



Patterns and determinants of fruit and vegetable consumption in urban Rwanda

Results of an urban consumer study in Kigali and North-western Rwanda

Sanne Bakker, Deirdre Mc Mahon, Valentine Uwase



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Results of an urban consumer study in Kigali and North-western Rwanda

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This report presents the findings of a consumer study conducted as part of the four year programme 'Investing in Horticultural Development in Rwanda' (HortInvest), funded by the Embassy of the Kingdom of The Netherlands in Rwanda. The aim of the study was to understand fruit and vegetable consumption patterns and determinants of the target population (urban consumers in the district towns of Karongi, Muhanga, Rubavu, Ngororero, Nyabihu, Rutsiro and in Kigali), in order to inform and shape an awareness campaign to promote fruit and vegetable consumption.

Keywords: Fruit, vegetables, consumption, urban, Rwanda, consumers.

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Contents

| | |
|---|-----------|
| List of abbreviations and acronyms | 5 |
| 1 Introduction | 7 |
| 1.1 HortInvest | 7 |
| 1.2 Background | 7 |
| 1.3 Aim and objectives | 9 |
| 1.3.1 Aim | 9 |
| 1.3.2 Specific objectives | 9 |
| 1.3.3 Research questions | 9 |
| 2 Methods | 11 |
| 2.1 Data collection methods | 11 |
| 2.2 Study area and population | 12 |
| 2.3 Sampling | 12 |
| 2.4 Survey team | 13 |
| 2.5 Ethical approval/official letters | 13 |
| 2.6 Data collection and entry | 13 |
| 2.7 Data quality assurance and security | 13 |
| 2.8 Data analysis | 13 |
| 2.9 Limitations of the study | 14 |
| 3 Results | 15 |
| 3.1 Respondents characteristics | 15 |
| 3.2 Fruit and vegetable consumption patterns | 17 |
| 3.3 Awareness on recommended daily intake | 22 |
| 3.4 Prioritisation of fruits and vegetables | 22 |
| 3.5 Sourcing | 23 |
| 3.6 Perceived benefits of fruit and vegetable consumption | 24 |
| 3.7 Advertisement | 25 |
| 3.8 Food choice motives | 25 |
| 3.9 Barriers to fruit and vegetable consumption | 26 |
| 4 Discussion, conclusions and recommendations | 31 |
| References | 35 |
| Appendix 1 Questionnaire | 37 |
| Appendix 2 Consent form | 45 |
| Appendix 3 Enumerator's Training plan | 47 |
| Appendix 4 NISR approval | 49 |
| Appendix 5 Barriers to fruit and vegetable consumption by district | 51 |

List of abbreviations and acronyms

| | |
|------|--|
| FCM | Food Choice Motives |
| FCQ | Food Choice Questionnaire |
| F&V | Fruits & Vegetables |
| M | Mean |
| M&E | Monitoring and Evaluation |
| MOH | Ministry of Health |
| NCD | Non Communicable Disease |
| NISR | National Institute of Statistics Rwanda |
| SD | Standard Deviation |
| SNV | Netherlands Development Organisation |
| WCDI | Wageningen Centre for Development Innovation, Wageningen University & Research |
| WHO | World Health Organization |
| WUR | Wageningen University & Research |

1 Introduction

1.1 HortInvest

The 'Investing in Horticultural Development in Rwanda' (HortInvest) project is a four year (2018-2021) horticultural value chain project that is funded by the Embassy of the Kingdom of The Netherlands in Rwanda. The project will support the mission of the Rwandan National Horticulture Policy in terms of fast economic growth and rapid reduction in poverty and malnutrition. HortInvest is implemented by a consortium consisting of SNV Netherlands Development Organisation (lead), IDH The Sustainable Trade Initiative, Wageningen University and Research (WUR), Agriterro and Holland Greentech.

HortInvest's objectives are 1) to increase the horticulture sector's relative contribution to the regional rural economy in North-western Rwanda and 2) to improve the food and nutrition security of poor households in North-western Rwanda. To achieve this, the project aims to improve market-led horticultural production and supplies for domestic and regional markets, enhance food and nutrition security of poor rural and urban households, develop high-value horticultural supply chains for export markets, and create an enabling environment for horticulture sector development. Cross-cutting issues that are being addressed as part of all project activities include gender equality, employment and income opportunities for rural youth, and the promotion of sustainable and climate resilient horticultural value chain systems. The HortInvest project focuses on supporting horticulture growers, their producer organisations and private sector partners, and works in close collaboration with the relevant government agencies.

Under the objective of improving the food and nutrition security of poor households, the HortInvest project aims to increase awareness amongst urban consumers on the importance of fruit and vegetable consumption as part of a safe, healthy and diverse diet. In order to inform the design of a well-tailored awareness raising campaign for urban consumers, a survey was conducted in October 2019 to assess patterns and determinants of fruit and vegetable consumption of the urban population in Kigali and North-western Rwanda.

This report describes the objectives, methodology and findings of the consumer study and provides recommendations for the design of a fruit and vegetable consumption awareness raising campaign for urban consumers, as well gives recommendations to improve integration of the food and nutrition security objectives in HortInvest's activities and interventions.

1.2 Background

Non communicable diseases (NCDs), also known as chronic diseases, are diseases that are not caused by infection or transmitted through contact with another person. The main types of NCDs are cardiovascular diseases, cancers, chronic respiratory diseases and diabetes. NCDs disproportionately affect people in low- and middle-income countries where more than three quarters of global NCD deaths – 32 million – occur¹. NCDs pose a threat to health and development in Rwanda with 1 in 3 of all deaths caused by NCDs. Overweight and obesity are on the rise in Rwanda, particularly in urban areas and among women². Access to and the consumption of healthy diets are key to reducing the chances of onset of diet related non-communicable diseases. An adequate consumption of fruits and vegetables could lead to significant improvements in public health, as it reduces the risk of the development of chronic diseases (e.g., heart diseases, high blood pressure, diabetes and obesity),

¹ <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>.

² World Health Organization. Noncommunicable diseases (NCD) Country Profiles. Geneva, Switzerland: WHO Document Production Services; 2014.

several cancers and prevents or alleviates several micronutrient deficiencies^{3,4}. The World Health Organization (WHO) recommends the daily consumption of fruits and vegetables to amount to at least 400 g⁵, which equals at least five servings of 80 g each. Furthermore, it is recommended that within the five servings, at least three are vegetables⁶.

A brief scan of the (English) literature, revealed that evidence on fruit and vegetable consumption patterns in Rwanda, as well as its drivers, is very limited. In 2005, Ruel et al. made a multi-country comparison of patterns and determinants of fruit and vegetable consumption in sub-Saharan Africa. For Rwanda, the “Enquête intégrale sur les conditions de vie des ménages au Rwanda”, the Integrated Household Living Conditions Survey (2000), was used. The analysis concluded that fruit intake was 14.8 kg/person/year, and was higher for urban consumers⁷ as compared to the rural population. Vegetable consumption was estimated at 46.2 kg/person/year, with also higher consumption among urban consumers. She concluded that in Rwanda, and other countries in sub-Saharan Africa, demand for fruit and vegetables increases as income increases, as low-income households prioritize basic energy requirement and spend their food budget mainly on staples such as sorghum, cassava, sweet potatoes and cooking bananas.

The Rwanda 2012-2013 NCD Risk factor survey, led by the Ministry of Health (MOH), also assessed dietary patterns among 7,225 Rwandans (2,687 men and 4,538 women) aged 15-64 years. The survey found that average daily consumption of fruit was 1.3 servings for rural and semi urban consumers, and 1.2 serving for urban consumers. Average daily consumption of vegetables was 1.6 servings for rural consumers, 1.5 for semi-urban and again 1.5 for urban consumers. Weekly fruit consumption was estimated at 1.6 days for rural and semi-urban consumers and 1.9 days for urban consumers. Weekly vegetable consumption was estimated at 3.9 days for rural consumers, 4.1 days for semi-urban consumers and 4.6 days for urban consumers. Differences in findings for female and male consumers and between different age groups were very small to neglectable⁸.

The literature scan identified research on fruit and vegetable consumption determinants in Ghana, Benin, and Nigeria, and South-Africa, but for Rwanda there is a data gap on the drivers and barriers of fruits and vegetable consumption among urban consumers. Besides, the above-mentioned surveys are outdated, as they have been conducted at least seven years ago.

Effective, evidence-based interventions are needed to improve diets and reduce NCDs and micronutrient deficiency related morbidity and mortality. Therefore it is crucial to understand the food choice motives and perceived barriers of urban consumers, in order to ensure the success of awareness raising and other activities to foster fruit and vegetable consumption.

³ Amo-Adjei, J., & Kumi-Kyereme, A. (2015). Fruit and Vegetable Consumption by Ecological Zone and Socioeconomic Status in Ghana. *Journal of Biosocial Science*, 47(5), 613-631. doi:10.1017/S002193201400025X.

⁴ Aune, D.; Giovannucci, E.; Boffetta, P.; Fadnes, L.T.; Keum, N.; Norat, T.; Greenwood, D.C.; Riboli, E.; Vatten, L.J.; Tonstad, S. Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality—A systematic review and dose-response meta-analysis of prospective studies. *Int. J. Epidemiol.* 2017, 46, 1029–1056.

⁵ World Health Organization. (2003). Diet, nutrition, and the prevention of chronic diseases: report of a joint WHO/FAO expert consultation (Vol. 916): World Health Organization.

⁶ FAO. (2003). What is a serving? Retrieved from <http://www.fao.org/english/newsroom/focus/2003/fruitveg2.htm>.

⁷ The definition of urban population followed that of the 3rd census of population and housing in Rwanda (2002); an urban population is that which is resident within the limits of the urban administrative units recognised as such by law. Besides the City of Kigali, the capital town of Rwanda, the country has 11 other provinces whose headquarters enjoy the status of urban areas. Three other agglomerations have been recognised this status of urban area also. They include: the towns of Nyanza in the Province of Butare, Ruhango in the Province of Gitarama and of Rwamagana in Province of Kibungo. In all, there are therefore 15 towns in Rwanda.

⁸ Republic of Rwanda Ministry of Health. *Rwanda Non-Communicable Diseases Risk Factors Report*. Kigali, Rwanda; Republic of Rwanda; Ministry of Health; 2015.

1.3 Aim and objectives

1.3.1 Aim

The aim of this study was to understand fruit and vegetable consumption patterns and determinants of the target population (urban consumers in the district towns of Karongi, Muhanga, Rubavu, Ngororero, Nyabihu, Rutsiro and in Kigali), in order to inform and design an HortInvest awareness campaign to promote fruit and vegetable consumption.

1.3.2 Specific objectives

Objective 1: To describe fruit and vegetable purchasing and consumption behaviour among urban consumers in the target area (six HortInvest target districts and Kigali).

Objective 2: To describe the importance of different food choice motives for urban consumers in the target area.

Objective 3: To assess the barriers to fruit and vegetable consumption for urban consumers in the target area.

1.3.3 Research questions

The studied was designed to answer the following research questions:

- What is the average daily and weekly fruit and vegetable intake of urban households?
- Where do urban households source their fruit and vegetables?
- How do urban households consume fruits and vegetables?
- What are the most important motives for food choices?
- What are the barriers to fruit and vegetable purchase and consumption?
- What are the perceived benefits of fruit and vegetables according to urban consumers?
- What is consumer's knowledge on recommended daily intake of fruits and vegetables?

2 Methods

2.1 Data collection methods

Data was collected through a consumer survey. The questionnaire developed for this survey was designed to gather insights into fruit and vegetable consumption behaviour of urban consumers in Kigali and towns of districts targeted by HortInvest. To measure underlying food choice motives, the Food Choice Questionnaire (FCQ) developed by Steptoe et al. (1995), and adapted for low-income African countries by Raaijmakers et al. (2018), was included in the survey questionnaire. The FCQ used consisted of 48 items, representing both health and non-health related food characteristics. Each item was introduced by the affirmative sentence “it is important to me that the food that I eat on a typical day ...” followed by each motive, and evaluated by the respondent on a 7-point Likert scale, going from 1= not important at all to 7=extremely important. The questionnaire was translated into Kinyarwanda.

Table 1 below presents the research questions and the corresponding variables included in the questionnaire. A copy of the questionnaire can be found in Appendix 1. A copy of the informed consent is included in Appendix 2.

Table 1 Measures included in the survey

| Research question | Variable |
|--|---|
| Demographics of the study population | Age Marital status People living in the household Household members disaggregated by age Ubudehe level ⁹ Education level Employment status |
| 1. What is the average daily and weekly fruit and vegetable intake of urban households? | Number of days/week consuming vegetables Number of days/week consuming fruits Servings per day fruits and vegetables (F&V) Consumption frequency of individual F&V (red, yellow, green sweet pepper, broccoli, tomato, cauliflower, onions (red and white), french beans and sugar snaps, carrot, passion fruit, oyster mushroom and lettuce, Irish potato, sweet potato, orange flesh sweet potato) Preferred types of fruits and vegetables during dry and rainy season |
| 2. Where do urban households source their fruit and vegetables? | Percentage of consumers sourcing from open market, street vendor, convenience stores, supermarkets, self-grown |
| 3. How do urban households consume fruits and vegetables? | Percentage consuming vegetable heated, raw |
| 4. What are the most important motives for food choices? | Scores for motives Mood, Convenience accessibility, Convenience preparation, Ethical concern, Natural content, Weight control, Price, Familiar, Health, Food safety |
| 5. What are the barriers to fruit and vegetable purchase and consumption? | Percentage of respondents identifying importance of barriers |
| 6. What are the perceived benefits of fruit and vegetables according to urban consumers? | Perceived benefits as reported by the respondents |

⁹ Ubudehe is a long-standing and cultural value of mutual assistance which was adopted by the government in 2000 as part of the strategies to address poverty reduction. In the present context, Ubudehe can be understood as a socio-economic stratification system in which poor Rwandans are supported with social protection schemes. Currently, Rwandans have been classified under four categories with the first category designated for the poorest people in society while the fourth category is for the wealthiest members of society (<https://www.newtimes.co.rw/news/new-ubudehe-categories-what-you-need-know>).

| Research question | Variable |
|--|---|
| 7. What is consumer's knowledge on recommended daily intake of fruits and vegetables? | Percentage of consumers aware of recommended daily intake for F&V (in number of servings a day as per WHO recommendation) |
| 8. How are the purchasing priorities of people aware of the recommended intake versus those who do not know? | Comparison of crop priorities between respondents with and without knowledge on recommended intake |

2.2 Study area and population

The study area included six district towns and Kigali (see table 2 below), corresponding to the markets where produce of the HortInvest supported smallholder farmers is marketed. The target population consisted of consumers who visit these markets for buying their groceries. The consumer survey was conducted among men and women visiting these markets. Respondents freely participated and received an incentive after finishing the questionnaire. The respondent selection criteria applied are the following: (i) respondent is (one of the) key decision makers on groceries for the household and (ii) the respondent is (one of the) persons who buys groceries for the household.

Table 2 Markets included in the sample

| District | Market name |
|------------------|---------------------|
| KARONGI | KARONGI CITY MARKET |
| MUHANGA | MUHANGA TOWN |
| RUBAVU | GISENYI |
| NGORORERO | NGORORERO MARKET |
| NYABIHU | KORA |
| RUTSIRO | GISIZA |
| KIGALI | KIMIRONKO |

2.3 Sampling

The following formula was used to calculate the sample size¹⁰:

Sample size =

$$\frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N} \right)}$$

With

- Z= z-score = 1.96 (confidence interval of 95%)
- N= population size = >100.000 The target population is consumers living in urban areas of Karongi, Muhanga, Rubavu, Ngororero, Nyabihu, Rutiro and Kigali. The Rwandan population and housing census is only disaggregated by district, which does not allow for an estimation of the target population. For this calculation, 100 000 was conservatively used as the population size, since the sample size doesn't change much for populations larger than 100,000
- P= sample proportion = 50%
- E= Margin of error = 5%

¹⁰ <https://www.surveymonkey.com/mp/sample-size-calculator/>

A sample size of 384 was required to estimate the true population proportion with a margin of error of 5% and a confidence level of 95%. Respondents were sampled from 7 different marketplaces, to represent the urban areas targeted by HortInvest. The sample size per market therefore was set to be at least 55.

Sampling was through convenience sampling at the markets in the districts and Kigali.

2.4 Survey team

The survey team consisted of coordinators from the HortInvest team (HortInvest Nutrition advisor, HortInvest M&E advisor, HortInvest Communications advisor & WCDI technical advisor), district nutrition coordinators, and enumerators. Twenty enumerators were recruited by SNV for this survey. A 2-day training was organized in Kigali to train enumerators on data collection methods and facilitated by the coordinators. See Appendix 3 for a detailed programme of the training.

2.5 Ethical approval/official letters

The National Institute of Statistics approved the study protocol and granted a research visa. A copy of the approval letter is included in Appendix 4. In addition, approval of local authorities to conduct surveys at the districts markets was sought prior to the survey. HortInvest nutrition district coordinators were responsible for liaising with district authorities.

2.6 Data collection and entry

The consumer survey was created in Akvo Flow. For data collection and entry the enumerators made use of tablets. The Akvo technical team in Nairobi built the surveys in Akvo Flow. Enumerators were trained in Kigali for two days before traveling to the HortInvest districts.

The pre-test was done in a non-study area in Kigali. During the pre-test every enumerator practiced the interview at least twice.

2.7 Data quality assurance and security

Thorough training of enumerators was done to familiarize them with the methods of data collection. The data was stored in SNV's Akvo Flow database. WCDI received a copy of the data set and maintains the SPSS data files for analysis.

2.8 Data analysis

All data was analysed using PASW statistics 22 for windows (SPSS Inc., Chicago IL, USA). Firstly, data was checked and cleaned by visual examination. Normality was examined by visual inspection.

For the Food Choice Questionnaire, an exploratory and confirmatory factor analysis was conducted to determine the underlying structure of the questionnaire. The exploratory factor analysis indicated 10 factors based on an EigenValue of above 1.0, with a total explained variance of 61.7%. Rotation failed to converge in 25 iterations. The confirmatory factor analysis was conducted with 11 factors and required 29 iterations.

2.9 Limitations of the study

This study has several limitations. First, and most importantly, fruit and vegetable consumption rates are based on self-reported data. Respondents may have over- or underreported their consumption due to various reasons such as short memory, or the tendency to report socially desirable answers.

As a result of the sampling approach (convenience sampling at the market), and the high numbers of women present at the markets, the sample included mostly women. The low representation of men in the sample made the analysis less suitable for gender based data comparison. In addition, it has not been possible to include only consumers visiting the market. In a few cases, the respondents that participated in the survey were also selling produce at the market. The enumerators explained that market visitors were not always willing to spend 30 minutes of their time to complete the questionnaire. The sales- women and -men on the contrary, were more willing to participate as they were present on the market for a longer period of time anyways and had no further follow-up obligations. Also, there is no guarantee that all consumers included in the sample can be officially classified as urban consumer. Some of them could belong to rural households but ended up in the study sample as they were visiting an urban market.

The sample of urban consumers was taken only from urban areas in districts targeted by HortInvest plus Kigali. It was not feasible within the scope of the project to include the urban areas in the entire country. Thus, the sample is not representative of all urban consumers in Rwanda, and therefore it should be noted that the results might differ from other regions in Rwanda.

Additionally, the timing of the survey, and the single measurement, limit the generalizability of the results. The survey was conducted at the onset of the rainy season. One of the main reported barriers to fruit and vegetable consumption is their seasonal availability. If the survey was to be conducted in a different season, the availability is expected to vary, which in turn would affect daily and weekly consumption rates.

3 Results

3.1 Respondents characteristics

Table 3 summarizes the characteristics of the respondents. The total number of respondents included in the survey was n=420, which is more than the required sample size according to the sample size calculation. Several of the enumerators exceeded the targeted number of respondents. The seven markets were still equally presented in the sample. All respondents were either the key decision maker for household grocery shopping or one of the key decision makers. Similarly, they were all the person or one of the persons responsible for buying the groceries.

The majority of the respondents were female (78%), with a mean age of 34 years. Most of the respondents were married (67%) and their households contained on average 5 members (Figure 1). Most of the households in the sample are classified as Ubudehe level 3 (51%), followed by level 2 (40%). Most common educational levels were primary (46%) and secondary (37%) school. A majority of 73% of the respondents reported to be self-employed.

Table 3 Respondent characteristics

| | N= | Percentage |
|---|------------|------------|
| Key decision maker for grocery shopping | | |
| Respondent is key one of the key decision makers within the HH for grocery shopping | 135 | 32 |
| Respondent is the key decision maker for grocery shopping | 285 | 68 |
| Buying groceries | | |
| Respondent is one of the persons within the HH that buys groceries | 118 | 28 |
| Respondent is the one buying groceries for the HH | 302 | 72 |
| Market | | |
| Nyabihu Kora | 60 | 14 |
| Karongi Karongi | 60 | 14 |
| Rutsiro Gisiza | 60 | 14 |
| Kigali Kimironko | 60 | 14 |
| Rubavu Gisenyi | 59 | 14 |
| Ngororero Ngororero - Kwizera Bosco | 61 | 15 |
| Muhanga Muhanga | 60 | 15 |
| Sex | | |
| Female | 329 | 78 |
| Male | 91 | 22 |
| Age in years | | |
| Mean (range) | 34 (17-78) | |
| Marital status | | |
| Divorced | 17 | 4 |
| Married/living with partner | 283 | 67 |
| Single | 89 | 21 |
| Widow | 31 | 7 |
| Household size | | |
| Mean (range) | 5 (1-12) | |
| Household composition | | |
| Members <5, average (range) | 1 (0-5) | |
| Members between 5-18, average (range) | 2 (0-7) | |
| Members between 18-30, average (range) | 1 (0-6) | |
| Members >30, average (range) | 1 (0-6) | |

| | N= | Percentage |
|-----------------------------|-----|------------|
| Ubudehe level | | |
| 1 | 21 | 5 |
| 2 | 166 | 40 |
| 3 | 216 | 51 |
| unknown | 17 | 5 |
| Educational level | | |
| Literate/adult education | 1 | 2 |
| No schooling | 27 | 6 |
| Nursery | 1 | 0 |
| Primary | 192 | 46 |
| Secondary | 155 | 37 |
| Undergraduate university | 27 | 6 |
| Post graduate university | 3 | 1 |
| Vocational training centres | 14 | 3 |
| Employment status | | |
| Housewife | 6 | 1 |
| Retired | 1 | 0 |
| Self-employed | 302 | 72 |
| Student (not employed) | 5 | 1 |
| Unemployed | 18 | 4 |
| Work full-time | 32 | 8 |
| Work part-time | 28 | 7 |
| Work informally | 28 | 7 |

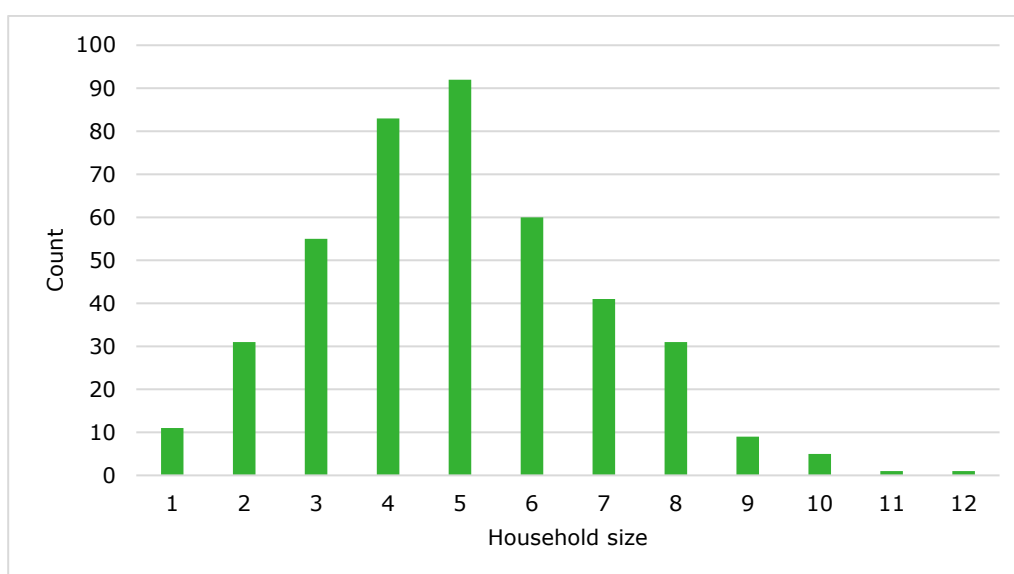


Figure 1 Household size

3.2 Fruit and vegetable consumption patterns

Respondents were asked how many servings of fruits and vegetables they consumed on the day prior to the survey. The results are presented in figure 2 and 3 below. The majority of the respondents did not consume fruits on the day prior to the survey. The most reported intake of vegetables was 2 servings.

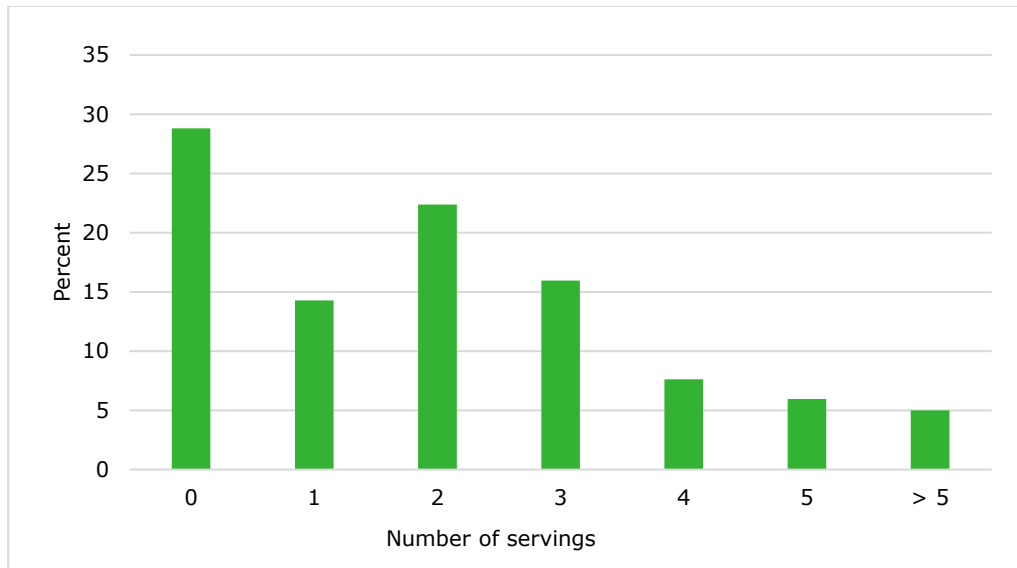


Figure 2 *Daily fruit intake*

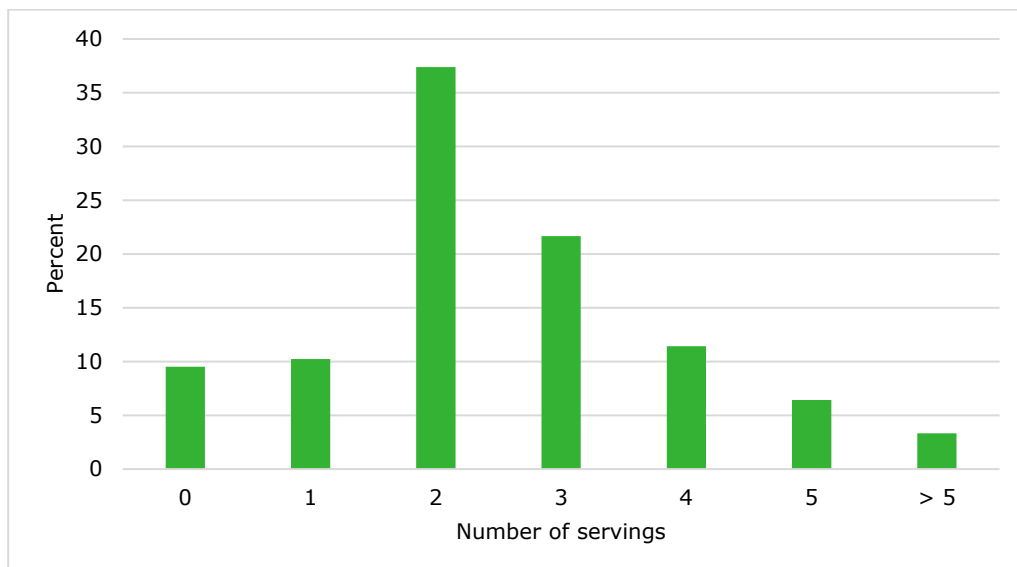


Figure 3 *Daily vegetable intake*

Figure 4 and 5 below present the data on daily fruit and vegetable consumption, disaggregated by district.

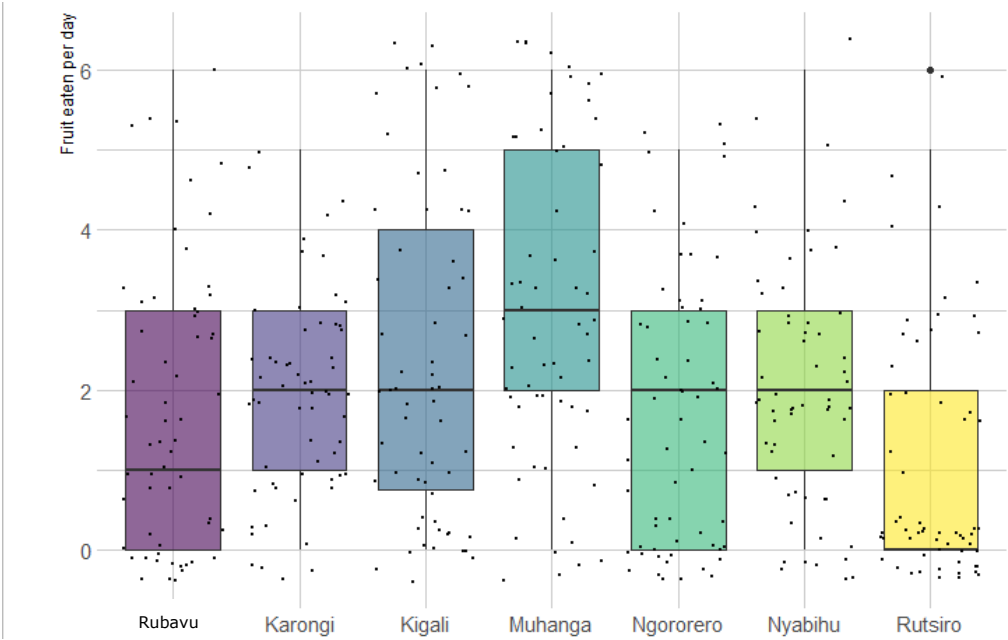


Figure 4 Daily fruit consumption by district

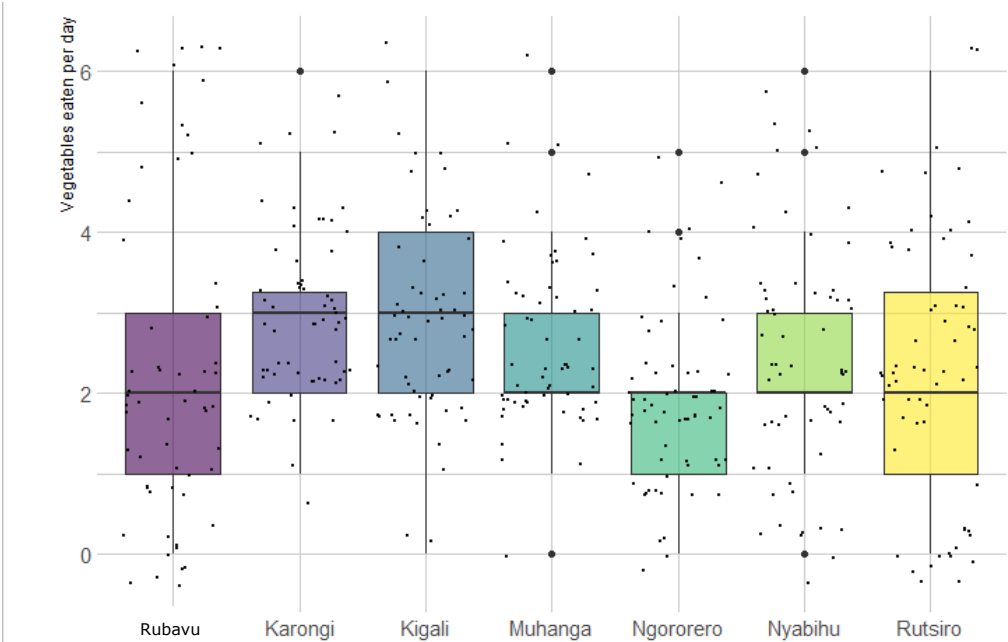


Figure 5 Daily vegetable consumption by district

ANOVA tests and non-parametric tests showed that daily fruit consumption is significantly higher in Muhanga compared to other districts and significantly lower in Rutsiro. As for daily vegetable consumption, consumption levels were significantly lower for Ngororero and Rutsiro as compared to other districts.

Respondents were asked on how many days in the past week they consumed fruit and vegetables. Findings on daily and weekly fruit and vegetable consumption can be found in table 4.

Table 4 Daily and weekly fruits and vegetable consumption

| Fruit | | Vegetables | |
|---|-----------|--|---------|
| Daily | | Daily | |
| Percentage | | Percentage | |
| 0 servings | 29 | 0 servings | 10 |
| 1 servings | 14 | 1 servings | 10 |
| 2 servings | 22 | 2 servings | 37 |
| 3 servings | 16 | 3 servings | 22 |
| 4 servings | 8 | 4 servings | 11 |
| 5 servings | 6 | 5 servings | 6 |
| >5 servings | 5 | >5 servings | 3 |
| Total daily fruit and vegetable intake | | | |
| Mean (SD) | 5 (2.8) | | |
| Range | 0-18 | | |
| Weekly fruit consumption in number of days | | Weekly vegetable consumption in number of days | |
| Mean (SD) | 3.4 (2.2) | Mean (SD) | 5 (1.9) |
| Percentage | | Percentage | |
| 0 days | 7 | 0 days | - |
| 1 days | 9 | 1 days | 2 |
| 2 days | 22 | 2 days | 8 |
| 3 days | 23 | 3 days | 15 |
| 4 days | 11 | 4 days | 10 |
| 5 days | 7 | 5 days | 11 |
| 6 days | 1 | 6 days | 4 |
| 7 days | 19 | 7 days | 49 |

Ninety-eight percent of the total respondents (n=420) reported to consume their vegetables heated, versus 10% that consumes their vegetables raw.

The survey also assessed the intake of individual fruits and vegetables, in line with the crop value chains supported through HortInvest. Figure 6 shows the consumption frequency of these crops. *Often* was defined at more than 2 times per week. *Rare* was defined as less than two times per week. Irish potato (91%), onions (96%) and tomato (93%) are most frequently consumed. Consumption frequency of the more nutritious fruits and vegetables is much lower, with consumption reported to be *often* by 15% of the respondents for orange flesh sweet potato, 46% for passion fruit, 1% for red pepper, 1% for yellow pepper, 61% green sweet pepper and 2% for broccoli.

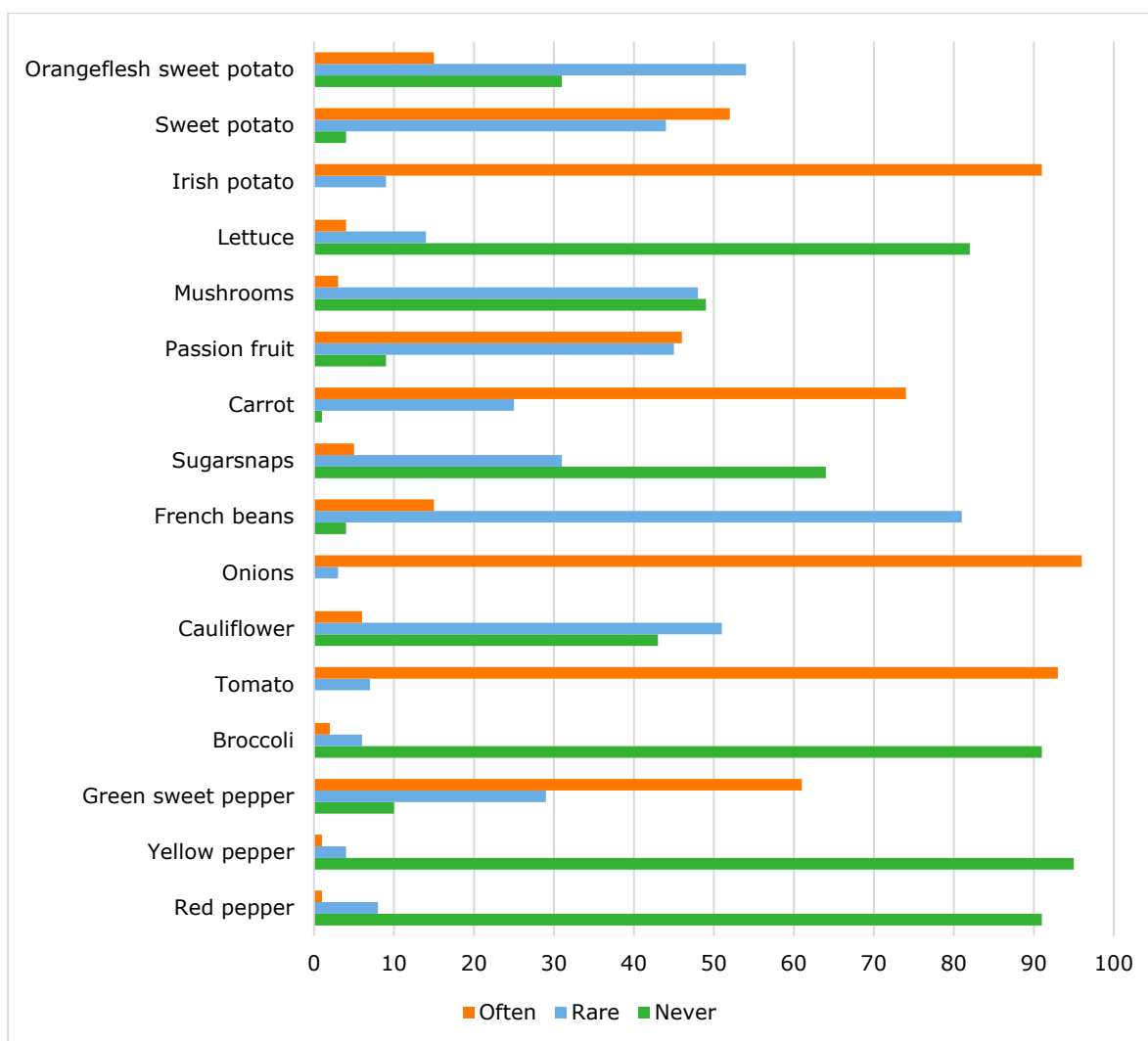


Figure 6 Consumption of crops targeted by HortInvest

In addition, respondents were asked to name the three fruits they most often consume during rainy season and during dry season. The questions were repeated for vegetables. Responses including more than 3 items were excluded, as it was not possible to determine which items would belong to the top three. Figure 7 shows that yellow banana was the most consumed fruit during dry and rainy season. After yellow banana, for almost half of the respondents (47%) tamarillos were one of the three most consumed fruits during rainy season, and passion fruit for 43%. During dry season pineapple (40%), apple (43%) and avocado (42%) were popular fruits after yellow banana. The fruits papaya, maracuja, water melon and mandarin were reported under "other".

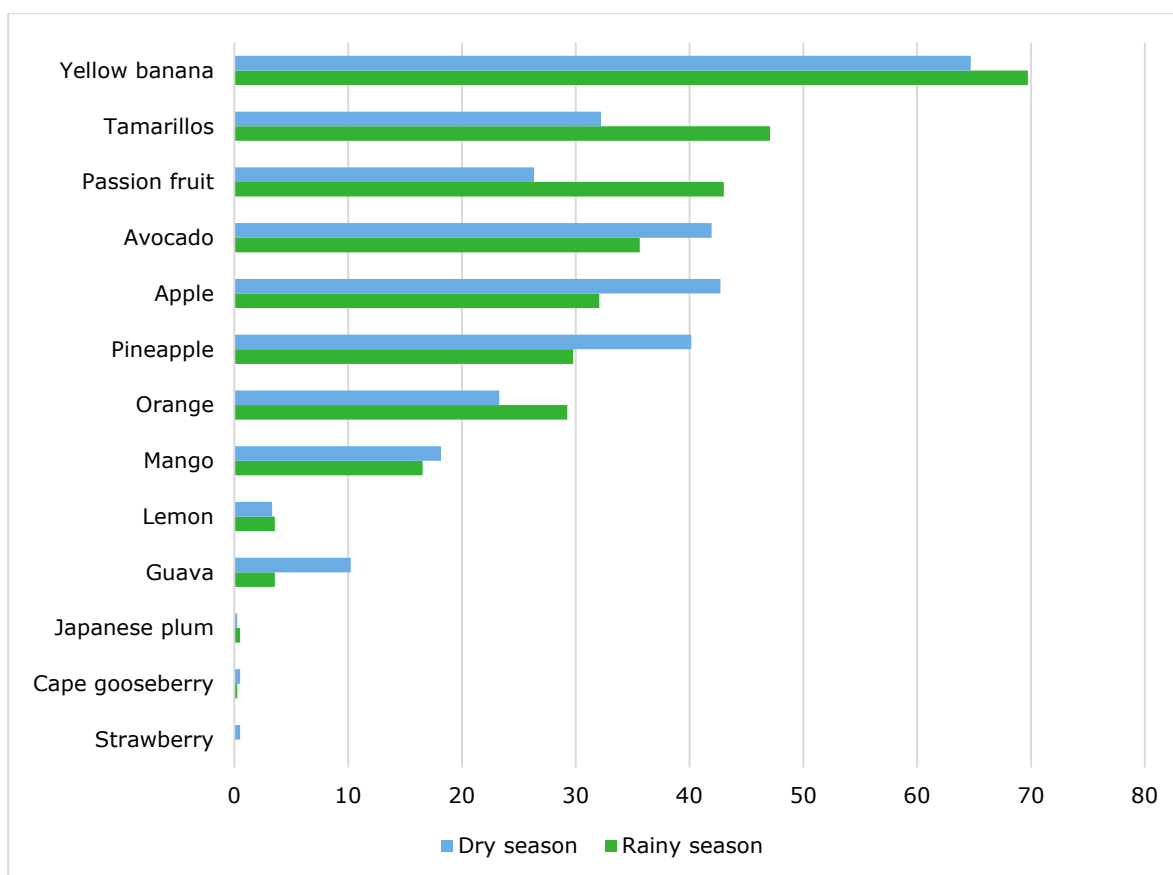


Figure 7 Fruits consumed most often during rainy season (n=393) and during dry season (n=391)

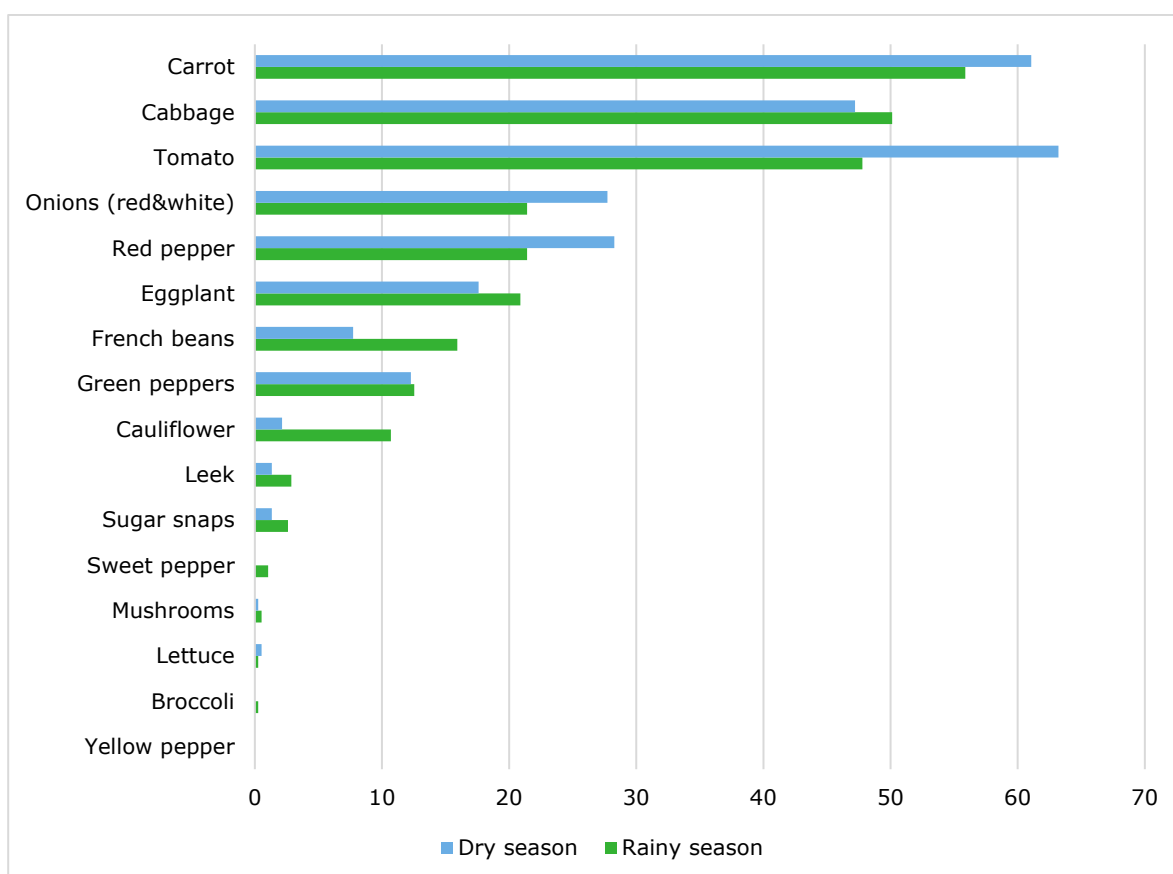


Figure 8 Vegetables consumed most often during rainy season (n=383) and during dry season (n=375)

As presented in figure 8, both during dry and rainy season, carrot, cabbage and tomato are most prevalent in respondents' top three of most consumed vegetables. The vegetables amaranth (dodo), spinach (epinari), cassava leaves (isombe), pumpkin leaves, garden eggs, bean leaves, night shade (isogo), and courgette were reported under "other". It is important to note that the list of options for vegetables included in the questionnaire was not corresponding with the local preferences. The most preferred vegetable during rainy season, turned out to be amaranth (69%), while this green leafy vegetable was not pre-included in the questionnaire. Similarly, cassava leaves were found to be highly preferred.

Mushrooms were reported only once. This might be explained by the fact that the question evolved around vegetables and mushroom are not considered as vegetables.

3.3 Awareness on recommended daily intake

Respondents were asked if they are aware of the daily recommended intake for fruits and vegetables. Only 17% of the respondents reported to be aware of the daily recommended intake. Out of this group, most respondents indicated that either two or three servings is the recommended daily total intake of fruits and vegetables. Other answers were in the range of 1 to 7 servings a day. Only 7 out of 420 respondents (2%) was aware of the official WHO recommendations of 5 servings per day.

3.4 Prioritisation of fruits and vegetables

Respondents were asked which food group they prioritize when it comes to household food purchases. The results are presented in figure 9. The majority of the respondents reported to prioritize staples, followed by vegetable and nuts.

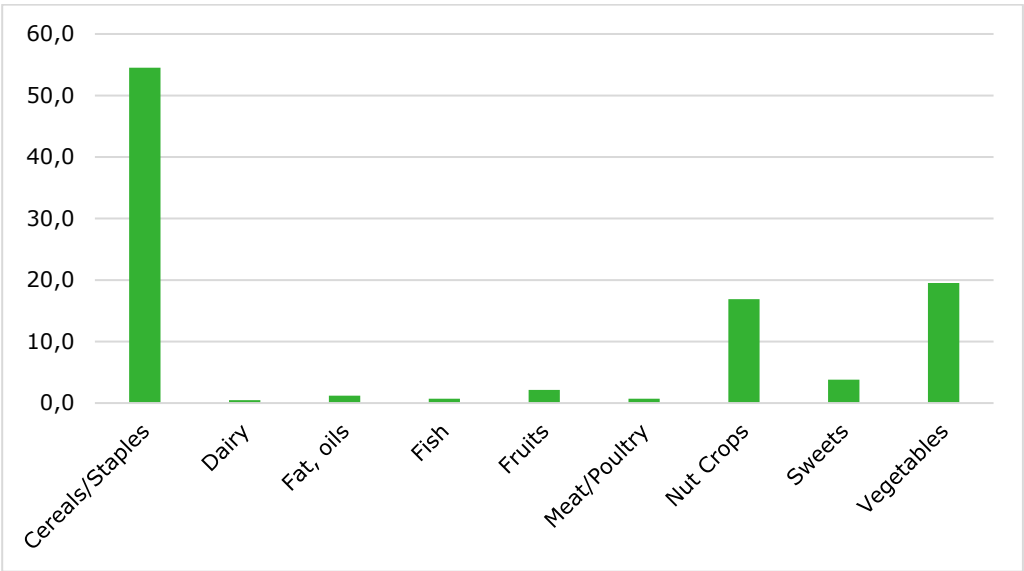


Figure 9 Percentage of respondents prioritising food groups for household food purchases

3.5 Sourcing

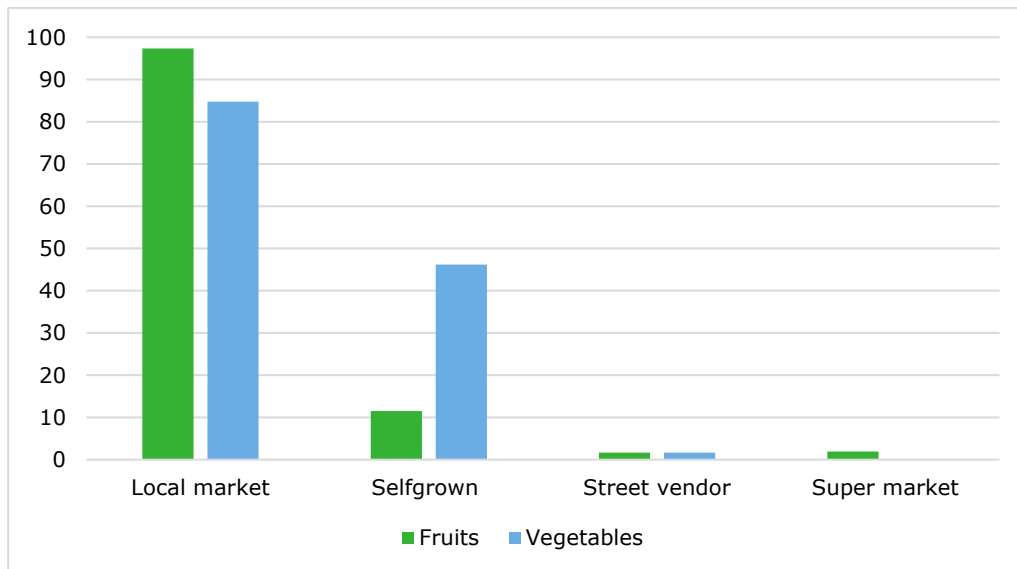


Figure 10 Source of fruits and vegetables

Respondents source most of their fruits and vegetables from the local market. Almost half of the respondents (46%, n=420) also consume self-grown vegetables. For fruits, this percentage was much lower (12%, n=417 as three respondents did not consume fruits), as presented in figure 10.

Figure 11 and 12 below present per district where consumers source their fruit and vegetable from. Where households source they fruit and vegetables from and the type of district are significantly related (chi square $p < 0.001$).

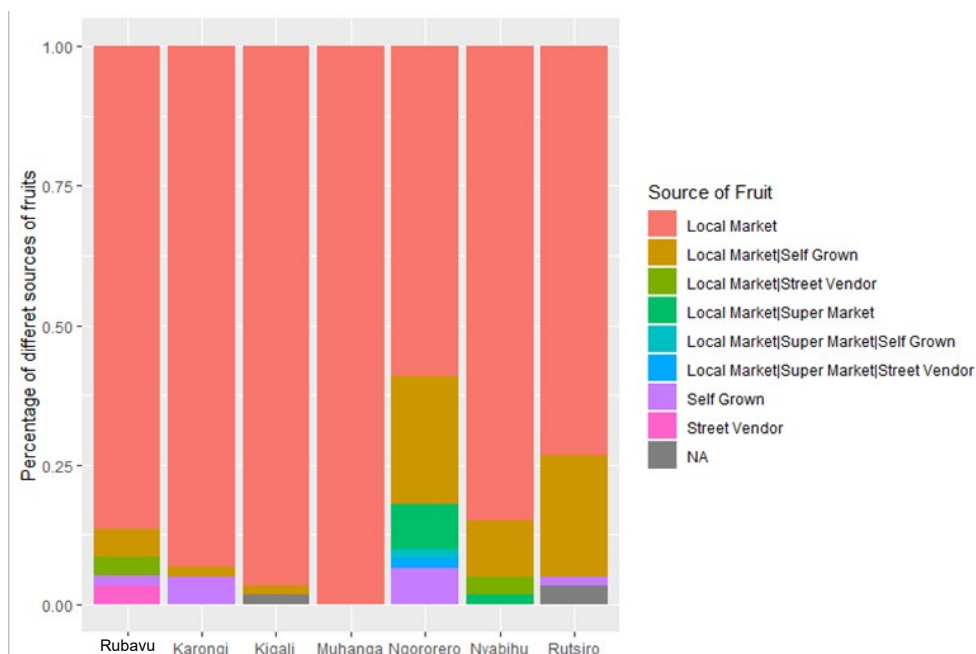
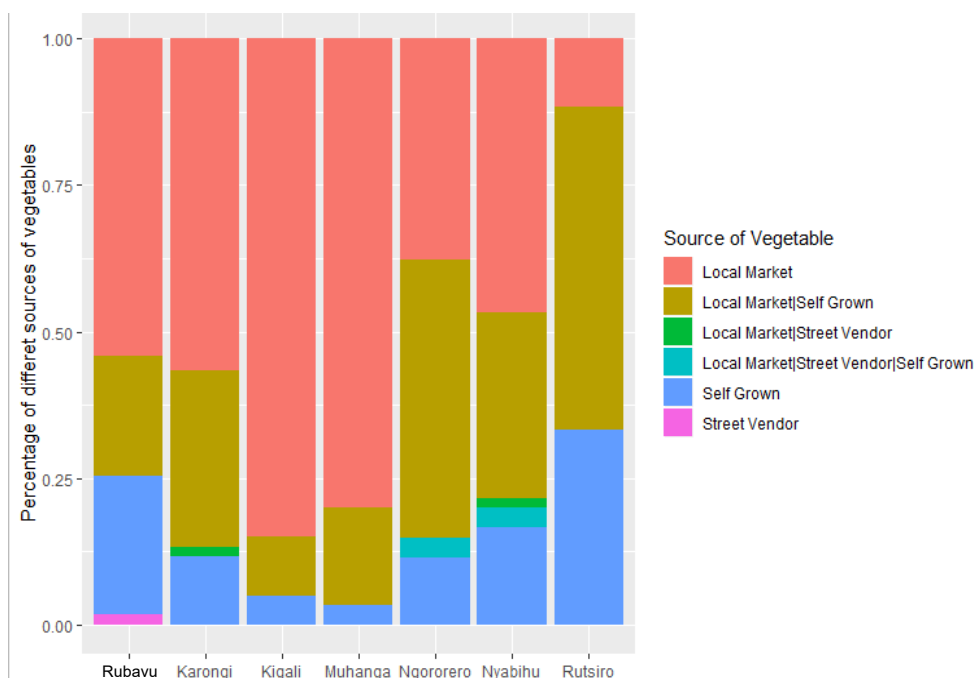


Figure 11 Sources of fruit by district



3.6 Perceived benefits of fruit and vegetable consumption

An open question was used to assess the perceived benefits of fruit and vegetable consumption. The list of benefits that were reported were entered into a word cloud generator¹¹. The size of the words is in proportion to the reporting frequency of the benefits.



¹¹ <https://www.jasondavies.com/wordcloud/>

3.7 Advertisement

Most of the respondents (49%) reported to not be influenced by advertisement for their food purchases, whereas 13% of the respondents *sometimes*, and 38% of the respondents confirmed to be influenced by advertisement. Figure 14 shows that most respondent heard advertisements for food on the radio. Newspapers/magazines, internet and billboards do not seem to be commonly used for food advertisement.

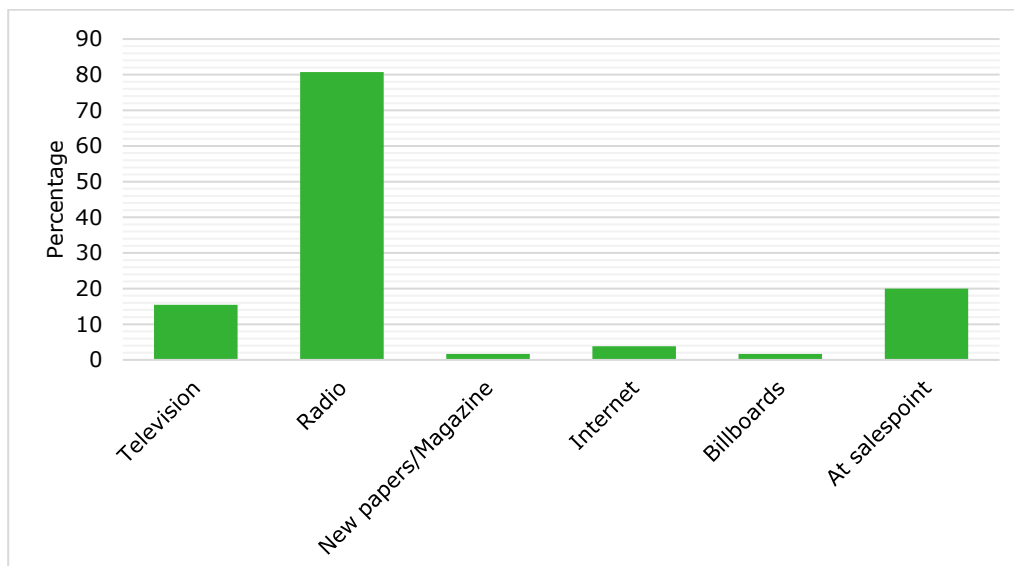


Figure 14 Percentage of respondents reporting to hear or see food advertisement through media channels

3.8 Food choice motives

Only the following food choice motives resulted in a Cronbach α of >0.7 , meaning that the items included for these motives were statistically related:

- **Health**
 - Convenience – preparation
 - Convenience – accessibility
- **Sensory appeal**
 - Natural content
- **Price**
 - Familiarity

Out of these, the motives Health, Sensory appeal and Price scored high (all $M > 5$), see table 5. Familiarity was considered the least important motive. Health as a motive, was assessed by asking respondents to rate the importance of the following items (introduced by the affirmative sentence “it is important to you that the food you eat on a typical day.....”); (i) contain vitamins, (ii) keep them healthy, (iii) are nutritious, (iv) are high in protein (v) are good for skin, teeth, hair and nails. and (vi) are high in fibre. Sensory appeal as a motive was assessed by asking respondents whether it is important for them that the food they buy (i) smells nice, (ii) is easy to swallow (iii) looks nice (iv) has a pleasant texture (v) tastes good (vi) is liked by the respondent and his/her family. Price was assessed using questions measured to what extent it is important for consumers that (i) they can get good quantity for money (ii) the products are cheap or (iii) not expensive and that (iv) they get value for money.

Table 5 Food choice motives, mean scores and SD

| | Mean | Std. Deviation |
|---------------------------|--------|----------------|
| Health | 5.5772 | .93579 |
| Functional Health | 5.4846 | .94278 |
| Mood | 5.6375 | .86664 |
| Convenience Preparation | 4.2190 | 1.59416 |
| Convenience Accessibility | 4.7720 | 1.70651 |
| Sensory Appeal | 5.1081 | 1.25715 |
| Natural Content | 4.8432 | 1.58506 |
| Price | 5.2203 | 1.44193 |
| Weight Control | 4.4830 | 1.42745 |
| Familiarity | 3.7254 | 1.51828 |
| Food Safety | 5.0625 | 1.36065 |

3.9 Barriers to fruit and vegetable consumption

Respondents were asked how often they abandon buying fruits and vegetables due to a list of potential barriers observed from literature. Figure 15 below summarizes how often these factors present a barrier to the consumers. The barriers most reported are related to prices (too expensive, or not available at good price), availability (at the particular market where consumers shop or due to seasonality), cleanliness (too much sand and dirt), and quality (do not look freshness or will not last long). Least important barriers seemed to be perception of food for the poor/for children, convenience for consumption on the go, satisfaction and cooking time. Figure 16,17 and 18 show disaggregation by district. In Appendix 5, disaggregated bar diagrams can be found for each potential barriers to fruit and vegetable purchasing. The chi-square test showed that there is an association between type of district and the extent to which factor formed a barrier for consumers.

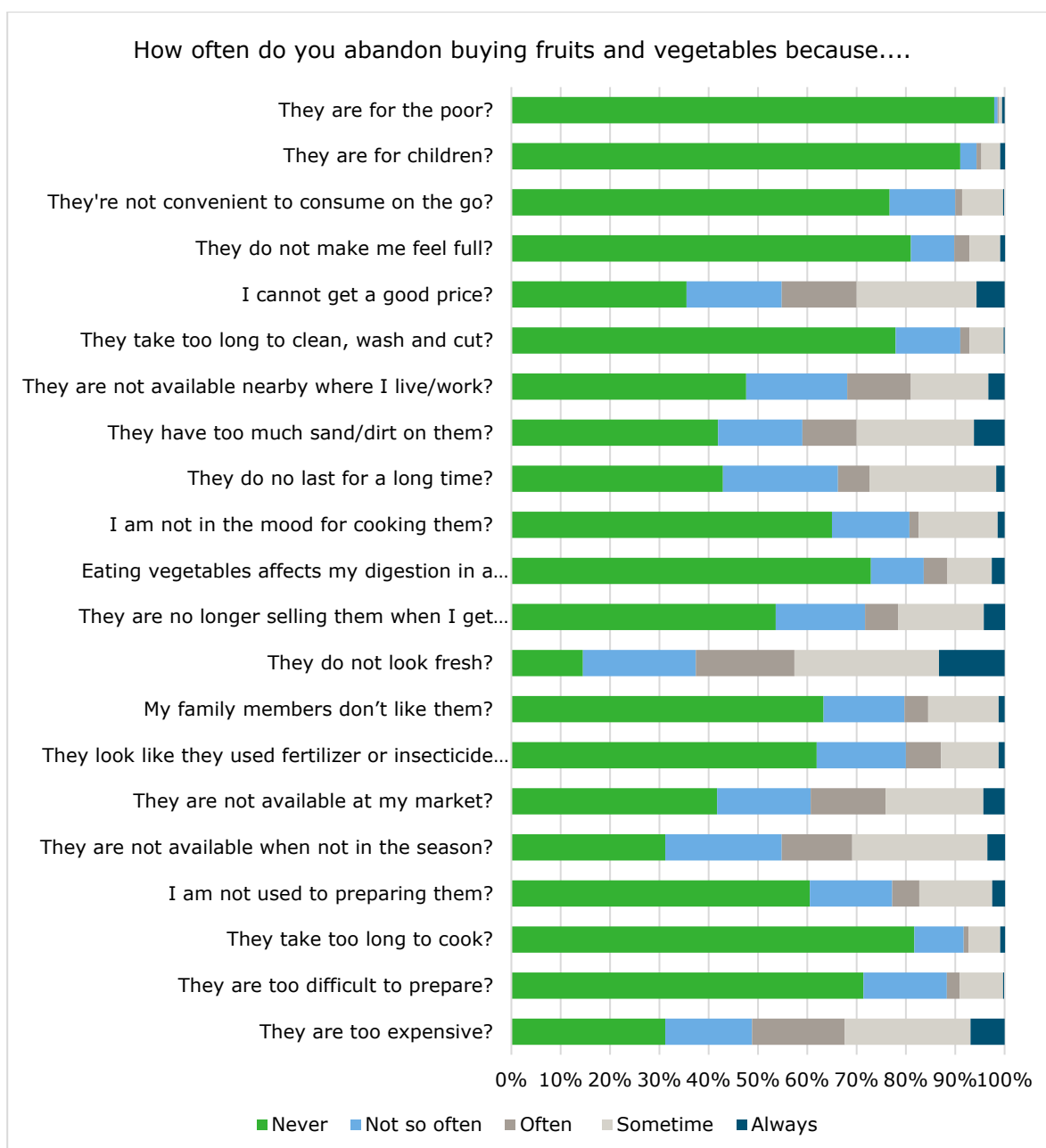


Figure 15 Barriers to fruit and vegetable consumption

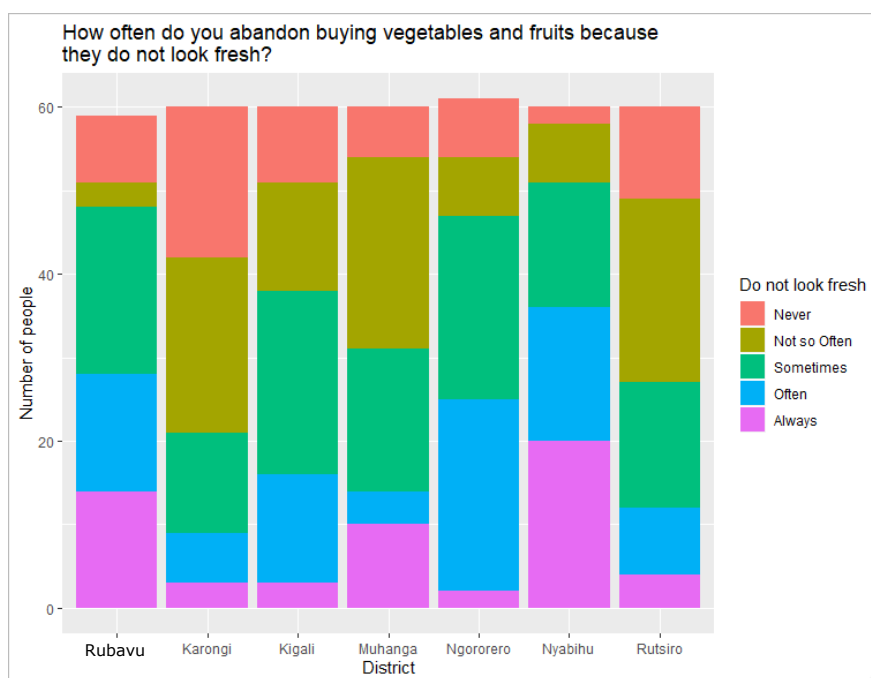


Figure 16 Barrier of not appealing fresh, disaggregated by district

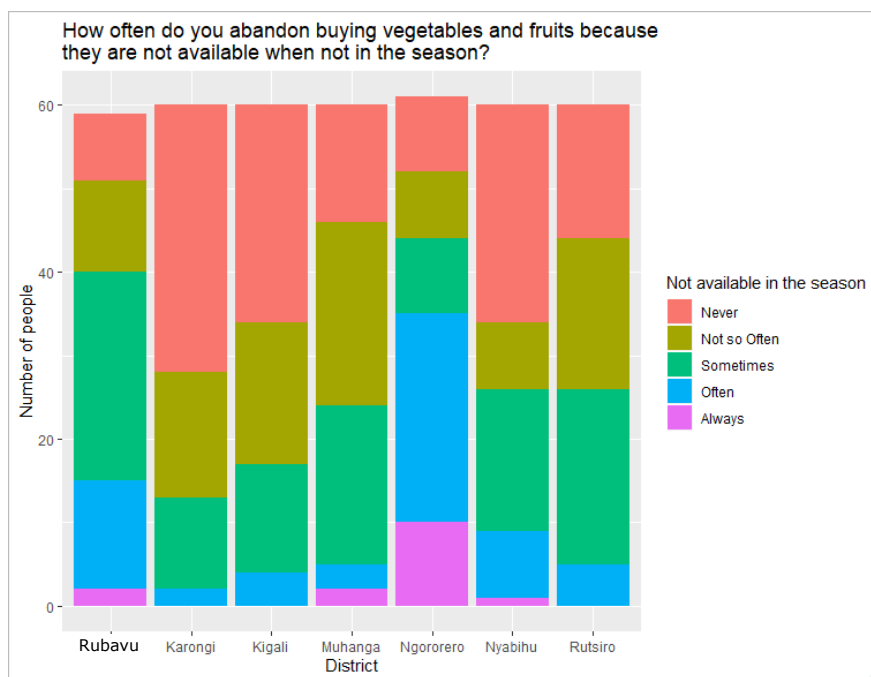


Figure 17 Barrier of seasonal availability, disaggregated by district

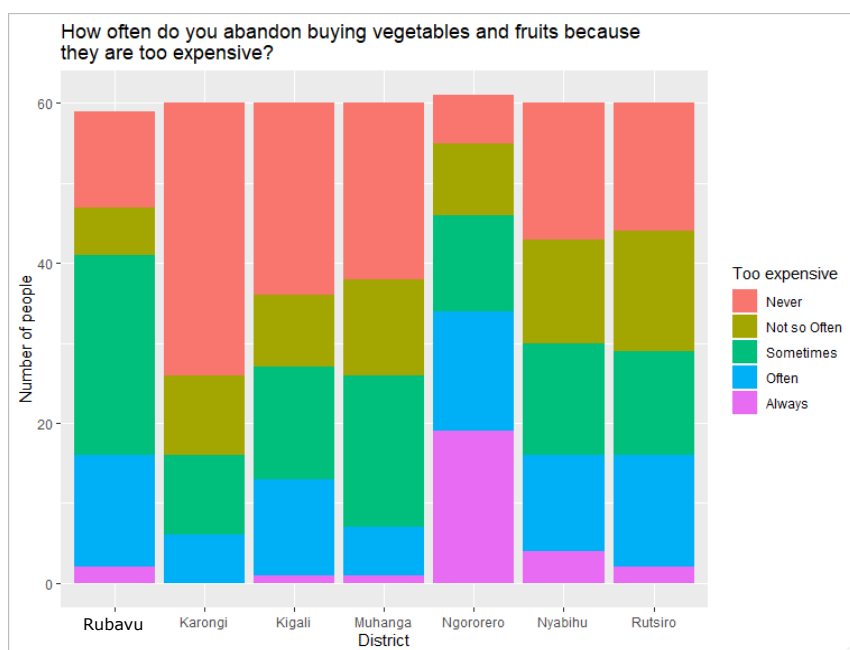


Figure 18 Barrier of being expensive, disaggregated by district

4 Discussion, conclusions and recommendations

This chapter discusses the main survey findings and conclusions and provides recommendations for the development of an awareness campaign promoting fruit and vegetable consumption among HortInvest targeted urban consumers (blue text box recommendations). Not all of the barriers to fruit and vegetable consumption identified in this study can be addressed in an awareness campaign. Hence, this section also includes recommendations to improve integration of the food and nutrition security objectives in HortInvest's activities and interventions (green text box recommendations). In October 2019, the HortInvest programme conducted a survey to provide insights into fruit and vegetable consumption behaviour and barriers amongst targeted HortInvest urban consumers. More specifically the objective of the study were to:

1. To describe fruit and vegetable purchasing and consumption behaviour among urban consumers
2. To describe the importance of different food choice motives for urban consumers
3. To assess the barriers to fruit and vegetable consumption for urban consumers

The study was conducted among consumers who visit the markets of the six district towns of HortInvest targeted districts, and Kigali. These different urban areas were equally and well represented in the sample (total sample n=420, sample size per district varied from n=59 to n=61). Respondents were only included if they met following two inclusion criteria: (i) respondent is (one of the) key decision makers on groceries for the household and (ii) the respondent is (one of the) persons who buys groceries for the household. The majority of the respondents was female (78%). This could imply that women are mostly responsible for going to the market for food purchases. The final sample size n=420 was sufficient to estimate true population proportions with a margin of error of 5% and a confidence level of 95%. The mean age was 34 years.

Fruit and vegetable consumption patterns

In general, the study findings showed that fruit and vegetable consumption is low and inadequate. The WHO recommended daily intake of fruits and vegetables is a total of five servings (or 400 grams) per day, of which preferably 3 servings of vegetables and 2 servings of fruit.

The most reported daily intake of vegetables was 2 servings, by 37% of the respondents. Daily vegetable consumption was significantly lower for Ngororero and Rutsiro as compared to other districts. Alarming is the intake of fruits, as the majority of the respondents (29%) did not consume any fruits on the day prior to the survey. Daily fruit consumption is significantly higher in Muhanga compared to other districts and very low in Rutsiro.

Average weekly fruit consumption was observed at 3.4 days per week. This is higher than the consumption level that were found in Rwanda 2012-2013 NCD Risk factor survey¹², which estimated weekly fruit consumption at 1.6 days for semi-urban consumers and 1.9 days for urban consumers. The findings for weekly vegetable consumption compare similarly, with an average weekly consumption of 5 days observed in this study versus 4.1 days for semi-urban consumers and 4.6 days for urban consumers observed in the Rwanda 2012-2013 NCD Risk factor survey. There are multiple explanations possible for these differences, one of them is the timing of the survey. This study was conducted in October (2019) and the Risk factor survey during the months of November (2012) to March (2013). Seasonality may have affected the availability of fruits and vegetables.

Ninety-eight percent of the total respondents (n=420) reported to consume their vegetables heated, versus 10% that consumes their vegetables raw. Though not included in the scope of this study, it will be important to know how vegetables are prepared, as some cooking methods reduce several key nutrients.

¹² The Rwanda 2012-2013 NCD Risk factor survey, led by the Ministry of Health (MOH), also assessed dietary patterns among 7,225 Rwandans (2,687 men and 4,538 women) aged 15-64 years.

The survey also assessed the intake of individual fruits and vegetables, in line with the crop value chains supported by HortInvest. Out of these, Irish potato (91%), onions (96%) and tomato (93%) are most often consumed, with 91%, 96% and 93% of respondents consuming these crops more than twice a week respectively. These foods, however, are relatively low in nutrition contents compared to other fruits and vegetables. Onions and tomatoes are often used for the preparation of stew, whereby they are thoroughly cooked, which may reduce the low nutrient content even further. Consumption frequency of the more nutritious HortInvest targeted fruits and vegetables is much lower, with consumption reported to be *often (>two times per week)* by only 15% of the respondents for orange flesh sweet potato, 46% for passion fruit, 1% for red pepper, 1% for yellow pepper, 61% green sweet pepper and 2% for broccoli.

The study also used open ended question to assess most consumed fruits and vegetables during dry and rainy season. Yellow banana was the most consumed fruit all year round, followed by tamarillos and passion fruit in rainy season and apple, avocado, and papaya in dry season. During both dry and rainy season, carrot, cabbage, and tomato were most consumed. Traditional leafy greens such as amaranth, cassava and pumpkin leaves were initially not included in the questionnaire but came out as popular vegetables among urban consumers.

Recommendations specifically for the awareness campaign

- *To focus the awareness campaign on a selection of crops which can contribute to daily intake of essential nutrients but are not yet already widely consumed. For example; broccoli, orange flesh sweet potato, avocado, amaranth, cassava leaves, papaya, pumpkin, papaya, carrot, red bell pepper, mango and spinach.*
- *To include messages to promote vegetable consumption beyond onions and tomato.*
- *To emphasize the importance of daily consumption of fruits and vegetables, as well variation and the correct amounts.*
- *To offer consumers new ideas for processing vegetables in addition to cooking them, such as drying, salads or wok, e.g. through cooking demonstrations.*
- *To explore why daily fruits and vegetable consumption levels are significantly lower in Rutsiro as compared to other districts and develop a tailored approach to address this.*

Sourcing of fruits and vegetables

Respondents source most of their fruits and vegetables from the local market. Almost half of the respondents (46%) also consume self-grown vegetables. Sourcing from own production was lower for Kigali and the district town of Muhanga, which are more urbanized as compared to the other district towns. For fruits, this percentage was much lower (12%), possibly this could be explained by the tendency to sell the self-grown fruits and keep vegetables for consumption, as has been reported for Rutsiro. This finding implies that, despite the fact that the survey was conducted in an urban setting, about half of the consumers do have the ability to grow crops for own consumption.

Implications/recommendations for HortInvest programme

- *To promote fruits which are suitable for backyard gardening such as tree tomato, passion fruits and paw paw, by including them into backyard gardening kits (including seeds and other inputs, as well as descriptions how to grow). It is recommended though to first assess the issues and attitudes related to growing and consuming self-grown fruit.*
- *HortInvest could consider including the urban consumers in the backyard garden activities currently implemented only in rural areas, since urban consumers appear to have access to land to grow fruits or vegetables. Even if urban households do not have land available, they could still grow vegetables on a small scale for home consumption, e.g. on pots or containers on a balcony.*

Food choice motives and barriers to fruit and vegetable purchasing

This study looked at purchasing and consumption determinants in two ways. The main motives for overall food choices were assessed using the validated FCM questionnaire developed by Steptoe et al. (1995) and adapted for low-income African countries by Raaijmakers et al. (2018). Secondly, the main barriers to purchasing specifically fruits and vegetables were assessed using a list of potential barriers observed in literature. Respondents were asked to report how frequent these barriers made them abandon purchasing fruits and vegetables.

When looking at the food choice motives, it was shown that the motives Health, Sensory appeal and Price were considered the most important motives in making food choices (and saw a Cronbach alpha of >0.7). Familiarity was considered least important.

Respondents were also asked which food group they prioritize when it comes to household food purchases. The majority of the respondents reported to prioritize staples, followed by vegetable and nuts.

This study found that the main barriers to purchasing fruits and vegetables are related to prices (too expensive, or not available at good price), availability (at the particular market where consumers shop or due to seasonality), cleanliness (too much sand and dirt), and quality (do not look freshness or will not last long). Further analysis to compare the findings by district concluded that barriers vary considerably. In Ngororero for example, approximately half of the respondent either always or often abandons buying vegetables and fruits because they are too expensive. Seasonal availability was a main barrier, but consumers in Karongi seemed to be less affected by it. In Nyabihu, freshness was a major reason to not buy vegetables.

Recommendations specifically for the awareness campaign

- *To further operationalize the motives of health by emphasizing health benefit of fruits and vegetables in campaign messages.*
- *To further operationalize the motive of sensory appeal by highlighting the taste, texture and scent of the fruits and vegetables in campaign messages. It is important to identify the specific sensory qualities that are appreciated by male and female, young and older consumers.*
- *For those vegetables and fruits which are known for a less pleasant texture, to present recipes that can alter this.*
- *To emphasize the (health care) costs of conditions and diseases caused by the consumption of cheap unhealthy foods and not consuming nutritious fruits and vegetables.*
- *To explain the urgency for pregnant and lactating women and children to consumer adequate level of fruits and vegetables to prevent micronutrient deficiencies.*

Recommendations for HortInvest programme

- *If familiarity is the least important motive for food choices, the HortInvest programme could promote nutritious fruits and vegetables which are not yet familiar to consumers, such as broccoli, and yellow and red bell pepper, combined with recipes explaining how to prepare them.*
- *To improve the sensory appeal of the fruits and vegetables by investing in quality preservation during transport, as well as presentation of the fruits and vegetables on the market (e.g. free from dirt and sand). It will be important to communicate these findings with producers, processors and traders, to make them aware of the fact the consumers value good quality and clean products.*
- *Further studies can look into the specific sensory qualities that are appreciated by male and female, young and older consumers.*
- *To contribute to the affordability of the more nutritious fruits and vegetables in domestic markets.*
- *Improve year round availability of more nutritious fruits and vegetables by investing in a variety of crops that could cover months with reduced availability and/or by preservation techniques.*

Consumer's knowledge on recommended daily intake and perceived benefits

Only 17% of the respondents reported to be aware of the daily recommended intake for fruits and vegetables. Among those who claimed to be aware, most respondents underestimated the daily recommended intake, and instead, assumed the recommended amount is two or three total servings of fruits and vegetables per day. Only 2% was aware of the official WHO recommendations of a total of 5 servings of fruits and vegetables per day. The WHO recommendations were used for this study because the food based dietary guidelines for Rwanda are currently being developed¹³.

Perceived benefits of fruit and vegetable consumption were presented in a word cloud with word sizes in proportion to the reporting frequency. Consumers primarily associated fruit and vegetable consumption with 'disease prevention', followed by 'vitamins', and 'health'. Consumers did not regularly specify what types of disease can be prevented by fruit and vegetable consumption. Preventive qualities for diabetes, certain cancers, cardiovascular diseases and obesity for example, were never or only sporadically mentioned. Yet non-communicable diseases pose a major health challenge in Rwanda and more than 1 in 3 of all deaths are caused by NCDs¹⁴.

Recommendations specifically for the awareness campaign

- *To emphasize the recommended daily intake of fruits and vegetables in line with the WHO recommendations or, once finalized, in line with the food based dietary guidelines for Rwanda.*
- *Use visuals in the campaign to specify what one serving looks like for a variety of fruits and vegetables (e.g. one serving of apple is one medium sized apple, one serving of avocado is three slices etc.).*
- *To make people aware of the preventive qualities of fruits and vegetables for the major non-communicable diseases, such as cardiovascular diseases, certain cancers, diabetes and obesity.*

Communication channels

Most of the respondents (49%) reported to not be influenced by advertisement for their food purchases, whereas 13% of the respondents sometimes, and 38% of the respondents confirmed to be influenced by advertisement. Most consumers recalled hearing food related advertisements on the radio. Newspapers/magazines, internet and billboards do not seem to be commonly used for food advertisement to urban consumers.

Recommendations for awareness campaign

- *To disseminate awareness raising message through radio.*
- *To explore why other channels are less utilized and consider advertisement at point of sale.*
- *To build on creative initiatives undertaken in other countries to promote fruit and vegetable consumption among different population groups.*

To conclude, the burden of NCDs is on the rise in Rwanda. One of the major contributors to the risks of the NCDs is poor eating habits. Fruit and vegetable consumption can protect against the risk on NCDs, but this study found that current fruit and vegetable consumption of urban consumers in six HortInvest target district towns and Kigali are inadequate. The insights into determinants of fruit and vegetable consumption and purchasing that were identified in this study can help tailor aware campaign messages and inform further interventions under HortInvest to promote food and nutrition security in Rwanda.

¹³ <https://www.newtimes.co.rw/news/nutrition-govt-fao-roll-out-new-guidelines>.

¹⁴ World Health Organization. Noncommunicable diseases (NCD) Country Profiles. Geneva, Switzerland: WHO Document Production Services; 2014.

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Appendix 1 Questionnaire

A. Interview ID

| | | |
|--|---|---------------------|
| Name of Supervisor | | |
| Name Enumerator | | |
| Date and time of interview | Date (day/ month/year) | |
| | Time (hr/min) | (...../..... am/pm) |
| District | | |
| Market | | |
| Respondent is key decision maker for grocery shopping | <input type="checkbox"/> Yes, respondent is the key decision maker for grocery shopping <input type="checkbox"/> Yes, respondent is one of the key decision makers within the household for grocery shopping <input type="checkbox"/> No ----> STOP INTERVIEW | |
| Respondent is the one buying groceries for the household | <input type="checkbox"/> Yes, respondent is the one buying groceries for the household <input type="checkbox"/> Yes, respondent is one of the persons within the household that buys groceries for the household <input type="checkbox"/> No ----> STOP INTERVIEW | |

B. Demographic characteristics

| | |
|--|---|
| 1. What is your age (in years)? | years |
| 2. What is your marital status? | <input type="checkbox"/> Married/living with partner <input type="checkbox"/> Widow/ widower <input type="checkbox"/> Single <input type="checkbox"/> Divorced |
| 3. How many people are living in your household.... | people |
| <i>Note: This means every person who usually resides in this households at least four nights a week on average and has so done over the last four weeks.</i> | |
| 4. Can you please specify how many people in your household are | Below 5? people Between 5-18? people Between 18-30? people Above 30? people |
| 5. What is the Ubudehe level of your household? | <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 |
| 6. What is the highest education level you completed? | <input type="checkbox"/> No schooling <input type="checkbox"/> Literate/adult education <input type="checkbox"/> Nursery <input type="checkbox"/> Primary <input type="checkbox"/> Secondary <input type="checkbox"/> Undergraduate university <input type="checkbox"/> Post graduate university |
| 7. What is your employment status? | <input type="checkbox"/> Work full-time <input type="checkbox"/> Work part-time <input type="checkbox"/> Work informally <input type="checkbox"/> Unemployed <input type="checkbox"/> Retired <input type="checkbox"/> Student (not employed) <input type="checkbox"/> Housewife (not employed) <input type="checkbox"/> Self-employed |

C. Fruit and vegetable purchasing and consumption

| | |
|---|--|
| <i>For the next two questions use the pictogram card to show what is meant by 1 serving (approximately 80 grams)</i> | |
| 8. How many servings of fruits do you eat on a typical day? | <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> >5 |
| 9. How many servings of vegetables do you eat on a typical day? | <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> >5 |
| <i>Add the servings of fruits and vegetables and double check with the respondent:</i> 10. Is it correct that you consumed (answer Q8 + answer Q9) servings of fruits and vegetables yesterday? | servings |
| 11. How many days in a typical week do you eat fruit? | days |
| 12. How many days in a typical week do you eat vegetables? | days |
| 13. Are you aware of the daily recommended number of servings of fruits and vegetables? If yes, how many? | <input type="checkbox"/> Yes servings <input type="checkbox"/> No |
| 14. Can you name the 3 fruits which you consume most often during rainy season? | Option to tick boxes for: passion fruit, yellow banana, avocado, pineapple, guava, apple, cape gooseberry, Japanese plum, lemon, mango, orange, strawberry, tamarillos, other please specify, don't know ¹⁵ |
| 15. And during dry season? | Option to tick boxes for: passion fruit, yellow banana, avocado, pineapple, guava, apple, cape gooseberry, Japanese plum, lemon, mango, orange, strawberry, tamarillos, other please specify, don't know ¹⁶ |
| 16. Can you name the 3 vegetables which you consume most often during rainy season? | Option to tick boxes for: red pepper, yellow pepper, green pepper, sweet pepper, broccoli, tomato, cauliflower, onions (red and white), french beans, sugar snaps, carrot, lettuce, cabbage, eggplant, leek, mushrooms, other please specify, don't know ¹⁷ |
| 17. And during dry season? | Option to tick boxes for: red pepper, yellow pepper, green pepper, sweet pepper, broccoli, tomato, cauliflower, onions (red and white), french beans, sugar snaps, carrot, lettuce, cabbage, eggplant, leek, mushrooms, other please specify, don't know ¹⁸ |

¹⁵ Based on Baseline report on the Rwanda Horticulture Organizations survey 2014 by MINAGRI and NAEB.

¹⁶ Based on Baseline report on the Rwanda Horticulture Organizations survey 2014 by MINAGRI and NAEB.

¹⁷ Idem.

¹⁸ Idem.

| | |
|--|--|
| 18.What, according to you, are the benefits of fruit and vegetable consumption? | |
| 19.Do you eat your vegetables mostly heated or raw? | <input type="checkbox"/> Heated <input type="checkbox"/> Raw |
| 20.Where do you source most of your fruits? | <input type="checkbox"/> Local market <input type="checkbox"/> Supermarket <input type="checkbox"/> Convenience store <input type="checkbox"/> Street vendor <input type="checkbox"/> Convenience store <input type="checkbox"/> Self-grown |
| 21.Where do you source most of your vegetables? | <input type="checkbox"/> Local market <input type="checkbox"/> Supermarket <input type="checkbox"/> Convenience store <input type="checkbox"/> Street vendor <input type="checkbox"/> Convenience store <input type="checkbox"/> Self-grown |
| 22.What type of food has the highest priority for your household purchases? <i>Note to enumerator: read the answer option out loud.</i> <i>AkvoFlow: food groups should shuffle around for each new respondent</i> | <input type="radio"/> Fruits <input type="radio"/> Vegetables <input type="radio"/> Cereals/staples <input type="radio"/> Nut crops <input type="radio"/> Meat/Poultry <input type="radio"/> Dairy <input type="radio"/> Fish <input type="radio"/> Fat, oils <input type="radio"/> Sweets |
| 23.Does advertisement influence your food purchases? | <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Sometimes |
| 24.Where do you see or hear advertisement for foods? <i>Multiple answers possible</i> | <input type="checkbox"/> Radio <input type="checkbox"/> Television <input type="checkbox"/> Newspaper/magazines <input type="checkbox"/> Internet <input type="checkbox"/> Billboards <input type="checkbox"/> At salespoint <input type="checkbox"/> Other, please specify |

Can you indicate how often you consume?

| | Never | Rare | Often (>2 times per week) |
|--|--------------------------|--------------------------|---------------------------|
| 25. Red pepper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 26. Yellow pepper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 27. Green sweet pepper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 28. Broccoli | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 29. Tomato | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 30. Cauliflower | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 31. Onions | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 32. French beans | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 33. Sugar snaps | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 34. Carrot | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 35. Passion fruit | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 36. Mushrooms | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 37. Lettuce | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 38. Irish potato | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 39. Sweet potato | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 40. Orange-fleshed sweet potato | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

D. Food choice motives

Factors related to functional health, convenience, food safety and general health

| It is important to me that the food I eat on a typical day | Not important at all | Low importance | Slightly important | Neutral | Moderately important | Very important | Extremely important |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 41. Contains a lot of vitamins | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 42. Makes me feel full | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 43. Is high in protein | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 44. Is good for digestion | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 45. Gives me energy | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 46. Can be cooked very simply | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 47. Can be bought on markets, road stalls and in shops close to where I live or work | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 48. Is good for my skin/teeth/hair/nails etc. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 49. Is easy to combine with other foods | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 50. Is handled in a hygienic way | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 51. Is easy to clean/wash | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 52. Keeps me healthy | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 53. Is high in fibre | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 54. Has medicinal benefits | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 55. Is free from contaminations (e.g. pesticides or fertilizers) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 56. Is easy to prepare | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 57. Is nutritious | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 58. Is good for my blood | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 59. Takes no time to prepare | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 60. Comes from a clean place | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 61. Is easily available on markets, road stalls and in shops | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Factors related to mood, price, weight control, sensory, natural, familiar and ethical concern

| It is important to me that the food I eat on a typical day... | Not important at all | Low importance | Slightly important | Neutral | Moderately important | Very important | Extremely important |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 62. Helps me to cope with life | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 63. Is good quantity for money | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 64. Smells nice | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 65. Is liked by myself and/or by my family | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 66. Is low in fat | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 67. Is cheap | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 68. Is easy to swallow | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 69. Is commonly eaten by my tribe | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 70. Looks nice | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 71. Helps me control my weight | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 72. Contains natural ingredients | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 73. Keeps me awake/alert | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 74. Is like the food I had when I was a child | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 75. Contains no artificial ingredients | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 76. Cheers me up | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 77. Fits my traditions (e.g. family traditions, special occasions) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 78. Has a pleasant texture | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 79. Helps me relax | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 80. Is what I usually eat | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 81. Tastes good | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 82. Is not expensive | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 83. Is packaged in an environmentally friendly way | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 84. Is good value for money | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 85. Is low in calories | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 86. Contains no additives | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 87. Is familiar | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 88. Makes me feel good | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 89. Is advertised in the media or at the market | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

E. Barriers to fruit and vegetable consumption

| How often do you abandon buying vegetables and fruits because: | Never | Not so often | Sometimes | Often | Always |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 90. They are too expensive | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 91. They are too difficult to prepare | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 92. They take too long to cook | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 93. I am not used to preparing them | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 94. They are not available when not in the season | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 95. They are not available at my market | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 96. They look like they used fertilizer or insecticide on it | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 97. My family members don't like them | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 98. They do not look fresh | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 99. They are no longer selling them when I get back from work/school | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 100. Eating vegetables affects my digestion in a negative way | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 101. I am not in the mood for looking | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 102. They do not last for a long time | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 103. They have too much sand/dirt on them | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 104. They are not available nearby where I live/work | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 105. They take too long to clean, wash and cut | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 106. I cannot get a good price | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 107. They do not make me feel full | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 108. Not convenient to consume on the go | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 109. I am enticed by other foods | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 110. They are for children | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 111. They are poor for the poor | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | |
|--|---|
| 112. May we contact you by phone in case we have a question later? | <input type="checkbox"/> Yes <input type="checkbox"/> No <i>Only if answer is Yes continue with the next question</i> |
| 113. What is your phone number? | |

Appendix 2 Consent form

Please remember to read this work-for-word to the respondent and make sure that they fully understand and give consent before continuing.

"Hello. My name is _____ and I work for the HortInvest project, with SNV, Wageningen University and other partners. We are conducting a survey to understand fruit and vegetable consumption patterns and determinants. The results of the survey will be used to design a campaign to promote fruit and vegetable consumption. We would very much appreciate your participation. The survey usually takes about 20 minutes. Your participation is voluntary and you may end the survey at any time or decide not to answer a particular question. Your answers will be kept confidential. I will ask you questions about your level of fruit and vegetable consumption and the motives for your food choices. If you decide not to participate this doesn't have any implications for you."

Consent form

The objective and procedure for this questionnaire have been explained to me by the research staff. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

Date _____/_____/2019

Signature or tick of interviewee _____

Date _____/_____/2019

Signature or tick of enumerator _____

Appendix 3 Enumerator's Training plan

| Date | Time | Topic | Venue | Responsible |
|-----------|---------------|---|-------|---|
| October 7 | 8:30 – 12:00 | Introduction to data quality and interview techniques | TBD | WCDI technical advisor HortInvest Nutrition Advisor and Local Team |
| | 13:00 – 17:00 | Introduction to the survey instrument and practice | TBD | WCDI technical advisor HortInvest Nutrition Advisor and Local Team |
| October 8 | 8:30 – 12:00 | Pre-test on the market | TBD | WCDI technical advisor HortInvest Nutrition Advisor and Local Team |
| | 13:00 – 17:00 | Evaluation of pre-test & final planning of the survey | TBD | WCDI technical advisor HortInvest Nutrition Advisor and Local Team |

Appendix 4 NISR approval

REPUBLIC OF RWANDA



NATIONAL INSTITUTE OF
STATISTICS OF RWANDA
P.O. Box 6139 Kigali
Tel: +250-571035 Fax: +250-570705
E-mail : info@statistics.gov.rw

22 AUG 2019
Kigali,
N° 0458/2019/10/NISR

Bernie F. Charles
Country Director
SNV Rwanda
KIGALI


Dear Sir,

RE: VISA Approval

Reference is made to your letter dated August 9th, 2019 requesting for authorization to conduct the "*Urban Consumer study*".

After examining your request and according to the law N° 45/2013 of 16/06/2013, stating on organization of statistical activities in Rwanda, we have the pleasure to inform you that the Visa is granted, with the conditions that the data and final report will be submitted to the NISR before the publication. However, since the study is targeting the program intervention area, the findings should not be generalized beyond the scope of the program.

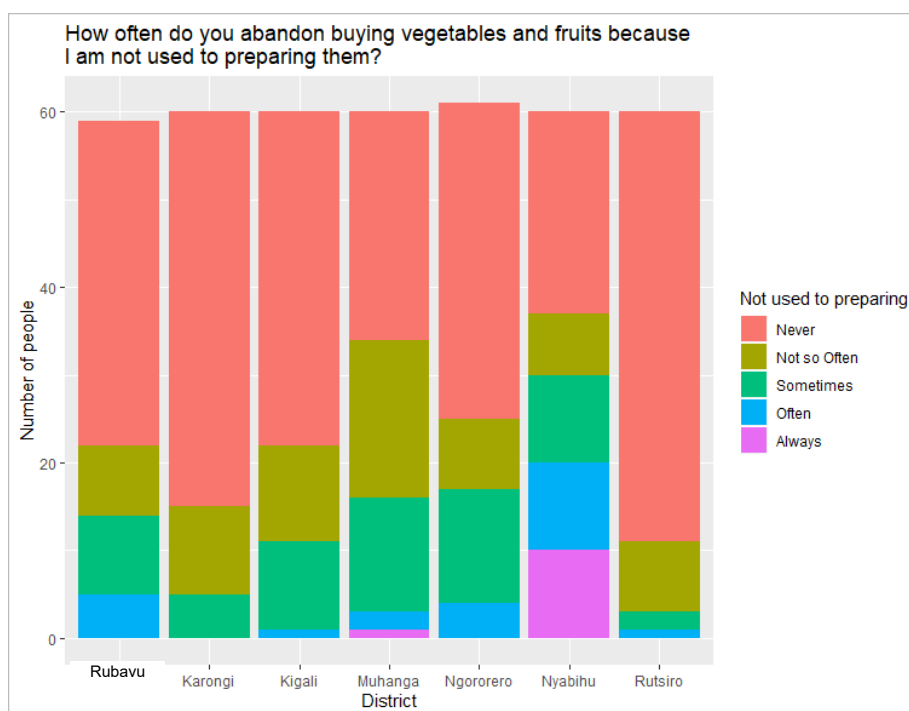
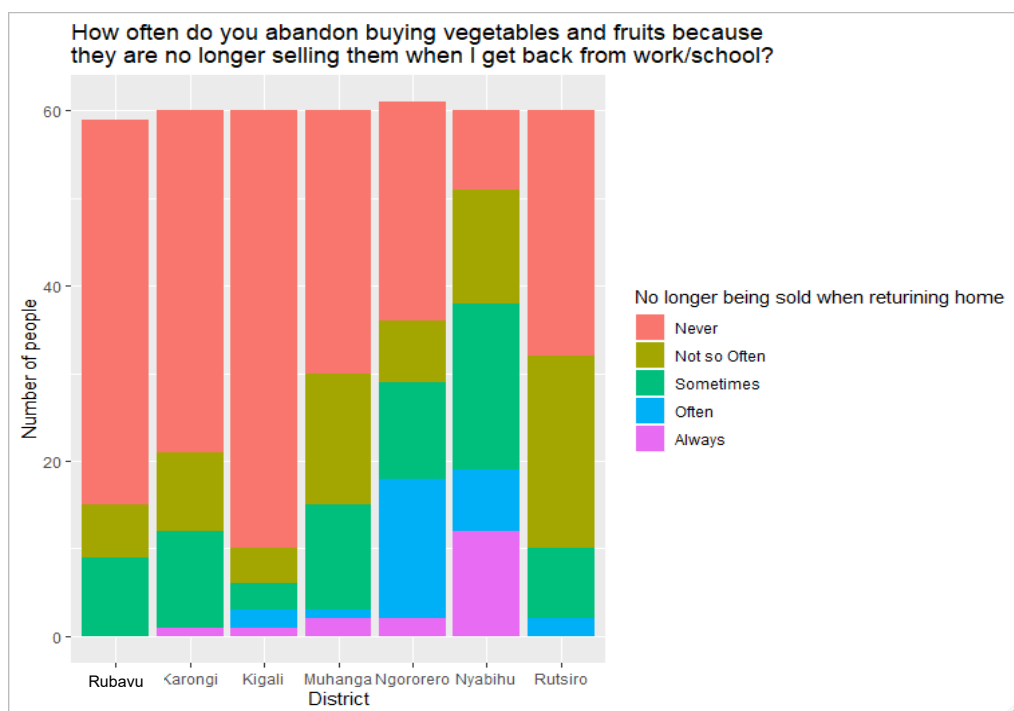
Thank you for your collaboration.

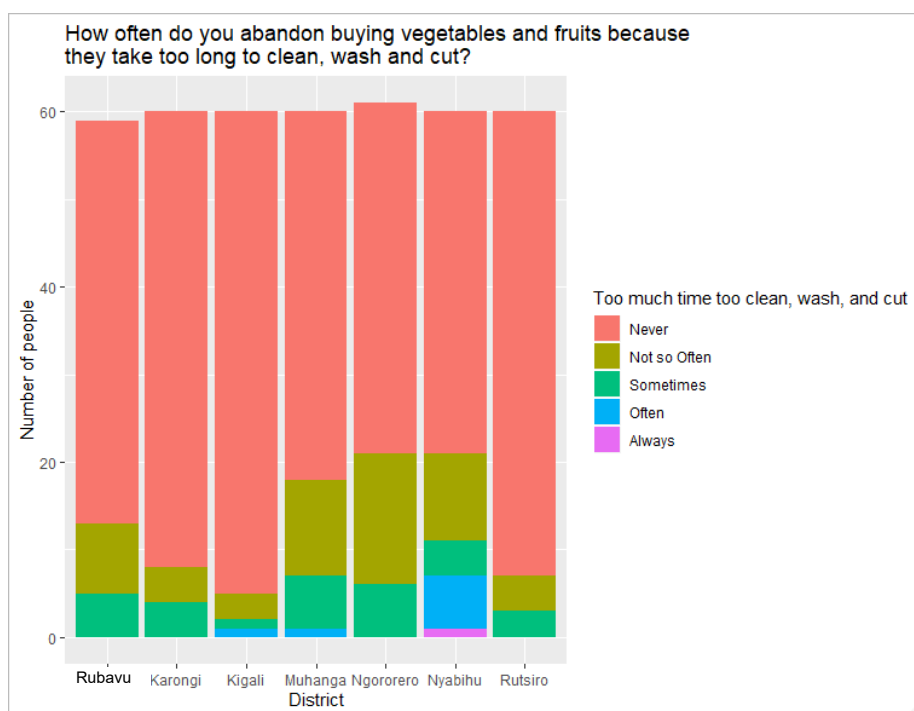

Yusuf MURANGWA
Director General

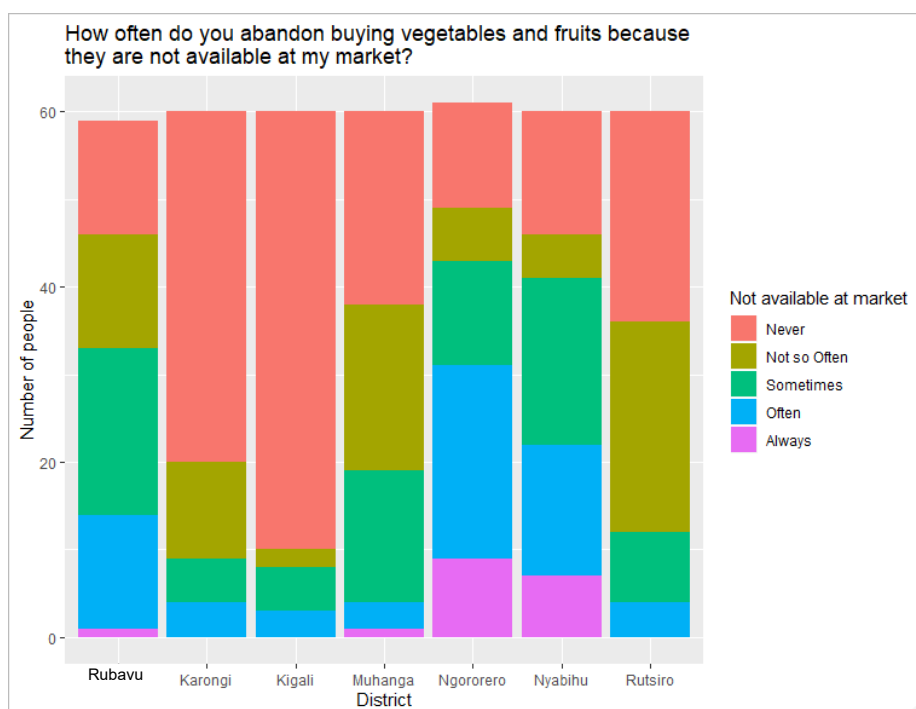
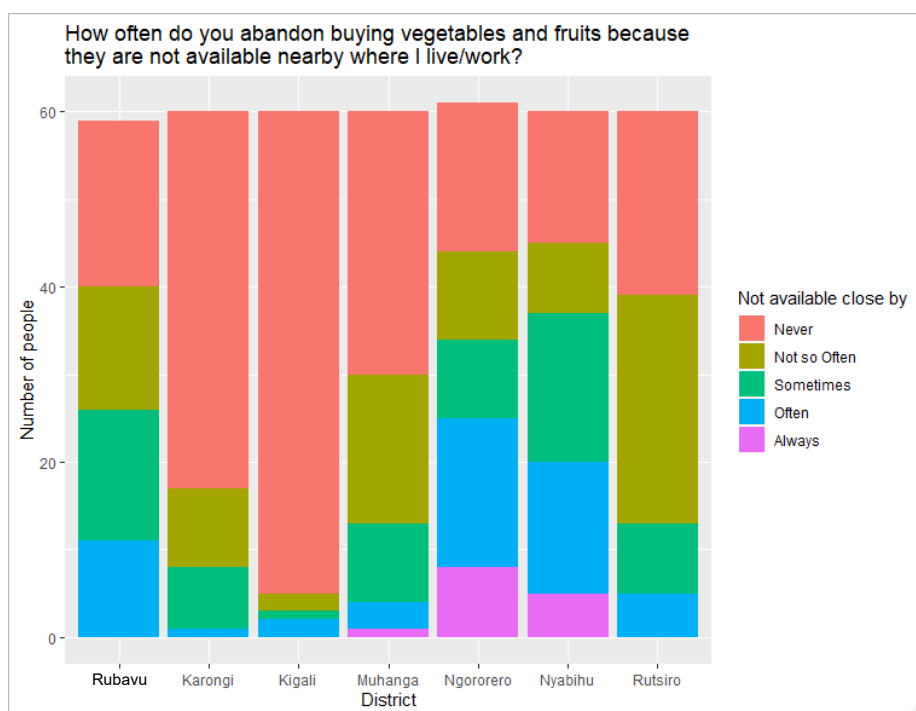


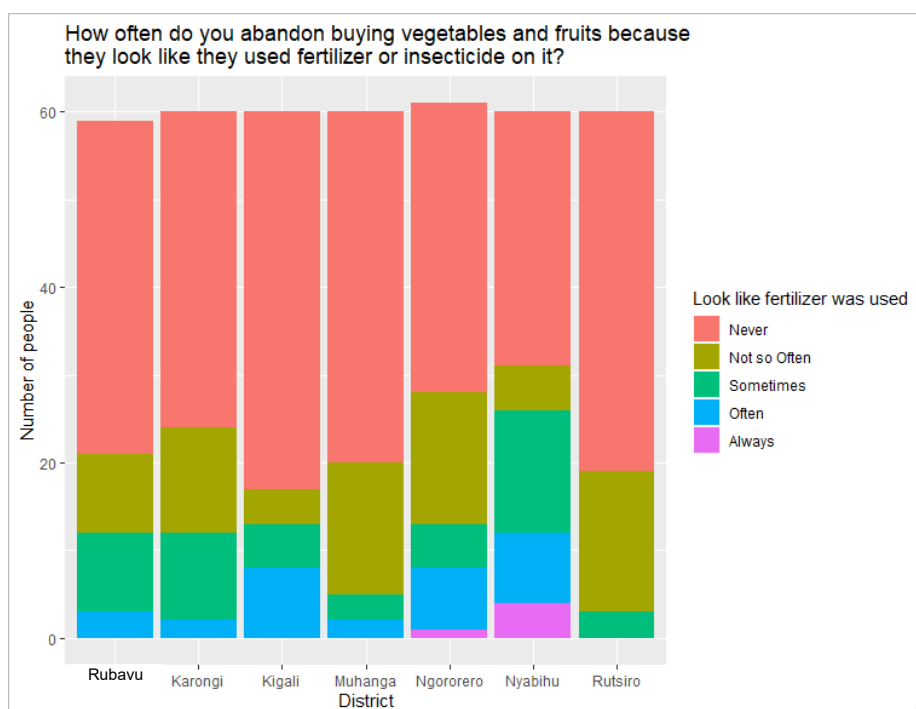
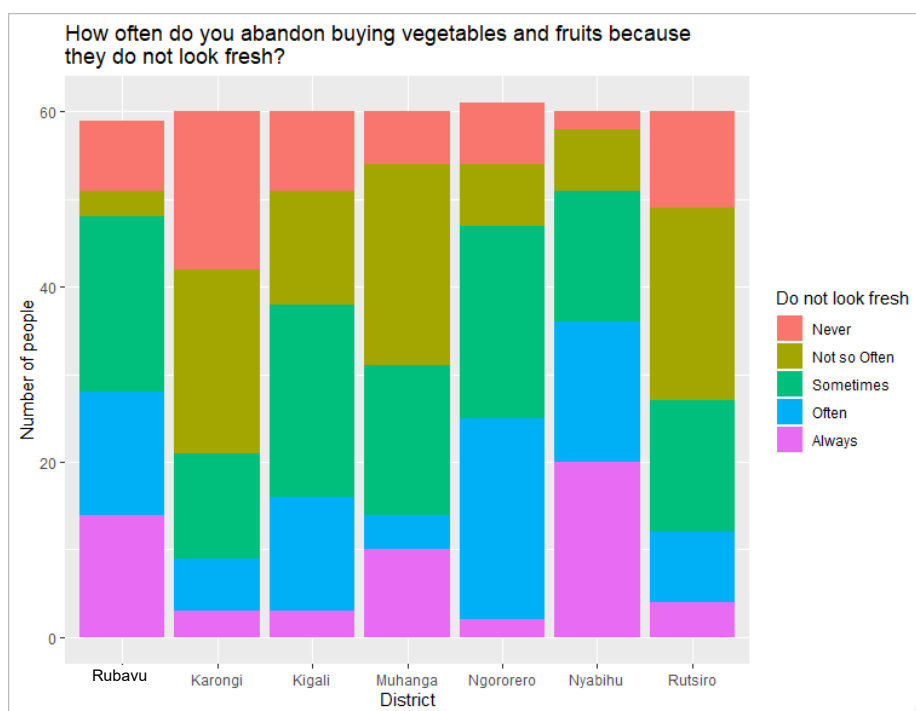
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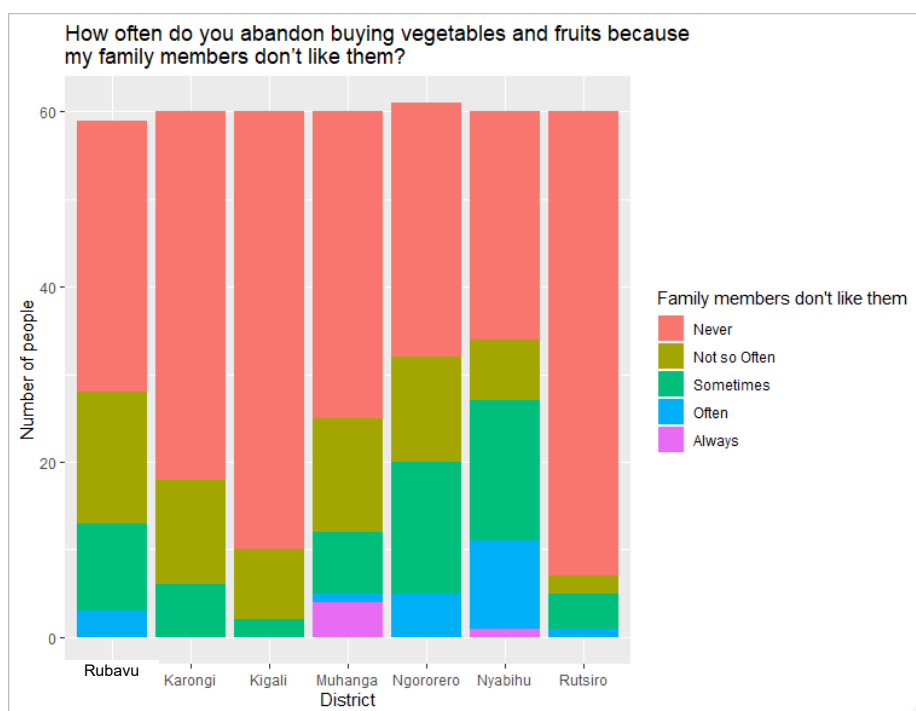
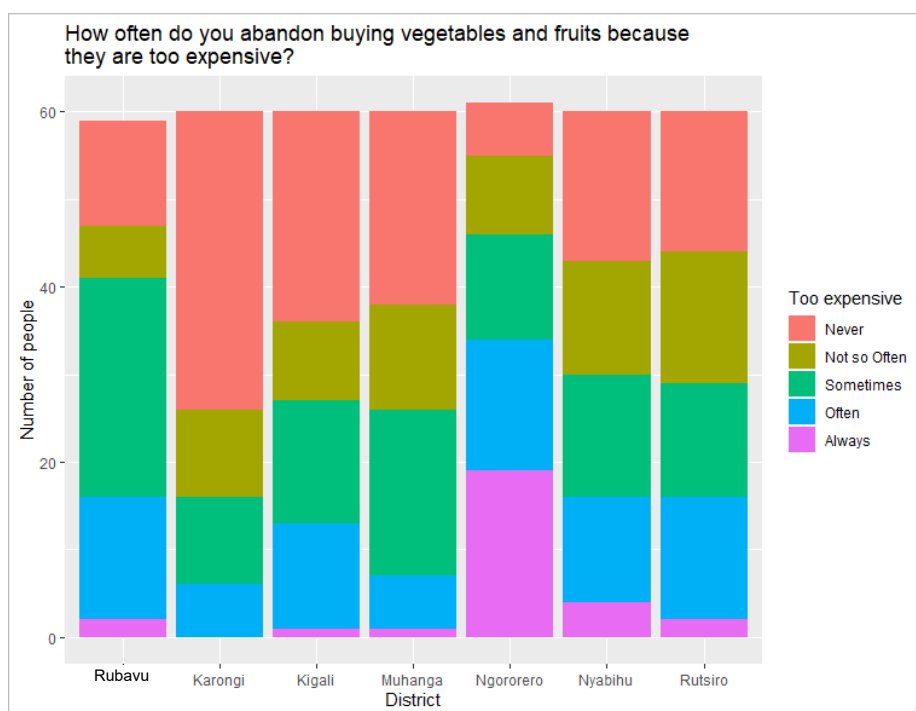
Appendix 5 Barriers to fruit and vegetable consumption by district

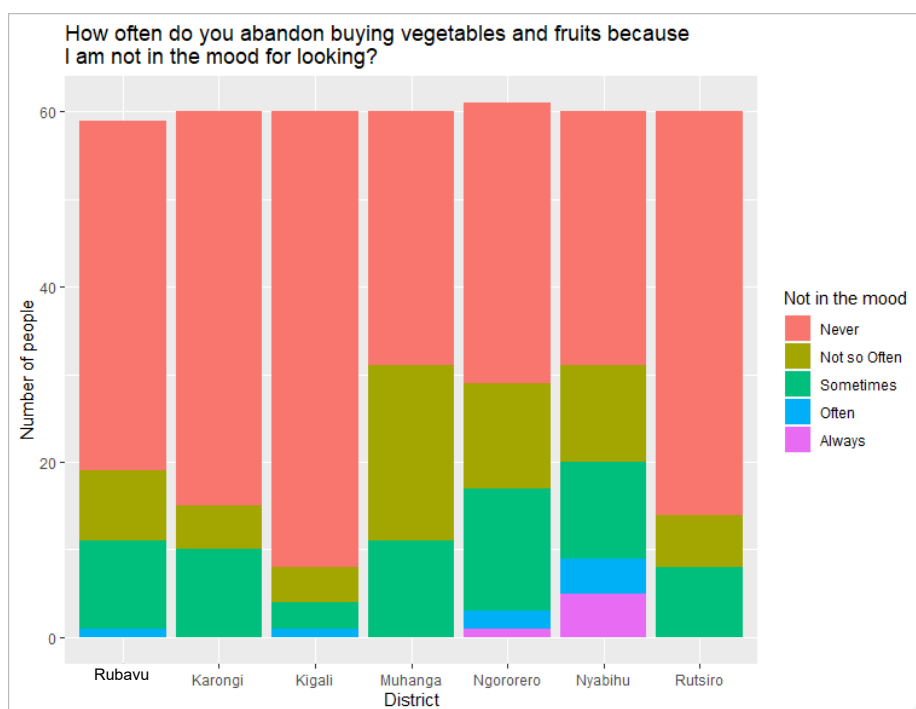
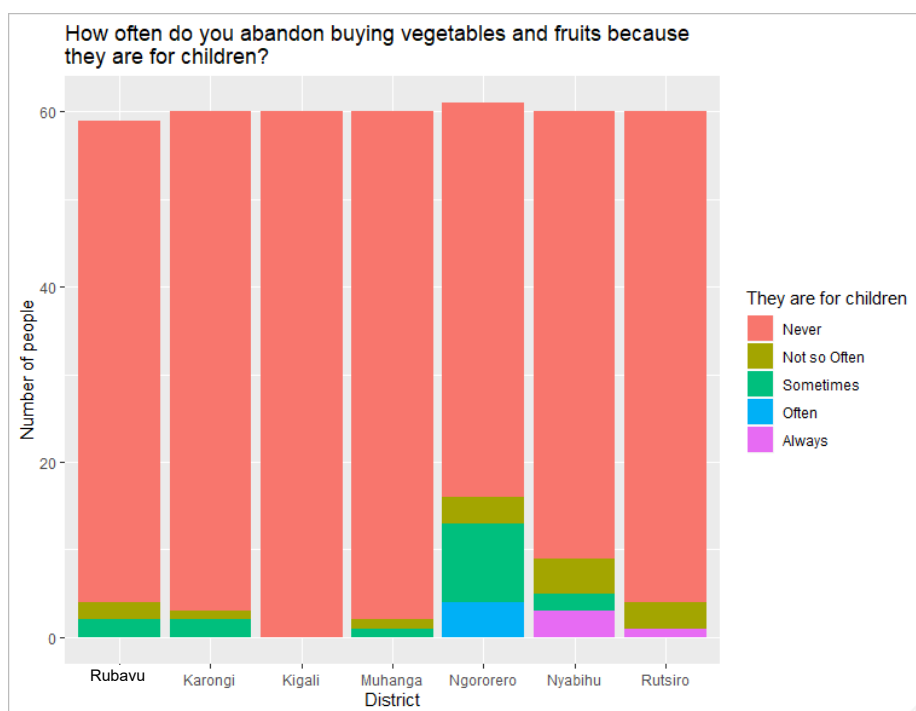


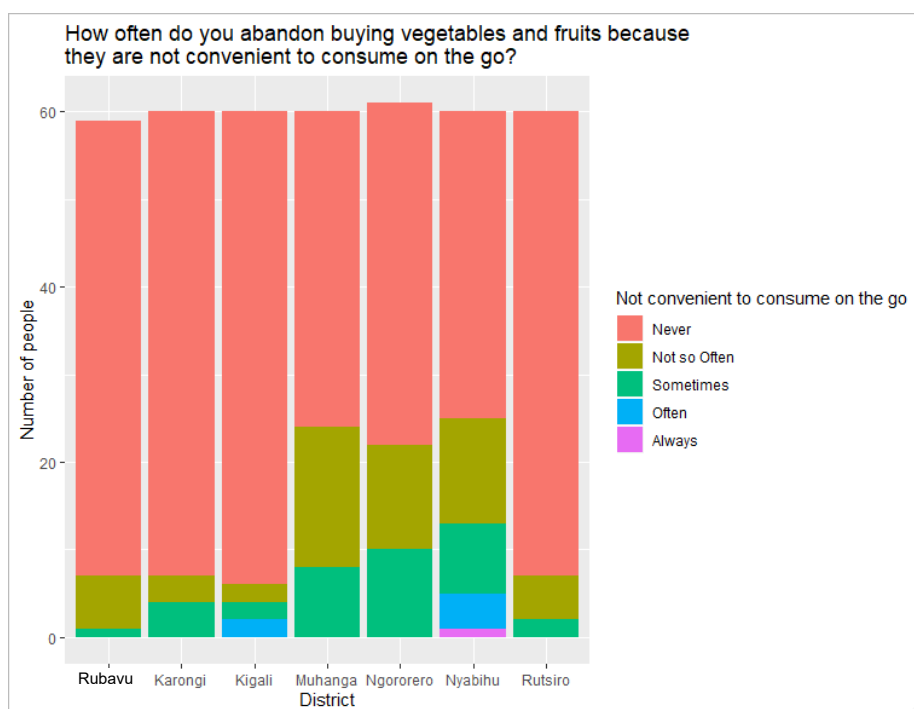
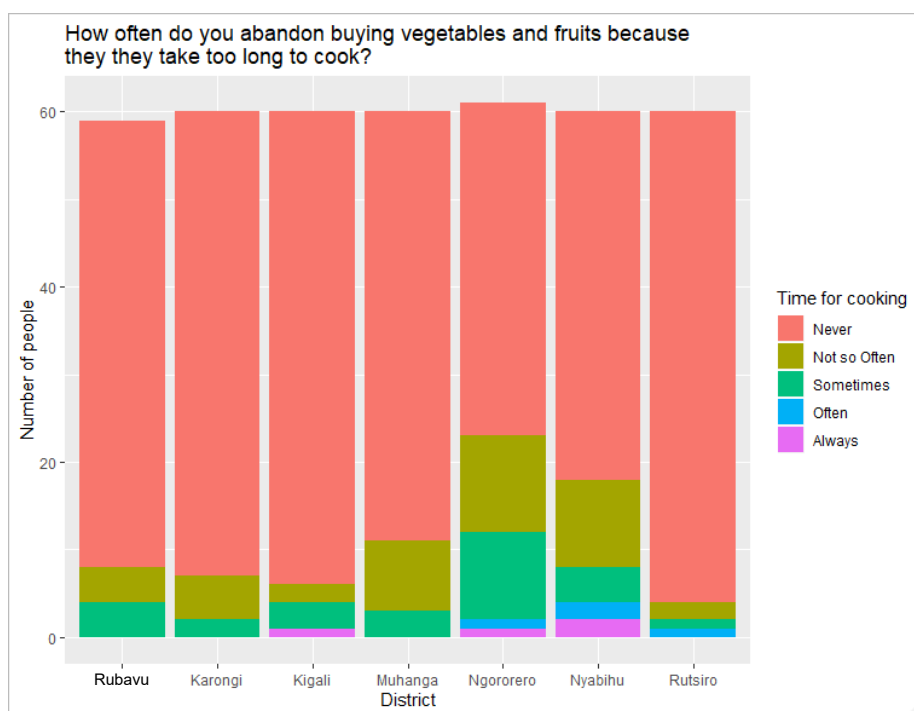


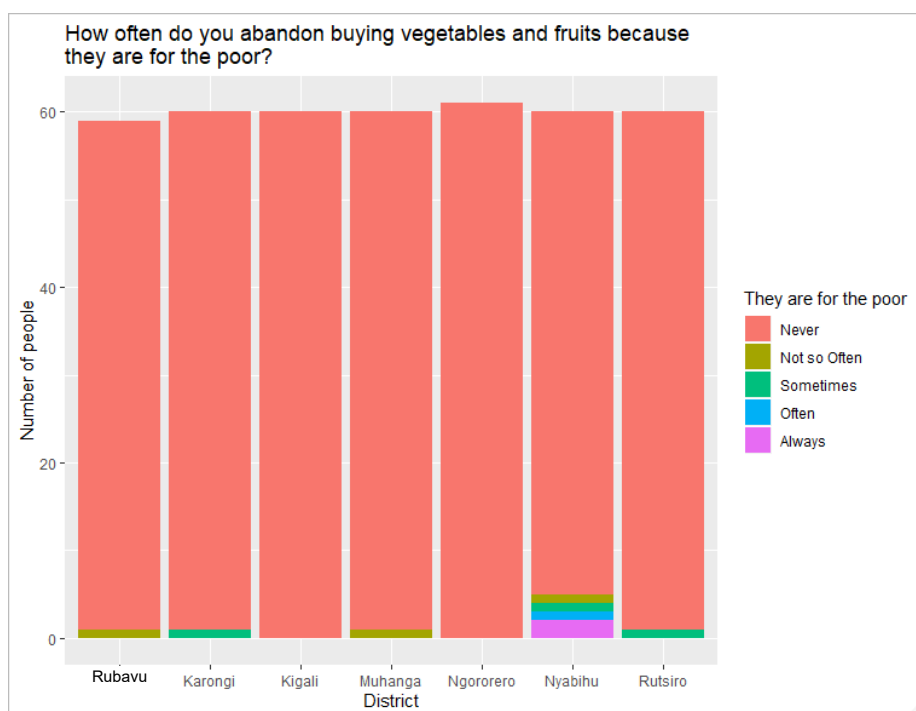
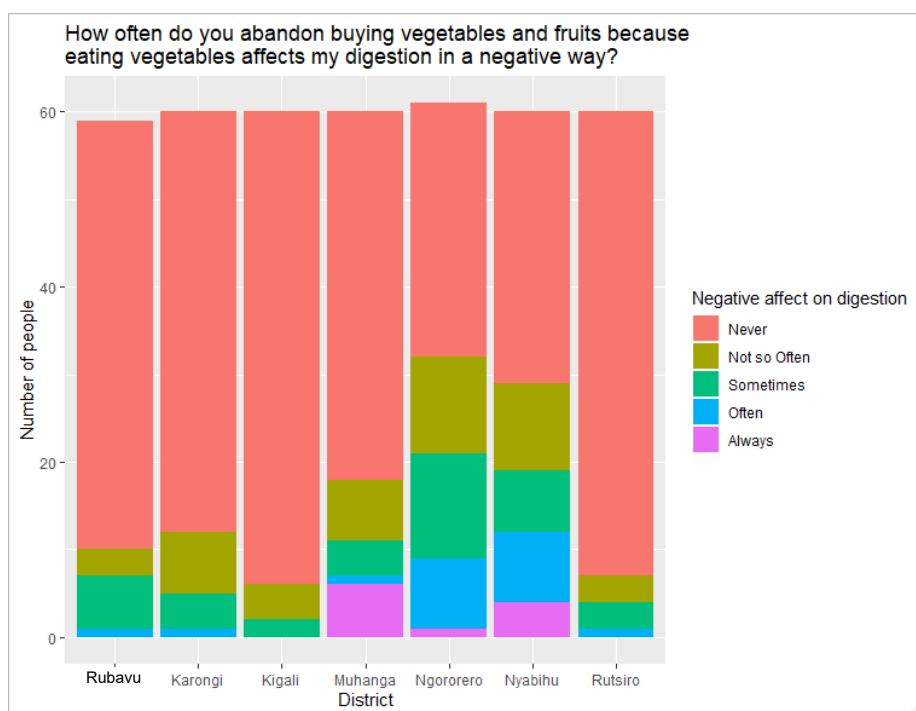


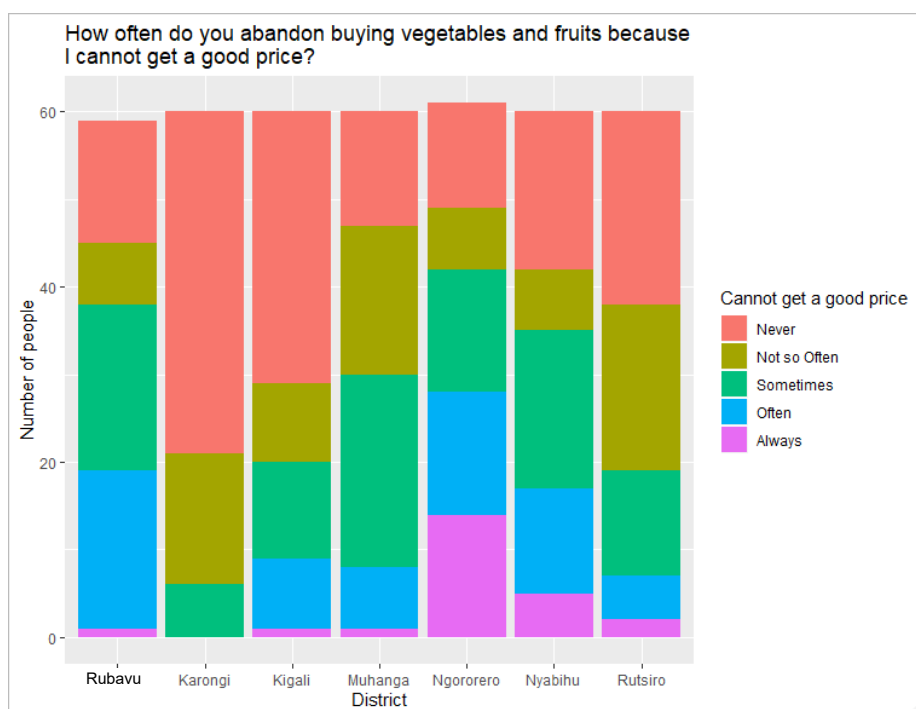
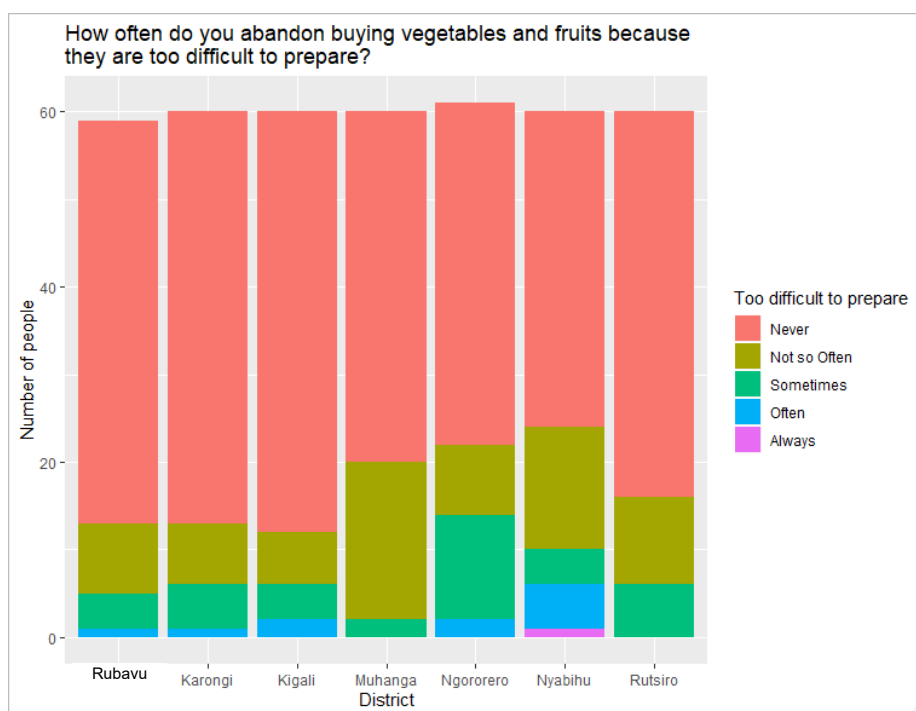


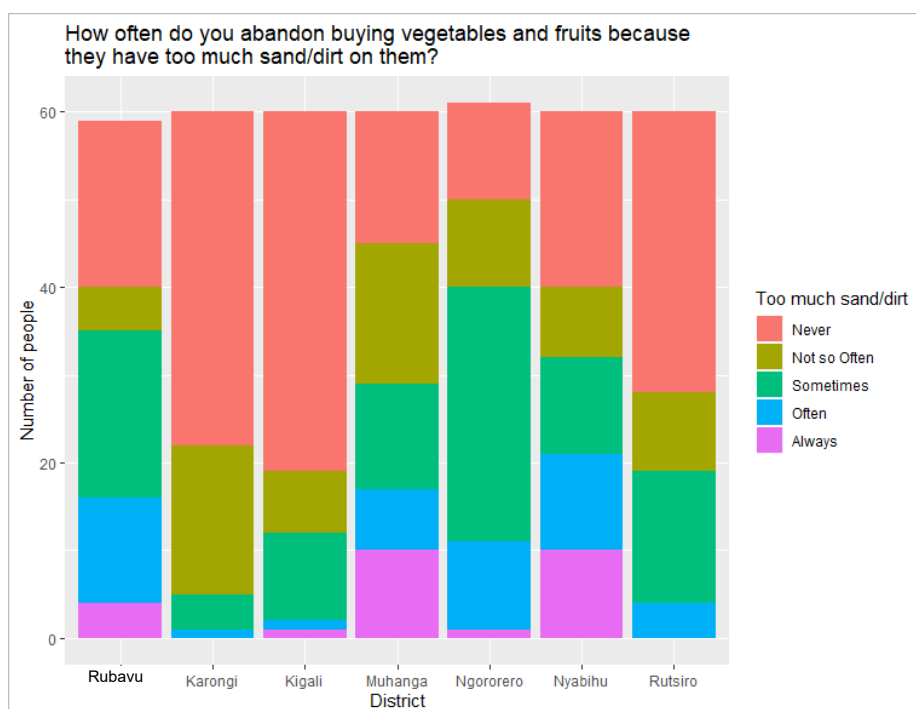
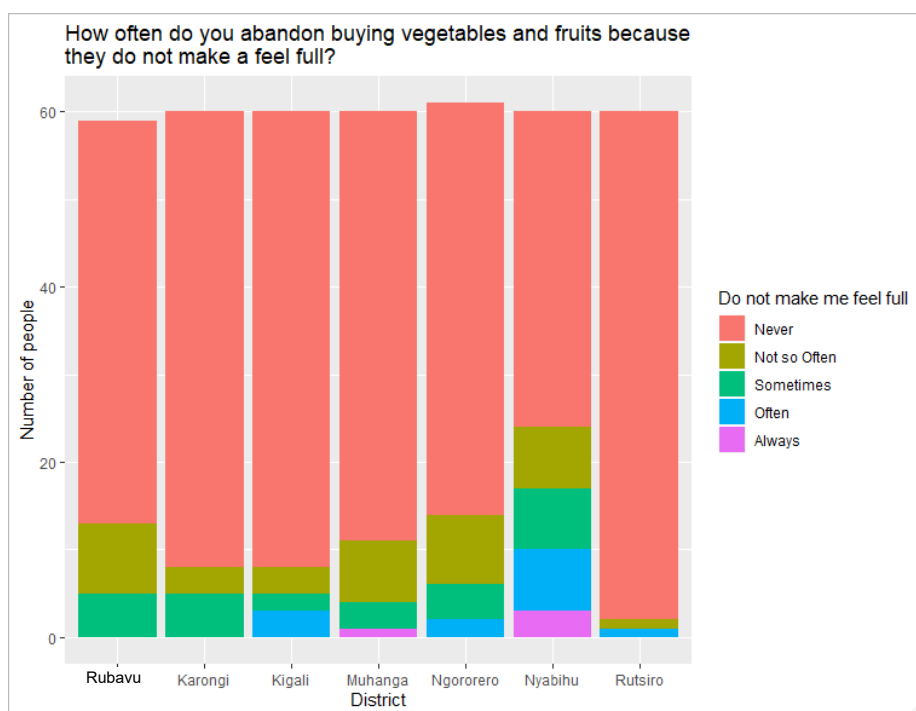












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Report WCDI-20-121

Wageningen Centre for Development Innovation supports value creation by strengthening capacities for sustainable development. As the international expertise and capacity building institute of Wageningen University & Research we bring knowledge into action, with the aim to explore the potential of nature to improve the quality of life. With approximately 30 locations, 5,000 members of staff and 12,000 students, Wageningen University & Research is a world leader in its domain. An integral way of working, and cooperation between the exact sciences and the technological and social disciplines are key to its approach.



To explore
the potential
of nature to
improve the
quality of life



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