



Food and Agriculture Organization
of the United Nations

MAPPING TERRITORIAL MARKETS IN CHIMBU PROVINCE AND IN EASTERN HIGHLANDS PROVINCE, PAPUA NEW GUINEA

SUMMARY REPORT







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Food and Agriculture Organization of the United Nations
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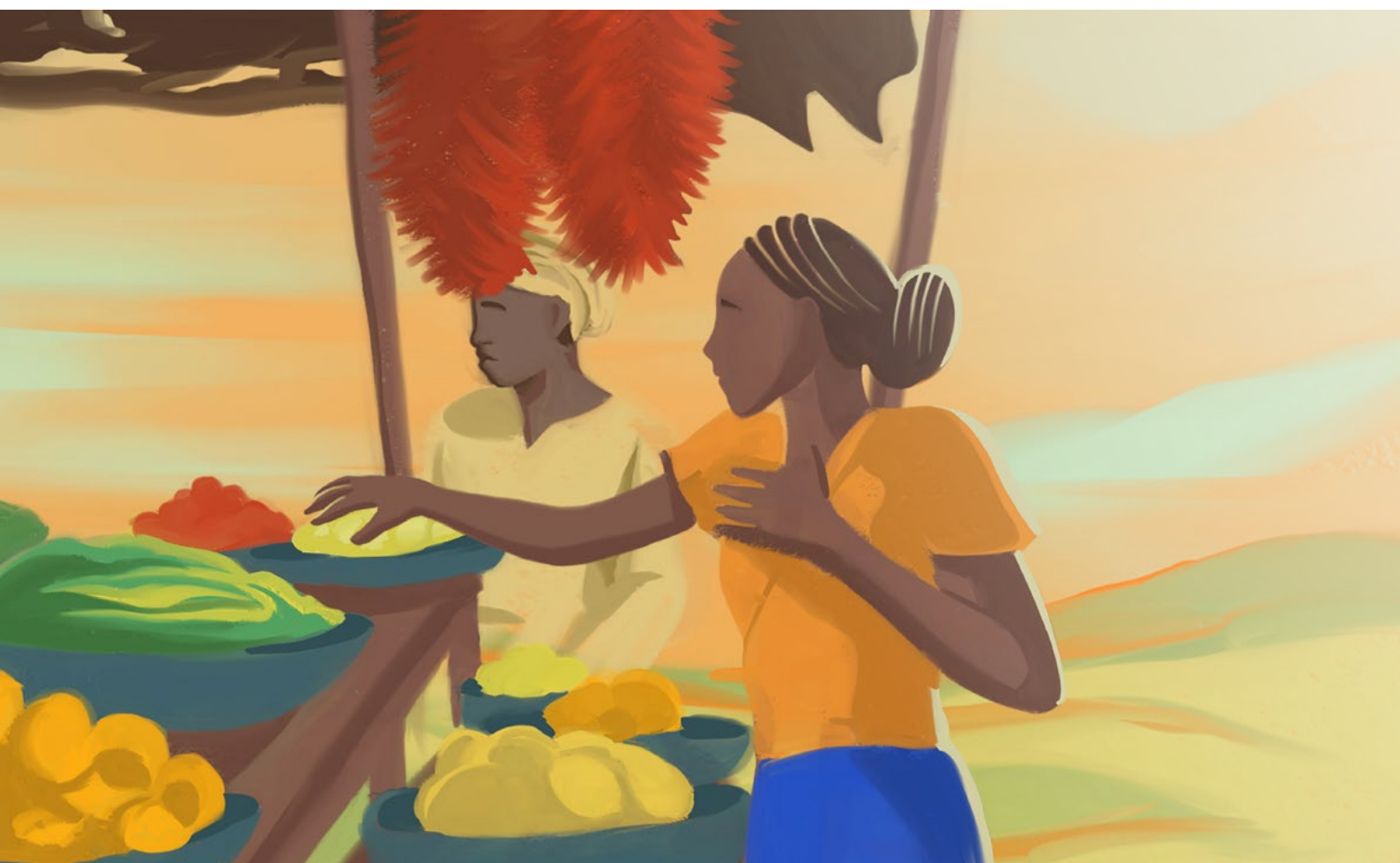


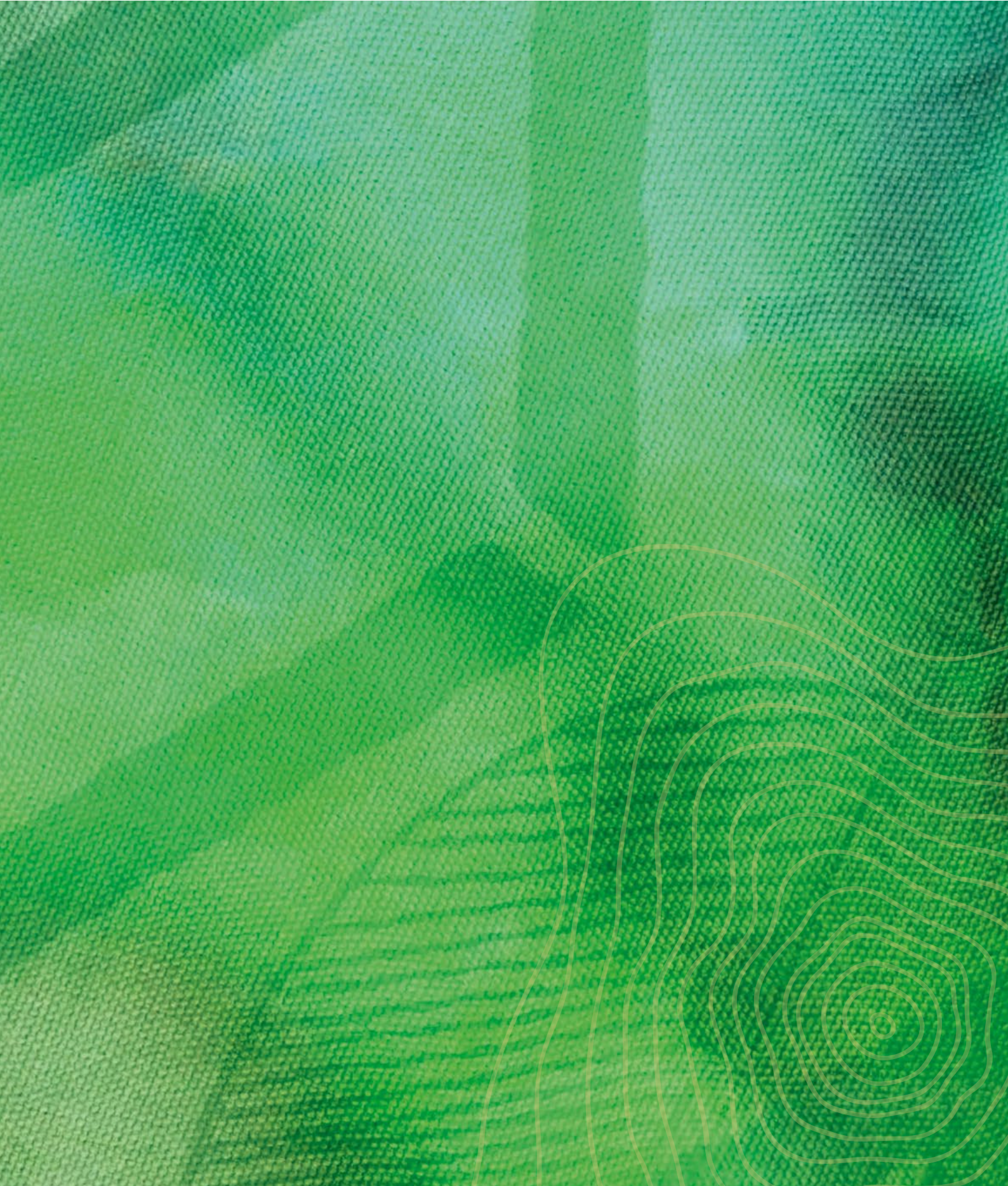
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INTRODUCTION

Smallholder farmers are responsible for most of the food consumed in the world, as well as most of the investments made in agriculture (CFS, 2016; FAO, 2017). They operate largely in a range of local and national markets that are embedded in territorial food systems, known as “territorial markets”.

From a consumer perspective, these markets serve as key retail outlets for access to the foods needed for healthy diets, in particular to fresh fruits and vegetables, fish, meat (including poultry) and staple foods.

Despite their importance, however, data concerning territorial markets are not often included in national data collection systems, and this includes data on the availability of food groups, food retailers and consumer profiles. As a result, they are often neglected in strategies aimed at improving nutrition, reducing poverty and fostering local economies.

This is the context in which FAO conducted a mapping of territorial markets in Papua New Guinea.¹ The objective of the mapping was to identify the business and operational models that work best to therefore serve as entry points for the implementation of policy and investment strategies towards more inclusive and nutrition-sensitive markets.



¹ The mapping exercise was implemented by the Flexible Multi-Partner Mechanism (FMM) subprogramme on Mainstreaming Nutrition into FMM portfolio coordinated by FAO's Food and Nutrition Division (ESN) to promote nutrition-sensitive food production in Papua New Guinea and six other countries (Ethiopia, Malawi, Mali, the Niger, South Sudan and Haiti). The goal of the Project is to strengthen production to improve the availability, affordability and consumption of safe and nutritious food to increase the quality of children's and women's diets for the prevention of malnutrition.



MAPPING PROCESS

The mapping process was based on a methodology and set of guidelines as developed by FAO and partners (FAO, 2022a). After selecting Oxfam Pacific (Papua New Guinea office) as service provider, the process began in November 2022 with a virtual training on the use of data collection tools in the form of questionnaires delivered by FAO to Oxfam. The mapping exercise took place in six markets, selected according to a number of predetermined criteria.² As illustrated in Figure 1, three of the markets included in the sample were located in Chimbu Province and three in Eastern Highlands.

For each sampled market, the mapping process involved three stages:

- 1 preliminary market analysis to determine a representative sample of retailers;
- 2 data collection from the representative sample of food retailers; and
- 3 data collection from a non-probabilistic sample of consumers that is large enough to reflect the existing diversity of the overall consumer base.

Figure 1. Locations of selected territorial markets



Source: Adapted from Map No. 4104 Rev.1 UNITED NATIONS, January 2004.
Department of Peacekeeping Operations, Cartographic Section.

² The three markets were selected based on the following criteria: (i) markets that are recognized by consumers as food markets; (ii) markets in which at least ten retailers operate; (iii) markets that are held with regular frequency; and (iv) markets offering products produced by family farmers; as well as the market's (in)formality, market size and territorial representation. Also important to market selection in the Eastern Highlands given its relative remoteness was accessibility, convenience and overall safety in conducting market surveys.



As a first step, the preliminary market analysis collected information on: (i) the given market's profile (including name, subcounty, town, market frequency, typology of market and GPS coordinates); and (ii) the distribution of retailers within the given market, based on sex, age and type of food (i.e. food group) sold.

After the preliminary market analysis, 300 retailers were selected to conduct the second survey consisting of 42 questions. The results of this survey were analysed to assess each market's performance across four synthetic indicators³ resulting from the aggregation of key surveyed variables: food diversity

indicator; economic gender gap indicator; business environment indicator; and producer–consumer link indicator. Three hundred consumers who were making their food purchases in the selected market were randomly selected to administer the consumers' survey, composed of 27 questions. Data were analysed to assess the market's performance against a fifth synthetic indicator: the minimum day-to-day contribution to healthy and diversified diets. The following sections provide an overview of the results of the mapping process for all six markets across each of the five synthetic indicators and other dimensions identified, including some key findings disaggregated by sex.

Table 1. Summary of the preliminary market analysis

District	Market	Average number of retailers selling at the market (1)	Number of retailers sampled	Number of consumers sampled
Chimbu Province	Kundiawa Main Market	200	52	51
	Yuwai Market	100	60	52
	Ganinge Market	100	28	40
Eastern Highlands	Goroka Market	600	109	73
	Lopi Market	100	29	41
	Asaro Market	50	26	40

Source: Authors' own elaboration.

³ A synthetic indicator is a composite measure that mathematically combines several pieces of information into a single measure, allowing for the evaluation and comparison of multidimensional phenomena. Synthetic indicators were useful to the mapping process, as they allowed for the aggregation of several kinds of data on each market as collected through the survey, and for the assessment of each market's performance against the given dimensions.



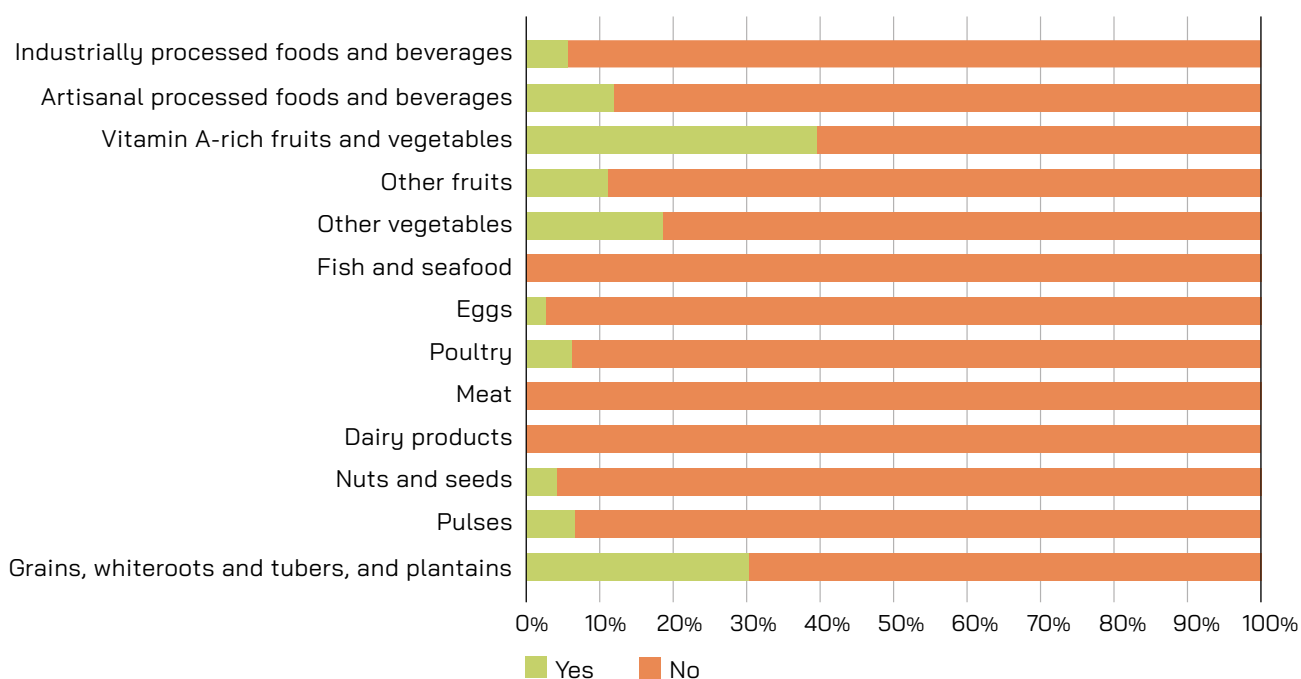
Food diversity

Key findings

Figure 2 shows the availability of food products in the mapped markets, analysed by food groups. The total availability of all food groups was quite low in the six markets, and some animal source foods were not offered at all, namely “Dairy products”, “Fish and seafood” and “Meat”. The food groups that were most frequently available were “Vitamin A-rich fruits and vegetables” offered by 40 percent of the total retailers, followed by “Grains, white roots and tubers, and plantains” by 31 percent and “Other vegetables” by 19 percent. Retailers offered “Eggs”; “Nuts and Seeds”; “Pulses”; and “Poultry” the least.

Considering the total volumes of products sold every month in the mapped territorial markets (Figure 3), “Vitamin A-rich fruits and vegetables” was by far the food group with the highest volumes of sales, estimated at around 145.5 kg of products sold monthly in all the six markets. The second food group was “Grains, white roots and tubers, and plantains” while “Eggs”; “Nuts and seeds”; and “Poultry” presented the lowest volumes of sales, with an estimate of around 0.7, 10.2 and 15 kg, respectively.

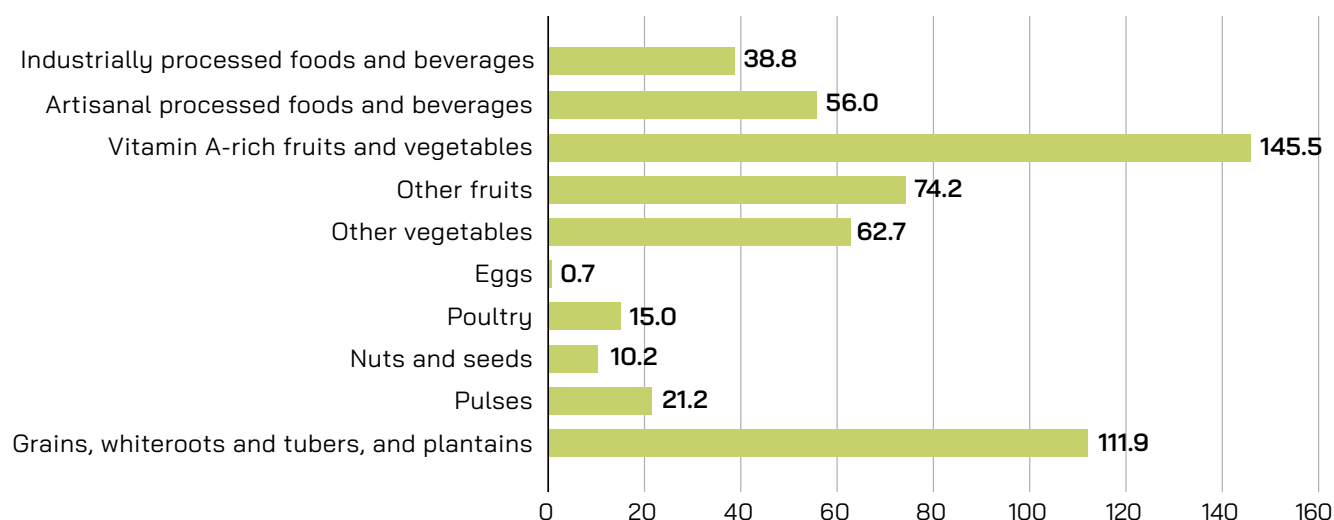
Figure 2. Total availability of products in the six markets, by food group



Source: Authors' own elaboration.



Figure 3. Estimated volumes of products sold, by food group (kg/month)



Source: Authors' own elaboration.

With regard to the diversity of food offered, [Table 2](#) lists the varieties available for each group across the analysed markets. As the table illustrates, "Vitamin A-rich fruits and vegetables" was the group with the largest number of options (15), but there is

also a wide variety of products offered for "Artisanal processed foods and beverages" followed by "Other vegetables" and "Grains, white roots and tubers, and plantains". "Poultry" and "Eggs", on the other hand, represented only one variety of product.


Table 2. Availability of different food products in all the selected markets, by food group

Grains, white roots and tubers, and plantains	Potatoes, cassava (tapiok), cooking bananas (plantains), corn, sweet potatoes, kaukau, taro, and yam	8 food items
Pulses	Beans and peas	2
Nuts and seeds	Peanuts	1
Poultry	Chicken	1
Eggs	Chicken eggs	1
Vitamin A-rich fruits and vegetables	Broccoli, sako, breadfruit leaves, pumpkin leaves, and watercress, carrots, pawpaw, ferns, kapiak leaf, tree tomato, fig leaves, mangoes, aupa (amaranth), sugar fruit, and sweet potato leaves	15
Other vegetables	Cabbage, onions, tomatoes, cauliflower, fresh beans, capsicum, cucumber, breadfruit leaves, krusako, lettuce, and zucchini	11
Other fruits	Bananas, lemon, orange, pineapple, ripe bananas, strawberries, and watermelon	7
Artisanal processed foods and beverages	Banana cake, bun, bun flour, doughnuts, flour balls, fried sausages, fried lamb, fried rice balls, fried stick meat, chicken cocktail, Hot coffee cups, and noodles cups	12
Industrially processed foods and beverages	Soft drinks and industrially processed juices	2

Source: Authors' own elaboration.

Food diversity indicator

Figure 4 shows the food diversity indicator,⁴ as calculated for each market.

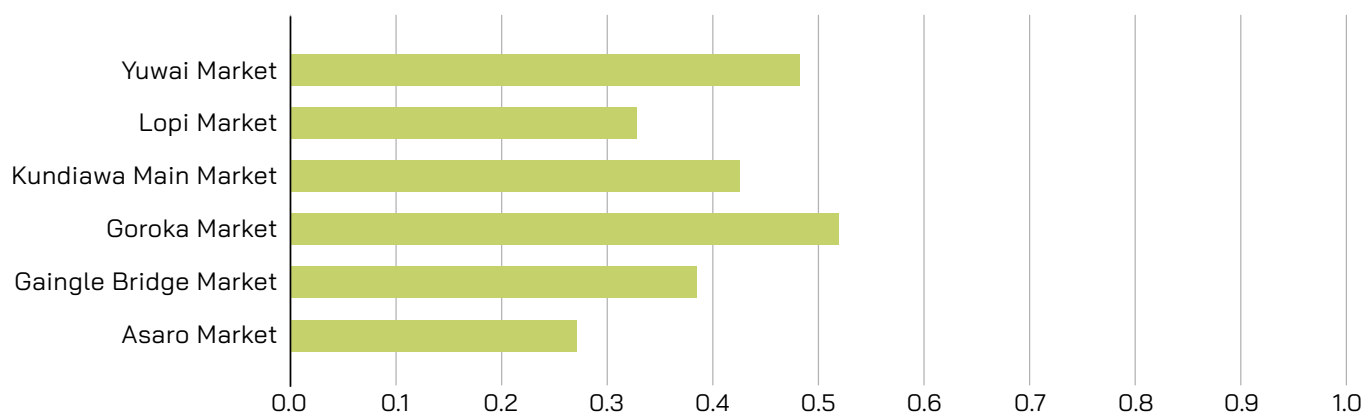
Goroka Market and Yuwai Market scored the highest in food diversity while Asaro Market

presents the lowest score. The values for the indicator are quite low overall, indicating a gap in availability of a diverse range of products offered across the six markets.

⁴ The food diversity indicator takes into account the number of food products available for each food group offered. The indicator is expressed as a value between zero and one, where zero indicates the lowest level of food diversity (i.e. none of the food products is offered at the market), and one indicates the maximum level of food diversity (i.e. four or more products for each food group are available at the market).



Figure 4. Food diversity indicator, by market



Source: Authors' own elaboration.

Business environment

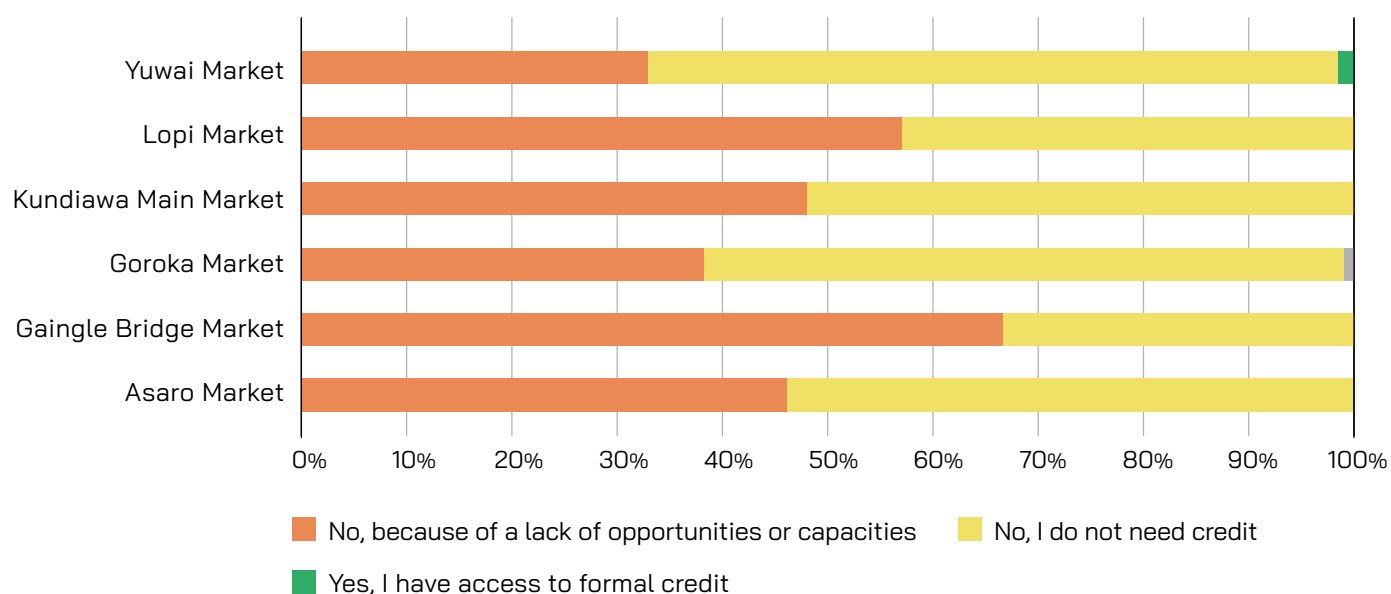
Key findings

The assessment of each market's business environment considers the market infrastructure, as well as the access to formal and informal credit and financial services. As shown in [Figure 5](#), almost all the total of retailers in all six markets did not have credit or loans, some for lack of opportunities, e.g. in Ganigle Bridge Market (66 percent), and some stated that they did not need any e.g. Yuwai Market (65 percent).

With regard to infrastructure availability across all six markets ([Figure 6](#)), the existing market infrastructure was very poor. Only 13 percent of total retailers had access to a retailer's booth and 7 percent to warehouses. Only 3 percent had access to toilets and 1 percent to water. None of the six markets presented facilities to collect and/or transform organic waste, cold warehouses and electricity.

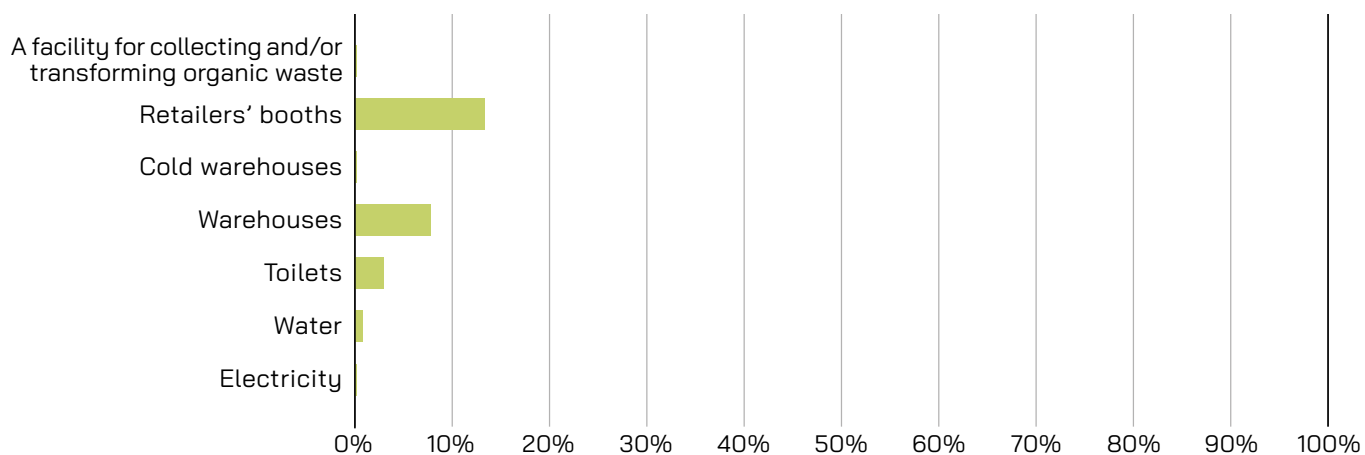


Figure 5. Access to credit or loans, by market



Source: Authors' own elaboration.

Figure 6. Infrastructure availability, by type of infrastructure)



Source: Authors' own elaboration.



Business environment indicator

Figure 7 shows the business environment indicator,⁵ as calculated for each market.

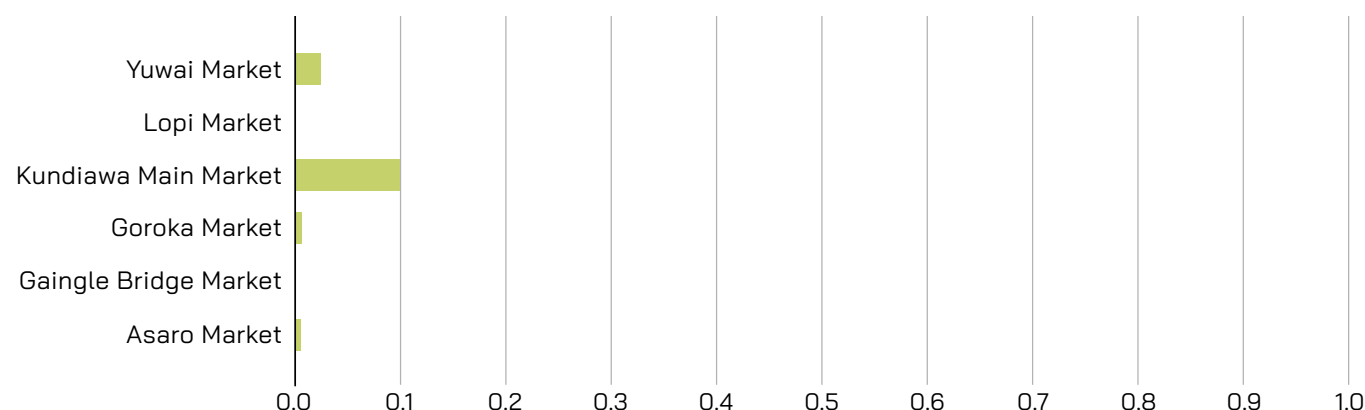
Markets scored very low for this indicator, with none of them reaching 0.1. Kundiawa Main Market scored the highest (0.098). This shows great potential to improve the business environment in which these retailers operate, both in terms of market infrastructures and facilities and in terms of business opportunities.

Economic gender gap

Key findings

Eighty-one percent of retailers operating in the selected markets were women while men accounted for around 19 percent. Figure 8 illustrates this disaggregation for each market, with Goroka Market and Yuwai Market having the highest prevalence of female retailers compared to male.

Figure 7. Business environment indicator, by market

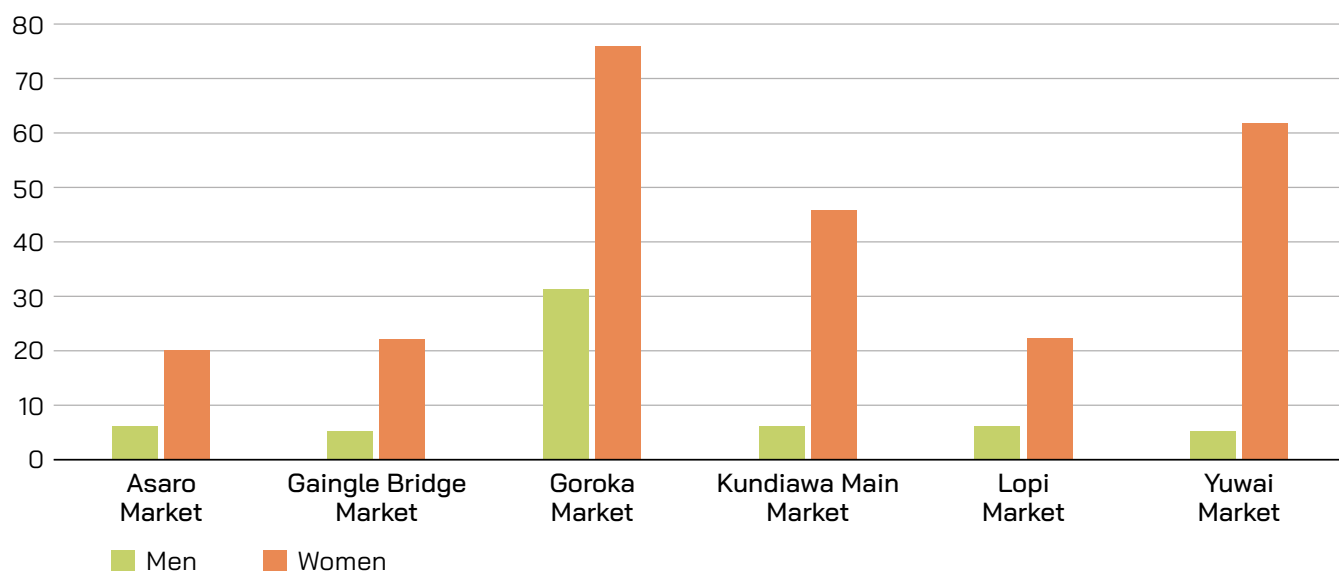


Source: Authors' own elaboration.

⁵ The business environment indicator takes into account existing infrastructure in the markets, along with retailer access to formal financial services. The indicator is expressed as a value between zero and one, where zero indicates a business environment that is not favourable to food retailers, and one indicates an environment that is favourable to them.



Figure 8. Distribution of retailers by retailers' sex and by market



Source: Authors' own elaboration.

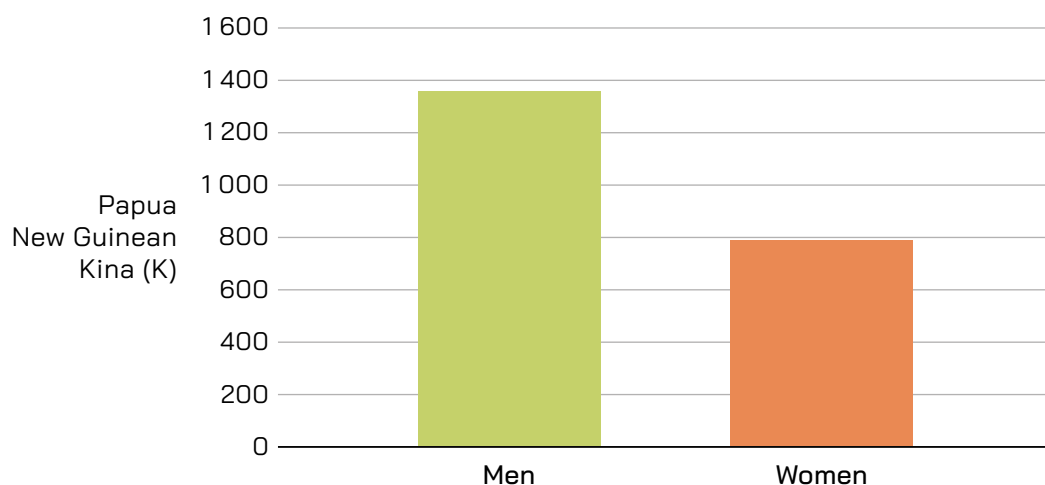
When considering the net take-home income disaggregated by sex (as in Figure 9), results show a huge gap between male and female retailers. On average, the monthly net take-home income of male retailers almost doubled that of female retailers (Papua New Guinean Kina (K)1 360/month as opposed to K 787/month).

Data on access to credit were also disaggregated by sex in order to determine whether women and men have equal opportunities to develop their businesses. The total share of retailers of both sexes with access to credit was almost non-existent for both formal and

informal credit. As shown in Figure 10, the proportion of female retailers who stated that they did not need any credit was higher than that of men. However, examining the share of female retailers with no access to credit due to lack of opportunities or capacities showed this segment to be significantly higher than that of male retailers. This means that women still face challenges in accessing credit and financial services compared to men, which affects their ability to scale up their businesses. This is also characterized by the significant difference in average net take-home income.

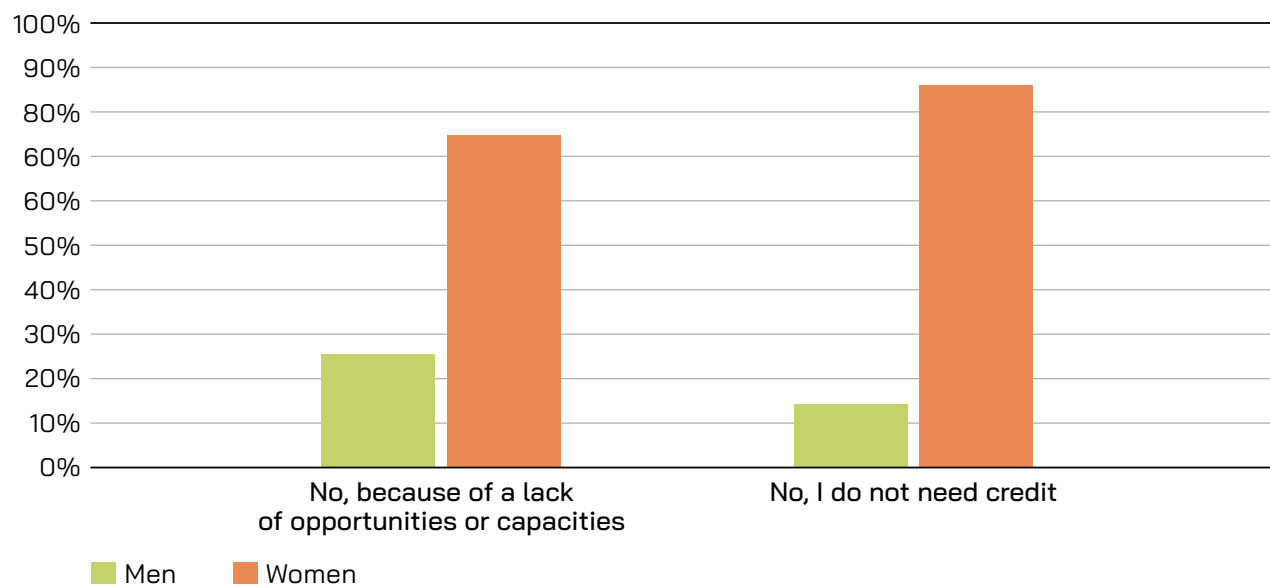


Figure 9. Average net take-home income, by retailers' sex (Papua New Guinean Kina (K) /month)



Source: Authors' own elaboration.

Figure 10. Access to credit or loans, by retailers' sex



Source: Authors' own elaboration.

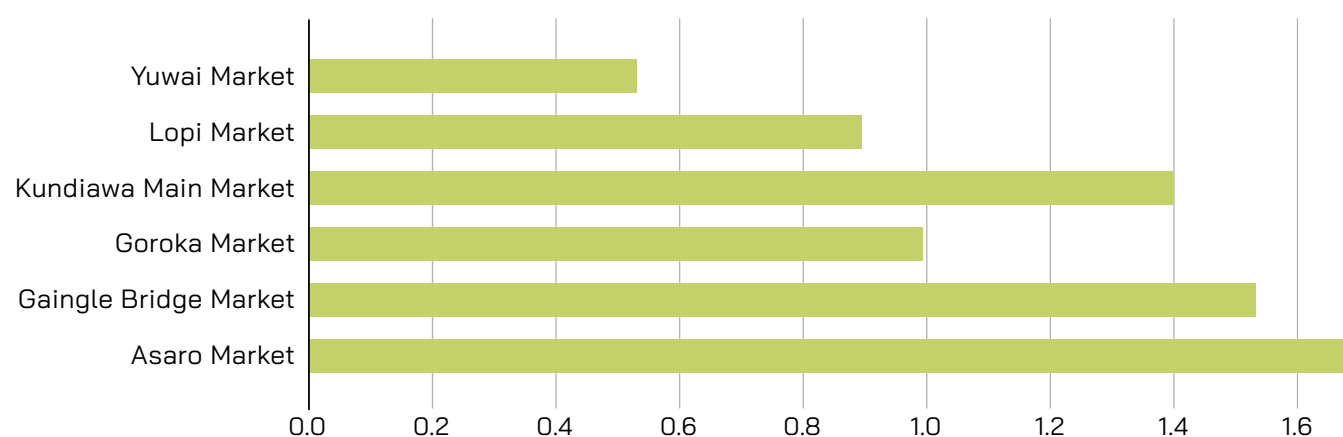


Economic gender gap indicator

Figure 11 shows the economic gender gap indicator,⁶ calculated for each market.

The indicator shows that there is equal inclusion for both men and women with regard to income gaps and access to financial services only in Goroka Market. Kundiawa, Asaro and Ganilge markets seemed to be more inclusive markets for women rather than for men while Yuwai and Luwai markets present more favourable conditions for male retailers than for female.

Figure 11. Economic gender gap indicator, by market



Source: Authors' own elaboration.

⁶ The economic gender gap indicator takes into account the gender income gap (calculated as the ratio of women's net take-home income to men's) and the gap between male and female retailers who do not have access to financial services. The synthetic indicator is expressed as a value between zero and $+\infty$, where one indicates equal inclusion of men and women; a value close to zero indicates that women are not included; and a value higher than one indicates that men are not included.



Producer–consumer link

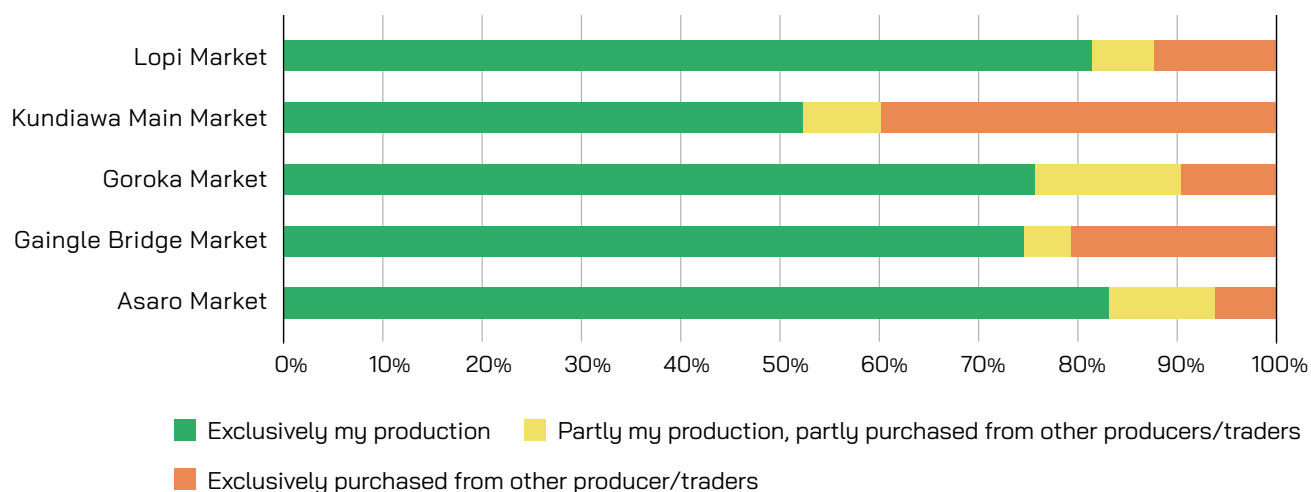
Key findings

This aspect of the market analysis sought to better understand the length of the supply chain, as well as the sourcing of products sold in the market by differentiating between retailers who are also producers and retailers who are not.

Figure 12 shows that in each market, retailers who sell only food products they have produced were by far the majority, exceeding 80 percent in Asaro and Lopi markets while Kundiawa market has the highest percentage of retailers who buy only the food products they sell from other producers/traders (40 percent).

Retailers who were not exclusively producers were asked to indicate the source of the products they purchase. As illustrated in Figure 13, the majority of these retailers bought products from wholesalers or from wholesalers and farmers, especially in Lopi and Ganigle Bridge markets while 35 percent of these retailers in Kundiawa Main Market bought only from farmers.

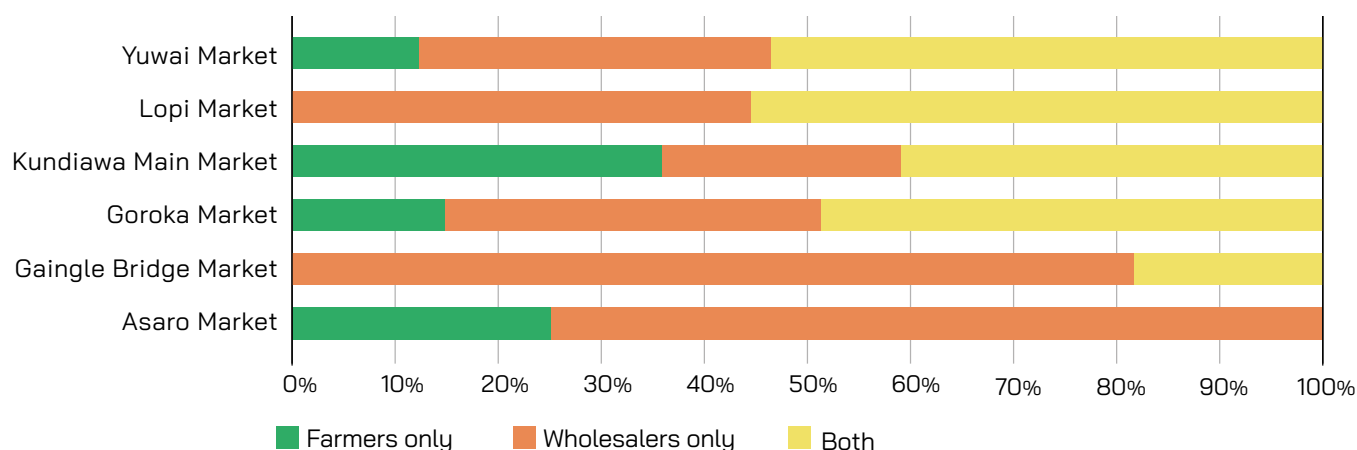
Figure 12. Product sourcing, by market



Source: Authors' own elaboration.



Figure 13. Product sourcing for retailers who sell products they have purchased, by market



Source: Authors' own elaboration.

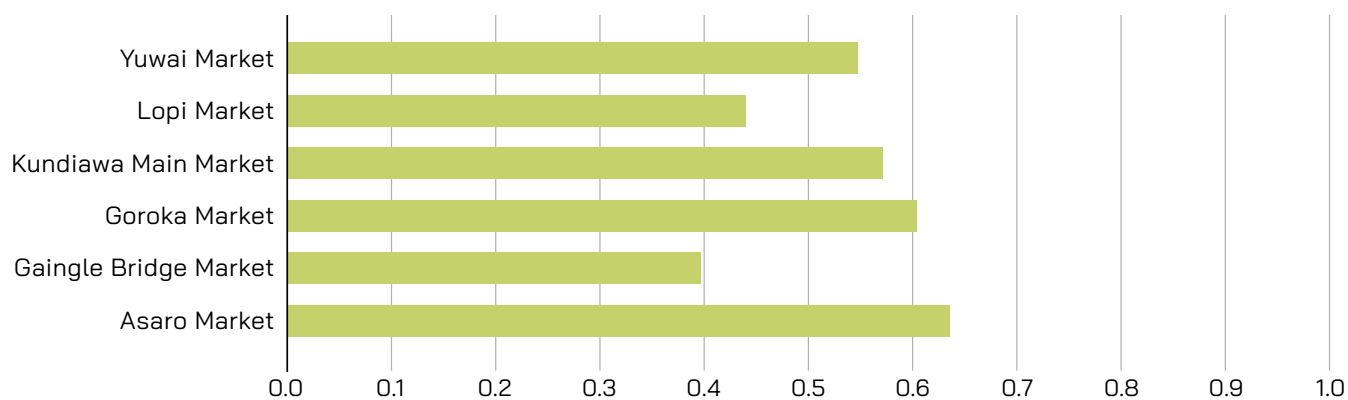
Producer–consumer link indicator

Figure 14 shows the producer–consumer link indicator,⁷ as calculated for each market.

All six markets scored more than 0.4 for this indicator, with Asaro Market and Goroka Market

scoring the highest at almost 0.6. These findings suggest that the supply chain is short and that there are not many intermediaries between producers and retailers.

Figure 14. Producer-consumer link indicator, by market



Source: Authors' own elaboration.

⁷ The producer–consumer link indicator takes into account the share of retailers who are also producers themselves and the share of retailers who purchase products they do not produce directly from farmers. The indicator is expressed as a value between zero and one, where one indicates a short supply chain in which farmers are directly linked to markets without intermediaries.



Minimum day-to-day contribution to healthy and diversified diets

Key findings

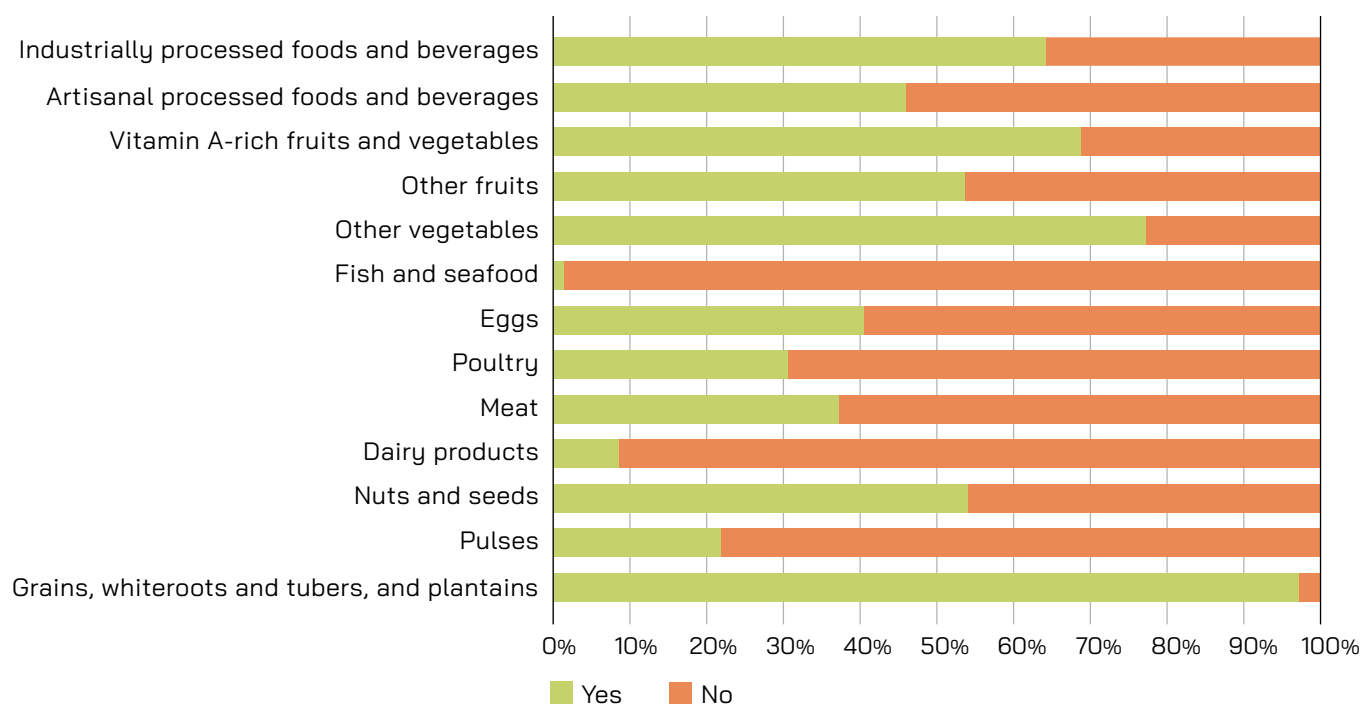
Territorial markets are essential outlets for the territories in which they are embedded and play a significant role in influencing diets among local consumers by ensuring exposure, availability and accessibility to a wide variety of products.

In order to fully understand the contribution of territorial markets to consumer diets, consumers in each market were interviewed regarding the food groups they consumed in the preceding 24 hours. As seen in the [Figure 15](#), over 60 percent of consumers reported having consumed products from the food groups: “Grains, white roots and tubers, and plantains”; “Vitamin A-rich fruits and vegetables”; “Other vegetables”; and “Industrially processed

foods and beverages” during the previous day whereas the animal source foods such as “Fish and seafood” were among the lowest consumed food groups at 1 percent.

The importance of territorial markets in ensuring local people’s access to food can be perceived by the frequency with which consumers visit those markets ([Figure 16](#)). At least 50 percent of consumers stated that they shop in one of the markets daily or more than once a week. The percentage of consumers visiting Kundiawa Main Market every day exceeded 70 percent while only 2 percent of consumers shop once a week or less in Yuwai Market.

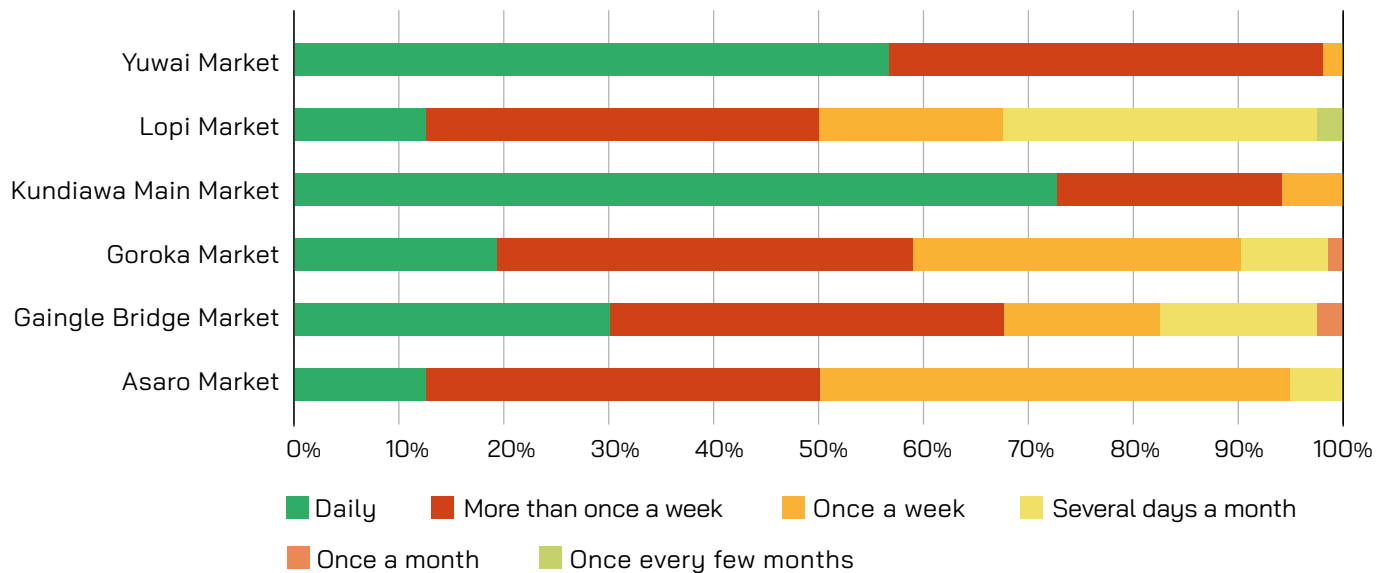
Figure 15. Food groups consumed in the preceding 24 hours



Source: Authors’ own elaboration.



Figure 16. Shopping frequency, by market



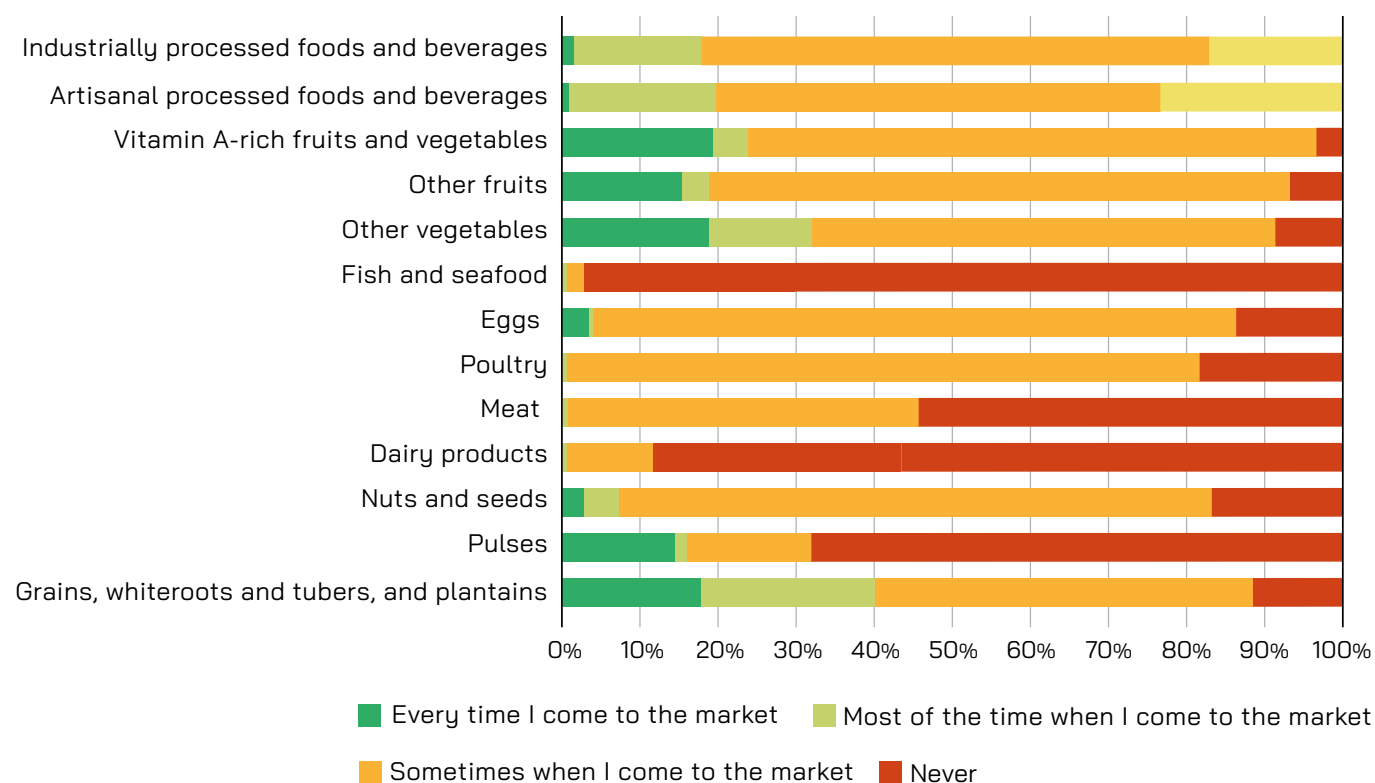
Source: Authors' own elaboration.

Figure 17 illustrates the purchasing frequency for each food group among the total number of consumers in all six markets. None of the food groups showed a high frequency of purchase among consumers coming to the market. "Grains, white roots and tubers, and plantains" is the food group most frequently bought; 40 percent of consumers buy it every time or most of the times they go to the market, and they buy "Poultry" the least.

Further investigations were conducted to determine why consumers do not purchase certain products more frequently (Figure 18). Affordability was a major concern, particularly for "Poultry"; "Eggs"; "Meat"; "Vitamin A-rich fruits and vegetable"; and both industrially and artisanal processed foods and beverages. Other reasons were the lack of availability in the market, particularly of "Fish and seafood" and due to the fact that consumers produce some products themselves, especially for "Other fruits", "Other vegetables" and "Grains, white roots and tubers, and plantain".



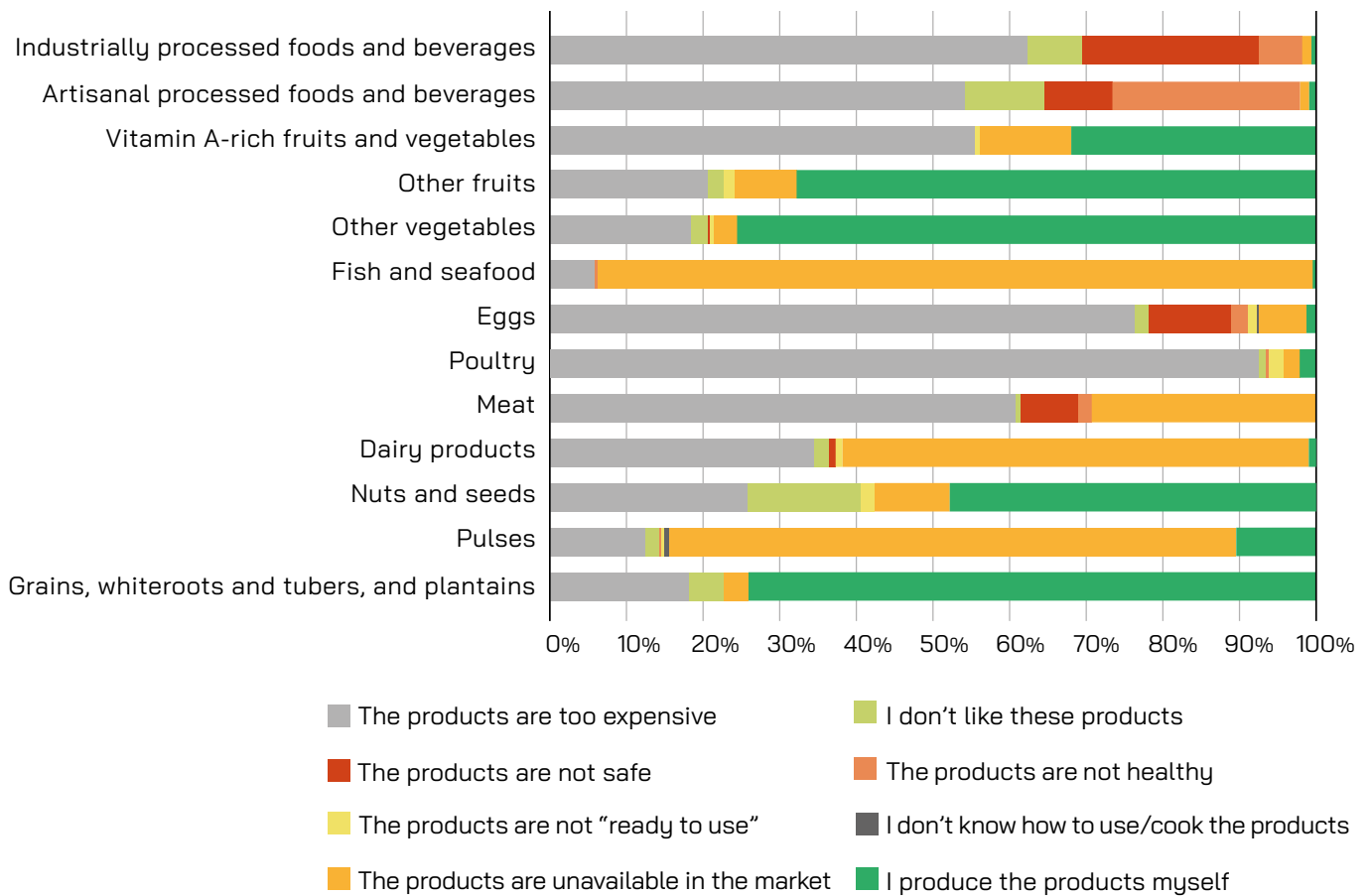
Figure 17. Consumer purchasing frequency, by food group



Source: Authors' own elaboration.



Figure 18. Reason for not buying products more often, by food group



Source: Authors' own elaboration.

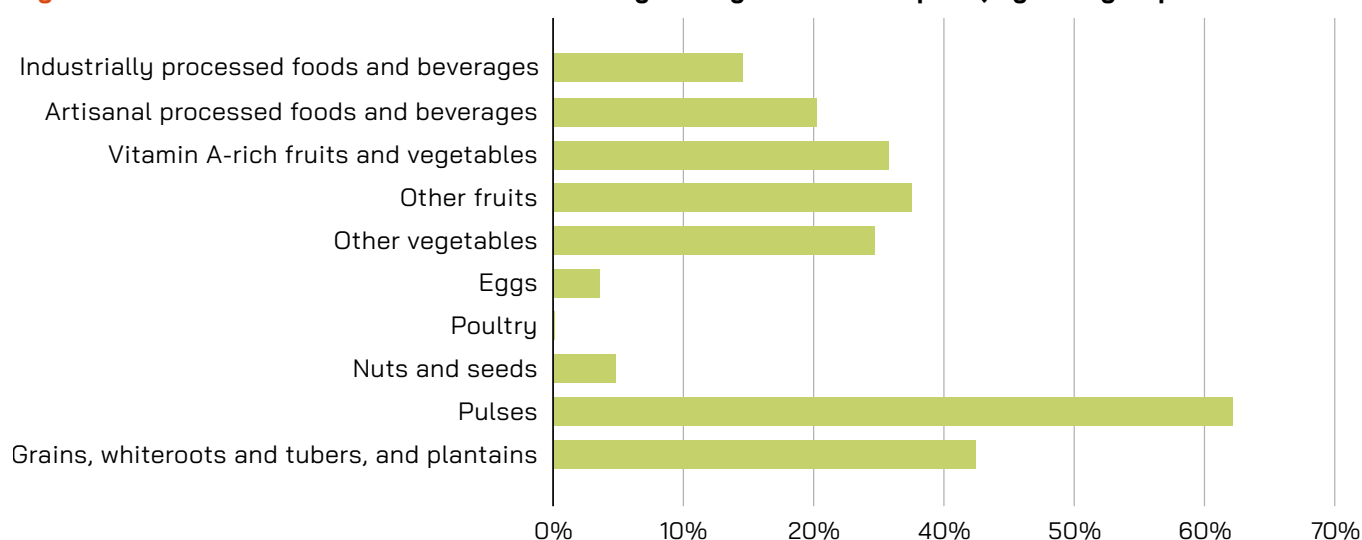


Figure 19 shows the minimum contribution of all three territorial markets to the day-to-day food consumption for each food group.⁸

This contribution exceeds 20 percent of most of the food groups except for “Poultry” of which the markets’ contribution to daily consumption is null. For fruits and vegetables, the value stands at around

30 percent and reaches 60 percent for “Pulses”, meaning that among the consumers reporting to have consumed pulses the day before the survey, almost 60 percent have claimed to buy pulses all the time or most of the time they visit the market and go to the market “Daily” or “More than once a week”. This shows how important these markets are for the supply of this food commodity.

Figure 19. Minimum contribution of markets to day-to-day food consumption, by food group



Source: Authors’ own elaboration.

⁸ The minimum contribution of markets to day-to-day food consumption estimates how much of the food consumed in a given day (by food group) comes from the mapped markets. For each food group, it is calculated as the share (%) of consumers who consumed products from the food group in the preceding 24 hours, who purchase products from the food group every time or most of the times they visit the mapped markets, and who visit the markets every day or more than once a week, over the total number of consumers who consume from the food group. The obtained value expresses the minimum contribution of the mapped markets to the day-to-day food consumption of the given food group.



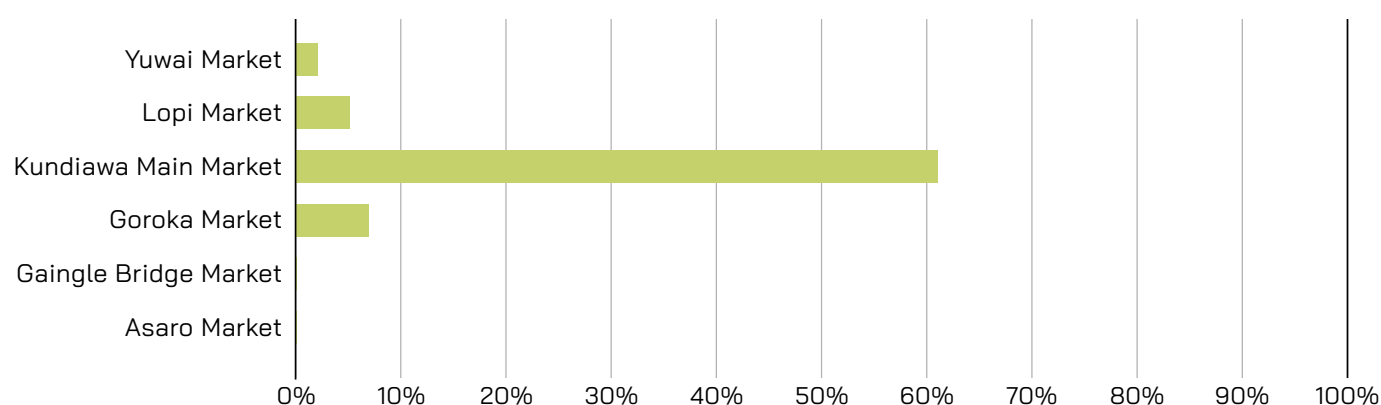
Figure 20 shows the minimum contribution of each market to the day-to-day purchase of healthy food baskets among their respective consumers.⁹

As the figure illustrates, markets for which the indicator has been calculated show a different contribution, ranging from zero to more than 60 percent of Kundiawa Main Market. This means that among the consumers shopping here, 60 percent rely on this market for the entire basket of products.

Minimum day-to-day contribution to healthy and diversified diets indicator

Figure 21 shows the minimum day-to-day contribution to healthy and diversified diets indicator,¹⁰ as calculated for each market. Kundiawa Market scores the highest indicator (0.48) compared to the other markets, signifying this market's importance in providing healthy and diversified products to its consumers.

Figure 20. Minimum contribution to the day-to-day purchase of healthy food baskets, by market



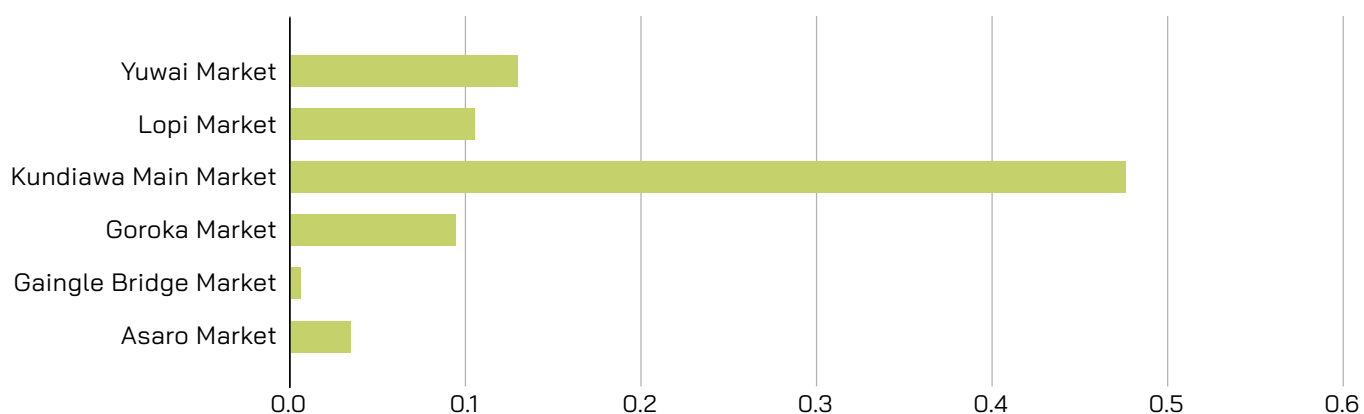
Source: Authors' own elaboration.

⁹ The minimum contribution of a market to the day-to-day purchase of healthy food baskets by its consumers estimates the number of consumers who purchase the entirety of their healthy food basket in a specific territorial market. It is calculated as the share (percentage) of consumers who consumed from at least five different food groups (at least three of which must include: a source of carbohydrates, a source of protein and a source of vitamins and fibre), and purchased all products from these food groups at the given territorial market, over the total number of consumers. The obtained value expresses the minimum contribution of the market to the purchase of healthy food baskets.

¹⁰ The minimum day-to-day contribution to healthy and diversified diets indicator takes into account the share of consumers relying on a given territorial market for their day-to-day consumption of specific food groups, along with the share of consumers relying on the market to purchase a healthy food basket. The indicator is expressed as a value between zero and one, where one indicates that the market contributes to ensuring access to healthy and diversified diets for all its consumers.



Figure 21. Minimum contribution to healthy and diversified diets, by market



Source: Authors' own elaboration.





CONCLUSIONS

Based on the report's findings, the following conclusions can be drawn:

- ✓ Availability of diverse products, especially animal source foods ones like poultry and eggs, is insufficient or non-existent across all six markets, leading to unmet demand.
- ✓ Limited access to credit and inadequate market infrastructure, including the absence of cold chain storage, pose significant challenges for retailers to scale up their businesses.
- ✓ While women constitute the majority of retailers in these markets, there is still a gender gap in terms of net income and access to formal credit. Special policy attention is needed to address this issue and provide business support, including financial literacy and affordable credit to help both women and men expand and diversify their businesses.
- ✓ The mapped markets generally have short supply chains, with few intermediaries between producers and consumers.
- ✓ These markets play a crucial role in providing a small but relevant share of consumers with healthy and diversified products. They are particularly important for daily consumption of plant-based products, such as "Pulses", which can compensate for the lack of animal source proteins.





ACTION POINTS

Improving the business environment, reducing losses and ensuring better availability and access to nutritious and diverse products

Maximizing the potential of territorial markets requires a series of interventions at the market level. Addressing technological and infrastructural gaps in the markets themselves and including cold chain storage and food processing are critical issues. Market-based interventions for nutrition should focus on investments to strengthen and revitalize markets and their food system actors (producers, food manufacturing operators and retailers) by promoting the use of technologies and innovations. This includes climate-friendly refrigeration systems and improved food processing techniques for greater food safety and preservation. In the analysed markets in Papua New Guinea, where the market infrastructures were completely absent, this type of intervention could not only improve the shelf life of the product sold, guaranteeing a higher profit to retailers and more availability of safe and fresh food to consumers, but it may also help to bring a higher variety of products to the markets, such as animal source foods. An example of successful intervention is the use of shared cold stores, like “ColdHubs” in southern Nigeria. These solar-powered containers extend the shelf life of produce from 2 to 21 days, benefiting small businesses. Retailers pay a reasonable fee to use these cost-effective solutions (FAO, 2022b).

Improving the benefits of market inclusion for retailers, especially women

To address the gaps and enable retailers to scale up their businesses and take full advantage of their participation in territorial markets, targeted microfinance interventions and business development services offer a well-established market and recognized approach, especially if they

are specifically designed and developed for women (in this case, women traders operating in territorial markets) (FAO, 2022c). In Papua New Guinea, women retailers were predominant in the markets, their net take-home income was nearly 40 percent less than that of men, had lower sales volumes for almost all food items (with the exception of artisanal products) and sold mainly agricultural food items that have smaller profit margins than processed items. Policy interventions that aim at increasing access of food retailers and producers to business development services and credit would help increase the scale of their business, diversify product offerings, improve their net take-home income and reduce poverty.

Examples of effective strategies under microfinance and microcredit programmes include building the capacity of service providers to target small-scale women entrepreneurs; providing technical and management training that develops women’s skills to compete in male-dominated sectors; facilitating networking opportunities among women entrepreneurs; and promoting the use of information and communication technology (ICT) for better access to price information, mobile money and financial education (FAO, 2018).

Additional policy recommendations to strengthen income pathways in territorial markets include supporting business development and financial literacy programmes for both men and women retailers; incentivizing the formation of producer organizations or farmer clusters to enhance efficiencies in input supply and market connections; establishing market shelters in larger markets to accommodate rural women retailers for multiple days; and strengthening social safety nets through cash transfer systems to improve the health and nutrition of vulnerable households.



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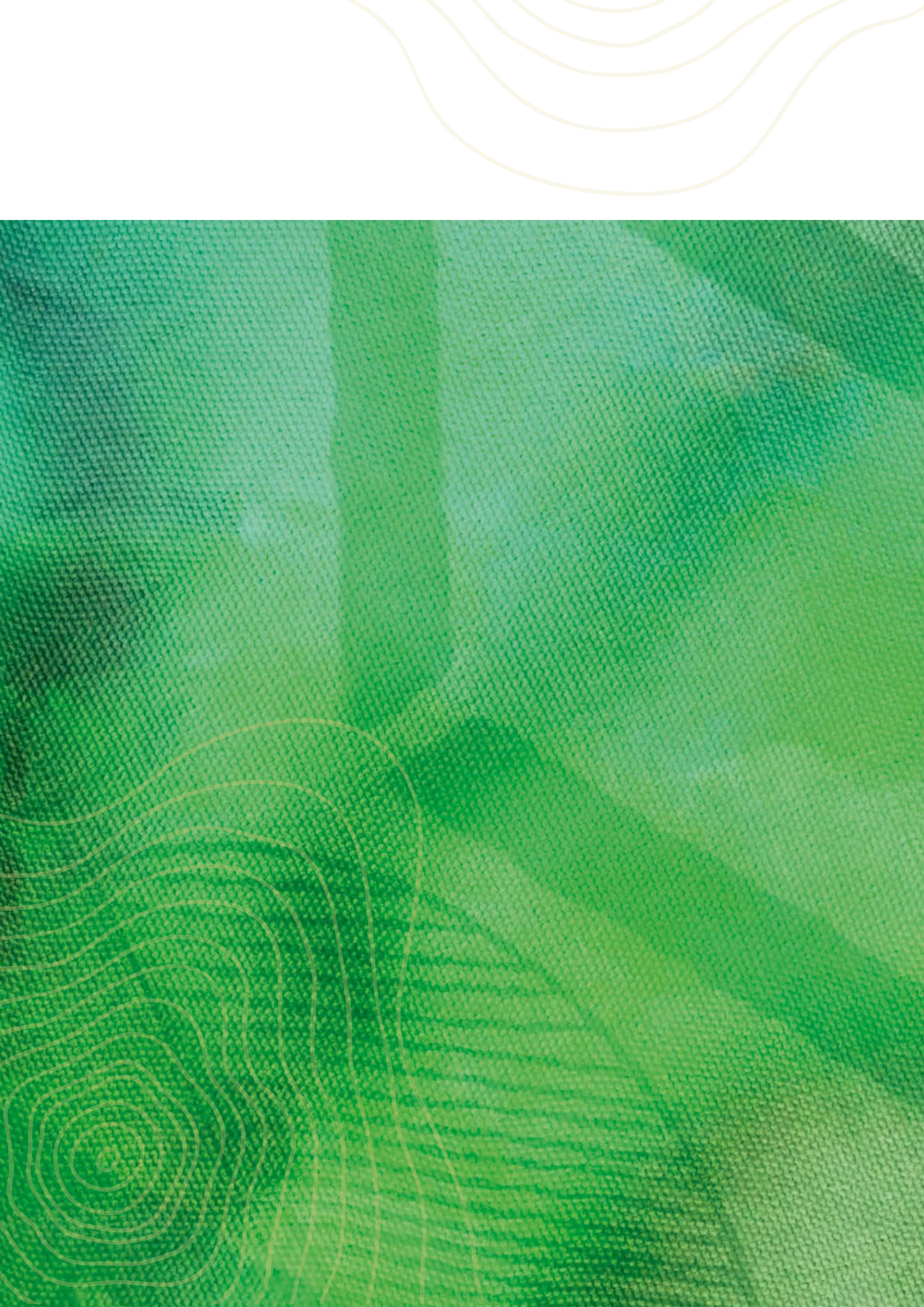
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