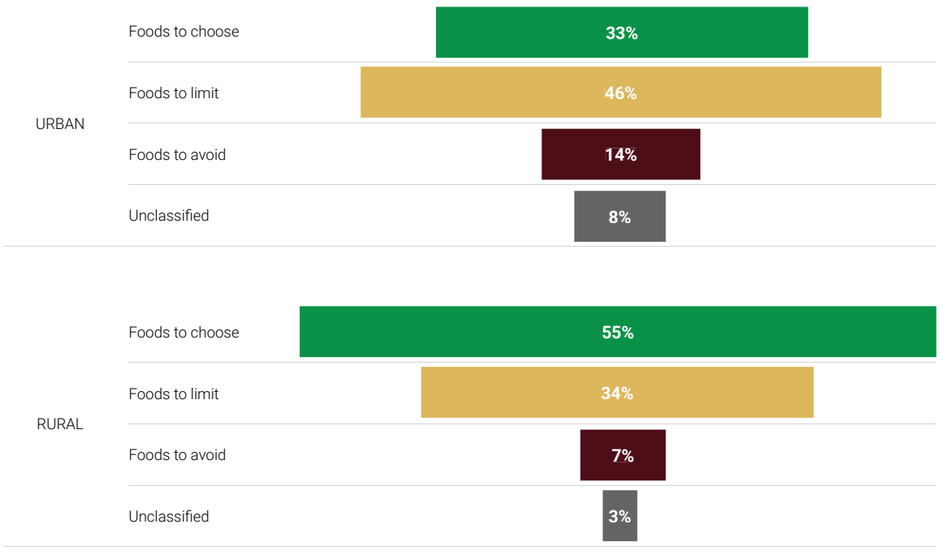
Table 6 **Quantity and contribution to the average DEC of the foods grouped according to the Pacific guidelines and by area**

			AVERAGE EDIBLE QUANTITY (G/ CAPITA/DAY)	AVERAGE FOOD CONSUMPTION IN MONETARY VALUE (VUV/ CAPITA/DAY)	CONTRIBUTION TO THE AVERAGE DIETARY ENERGY CONSUMPTION (%)
URBAN	ENERGY FOODS TO CHOOSE	Kumara / sweet potato	203	24	7
		Banana, cooking, raw	85	10	4
		Coconut, brown	21	2	3
		Taro, common	48	7	2
		Yam, not further specified	42	13	1
		Cassava / tapioca / manioc	25	2	1
		Banana, cooking, boiled	29	1	1
	ENERGY FOODS TO LIMIT	Rice, not further specified	211	41	24
		Crackers, all others	46	18	7
		Bread, loaf, not further specified	65	13	5
		Laplap (grated cassava, cooked)	80	6	4
	ENERGY FOODS TO AVOID	Oil, cooking	17	5	5
		Sugar, not further specified	19	4	2
		Butter, not further specified	10	5	2
	PROTECTIVE FOODS TO CHOOSE	Banana	33	4	1
		Cabbage, slippery bush	107	11	1
		Chicken, not further specified	73	56	5
		Fish, pelagic/ocean, not further specified	23	19	1
	BODY-BUILDING FOODS TO LIMIT	Beef, not further specified	30	10	2
	NOT CLASSIFIED (SPICES/ ALCOHOL/ TOBACCO/ MEALS AWAY FROM HOME)	Lunch away from home	209	44	7

RURAL	ENERGY FOODS TO CHOOSE	Coconut, brown	65	6	10
		Banana, cooking, raw	165	15	8
		Taro, common	144	16	6
		Cassava / tapioca / manioc	90	6	5
		Kumara / sweet potato	111	8	4
		Banana, cooking, boiled	79	4	3
		Yam, not further specified	80	11	3
		Breadfruit	33	2	1
	ENERGY FOODS TO LIMIT	Rice, not further specified	146	28	18
		Crackers, all others	24	11	4
		Laplap (grated cassava, cooked)	56	6	3
		Bread, loaf, all others	30	6	3
		Flour, not further specified	13	2	2
	ENERGY FOODS TO AVOID	Sugar, not further specified	15	3	2
		Oil, cooking	6	2	2
	PROTECTIVE FOODS TO CHOOSE	Cabbage, slippery bush	129	10	2
		Banana	33	3	1
		Fruit, not further specified	46	6	1
		Fish, reef, not further specified	41	20	2
		Chicken, not further specified	14	13	1
	BODY-BUILDING FOODS TO LIMIT	Beef, not further specified	18	7	1
	NOT CLASSIFIED (SPICES/ ALCOHOL/ TOBACCO/ MEALS AWAY FROM HOME)	Lunch away from home	45	8	2

The difference in the healthy pattern in rural areas compared to urban areas is interesting. While in urban areas 60 percent of the dietary energy consumed comes from foods to avoid or limit, in rural areas this share drops to 41 percent of the average dietary energy consumed. This is mainly due to a higher consumption in urban areas of energy foods to avoid like sugar, oil and butter (18, 17 and 10 g/capita/day respectively in urban areas compared with 15, 6 and 2 g/capita/day in rural areas), body building foods to avoid (for instance the quantity of canned meat is 6 g/capita/day in urban areas compared with less than 2 g/capita/day in rural areas) and protective foods to avoid like fruit juice (4 g/capita/day in urban areas while almost none in rural areas).

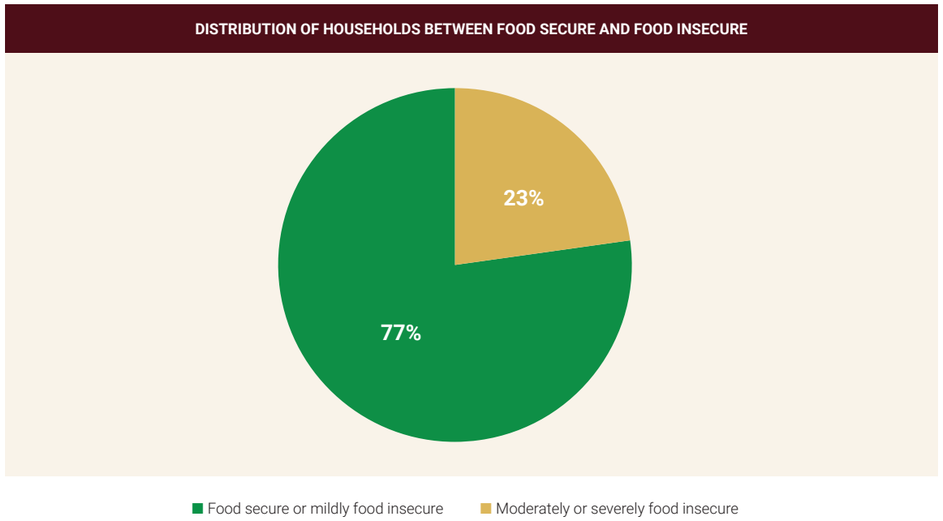
Figure 37 **Differences in the dietary pattern between rural and urban areas (as percentage of DEC in each group)**



V. ANALYSIS OF THE DIETARY PATTERNS OF THE FOOD INSECURE[48]

As already mentioned, the Food Insecurity Experience Scale (FIES) module was introduced for the first time in Vanuatu through the NSDP Baseline Survey. To account for local context the leading question was changed to refer to difficult access to food due to a lack of resources or environmental conditions. The eight questions of the scale were not changed and were kept in their original format without pre-testing. The statistical validity of the scale was tested and it was found that the scale performs well in Vanuatu[49] and the number of affirmative answer to the eight questions of the scale (raw score) can be considered as an ordinal measure of the food insecurity.[50] Based on these findings, a level of food insecurity was associated with each household. A household is classified as "food secure or mildly food insecure" when the raw score is less than or equal to three, and a household is considered as "moderately or severely food insecure" when the raw score is higher than or equal to 4.[51,52] Following this categorisation it was found that 23 percent of households in Vanuatu are moderately or severely food insecure.

Figure 38 **Percentage of food insecure households versus food secure**



A better understanding of the profile and dietary pattern of food insecure households is important to adopt the best policies aiming to reduce food insecurity and all forms of malnutrition.

48 Because of the poor performance of the scale in the region of rural Tafea, all the analysis presented in this section excludes the region of rural Tafea, which equates to around 613 households from the sample of 7652 households in Vanuatu.
49 Except for the region of rural Tafea.
50 For instance, a raw score of four reveals a higher level of severity of food insecurity than a raw score of three. For more detail see the technical annex and refer to the Voices of the Hungry website: http://www.fao.org/in-action/voices-of-the-hungry/en/
51 At this threshold the probability of being moderately or severely food insecure is 50%.
52 Due to the low number of sampled households presenting a raw score of 8 (77 households out of a sample of 4 549 households), the moderately and severely food insecure have been combined into only one category.

a. Profile of the food insecure

The urban area of Shefa, which is also the most populous region of Vanuatu, has a concentration of around 10 percent of the food insecure, while the rural area of Shefa has an even higher concentration of 27 percent of the food insecure in Vanuatu, followed by rural Penama with 26 percent. The rural region of Torba, which is also the region with the lowest number of people, has less than 5 percent of the food insecure households.

Figure 39 **Regional distribution of the food insecure households**

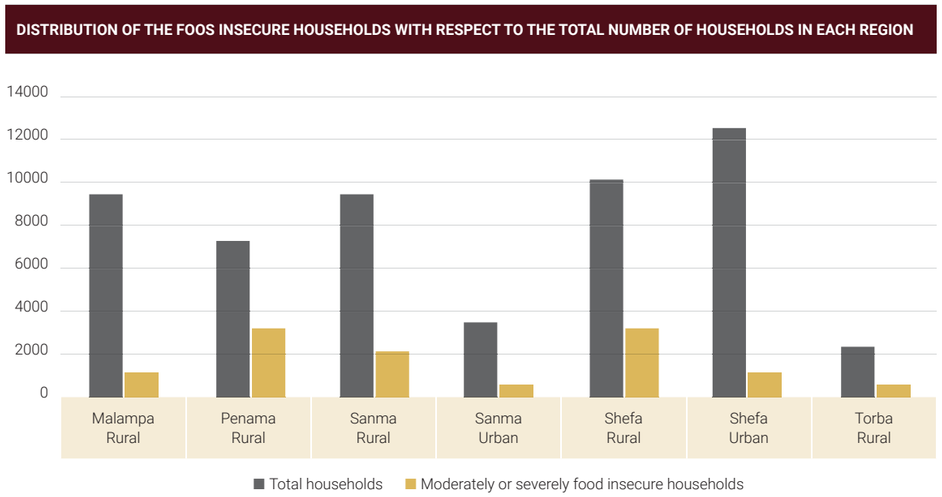


Figure 40 **Regional distribution of the food insecure households**

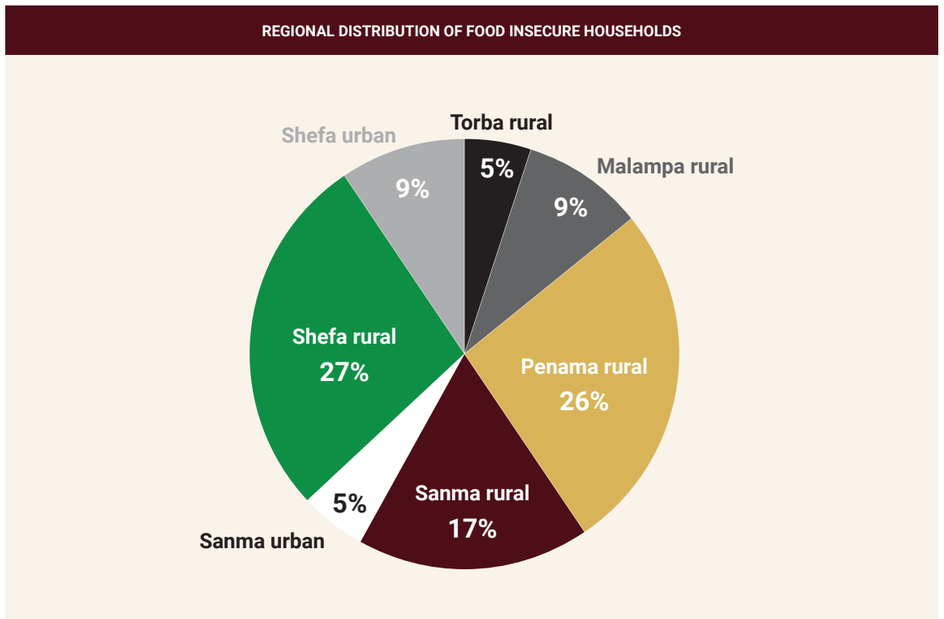
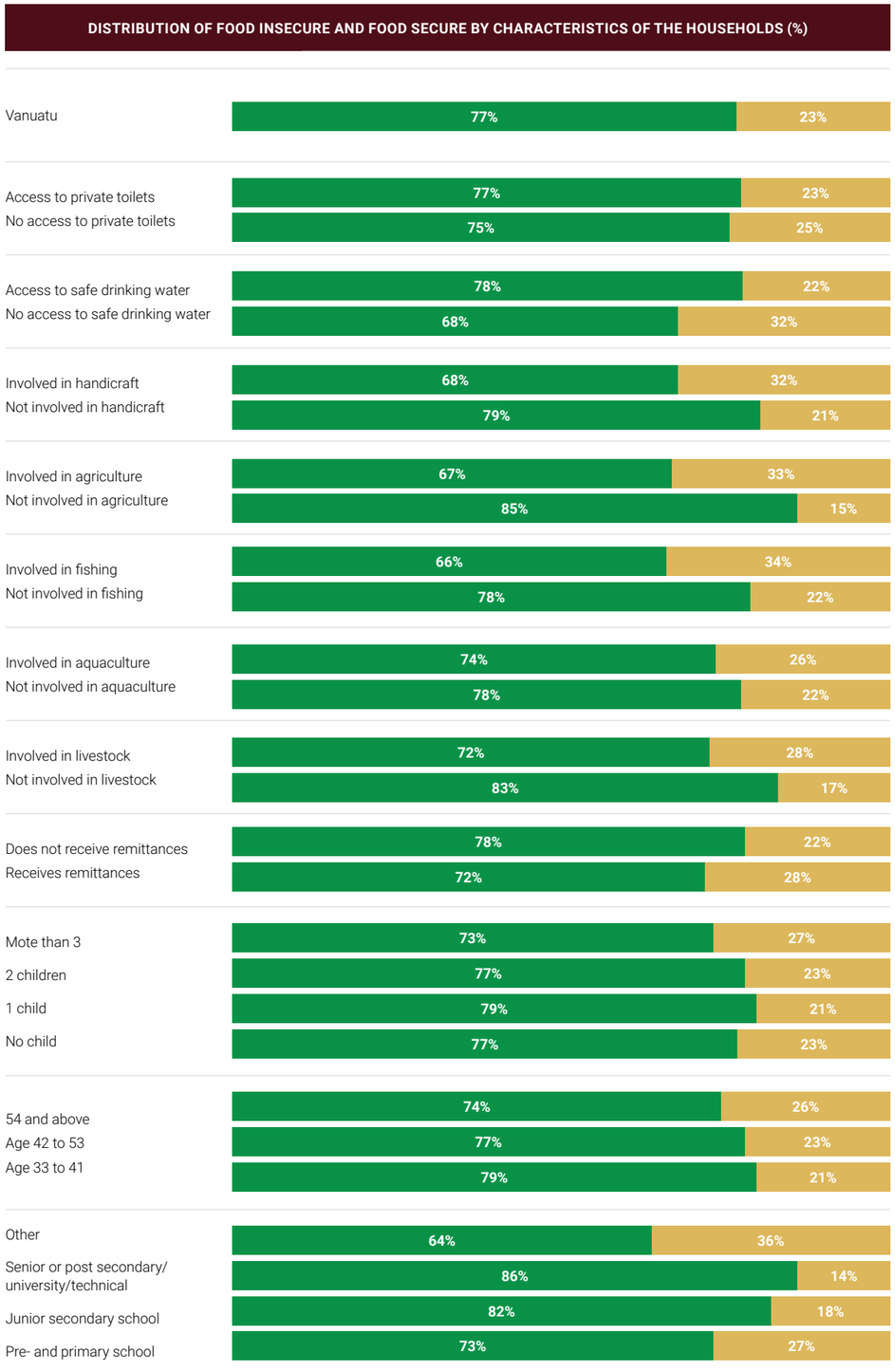


Figure 41 **Profile of the food insecure**



In terms of the main characteristics of the 23 percent of households who are food insecure, almost one person in two in rural Penama and one person in three in rural Shefa is food insecure compared with one person in ten in urban Shefa or rural Malampa. Food insecure households can be found in all expenditure quintiles, with a higher proportion of the food insecure being found among households belonging to the second and third quintile of expenditure, with 29 percent and 27 percent respectively of households belonging to these quintiles being food insecure. Food insecure households also have slightly more children of less than 14 years old than do food secure households, with an average number of children in food insecure households being 1.9 compared with 1.7 children in food secure households, and an average household size of 4.9 people compared with 4.7 people.

Not much difference is observed within male or female headed households – they both exhibit almost the same incidence of food insecurity. A higher share of food insecurity seems to be observed within households whose head is older than 54 years. The same occurs for households with more than three children, with the percentage of food insecurity being higher for these households than for households of smaller size. There is a higher prevalence of food insecure households among those involved in aquaculture, fishing, livestock, agriculture or handicraft activities than among those not involved in these activities. The same is observed for households receiving remittances: 28 percent of households receiving remittances are food insecure compared with 22 percent of households not receiving remittances. Finally, and not surprisingly, almost one household in three with no access to a safe source of drinking water is food insecure against one in five who are food insecure among households with access to safe drinking water. The lowest percentage of food insecurity is observed among households whose head presents a high level of education (secondary and more).

b. Overall pattern of the food consumption of the food insecure and food secure

On average, the dietary energy consumed by food insecure households is slightly lower than that consumed by food secure households on a per capita basis. However, when we control for expenditures and other household characteristics, the regression evidenced a higher DEC for the food insecure than

for food secure households and this is mainly due to the variability observed in the DEC distribution of the food insecure (a coefficient of variation of DEC of 35 percent for the food insecure versus 29 percent for the food secure). In fact, when the DEC of the food insecure is plotted against total expenditure decile it can be seen that, except for the lowest expenditure decile, the DEC of the food insecure is always slightly higher than that of the food secure. With such low and high levels of DEC, the probability of finding undernourished people among the food insecure households belonging to the first expenditure quintile is high, as is the probability of finding overweight or obese people among food insecure households belonging to the upper quintile of the expenditure distribution. This is an important finding pointing towards the probability of finding a higher prevalence of people exposed to NCDs among the food insecure than among food secure households due to poorer access to healthy foods.

Figure 42 Distribution of DEC by level of food insecurity

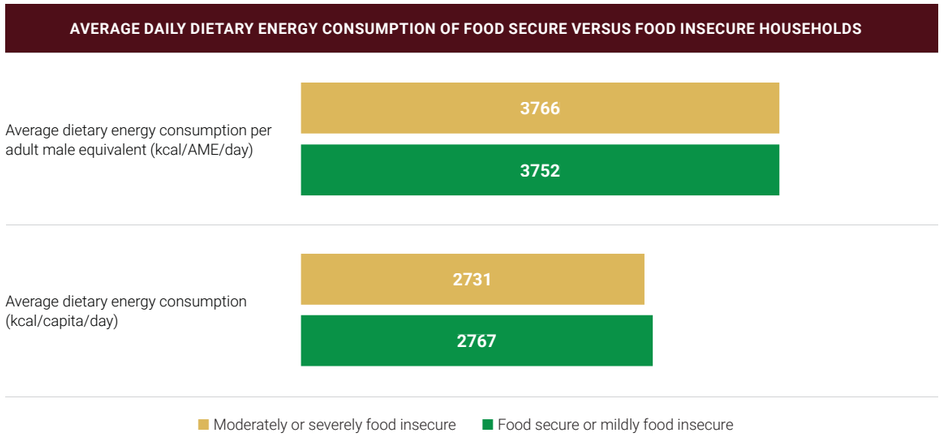
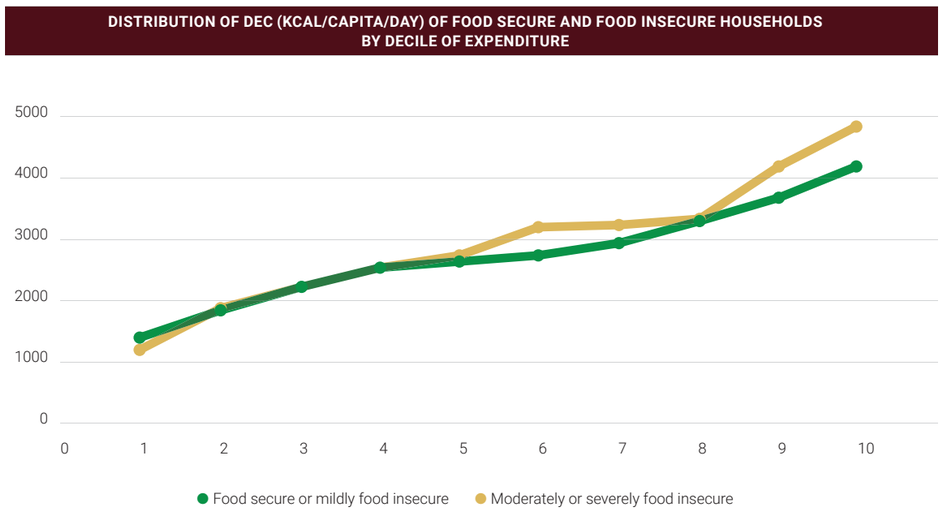


Figure 43 Distribution of DEC by level of food insecurity and expenditure decile



This trend is further confirmed by the difference in the amount spent to acquire 1 000 kcal by food insecure households compared with food secure households. Food insecure households spend on average VUV 7 less to acquire 1 000 kcal than food secure households,[53] which indicates sources of dietary energy of lower quality, with a total amount spent on food of VUV 378 compared with VUV 407. The average total expenditure of food insecure households is VUV 130 less than that of food secure households, and the proportion of food expenditure in their total expenditure is 62 percent compared with 58 percent in food secure households.

Figure 44 Distribution of the cost of food by level of food insecurity

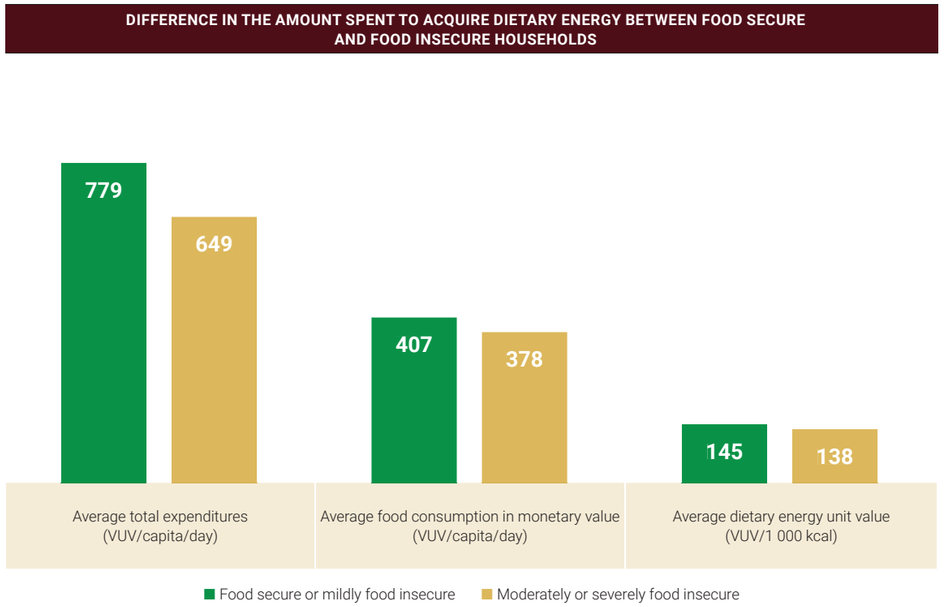
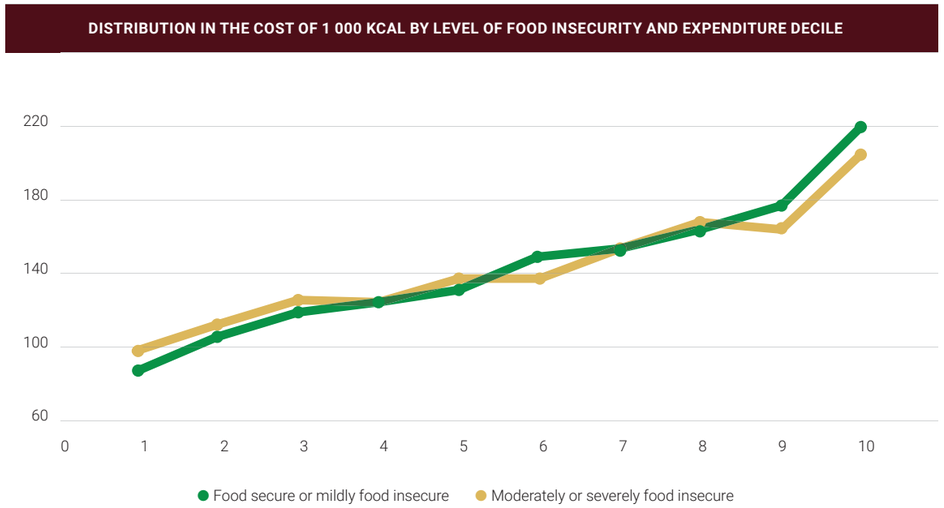


Figure 45 Distribution of the cost of food by level of food insecurity (VUV per 1 000 kcal)

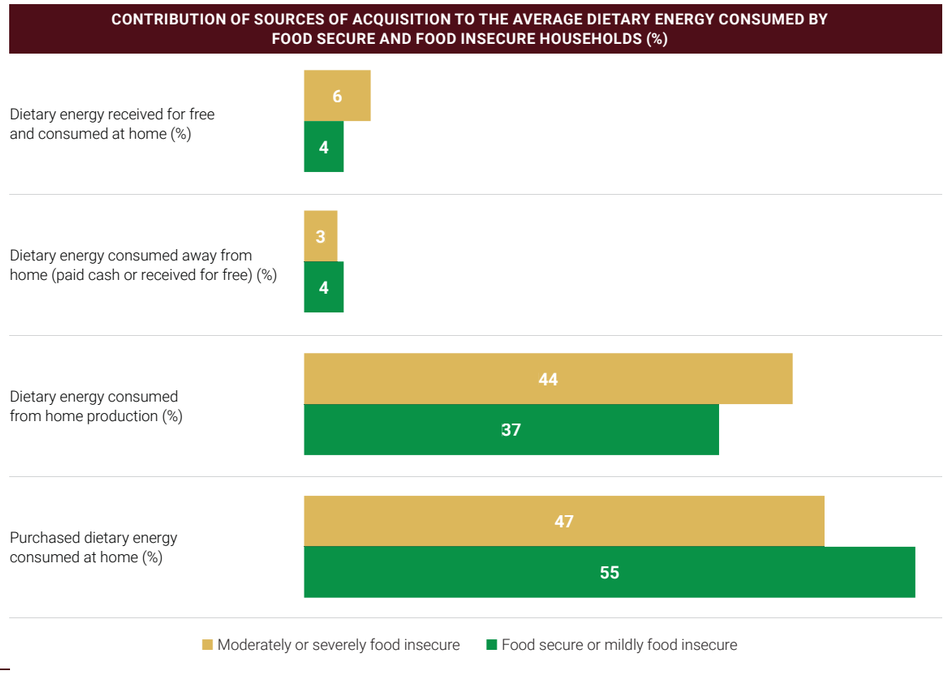


Of the dietary energy consumed by food insecure households, 44 percent comes from their own production, while this share drops to 37 percent for food secure households, who purchase more than 55 percent of

53 Results indicate a significant difference in the cost of 1 000 kcal between food secure and food insecure households (t = 2.13, p value = 0.033 and df = 4547).

the dietary energy they consume. Food insecure households also depend more on food received for free, as 6 percent of the dietary energy they consume comes from food received for free, which also translates into less control over the quality of the food consumed.

Figure 46 Main sources of acquisition of the DEC of the food secure



c. Main food products consumed by the food insecure and food secure

Food insecure households consume less cereals (on average 11 g/capita/day less rice) but more roots, tubers, plantains and pulses (mainly through the higher quantities of taro and cassava consumed at 29 and 23 g/capita/day more respectively) than food secure households.

Figure 47 Contribution of the main food groups to the dietary energy consumed by food secure and food insecure households

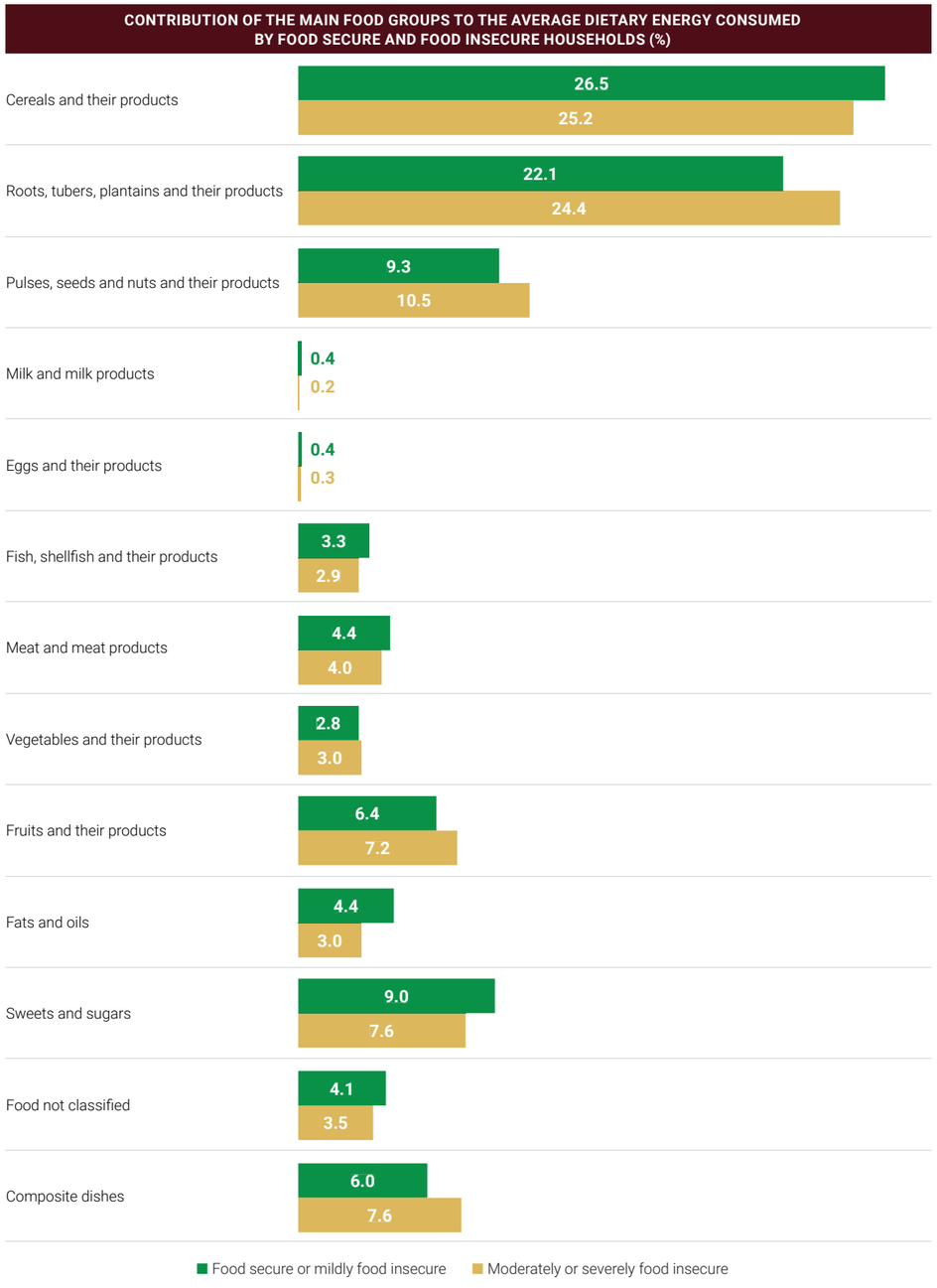
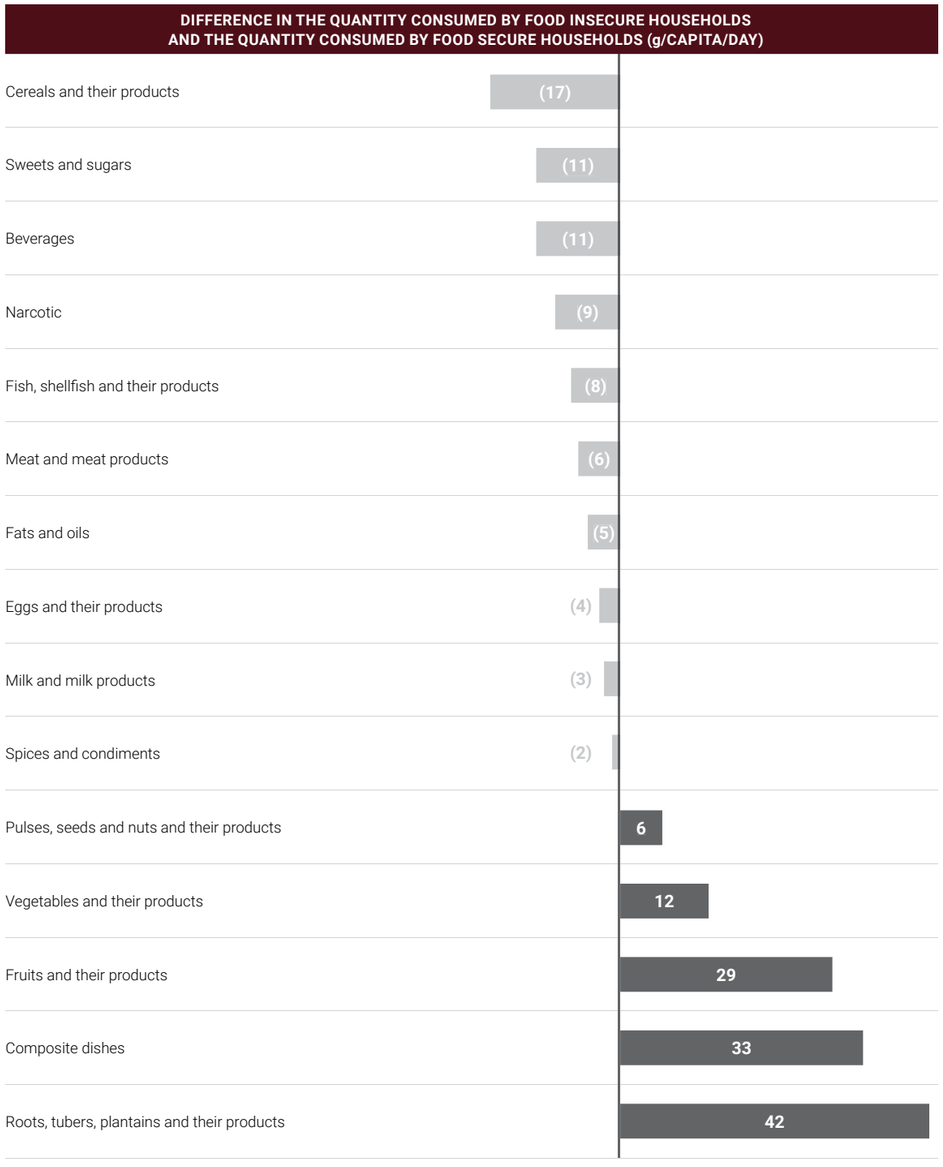


Figure 48 **Differences in the quantity consumed of main food groups by food secure and food insecure households**



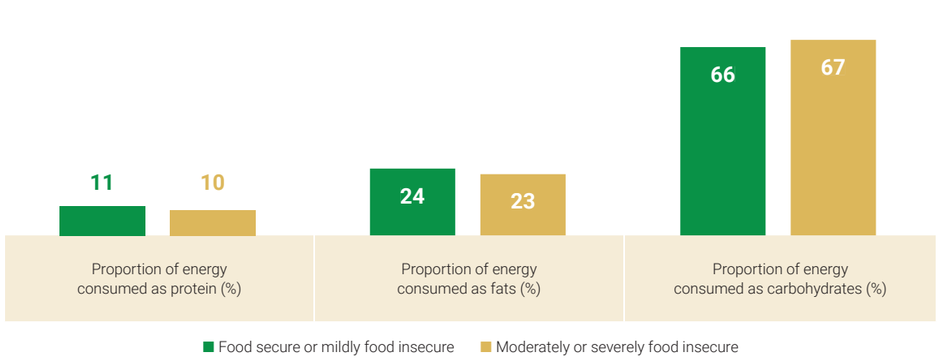
The difference is small but the contribution of protein dense products like meat, fish, dairy products and eggs to the average DEC of the food insecure is slightly lower than that of food secure households, with on average 6 g/capita/day and 8 g/capita/day less of meat and fish. Conversely, food insecure households consume on average 40 g/capita/day more of fruits and vegetables than food secure households. Finally, food insecure households consume more composite dishes (mainly boiled cooking banana or laplap) than food secure households do.

d. Nutrient consumption of the food insecure versus food secure

The difference in terms of contribution of macronutrients to the overall DEC is not that significant but, as expected, through the lower consumption of meat, fish and eggs, the contribution of proteins is lower and that from carbohydrates is higher for food insecure households. Food secure households tend to access more energy from fats than food insecure households through higher consumption of oils and fats. (On average, food secure households consume 3 g/capita/day more of butter and 2 g/capita/day more of cooking oil than food insecure households).

On average the quantity available for consumption of vitamins A, B1, B2 and C is slightly higher among food insecure households than food secure households, mainly due to the larger consumption of fruits and vegetables rich in these vitamins. In contrast, the quantity of vitamin B12 available for consumption is much lower for food insecure households mainly due to the lower consumption of fish and fish products.

Figure 49 **Contribution of macronutrients to the average DEC (%)**

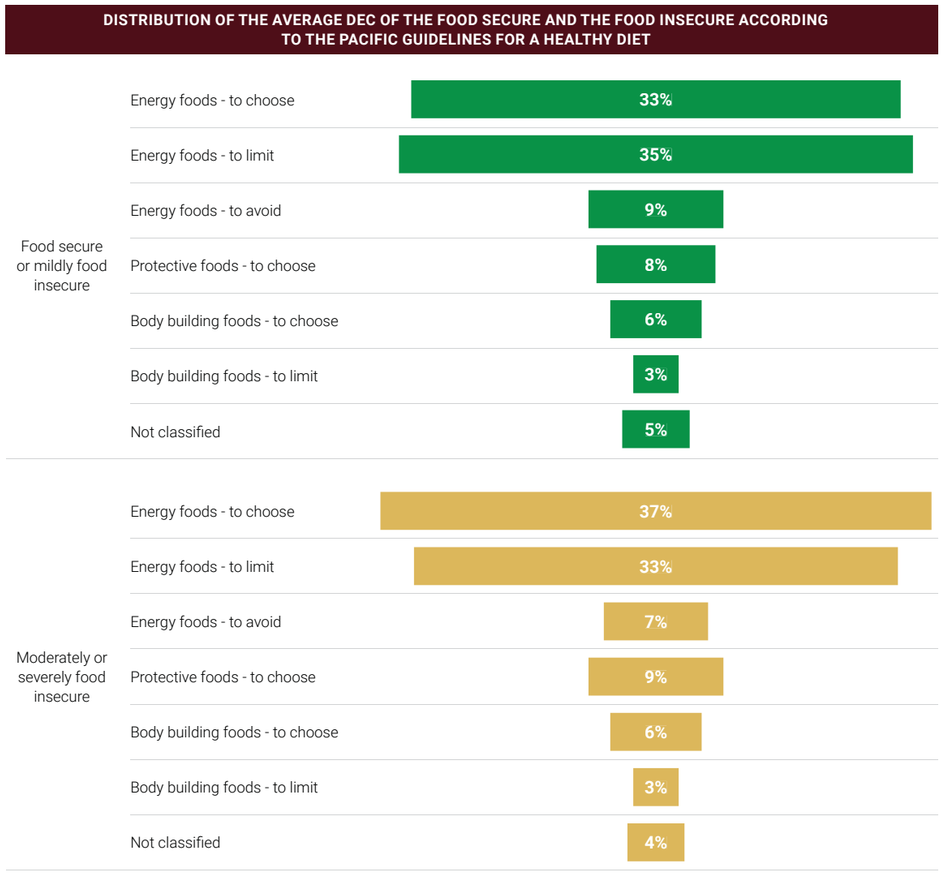


e. Healthy living pattern

When the foods consumed are categorised according to the Pacific guidelines for a healthy diet, it can be seen that there is not much difference in the contribution of energy foods or body building foods to the total DEC consumed by food secure versus food insecure households. The main difference is in the slightly higher contribution of protective foods to the diet of the food insecure due to higher consumption of fruits and vegetables. The contribution of energy foods to choose is higher among food insecure households than food secure households and this is mainly because of the higher consumption of locally produced staple foods. Conversely, food secure households consume more cereals and cereal products like crackers or bread that are classified as energy foods to limit.

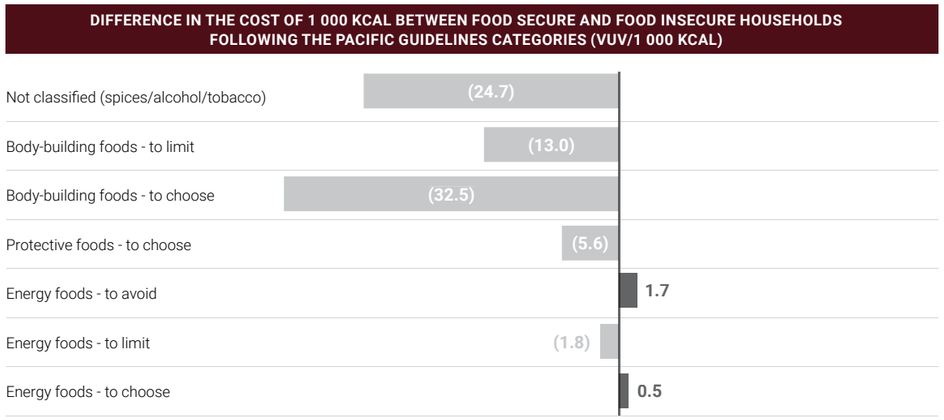
But when we look further at the cost of the dietary energy of the foods classified according to the Pacific guidelines and consumed by food secure and food insecure households,[54] some important differences emerge. To acquire 1 000 kcal from body building foods among which to choose, food insecure households are spending on average 32 VUV less than food secure households. This means food insecure households have access to body building foods that are less diversified or for which the nutritious properties are different (for instance a higher consumption of protein rich vegetable foods instead of protein rich animal foods). The same pattern can be observed for protective foods. The cost of 1 000 kcal from protective foods consumed by food insecure households is around VUV 6 lower than that from protective foods consumed by food secure households.

Figure 50 **Difference between dietary pattern of the DEC of food secure and food insecure households according to the Pacific guidelines**



54 We used a simple ratio of the average amount spent and average dietary energy consumed by groups as a proxy of the cost of 1 000 kcal.

Figure 51 **Difference between the cost of 1 000 kcal of food secure and food insecure households by Pacific guidelines classification**



As can be seen from table 7 below, which shows the products consumed by at least 33 percent of food secure and food insecure households, locally grown products (such as coconut, cooking banana, taro or kumara) are consumed by a larger percentage of food insecure households than food secure households. The same trend is observed for protective foods (such as papaya, green coconut and orange) for which the percentage of food insecure households consuming them is higher than the percentage of food secure households. The trend, in turn, reverses for body building foods, with a higher proportion of food secure households consuming canned tuna, fresh fish, chicken or beef than do food insecure households. Even if not considered a food product, more kava is consumed by food secure households than food insecure households.

Table 7 **Products consumed by at least 33 percent of food secure and food insecure households in the previous seven days**

		FOOD SECURE OR MILDLY FOOD INSECURE(%)	MODERATELY OR SEVERELY FOOD INSECURE(%)
Energy foods – to choose	Coconut, brown	78	82
	Banana, cooking, raw	78	78
	Taro, common	57	67
	Banana, cooking, boiled	39	53
	Kumara / sweet potato	49	49
	Yam, not further specified	40	38
	Cassava / tapioca / manioc	<33	38
Energy foods – to limit	Rice, not further specified	94	92
	Laplap (grated cassava, cooked)	55	68
	Crackers, all others	70	68
	Noodles, not further specified	40	44
	Bread, loaf, all others	41	42
Energy foods – to avoid	Sugar, not further specified	81	76
	Oil, cooking	60	56

Protective foods – to choose	Cabbage, slippery bush	95	95
	Banana	71	71
	Papaya	66	68
	Coconut, green	51	60
	Orange	<33	44
	Grapefruit	35	42
	Fruit, not further specified	<33	39
	Cucumber, unpeeled	40	<33
Body-building foods – to limit	Tuna canned	69	64
Body-building foods – to choose	Fish, reef, not further specified	42	37
	Chicken, not further specified	45	37
Body-building foods – to limit	Beef, not further specified	41	34
	Mackerel, canned	33	33
Not classified	Salt, not further specified	89	90
	Tobacco	41	42
	Kava	46	41
	Lunch away from home	33	<33

CONCLUSION

The analysis of the food insecurity experience scale and food data collected in the 2019 National Sustainable Development Plan Baseline Survey reveals very interesting patterns in the food consumption of Ni-Vanuatu and provides valuable information to be used in the future to form food security and nutrition policies aiming to ensure access to safe, nutritious and sufficient food for all.

The analysis shows that Vanuatu is quite unusual in its food consumption and nutritional profile. Vanuatu is characterised by a relatively high level of DEC, but it is not equally distributed, considering the moderate proportion of people whose access to dietary energy is still insufficient to be in good health and perform a light level of physical activity and the proportion of those that are overweight and obese.

More than 40 percent of the dietary energy consumption is sourced from energy dense foods, consumption of which should be limited or avoided. Building foods that are rich in protein and calcium, which households are recommended to choose, contribute only 6 percent of the dietary energy that is consumed. Therefore, Ni-Vanuatu have an overall diet that seems quite limited in healthy foods compared with foods to avoid or limit.

This trend is further confirmed by the 21 percent of households who report accessing only a few kinds of foods, or those that are not able to access healthy or nutritious foods. For these households, access to enough dietary energy does not seem to be an issue, but the quality or the diversity of the dietary energy that is accessed is an issue. These households are experiencing moderate or severe forms of food insecurity, since their limited access to a balanced diet or healthy foods translates into a higher amount of dietary energy, which increases the risk for these households of being exposed to NCDs.

Further uses of this report

This report is the first of its kind in Vanuatu. It only states facts, but the wealth of information it provides on the food security and food consumption patterns of the Ni-Vanuatu can be taken further to:

- communicate to all stakeholders on the status of food security and nutrition in Vanuatu;
- assess the data gap and needs in terms of food consumption and nutrition information and develop further nutrition assessment tools and surveys;
- form recommendations intended to improve the overall diet of Ni-Vanuatu and reduce the risk associated with bad eating habits and/or access to an unhealthy diet;
- develop policies intended to increase access to more traditional healthy local foods;
- identify pockets of food insecurity and further develop policies targeting the most vulnerable populations;
- report on SDG Target 2.1 indicators;
- further assess the impact of cyclone Harold and/or COVID-19 on food security and food systems to provide a baseline for future evaluations;
- serve as a baseline to assess the changes in food security and food consumption patterns over time in Vanuatu;
- complement further analysis such as that on welfare and hardship in Vanuatu.

ANNEX 1.
LIMITS TO THE ANALYSIS

The Vanuatu 2019–2020 NSDP Baseline Survey implemented by the Vanuatu Statistics Office is an extended version of the Household Income and Expenditure Survey and was the first survey conducted in the Pacific and following the recommendations of the Pacific Statistics Methods Board (PSMB) to collect in-house consumption through a 7-day recall module rather than a 14-day diary. In this module households were asked if they consumed some specific foods over the previous 7 days and, in the case of an affirmative answer, what was the total quantity they consumed of this quantity, and what was the quantity coming from own production or received for free. The difference between total quantity consumed and quantity consumed from own production or from a gift was associated to quantities purchased.

Food quantities collected were converted into grams and nutrient values were allocated to the quantities using the nutrient values from the Pacific Nutrient Database (PNDB) developed by SPC in collaboration with FAO and the University of Wollongong.[55] More information on the food data processing can be found in the Survey Technical Report..

- Households were asked to report quantities consumed in the unit of measurement in which the product was acquired (bundle, bag, kg, cup etc). To convert all the quantities into grams,[56] a regional market survey was conducted in parallel to collect information on the weight in grams of one unit of product. The information was collected for the six regions of Vanuatu. The market survey collected information for 267 combinations of products/unit of measurement, while from the food files we had 933 combinations of products/units (excluding standard units such as kg, g, litres or millilitres). For the combinations not covered (more than 9700 transactions) it was necessary to use ad hoc conversions provided by VNSO.

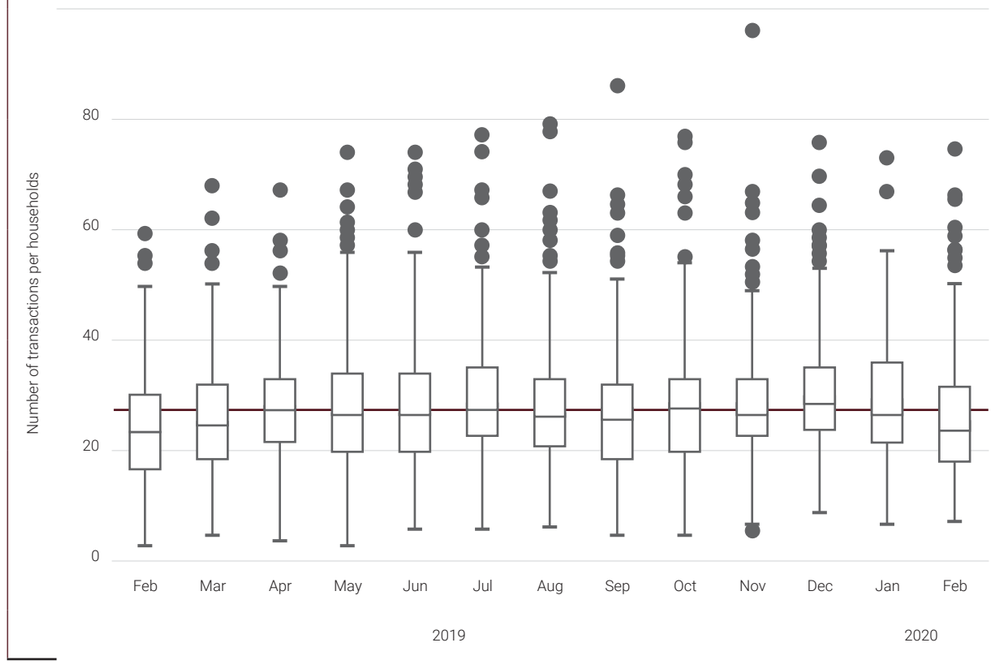
- Information on the amount spent to acquire the quantities reported was not collected. To estimate such amounts, the price of one gram of product was also collected in the market survey. However, the price in grams was provided for only 107 products, while the survey collected information on the food consumed for 171 products. Therefore ad hoc price information was further needed.

- Some improbable/implausible quantities were reported in some regions and it is believed these quantities were the result of wrong recording of the unit, or households buying in bulk some quantities to be consumed during and after the reference period (such as 25 kg of rice). Conversely, there may have been an underreporting of the quantities corresponding to a specific product and unit (such as one gram of rice). To correct for these outstanding quantities associated with the product and unit, a heavy cleaning process was performed. To correct for low or high quantities we use the Tukey Interquartile Range (IQR) approach with a multiplier of 2 and whenever the quantity was out of the range [25th percentile −2*IQR, 75th percentile +2*IQR] it was replaced by the median quantity reported of that product in that unit. Around 0.82 percent of the original quantities were corrected. Of the outstanding quantities associated with some units it was found that most of them were systematic and failed to be detected by the Tukey method, and in such cases a scrutinized cleaning was performed on specific clusters (for instance huge quantities of taro in the region of Malampa were associated to the unit “each”). After the conversion of all the quantities into grams, another correction of outstanding quantities was performed looking at the quantities consumed per capita and area of residence (urban and rural). We used the Tukey Interquartile Range (IQR) approach with a multiplier of 1.5 and whenever the quantity was out of the range [25th percentile − 1.5*IQR, 75th percentile + 1.5*IQR] the quantity in grams was replaced by the median quantity reported of that product in that area. Around 2 percent of the quantities in grams were corrected.

- Among the “novelties” in this survey, is the comprehensive module on food away from home (FAFH). Household members were asked to report on the number of breakfasts, lunches and dinners they consumed each day outside the house and report on amount spent on these meals. Overall, the data were satisfactory, but it was found that some amounts (corresponding to 334 transactions) were not reported and needed to be estimated. We also found some outstanding numbers of meals reported (for instance 200 lunches per day) that needed additional correction.

- The survey was conducted from February 2019 to February 2020. On average the number of transactions reported per household per week is close to 27 with a minimum of 1 transaction only and a maximum of 96 transactions. However, as seen in the graph below, 56 households reported having consumed no more than 5 products over the previous 7 days, of which 18 reported less than 3 products. It is possible that these households underreported the exact number of food products they consumed and answered no to the filter question.

Figure 52 Distribution of number of transactions per household by survey round over the previous 7 days



- Finally, 88 households were dropped from the analysis for showing unacceptably low or high levels of DEC. The interquartile range (IQR) approach was used to detect outstanding values of dietary energy consumption and a decision was made to drop these households with the justification that the survey was asking respondents to report on the quantities of food that reached the household during the previous seven days that was to be consumed during the same period. A low level of DEC associated with a very low number of records was doubtless hiding data issues that could not be addressed during the data processing phase. A high level of DEC was also evidencing a problem of overreporting that could not be addressed during the treatment phase of the food data. This final cleaning phase was conducted to identify 73 households with a DEC lower than 700 kcal/capita/day and 15 households with a DEC higher than 10 000 kcal/capita/day. It is important to

55 SPC, UOW and FAO (2020). The Pacific Nutrient Database User Guide: A tool to facilitate the analysis of poverty, nutrition and food security in the Pacific region. Pacific Community, University of Wollongong and the Food and Agriculture Organization of the United Nations. 15 pp.

56 The gram is the reference unit used in all the Food Composition Tables that allocate the nutrient value for 100 grams of edible portion of the products. Therefore, to convert the quantities into nutrient values it is important to convert first all quantities collected in local unit of measurement into gram.

remember that the household survey captured the amount of food available for consumption over a certain period of time and not the amount that is actually consumed. A low DEC can be the consequence of underreporting (low quantity reported), misreporting quantities of food consumed over the reference period (wrong unit of measurement), miscoding during treatment phase, and so on. A high DEC can also be the consequence of over reporting of the quantity of food consumed, but the high DEC observed among rich households can also be associated with a higher level of food wasted.

ANNEX 2. METHODOLOGICAL ANNEX RELATED TO SDG 2.1 ESTIMATES

Annex 2.1 SDG 2.1.1 – The prevalence of undernourishment

Definition: Undernourishment is defined as the condition of an individual whose habitual food consumption is insufficient to provide, on average, the amount of dietary energy required to maintain a normal, active, healthy life.

How it is reported: The SDG 2.1.1 indicator is reported as a prevalence and is denominated as "prevalence of undernourishment" (PoU), which is an estimate of the percentage of individuals in the total population that are in a condition of undernourishment.

Methodology: To compute an estimate of the prevalence of undernourishment in a population, the probability distribution of habitual dietary energy intake levels (expressed in kcal per person per day) for the average individual is modelled as a parametric probability density function (pdf), f(x). The indicator is obtained as the cumulative probability that the habitual dietary energy intake (x) is below the minimum dietary energy requirements (MDER) (i.e. the lowest limit of the range of energy requirements for the population's representative average individual) as in the formula below:

$$PoU = \int x<MDER\, f(x|\theta)dx$$

where θ is a vector of parameters that characterizes the pdf. The distribution is assumed to be lognormal, and thus fully characterised by only two parameters: the mean dietary energy consumption (DEC), and its coefficient of variation (CV).

	PoU (%)	Average DEC	MDER	CV (%)
Vanuatu	8	2 758	1 720	31
Urban	<2.5	3 023	1 752	22
Rural	12	2 663	1 708	33

Data sources: main sources used to estimate the three parameters for Vanuatu

- Minimum dietary energy requirement (MDER): Human energy requirements for an individual in a given sex/age class are determined on the basis of normative requirements for basic metabolic rate (BMR) per kilogram of body mass, multiplied by the ideal weights that a healthy person of that class may have, given his or her height, and then multiplied by a coefficient of physical activity level (PAL) to take into account physical activity. Given that both healthy BMIs and PALs vary among active and healthy individuals of the same sex and age, a *range* of energy requirements applies to each sex and age group of the population. The MDER for the average individual in the population, that is the threshold used in the PoU formula, is obtained as the weighted average of the lower bounds of the energy requirement ranges for each sex and age group, using the shares of the population in each sex and age group as weights.

- Information on the population structure by sex and age is extracted from the demographic information on age and gender collected in the NSDP Baseline Survey while information on median height by sex and age class comes from the 2012/13 HIES of Solomon Islands, which is the closest neighbour country for which information on height was available.

- Dietary energy consumption (DEC) and coefficient of variation (CV) were extracted from the food data collected in the 2019 NSDP Baseline Survey that collected the quantities of products consumed by the household during the previous seven days. These quantities were converted into grams using conversion factors provided by the market survey and ad hoc conversions from VNSO and further converted into nutrient values using the Pacific Nutrient Database developed jointly by SPC, FAO and the University of Wollongong and based on the Food Composition Table of the Pacific. The average DEC and the CV that describe the distribution of average daily dietary energy consumption in the population can be estimated. However, because of excess variability[57] observed in the distribution of daily energy, additional data treatment[58] was needed to get a reliable estimate of the CV. The treatment of excess variability leads to a CV that varies between 29 percent and 31 percent.

Challenges and limitations: While formally the state of being undernourished or not is a condition that applies to individuals, and given that the data is usually available on a large scale, it is impossible to reliably identify which individuals in a certain group are actually undernourished. Through the statistical model described above, the indicator can only be computed with reference to a population or a group of individuals for which a representative sample is available. Therefore only the prevalence at national level and for urban and rural areas is provided, but due to the probabilistic nature of the inference and the margins of uncertainty associated with estimates of each of the parameters in the model, the precision of the PoU estimates is generally low, with margins of error that can be expected to probably exceed 5 percentage points in most cases. As can be seen from the simple sensitivity analysis of the PoU performed using different values for the CV and average dietary energy consumption, the PoU varies from 6 percent to 10 percent based on values of the parameters. The prevalence of 8 percent reported in this report corresponds to the midpoint between the estimate we would get using the DEC from the survey and a lower CV corresponding to the reduced form of the equation used to correct for excess variability and 10 percent, which is the value presented in SOFI 2020 based on a lower DEC and a lower CV.

	AVERAGE DIETARY ENERGY CONSUMPTION (KCAL/CAPITA/ DAY)	COEFFICIENT OF VARIATION OF DEC (%)	MINIMUM DIETARY ENERGY REQUIREMENT (KCAL/CAPITA/ DAY)	PREVALENCE OF UNDERNOUR-ISHMENT IN VANUATU (%)	NUMBER OF PEOPLE UNDER-NOURISHED IN VANUATU
Vanuatu – using survey data	2 758	0.29	1 720	6.5	19 334
Vanuatu – using survey data	2 758	0.31	1 720	8.1	23 931
Vanuatu – using DES from FBS – SOFI 2020	2 536	0.28	1 698	9.7	28 591
Vanuatu – using DES from FBS and CV from survey	2 536	0.30	1 698	10.9	32 220

57 Excess variability is due to survey design (the 2019 NSDP of Vanuatu was not designed to measure individual food consumption), field work, data entry or other measurement errors.

58 The coefficient of variation that measures inequality in accessing dietary energy is estimated as the sum of inequality in accessing energy due to socioeconomic differences (CV of income) and inequality in accessing energy due to differences in energy requirements (CV of requirements). See http://www.fao.org/3/a-i4046e.pdf for more details about the estimation of the CV and treatment for excess variability. In the case of Vanuatu we used expenditure distribution as a welfare indicator to measure inequality in access to food.

References:

FAO. 1996. *The Sixth World Food Survey*, pp. 114–143. Rome.

FAO. 2014. *Advances in hunger measurement: traditional FAO methods and recent innovations.* FAO Statistics Division Working Paper No. 14-04. Rome.

FAO. 2014. *Refinements to the FAO methodology for estimating the prevalence of undernourishment indicator.* FAO Statistics Division Working Paper No. 14-05. Rome.

L. Naiken. 2002. Keynote paper: FAO methodology for estimating the prevalence of undernourishment. In: FAO. *Proceedings: Measurement and Assessment of Food Deprivation and Undernutrition International Scientific Symposium, Rome, 26–28 June 2002*. Rome.

Annex 2.2. SDG 2.1.2 – the prevalence of moderate or severe food insecurity based on the FIES

Definition: Food insecurity as measured by this indicator refers to limited access to food, at the level of individuals or households, due to lack of money or other resources. The severity of food insecurity is measured using data collected with the Food Insecurity Experience Scale survey module (FIES-SM), a set of eight questions asking individuals or households to self-report conditions and experiences typically associated with limited access to food because of a lack of money or other resources. In the case of Vanuatu the question was asked of the head of the household to report on behalf of the household. Furthermore, it was felt that the concept of "lack of money or other resources" did not really reflect the difficulty in access to food, so the question was changed to refer to "a lack of money, lack of access to natural resources or other environmental factors". The original 8 questions of the scale are:

Q1. Were you worried you would run out of food because of a lack of money or other resources?

Q2. Were you unable to eat healthy and nutritious food because of a lack of money or other resources?

Q3. Did you eat only a few kinds of food because of a lack of money or other resources?

Q4. Did you have to skip a meal because there was not enough money or other resources to get food?

Q5. Did you eat less than you thought you should because of a lack of money or other resources?

Q6. Did your household run out of food because of a lack of money or other resources?

Q7. Were you hungry but did not eat because there was not enough money or other resources?

Q8. Did you go without eating for a whole day because of a lack of money or other resources?

This indicator is particularly relevant for countries where severe food deprivation may no longer be of concern, but where sizeable pockets of food insecurity still remain. In this sense, it is an indicator that is fully aligned with the universality principles of the 2030 Agenda. Of note also is the reference to the 12 months period so that the indicator reflects chronic food insecurity. To that extent, the SDG 2.1.2 is also aligned to SDG 2.1.1, as both are a measure of chronic food insecurity.

How it is reported: The estimates correspond to the prevalence (%) of individuals in the population living in households where *at least one adult was found to be food insecure*.

Data source: The eight questions of the FIES-FM were introduced for the first time in Vanuatu through the 2019 NSDP Baseline Survey.

Methodology: The data were validated and used to construct a scale of food-insecurity severity using the Rasch model, which postulates that the probability of observing an affirmative answer by respondent *I* to question *j* is a logistic function of the distance, on an underlying scale of severity, between the position of the respondent, *ai*, and that of the item, *bj*.

$$\text{Prob}(X_{i,j} = \text{Yes}) = \exp(a_i - b_j)/(1 + \exp(a_i - b_j))$$

By applying the Rasch model to the FIES data, it is possible to estimate the probability of being food insecure $(p_{i,L})$ at each level of severity of food insecurity L (moderate or severe, or severe), for each respondent *I*, with $0 < p_{I,L} < 1$.

The prevalence of food insecurity at each level of severity *(FIL)* in the population is computed as the weighted sum of the probability of being severely food insecure for all respondents *(i)* in a sample:

$$FIL = \Sigma p_{i,L} w_i$$

where *wi* are post-stratification weights that indicate the proportion of individuals or households in the national population represented by each record in the sample.

Challenges: to produce comparable measures over time and across different populations, a common scale was established as a reference (exactly the same as converting measures of temperature across different measuring scales – such as Celsius and Fahrenheit). The national scale of severity of food insecurity in Vanuatu was then equated to the global standard to obtain an SDG 2.1.2 estimate that can be further compared with the global, regional or country level of severe food insecurity based on the FIES. Except for the region of rural Tafea, the scale performed well in Vanuatu. All the questions seem to have been properly interpreted by enumerators and understood by respondents. Given the results of the statistical validation, the raw score can be considered a reliable, ordinal indicator of food security severity. The two thresholds proposed for international monitoring on the global FIES scale are calibrated on the scale produced by the FIES application in Vanuatu.[59] The results reveal that, after appropriate scaling of the severity values, the items SKIPPED, corresponding to the question *"Did you have to skip a meal because there was not enough money or other resources to get food?"* and WORRIED, corresponding to the question *"Were you worried you would run out of food because of a lack of money or other resources?"* were unique and the correlation between the remaining seven items of the Vanuatu scale with the global standard is 98 percent.[60]

References:

FAO. 2016. *Methods for estimating comparable rates of food insecurity experienced by adults throughout the world.* Rome.

FAO. 2018. Voices of the hungry. Rome. www.fao.org/in-action/voices-of-the-hungry

59 The global adjusted FIES threshold value of −0.50 is used for moderate food insecurity and the value of 2.88 is used for severe food insecurity calibrated on the Vanuatu scale excluding the item SKIPPED and WORRIED. Without equating to the global scale the national threshold is −0.44 for moderate or severe and 2.67 for severe, which would give a percentage of individuals with moderate or severe food insecurity of 22.6% (±2.2%) and of 2.8% (±0.8%) for severe.

60 The correlation could have been further increased to 98% by dropping the item WORRIED, but the trend is to try to keep as many common items as possible when equating to the global scale if it does not significantly increase the correlation.

ANNEX 3. REGRESSION ANALYSIS OF THE IMPACT OF CHARACTERISTICS OF THE HOUSEHOLD ON THE AVERAGE DIETARY ENERGY CONSUMPTION

To assess the impact of the socioeconomic, demographic and regional characteristics of the household on the dietary energy consumption, a simple linear regression was performed linking the average dietary energy consumption to household characteristics

where

$$ln(DEC_i) = \beta_0 + \beta_1 \, ln(inc_i) + \sum_j^n \beta_j HHchar_{ij}$$

DEC_i is the dietary energy consumption of household i
Inc_i is the per capita total expenditures of household i
$HHchar_{ij}$ is the characteristic j of the household i

LOGARITHM OF DEC	COEF.	STD. ERR.	T	P > T
Logarithm of per capita total household expenditures	0.49***	0.01	51.84	0.00
Urban[1]	0.06*	0.03	1.93	0.05
Strata[2]				
Sanma – rural	0.11***	0.03	3.73	0.00
Penama – rural	0.08**	0.03	2.63	0.01
Malampa – rural	0.23***	0.03	8.39	0.00
Shefa – rural	−0.03	0.03	−1.24	0.22
Tafea – rural	0.09***	0.03	3.06	0.00
Sanma – urban	0.11***	0.02	4.63	0.00
Shefa – urban	0.00	(omitted)		
Female headed household[3]	−0.02	0.01	−1.42	0.16
Age of the head of the household	−0.00	0.00	−1.01	0.31
Number of children less than 14 years old	−0.05***	0.00	−15.67	0.00
Marital status of the head of the household[4]				
Legally married (certificate)	−0.05***	0.02	−2.97	0.00
Custom married (kastom)	−0.05**	0.02	−2.22	0.03
Both legally married and cus.	−0.05**	0.02	−2.71	0.01
Common law, live in, de facto	−0.02	0.02	−0.70	0.48
Level of education of the head of the household[5]				
Junior secondary school	−0.07***	0.01	−4.96	0.00
Senior or post secondary/uni..	−0.10***	0.01	−6.58	0.00
Other	0.02	0.02	1.03	0.30
Activity of the head of the household[6]				
Involved in farming, livestock etc.	0.00	0.02	−0.06	0.95
Work in another sector/activities	−0.01	0.02	−0.60	0.55
Taking care of the household	0.03	0.02	1.64	0.10
Receive remittances from another household	0.02	0.01	1.54	0.13
Involved in livestock activities	−0.01	0.01	−0.46	0.64
Involved in aquaculture activities	−0.04***	0.01	−2.95	0.00
Involved in fisheries activities	0.04**	0.01	2.70	0.01
Involved in agriculture activities	0.04**	0.01	3.17	0.00
Involved in handicraft activities	−0.00	0.01	−0.33	0.74
Has access to safe water	0.00	0.01	−0.21	0.84
Has access to private toilets	−0.04***	0.01	−3.78	0.00
Moderately or severely food insecure[7]	0.05***	0.01	3.95	0.00
Constant	1.85	0.13	14.36	0.00

1. Rural is the reference category
2. Torba rural is the reference category
3. Male headed households are the reference group
4. Never married/divorced/widowed is the reference category
5. Pre school and preliminary school is the reference category
6. Studying/unemployed/retired/other is the reference category
7. Food secure or mildly food insecure is the reference category

****p value < 0.001, ** p value < 0.01, * p value < 0.05*

ANNEX 4.
FOOD GROUP CLASSIFICATION

Description of the food in the recall section	Classification of the product in GIFT	Classification of the product according to Pacific guidelines for a healthy living	Percentage of house-holds who consumed the food in the previous 7 days
Bread, loaf, all others	Cereals and their products	Energy foods - to limit	41
Bread, loaf, not further specified	Cereals and their products	Energy foods - to limit	29
Breakfast cereal, not further specified	Cereals and their products	Energy foods - to limit	1
Flour, cornflour/maize	Cereals and their products	Energy foods - to limit	0
Flour, not further specified	Cereals and their products	Energy foods - to limit	10
Noodles, not further specified	Cereals and their products	Energy foods - to limit	41
Rice, not further specified	Cereals and their products	Energy foods - to limit	93
Banana, cooking, raw	Roots, tubers, plantain	Energy foods - to choose	78
Cassava / tapioca / manioc	Roots, tubers, plantain	Energy foods - to choose	32
Kumara / sweet potato	Roots, tubers, plantain	Energy foods - to choose	49
Potato, not further specified	Roots, tubers, plantain	Energy foods - to choose	9
Taro, common	Roots, tubers, plantain	Energy foods - to choose	59
Yam, not further specified	Roots, tubers, plantain	Energy foods - to choose	39
Beans, legumes canned e.g. red kidney, chickpea, lima	Pulses, seeds and nuts	Protective foods - to choose	0
Coconut, brown	Pulses, seeds and nuts	Energy foods - to choose	79
Nuts, not further specified	Pulses, seeds and nuts	Body-building foods - to choose	11
Peanut butter, not further specified	Pulses, seeds and nuts	Energy foods - to avoid	14
Pili nut (Ngali/nangai), not further specified	Pulses, seeds and nuts	Body-building foods - to choose	9
Cheese, not further specified	Milk and milk products	Body-building foods - to limit	1
Cream, dairy based, not further specified	Milk and milk products	Body-building foods - to limit	0
Creamer, powdered	Milk and milk products	Body-building foods - to avoid	3
Milk, evaporated, unsweetened, not further specified	Milk and milk products	Body-building foods - to limit	0
Milk, powdered, not further specified	Milk and milk products	Body-building foods - to limit	13
Milk, whole, long life, shelf stable (UHT)	Milk and milk products	Body-building foods - to limit	9
Yoghurt, not further specified	Milk and milk products	Body-building foods - to limit	1
Egg, chicken, fresh	Eggs and their products	Body-building foods - to choose	31
Crab, not further specified	Fish, shellfish and their products	Body-building foods - to choose	13
Crayfish / lobster, not further specified	Fish, shellfish and their products	Body-building foods - to choose	2
Fish, not further specified	Fish, shellfish and their products	Body-building foods - to choose	2
Fish, pelagic/ocean, not further specified	Fish, shellfish and their products	Body-building foods - to choose	9
Fish, reef, not further specified	Fish, shellfish and their products	Body-building foods - to choose	41
Mackerel, canned, not further specified	Fish, shellfish and their products	Body-building foods - to limit	33
Mussels	Fish, shellfish and their products	Body-building foods - to choose	6
Prawn/shrimp, not further specified	Fish, shellfish and their products	Body-building foods - to choose	0
Tuna canned, not further specified	Fish, shellfish and their products	Body-building foods - to limit	68
Bat/flying fox (fruit bat)	Meat and meat products	Body-building foods - to choose	3
Beef, canned, corned	Meat and meat products	Body-building foods - to avoid	21
Beef, not further specified	Meat and meat products	Body-building foods - to limit	39
Canned meat, not further specified	Meat and meat products	Body-building foods - to avoid	0
Chicken, not further specified	Meat and meat products	Body-building foods - to choose	43
Lamb and mutton, lean, cuts not specified	Meat and meat products	Body-building foods - to limit	0
Pork, canned	Meat and meat products	Body-building foods - to avoid	0
Pork, not further specified	Meat and meat products	Body-building foods - to limit	13
Pork, offal, not further specified	Meat and meat products	Body-building foods - to avoid	2
Beans, green	Vegetables and their products	Protective foods - to choose	18
Beans, long	Vegetables and their products	Protective foods - to choose	15
Cabbage, Chinese	Vegetables and their products	Protective foods - to choose	0
Cabbage, European, white	Vegetables and their products	Protective foods - to choose	12
Cabbage, not further specified	Vegetables and their products	Protective foods - to choose	0
Cabbage, slippery bush	Vegetables and their products	Protective foods - to choose	95
Capsicum, not further specified	Vegetables and their products	Protective foods - to choose	29
Carrot	Vegetables and their products	Protective foods - to choose	13
Choko	Vegetables and their products	Protective foods - to choose	24
Corn, cob, not further specified	Vegetables and their products	Protective foods - to choose	25
Cucumber, unpeeled	Vegetables and their products	Protective foods - to choose	38
Eggplant	Vegetables and their products	Protective foods - to choose	2
Garlic, peeled	Vegetables and their products	Protective foods - to choose	17
Leaves, tips, pumpkin	Vegetables and their products	Protective foods - to choose	19
Leaves, watercress	Vegetables and their products	Protective foods - to choose	6
Lettuce, not further specified	Vegetables and their products	Protective foods - to choose	8
Onion, brown	Vegetables and their products	Protective foods - to choose	25
Onion, spring	Vegetables and their products	Protective foods - to choose	23
Pumpkin	Vegetables and their products	Protective foods - to choose	12
Tomato, common	Vegetables and their products	Protective foods - to choose	29
Vegetables, not further specified	Vegetables and their products	Protective foods - to choose	5
Avocado	Fruits and their products	Protective foods - to choose	16
Banana	Fruits and their products	Protective foods - to choose	71
Breadfruit	Fruits and their products	Energy foods - to choose	13
Coconut, green	Fruits and their products	Protective foods - to choose	53
Fruit, canned, not further specified	Fruits and their products	Protective foods - to limit	0
Fruit, not further specified	Fruits and their products	Protective foods - to choose	32
Grapefruit	Fruits and their products	Protective foods - to choose	37
Guava	Fruits and their products	Protective foods - to choose	7

Lime	Fruits and their products	Protective foods - to choose	25
Lychee	Fruits and their products	Protective foods - to choose	0
Mandarin	Fruits and their products	Protective foods - to choose	10
Mango	Fruits and their products	Protective foods - to choose	16
Orange	Fruits and their products	Protective foods - to choose	34
Papaya	Fruits and their products	Protective foods - to choose	67
Passionfruit	Fruits and their products	Protective foods - to choose	5
Pineapple	Fruits and their products	Protective foods - to choose	15
Watermelon	Fruits and their products	Protective foods - to choose	9
Bacon, not further specified	Fats and oils	Body-building foods - to avoid	5
Butter, not further specified	Fats and oils	Energy foods - to avoid	29
Margarine, not further specified	Fats and oils	Energy foods - to avoid	1
Oil, coconut	Fats and oils	Energy foods - to avoid	0
Oil, cooking	Fats and oils	Energy foods - to avoid	59
Biscuits, sweet, all others	Sweets and sugars	Energy foods - to avoid	14
Cake, not further specified	Sweets and sugars	Energy foods - to avoid	9
Chewing gum, bubble gum	Sweets and sugars	Energy foods - to avoid	16
Chocolate candies (e.g. M&Ms)	Sweets and sugars	Energy foods - to avoid	1
Chocolate, not further specified	Sweets and sugars	Energy foods - to avoid	2
Crackers, all others	Sweets and sugars	Energy foods - to limit	69
Ice blocks, flavoured ice, popsicles	Sweets and sugars	Energy foods - to avoid	0
Ice cream, vanilla	Sweets and sugars	Energy foods - to limit	11
Jam	Sweets and sugars	Energy foods - to avoid	3
Milk, condensed, whole, sweetened	Sweets and sugars	Body-building foods - to avoid	0
Nutella, or other chocolate spread	Sweets and sugars	Energy foods - to avoid	1
Pancake mix	Sweets and sugars	Energy foods - to avoid	1
Pastry, not further specified	Sweets and sugars	Energy foods - to avoid	3
Pudding (dairy based)	Sweets and sugars	Energy foods - to avoid	0
Sugar, not further specified	Sweets and sugars	Energy foods - to avoid	80
Sweets, jelly lollies	Sweets and sugars	Energy foods - to avoid	3
Bouillon/stock cube, not further specified	Spices and condiments	Not classified	2
Ginger root, fresh	Spices and condiments	Not classified	18
Mayonnaise	Spices and condiments	Energy foods - to avoid	0
Salt, not further specified	Spices and condiments	Not classified	89
Sauce, not further specified	Spices and condiments	Not classified	20
Spices, not further specified	Spices and condiments	Not classified	12
Vinegar, plain	Spices and condiments	Not classified	3
Beer, homebrew	Beverages	Not classified	1
Beer, not further specified	Beverages	Not classified	7
Beverage, chocolate flavour, from base (Milo)	Beverages	Energy foods - to avoid	4
Bottled water/spring water	Beverages	Not classified	13
Cocoa, cocoa powder	Beverages	Energy foods - to limit	0
Coconut toddy, boiled	Beverages	Energy foods - to avoid	0
Coconut, water only	Beverages	Protective foods - to choose	1
Coffee, ground	Beverages	Not classified	0
Coffee, instant, powder (e.g. Nescafé)	Beverages	Not classified	26
Cola flavour soft drink eg. Coca Cola/Pepsi	Beverages	Energy foods - to avoid	3
Cordial, not further specified	Beverages	Energy foods - to avoid	2
Juice, fruit, not further specified	Beverages	Protective foods - to avoid	3
Lemonade, soft drink, e.g. Sprite, 7 Up	Beverages	Energy foods - to avoid	3
Milk, soy	Beverages	Body-building foods - to choose	1
Soft drink, not further specified	Beverages	Energy foods - to avoid	3
Tea, black, bag	Beverages	Not classified	9
Tea, iced, commercial	Beverages	Not classified	3
Whiskey	Beverages	Not classified	1
Wine, not further specified	Beverages	Not classified	5
Infant formula, not further specified	Foods for nutritional use	Not classified	1
Food unspecified	Food not classified	Not classified	0
Restaurants, cafés and the like - foods	Food not classified	Not classified	0
Breakfast away from home	Food not classified	Not classified	6
Dinner away from home	Food not classified	Not classified	7
Lunch away from home	Food not classified	Not classified	32
Banana, cooking, boiled	Composite dishes	Energy foods - to choose	42
Beef, grilled/bbq	Composite dishes	Body-building foods - to limit	1
Chicken, grilled/bbq	Composite dishes	Body-building foods - to limit	2
Laplap (grated cassava, cooked)	Composite dishes	Energy foods - to limit	58
Leaves, choko, boiled	Composite dishes	Protective foods - to choose	1
Leaves, taro, boiled	Composite dishes	Protective foods - to choose	0
Sandwich, filled with chicken	Composite dishes	Body-building foods - to limit	2
Takeaway, fish, fried, bbq'd	Composite dishes	Body-building foods - to avoid	1
Takeaway, hamburger, bread roll, beef patty	Composite dishes	Body-building foods - to avoid	1
Takeaway, pizza, not further specified	Composite dishes	Body-building foods - to avoid	0
Takeaway, salad, mixed vegetables	Composite dishes	Body-building foods - to avoid	3
Chips, not further specified	Savoury snacks	Energy foods - to avoid	3
Savoury snacks, chips e.g. Twisties, Pringles, cheeze-balls	Savoury snacks	Energy foods - to avoid	18
Betel nut	Narcotic	Not classified	1
Kava	Narcotic	Not classified	45
Tobacco	Narcotic	Not classified	41