

**ASSESSMENT OF SOCIO-ECONOMIC FACTORS HINDERING FOOD ACCESSIBILITY FOR SMALL SCALE
IRISH POTATO FARMING HOUSEHOLDS**

Case study of Buringo cell, Bugeshi sector, Rubavu district-Rwanda



A research project submitted to Van Hall Larenstein University of Applied Sciences in partial fulfillment of the requirements for the degree of Master in Management of Development (Specialisation: Rural Development and Food Security)

By

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TABLE OF CONTENTS

| | |
|--|-----|
| ACKNOWLEDGMENT | i |
| DEDICATION | ii |
| LIST OF TABLES | v |
| LIST OF FIGURES | v |
| ABBREVIATIONS | vi |
| ABSTRACT | vii |
| CHAPTER 1 INTRODUCTION | 1 |
| 1.1 Background information | 1 |
| 1.2 Research problem | 2 |
| 1.3 Research objective | 2 |
| 1.4 Research questions | 2 |
| CHAPTER 2 LITERATURE REVIEW | 3 |
| 2.1 Defining concepts | 3 |
| 2.2 Determinants of food accessibility | 4 |
| 2.2.1 Economic access | 4 |
| 2.2.2 Social Access | 5 |
| 2.2.3 Physical access | 6 |
| CHAPTER 3 RESEARCH METHODOLOGY | 7 |
| 3.1 Study area | 7 |
| 3.2 Research design and strategy | 8 |
| 3.2.1 Research strategy | 8 |
| 3.2.2 Research design | 9 |
| 3.3. Sampling methods | 9 |
| 3.4 Data Collection | 10 |
| 3.4.1 Data sources | 10 |
| 3.4.2 Data collection tools | 11 |
| 3.5 Data Analysis | 12 |
| 3.6 Ethical consideration | 13 |
| 3.7 Research context | 13 |
| CHAPTER 4 RESEARCH FINDINGS | 14 |

| | |
|---|----|
| 4.1.Respondent identification | 14 |
| 4.2. Influence of Income from potato production on food accessibility..... | 17 |
| 4.3 Control over income at the household level..... | 22 |
| 4.4 Food Consumption Score and food sources..... | 25 |
| CHAPTER 5 DISCUSSION OF RESULTS | 29 |
| 5.1. Influence of income from potato production to food accessibility | 29 |
| 5.2. Influence of Control over income on food accessibility | 29 |
| 5.3. Influence of Food sources to Food accessibility | 30 |
| CHAPTER 6 CONCLUSION AND RECOMMENDATIONS | 34 |
| 6.1 Conclusion | 34 |
| 6.2 Recommendations | 35 |
| REFERENCES | 37 |
| APPENDIXES | 40 |
| Appendix 1. Irish potato productivity in Season 2014 A; 2015 A and 2016A | 40 |
| Appendix 2. Food Consumption Score | 41 |
| Appendix 3. Household interview guide | 43 |
| Appendix 4. Topic guide for focus group discussion..... | 47 |
| Appendix 5. The key informant interview guide | 49 |
| Appendix 6. Observation Checklist | 50 |
| Appendix 7. The link between type of household, control over income and household's priority needs | 51 |

LIST OF TABLES

| | |
|--|-----------|
| Table 1. Type of respondents' household | 16 |
| Table 2. Size of household | 16 |
| Table 3. Number of people who are able to work within the household..... | 17 |
| Table 4. Size of arable land for respondents..... | 17 |
| Table 5. Potato yield comparison to three years ago | 19 |
| Table 6. source of income..... | 20 |
| Table 7. People involved in Irish potato production at the household level..... | 22 |
| Table 8. Results from household priority need ranking | 24 |
| Table 9. Food sources for small scale potato farming households in Buringo cell | 26 |

LIST OF FIGURES

| | |
|---|-----------|
| Figure 1. The conceptual framework from the food security concept..... | 6 |
| Figure 2. Map of Rubavu district | 8 |
| Figure 3. Sex of the respondents..... | 14 |
| Figure 4. Age of the respondents | 14 |
| Figure 5. Respondents' level of education | 15 |
| Figure 6. Produced potato ready for the big market..... | 18 |
| Figure 7. Reasons for the increase in potato production | 19 |
| Figure 8. Domestic animals reared in the study area | 21 |
| Figure 9. Control over income at the household level | 23 |
| Figure 10. Food consumption score | 25 |
| Figure 11. Timing distance to the physical market | 27 |
| Figure 12. Spoiled potato due to poor storage skills and capacities..... | 28 |
| Figure13. Food consumption score sheet 1..... | 41 |
| Figure 14. Food consumption score sheet 2..... | 42 |
| Figure 15. Some food items available to the physical market..... | 53 |

ABBREVIATIONS

| | |
|----------------|---|
| CIP | Crop Intensification Program |
| COFAR | Coopérative des Facilitateurs Agricoles de Rubavu |
| FFS | Farmer Field School |
| FCS | Food Consumption Score |
| FGD | Focus Group Discussion |
| MINAGRI | Ministry of Agriculture and animal resources/Rwanda |
| mt | Metric tonnes |
| RAB | Rwanda Agriculture Board |
| USAID | United States Agency for International Development |

ABSTRACT

The Ministry of Agriculture of Rwanda (MINAGRI) launched the Crop Intensification Program (CIP) in 2007 with the aim of making agricultural systems more commercially-oriented in order to increase productivity, self-sufficiency; reduce poverty and improve food security outcomes. This program was implemented by the Rwanda Agriculture Board (RAB) through crop specialisation, increased fertilizer and quality seeds use, land use consolidation among farmers to raise productivity, provision of efficient extension service delivery to farmers, improvement of post-harvest handling and storage mechanisms and better coordination of farmers' activities (MINAGRI, 2011). Irish potato productivity in Rubavu district increased from 26.6 tons/ha in season 2014A to 28.5tons/ha in season 2015A. Despite the increasing productivity in Irish potato production, Rubavu district still accounts for the highest rates of food-insecure households from the western part of Rwanda (Lodge & Winneba, 2015).

This research was conducted to assess the socio-economic factors hindering food accessibility for small scale Irish potato farming households in Rubavu district, Bugeshi sector, Buringo cell where high potato production is of practice. Different methods such as semi-structured interviews, key informant interviews, focus group discussions, and participatory observation were used to collect qualitative data. 20 households were selected randomly, composed of 17 male-headed households and 3 female-headed households. Three key informants were contacted and two focus group discussions were conducted with eight respondents per group.

Key findings from the research showed that a large number of small-scale Irish potato farming households depend mainly on Irish potato farming as their livelihood. This is not enough to solve household needs, thus there is a necessity for other income sources to support Irish potato income. Some sampled households try to diversify into livestock-keeping, but the revenue generated is still insufficient. It was also found that control over income was done mainly by men and since the needs of men differ from women's, it can be a factor hindering food accessibility as men's priority expenses seem to be far from food as compared to women. The lack of crop diversification, storage skills, and capacities is pushing small scale Irish potato farming households to sell a big part of their production at a low price compared to prices during food shortage time in order to avoid damage and also to be able to buy other food items.

Even though the price of Irish potato has increased compared to three years ago, the farmers are still forced to sell at a low price due to excess production in the market during harvesting season. Finally, the main food source in the study area is "purchase" as shown from Food consumption score calculations (see appendix 2, page 41) which requires much of income and this is not enough for the case of small scale potato farming households from Bugeshi sector. In a few words, food price fluctuation on the market while income is not growing up is one of the factors that may hinder food accessibility thus food security.

From key findings, recommendations were suggested to the Rwanda Agriculture Board including the increase of business skills in order to assist farmers in diversifying in small businesses to increase their income, further research on the food utilisation was also recommended to the unit of research to understand the level of awareness for smallscale farming households on nutritious food as some types of food were found not consumed by some households

CHAPTER 1 INTRODUCTION

1.1 Background information

Agriculture is the main source of livelihood for the majority of the people in Rwanda, it involves > 80% of the population, and contributes 30% to the country's GDP (B.K.Paul & R.Frelat, 2018). Agriculture in Rwanda is dominated by small-scale, subsistence-oriented farming. 66 percent of food crops produced by rural households is destined at-home consumption (World Bank , 2007). The problem of land scarcity is a big challenge for farmers in the country.

The Ministry of Agriculture of Rwanda(MINAGRI) introduced the Crop Intensification Program (CIP) and more commercially-oriented agricultural systems (launched in 2007), to increase productivity; self-sufficiency; reduce poverty and improve food security outcomes. The immediate objective of the program is to increase crop productivity and profitability of farming. CIP targets six priority crops namely: maize, beans, cassava, rice, wheat, and Irish potato (MINAGRI, 2011). This program of sustainable agricultural intensification is implemented by Rwanda Agriculture Board (RAB) through crop specialisation, increased fertilizer and quality seeds use, land use consolidation among farmers to raise productivity, provision of efficient extension service delivery to farmers, improvement of post-harvest handling and storage mechanisms and better coordination of farmers' activities (Prete, et al., 2019).

In 2014, countrywide roots and tubers accounted for the first in terms of crop production (54%) (MINAGRI, 2014). Irish potato is one of the most important crops in Rwanda and is cultivated especially in four districts in the north-west (Rubavu, Musanze, Nyabihu, and Burera) that contribute to over 60% of the country production (International Potato Center, 2018). There is approximately 150,000 ha under Irish potato production in Rwanda with an average yield of 11.8 t per ha (FAOSTAT, 2010). MINAGRI reported that the average yield in 2013 was 14.8mt/ha but the best farmers were reported to reach 30mt/ha with improved varieties, clean seed potatoes and improved agricultural practices (Lodge & Winneba, 2015). Farmers in Rubavu district are growing Irish potato, beans, and maize. Irish potato is the staple food and the most income-generating crop grown in the district. Irish potato productivity in this district has been increasing from 26.6 tons/ha in season 2014A to 28.5tons/ha in season 2015A then up to 31.3tons /ha in season 2016A as shown from Appendix 1, page 40 (Rubavu district, 2014; Rubavu district , 2016; Rubavu district , 2015). In Rwanda, agricultural season A starts from September to January while season B starts from February to June.

At the provincial level, western province accounts for 50% of the households with poor food consumption, 38% of those with borderline food consumption, 30% of the households reporting any food access issue, and 28% of the households with one or more stunted children under 5 (World Food Programme, 2012). Food insecurity is most prevalent in the Western Province of the country; more than 20 percent of households had unacceptable diets,

this province has a higher percentage of households with unacceptable diets in both March 2012 and March 2013 (Hjelm, 2016). Rubavu district accounts for the largest numbers and highest rates of food-insecure households from the western part of Rwanda (Lodge & Winneba, 2015). Stunting in children below the age of five in Rubavu district is at 46%, wasting at 2% and underweight at 12%. Anemia among children is at 30% while for women it is at 19% (National Institute of Statistics of Rwanda(NISR); Ministry of health(MOH); ICF International, 2016).

Rwanda Agriculture Board is lacking information on factors hindering the food security of small scale farming households. This research aimed to assess socio-economic factors hindering food accessibility for small scale Irish potato farming households in Rubavu district, Bugeshi sector, Buringo cell where high production comes from and small scale Irish potato farming households is the target group.

1.2 Research problem

The Crop Intensification Program's assumption towards increase food security is: increasing productivity will allow small-scale farmers to shift from subsistence farming to market-oriented farming and this will lead to an increase of income then small scale farmers will be able to buy nutritious food for their food security purpose. Farmers in Rubavu district have been able to increase Irish potato yield, yet farming households in this district are food insecure under which food accessibility is still a problem. Rwanda Agriculture Board which is implementing the Crop Intensification Program (CIP) is lacking information on factors hindering food security of small scale farming households in Rubavu district so as to work on them by planning appropriate interventions to be able to achieve the Crop Intensification Program (CIP) goal of improving food security.

1.3 Research objective

This research aimed to assess the socio-economic factors hindering food accessibility that affect the food security of small scale Irish potato farming households, so as to make specific recommendations to the Rwanda Agriculture Board (RAB) on areas of focus for additional interventions needed to improve the food security of farming households in Rubavu district.

1.4 Research questions

Main question

What are socio-economic factors that affect food accessibility of small scale Irish potato farming households in Rubavu district?

Sub questions

1. What is the influence of income from Irish potato production on food accessibility of small scale Irish potato farming households in Rubavu district?
2. How does control over income influence food accessibility of small scale Irish potato farming households in Rubavu district?
3. How do different food sources contribute to food accessibility of small scale Irish potato farming households in Rubavu district?

CHAPTER 2 LITERATURE REVIEW

The chapter will provide a literature review of the food security concept then focus more on food accessibility and its different economic, social and physical determinants from different authors' views. Since food accessibility is a component of the food security framework, the framework has therefore been used to illustrate how the CIP program has contributed to the increase of production expecting to increase income. From the diagram at the end of this chapter, food accessibility concept has been narrowed down into different dimensions of physical, social and economic access and indicators that will be measured and help to know where additional intervention is needed so as to improve the food security of small scale potato farming households in Rubavu district.

2.1 Defining concepts

Food security: According to USAID,(1992), Food security can be defined as a state in which all people, at all times, have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life. Leroy, et al.,(2015) define it as follow: "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".

Food security is divided into four dimensions:

Food availability is the quantity of food that is physically present in a country or area through all forms of domestic production, commercial imports, reserves and food aid (Hjelm, 2016; USAID, 1992).

Food accessibility: According to United States Department for International Development (1992), food access is defined as "when individuals have adequate income or other resources to purchase or barter to obtain levels of appropriate foods needed to maintain consumption of adequate diet or nutrition". While for Hjelm,(2016) food access represents the households' ability to regularly get adequate amounts of food through a combination of their own stock and home production, purchases, barter, gifts, borrowing or food aid. This last definition is the one that will be considered for this research as it encompasses many sources of food in combination with household stock and production that can apply for the rural areas of Rwanda especially for the research area (Rubavu district) and our target group(farming households). This definition also contains the important keyword "regularly" that can ensure the current and future household food accessibility capacity when it is taken into consideration.

Food utilisation refers to households' biological use of the food to which they have access; intra-household food distribution, and individuals' ability to absorb nutrients – the conversion efficiency of food by the body (Hjelm, 2016). Effective food utilization depends in large measure on knowledge within the household of food storage and processing techniques, basic principles of nutrition and proper childcare, and illness management (Riely, et al., 1999)

Food stability: Stability describes the temporal dimension of food and nutrition security, respectively the time frame over which food and nutrition security is being considered. Stability is given when the supply on household-level remains constant during the year and in the long-term. Even if your food intake is adequate today, you are still considered to be food insecure if you have inadequate access to food on a periodic basis, risking a deterioration of your nutritional status. There are many factors that may have an

impact on your food security status such as Adverse weather conditions, political instability, or economic factors (unemployment, rising food prices) (Hjelm, 2016).

Food insecurity exists when people are undernourished as a result of the physical unavailability of food, their lack of social or economic access to adequate food, and/or inadequate food use (Riely, et al., 1999).

Household is considered as the social unit living in the same house, eating together and make a coordinated decision over the allocation of resources (Netting, 1993)

Small scale farming households are defined based on the size of the land owned by a household. The small scale farming household is characterised by limited capital, small land and limited access to inputs. The wealth, market orientation farming, and the level of vulnerability to the risk are used to determine small scale farming households (Chamberlin, 2008). According to Burgoyne, (2008), smallholder farming households are rural cultivators practicing intensive, subsistence, and diversified agriculture with the use of limited resources. The researcher prefers to use the same definition as Chamberlin's as the target population is under market-oriented farming households regardless the size of land.

2.2 Determinants of food accessibility

The Crop Intensification Program assumption is not far from what Prete, et al.,(2019) said: "increased incomes and improved market access also explain farmers' ability to buy diverse and nutritious foods, such that their food and nutrition security would be assured even if their production becomes commercially-oriented".

This research aims to focus on the food accessibility rather than other food security dimensions because food security seems highly depending on food accessibility and if food accessibility is worked on taking into consideration the current situation (from Rubavu potato zone) of increased production that is flowing well, this dimension can have an influence on other dimensions like food utilization and food stability and help to improve food security.

Food insecurity in South Africa is not viewed as a failure to produce enough food nationally, but rather as a failure to provide adequate cash to purchase food at the household level (Grobler, 2013). Numerous studies refer to the use of social security schemes to improve food security by improving food access, or by providing households with income to purchase food (Adato & Basset, 2012; Cook & Frank, 2007; Miller, et al., 2011). Producing enough food to meet demand at reasonable prices is necessary but not enough to achieve good nutrition and not enough to achieve food security. Food security at the household and individual level depends on access to food (Pinstrup-Andersen, 2013).

2.2.1 Economic access

Economic access to food depends on household income as well as on food prices (World Food Programme, 2012). Most of the farmers in Rubavu district are smallholders and are facing the challenge in storage facilities and limited skills on food processing which increases postharvest losses. Lack of storage facilities and limited processing capacity is a problem in Rubavu potato zone and is also pushing farmers to sell the

whole production in a rush to avoid damages (FAO, 2016). The crop prices in such a situation are likely to go down and this may affect farmers' income thus their economic food accessibility.

Many agricultural interventions aim to improve incomes, increase food availability and reduce food prices (World Bank, 2007a). Their effects on nutrition could be better understood if food environment measures helped to explain how additional income is likely to be spent, and how food availability and prices change as a result of large-scale interventions (Herforth & Ahmed, 2015). Most developed countries are much interested in market-oriented agriculture serves as a supplier of raw materials for the food processing industry more than providing food for direct consumption (Pinstrup-Andersen, 2013)

Gender inequalities may play a role in poor agricultural productivity and efficiency while challenging development programs. Some projects and programs are mismanaged, forgone agricultural output and incomes, and food and nutrition insecurity may result from the misunderstanding of gender roles within the community (World Bank; Food and Agriculture Organisation; International Fund for Agricultural Development, 2009). Women of the large household size are likely to spend much more time on their reproductive roles rather than dealing with income-generating activities (Mukamana, et al., 2017).

Increased income doesn't define improve in nutrition, there are many factors playing in between such as who is controlling the income, as women and men use income in different contexts (UNICEF, 2011) Another factor is that, most of the time child malnutrition is due to lack or poor care practices that are not clearly linked to income. From the research done on the determinants and impacts of farmer collective action in Kenya, Fischer & Qaim,(2012) state that women seem to make other decisions than men that can have an effect on business orientation and from an institutional theory analysis from a social marketing point of view, Amine & Staub,(2009) supported the idea saying that "Women choose to adopt slow-growth strategies to keep control over the business while men are more looking for new opportunities and are less risk-averse".

The impact of income on nutrition can be strengthened by the consumers' awareness of what foods are needed to be bought as income increases.

2.2.2 Social Access

Food consumption captures the number of different kinds of food or food groups that people eat and the frequency with which they eat them and the food sources. There are many sources from which households obtain their food such as own production and consume from their own stocks; purchase from the market place; transfer from relatives, community members, the government or foreign donors; or collect it from the wild (Riely, et al., 1999). "Potato is a good source of dietary energy and some micronutrients, and its protein content is very high in comparison with other roots and tubers. It can also be important staple foods, but balanced diets need to include other vegetables and whole-grain foods" (FAO, 2008). Dietary quality is described as having at least the adequacy of health-promoting foods and balance of foods, food groups, and nutrients linked with poor health outcomes.

Level of education of any household member, the age of the head of the family; the number of people that can work within a household; household location; formal and informal social networks are factors that can influence income diversification of rural households which at the end may contribute to household food accessibility (Xu, et al., 2015). The literacy level is important for communication. Farmers can interact better when their communication skills and literacy level are understandable. The ability to read also defines the adaptation capability, because through reading farmers can discover themselves new technologies that can help to improve their activities and to diversify income based on the acquired

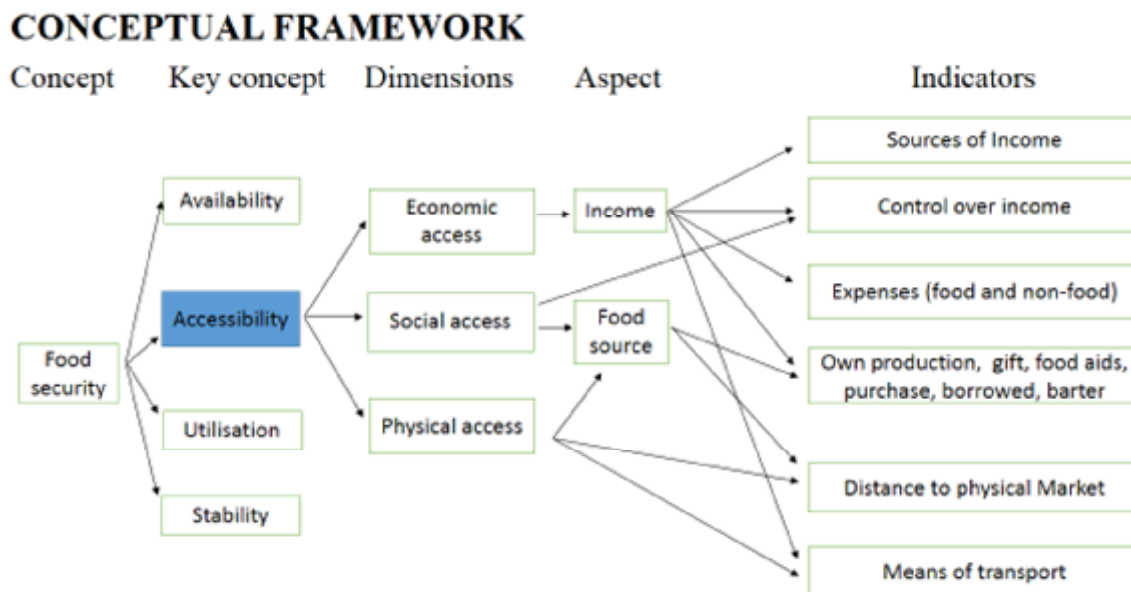
knowledge (Langyintuo & Mungoma, 2008). The literacy level is necessary for good networking, communication, and record-keeping.

2.2.3 Physical access

Markets make an important contribution to the availability of food and access to food year-round (both physically and economically). Between producing and non-producing areas, markets determine the movement of commodities from supply to demand and deliver them to end consumers. (Franchis, 2012)

According to Wiklund & Shepherd,(2005), long distances are harmful to agriculture profit as it causes high input costs, lower output prices, fewer buyers, weak access to supporting services and fewer opportunities to add value. The location of the farm with long distance to the market can be a barrier to market access and therefore lower the opportunities of farmers to be market-oriented. Also, Chamberlin & Jayne,(2013b) in unpacking the meaning of ‘Market Access’ from Rural Kenya, revealed these to be the common causes that keep the farmers in chronic poverty”. The degree of taking risks is often determined by the wealth of a household or farmer, ownership of transport or improved access to roads (Heltberg & Tarp, 2002).

Figure 1. The conceptual framework from the food security concept



Source: Own source, 2019

CHAPTER 3 RESEARCH METHODOLOGY

This chapter provides information about the study area, research context, and the methodology that was used for the research which is described in detail under the research design, research strategy, data collection (data collection tools, sampling), data analysis and ethical consideration.

3.1 Study area

The research was done in Rubavu district (Bugeshi sector, Buringo cell, Mutegengeri and Buringo villages) which is located in the Western province of Rwanda, bordered on the East by Nyabihu District, the West, and North by Democratic Republic of Congo (DRC) and south by Rutsiro District. Rubavu district is composed of 12 administrative sectors, 80 Cells, and 525 Villages. The population of Rubavu district is estimated to be 423,000. Males comprise 194,000 and females 229,000 (National Institute of Statistics of Rwanda, 2011). The district is characterised by fertile volcanic soil which is suitable for crop production although highly prone to floods during rainy season and landslides aggravated by heavy rains, land use practices and other factors (Baptiste & Gabriel, 2014).

With volcanic fertile soil suitable for Irish potato, land tenure is an indication of wealth in Rubavu potato zone. Most farmers do own small plots with big family sizes. Poor people in this zone cultivate less than 0.5ha of land (smallholder farmers) which limits crop diversification capacity (Browne & Lecumberri, 2011).

Rubavu district has been selected for this research based on its food security status which is still a problem while the district is known on volcanic fertile soil suitable for potato production as an income-generating activity. Bugeshi sector was chosen based on its Irish potato productivity which is high compared to other sectors' productivity, this sector is known for its big number of potato farmers and the large amount of Irish potato produced in Rubavu is coming from Bugeshi sector (See appendix 1, page 40). Buringo cell is selected based on its high potato produce compared to other cells in the sector and is made of 912 Irish potato producers. The essence of selecting the highest producing area was to study the problem from the root and to understand well the problem starting from the assumptions of the commissioner (Rwanda Agriculture Board) of "increasing yield will lead to increase of income then improvement of food security". The villages were selected randomly (Mutegengeri, Butaka, and Gahira).

Source: Minaloc

Specific study area

www.newsofrw

3.2 Research design and strategy

The research approach was qualitative and started by a desk study which helped to identify the research problem. After defining the objective of the research then research questions were formulated based on the conceptual framework. Data collection is the following step and was done in Rubavu district from Rwanda. After data collection, data analysis, results discussion then conclusions and recommendations to the commissioner (RAB) were drawn. Data were collected using household interviews, focus group discussion, key informant interviews as well as observation. All these techniques for triangulation of information at the household level, group level, and expert level and to facilitate discussion of results with the existing literature.

3.2.2 Research design

This is a case study of Rubavu district, Bugeshi sector, Buringo cell, as the researcher wanted to examine in-depth information to find out the factors hindering food accessibility in small scale potato farming households. According to Yin (1984), a case study is “an empirical inquiry that investigates a current phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used.” The research was conducted using the participatory approach which allows respondents to have active participation in the research and share their points of view on a given topic in a freeway. The researcher was on-field during the whole period of data collection as she was really curious to understand the factors hindering food accessibility in Irish potato farming households who managed to increase yield and income.

The qualitative method was used for data collection through semi-structured interviews, focus group discussion and observations.

The means through which data are collected has an effect on the findings and if we want to build confidence in the credibility of our research, it is important to collect information in different ways (Laws, et al., 2013)

3.3. Sampling methods

Purposive sampling method was used to select the study area) and simple random was used to select respondents. Since the research goal is to assess factors hindering food accessibility of small scale farming households in Rubavu district the selection of the study area was based on the sector that is highly producing Irish potato (Bugeshi sector) compared to other sectors of Rubavu district. The participants for both household interviews and focus group discussions were selected from small scale potato farming households and they have to be aged above 18 since they are the ones considered to be mature and allowed to work. Small scale because they are the most vulnerable to food insecurity due to their small land limiting crop diversification. The participants have to be husband or wife (for male-headed households) as they can be male or female for single-headed households to avoid information from one side.

Simple random sampling was used to select interview participants (for both Household and FGD) with the help of the village leaders and extension workers as they are the ones who know the small scale farming households in their villages. The total sample size was 20 participants for the household interview as the information had reached a saturation point. Two Focus group discussions were conducted and each FGD with 8 smallholder potato farming household member; The researcher conducted one FGD at the beginning of data collection to have a picture of factors determining food accessibility and to be able to adjust household interview guide while the other FGD was conducted at the end of data collection to confirm what has been said from household interviews.

Three key informants were selected for expert interviews: One key informant was the sector agronomist working in the same sector, He was in good position to give information on farmers activities and food sources as he works with farmers at sector level and know many of their performance and weaknesses, The second key informant was the district agronomist who has the overall picture of information at the district level. Finally comes the focal point of the Rwanda Agriculture Board in Rubavu district.

During FGD, group facilitation was done by the researcher with the help of the facilitator in agriculture from COFAR (Coopérative des Facilitateurs Agricoles de Rubavu). Participants were men and women for both focus group discussions and household interviews to have balanced and reliable information.

3.4 Data Collection

3.4.1 Data sources

a. Secondary data

Secondary data were collected through a desk study. This information was found from different documents, from previous researches done on food security and determinants of food accessibility and is mostly extracted from policy documents, journals, internet sources, governmental reports and the report from international organizations like USAID, UNICEF, FAO, and WFP. Secondary data from Governmental reports and policy documents were used for the background of the research, describing the study area, and defining the problem statement. Information from previous researches, journals, and international organisations was used for defining and operationalising the concepts used in the study and was used for discussion of results to relate to what was found from primary data collection so as to find answers to the research questions.

b. Primary data

Primary data about factors hindering food accessibility was collected through semi-structured interviews, focus group discussion, observations as well as key informant interviews. All these methods were used for triangulation purpose, the idea is to look at the same thing from different perspectives to increase confidence in the results.

Semi-structured interviews conducted with Irish potato farming households and Focus group discussion were used to answer all the three sub-questions, Observation was used to answer sub-question 1 (income from potato and food accessibility), 3 (food sources) while Key informant interview was a bit different compared to the household interview because there are some questions that may apply in household interview that are not relevant to the key informants and vice versa. Key informants were consulted for general information as they have an overall picture of the situation due to their position and expertise in the community. A key informant interview was applied for questions that answer to sub-questions 1 (income from potato and food accessibility), 3 (food sources).

3.4.2 Data collection tools

Different tools were used to find out information that helps to answer the research questions so as to achieve the research objective of informing RAB of the areas of focus for additional activities/interventions for improving the food security of farming households in Rubavu district.

Different tools used for data collection include semi-structured interview guides, observation checklist, and food consumption score sheet.

Semi-structured interview guide

This semi-structured interview guide was used for the household interviews to collect information on questions that require in-depth information, that need rooms for probing and asking for more information like questions that answer the sub-question 2(Control over income) of this research. The interview guide was designed in the English language and was translated into Kinyarwanda (local language) to facilitate communication with respondents. This guide contained identification part, questions that would help to verify existing information of increased production of potato and verify whether small scale potato farmers are selling potato and getting income before we start sections of questions that will help to find answers to the research questions.

In addition to the above, different topics were discussed through Focus group discussion. This group discussion was used to have collective information answering the three sub-questions and was also used to validate the information from household interviews.

Observation

This tool was used to collect information through participant observation. It was done during data collection in parallel with the household interviews and focus group discussions. Using a checklist, the researcher was with the participant while doing the observation especially for visiting some of the income activities and the possible food sources and also during Focus group discussion the researcher was doing an observation on the body language of participants.

Food consumption score sheet

Food Consumption Score (FCS) is often considered as an indicator of both quantity and quality (Leroy, et al., 2015). For this research, the Food consumption score was calculated as it gives information for a period of 7 days. FCS is also chosen because it allows us to know food groups that are consumed and their sources at the household level. Food consumption score guideline was giving information on food and food groups consumed by small scale potato farming households and the main food source (sub-question3) was determined from the same food consumption score sheet. Steps for calculating the FCS are shown in appendix 2, page 41.

The interview guide was tested on five households from Kabumba cell in Bugeshi village, for final corrections of certain questions to make them more understandable to the respondents before data collection starts.

Household interviews took place in respondents houses for their privacy where kids would not be disturbing or people passing around the house, most of the time the present respondent among husband and wife was the one contacted and most of the time we would find one of them and the other one not, except in one household the researcher managed to find both of them and there the interview was mainly to the woman but also the husband would intervene where the wife gets confused especially in food consumption score measurement. The household interview was taking 30 to 45 minutes depending on the respondent's answers. The household interview guide was made copies and each household's information would be recorded on its own questionnaire and the copy would be numbered. During the interview, the researcher was taking notes (filling on the interview guide) to record the findings.

Focus Group Discussion was taking between 45 minutes to 1 hour and was conducted in one of the participant's households with a mixed group of men and women that were selected based on their land possession (small scale potato farming households). The researcher was the facilitator while the note-taker was the bachelor student who was experienced in note-taking as he has been working for 4 years in a consultancy company doing data collection. The researcher was the one taking the audio recording to help remember respondents' points of view in case she might have missed out on some points.

For observation, it was done in parallel with household interviews where potato fields, income sources (like domestic animals were checked on) and pictures were taken while observing and the observation checklist was structured to help to focus on what is needed for research questions.

Respondents were asked to share information on Irish potato production nowadays compared to three years ago (2016) and to share the influence of income from potato production to their food accessibility; they were asked to share on how the control over income is done in their households and their priority needs, finally Food consumption score was measured to confirm the food consumption profile of the household and know their main food source so as to study its influence on food accessibility thus food security.

3.5 Data Analysis

For qualitative data, data were organised in themes to facilitate analysis. The questions for the interview were structured in line with the research questions. They were presented and analysed in a qualitative manner to bring out the prevailing opinions of the respondents. Results were presented in tables, graphs, and charts.

To analyse household food accessibility and source of food, a Food consumption score was used. Some variables that may help to explain household food consumption are: *Location* (livelihood zones, urban/rural, 'distance to the main road', distance to the nearest market), *Livelihoods and wealth* (livelihood groups, number of income activities, household wealth), *Agriculture* (size of land cultivated, crop diversity, ownership of livestock, growing a kitchen garden), *Household demographics* (education of the household head, age of the head of household, household size) (World Food Programme, 2012). To be able to answer research questions: for sub-question 1, information was grouped into three groups (agriculture farming, Livestock farming, and off-farm activities). For the sub-question 3, food

sources were grouped in seven food source groups and were given code to facilitate analysis as shown on the food consumption score sheet (see Appendix2, page 41). Those food source code are Purchase(1),Own production(2),Traded goods/services, barter(3),Borrowed(4),Received as gift(5),Food aid(6) and other sources(7).

3.6 Ethical consideration

Before any interview, the introduction of both the researcher and the research purpose was done in front of respondents and the researcher was asking for permission from respondents/participants to proceed with the interview. Respondents were assured of anonymity as well as confidentiality. The participants were assured that all the information will only be accessed by the researcher and they were given new ID(household number and group number) that were used for recording findings, During the focus group discussion, group participants were assured by starting the audio recording after the introduction of participants to avoid their names to appear in the record and each participant was given ID that was used for the note-taking.

The researcher ensured that a safe location was selected for the participants to be able to share information. This was done by avoiding locations that are closer to the road where many people were passing by, both the interviews and group discussions were done in places that were free from noise. In addition, the researcher ensured that the issue of one participant dominating the group was avoided by making sure that everyone from the group is given equal opportunity to express his/her point of view/opinions. Respondents were informed that participation is voluntary.

3.7 Research context

The Rwanda Agriculture Board is implementing the CIP program and is working with the cooperatives of facilitators for the provision of efficient extension service delivery to farmers at the district level. In Rubavu district the task is assigned to COFAR (Coopérative des Facilitateurs Agricoles de Rubavu). This cooperative is made of 60 facilitators intensively trained by qualified FFS Master Trainers from RAB and the ministry's partners, and these facilitators are covering the whole district.

The mission of COFAR is to deliver agricultural extension services to farmers to increase their agricultural knowledge through Farmer Field Schools (FFS) approach so as to increase crop productivity. The cooperative members facilitate the 'learning by doing' process and supervise season-long experiments in the FFS plot of the group where farmers compare farmers' practices to integrated pest management practices. At the end of the season, farmers are able to improve their agricultural productivity.

With this strategy, small scale Irish potato farming households managed to increase their productivity. After harvesting, potato farmers bring their production to the cooperative (ikusanyirizo) which collects farmers' Irish potato production and sells to the big market. According to the rules, the cooperative is asked to pay the farmer but not cash but through the bank(microfinance). This approach of paying on bank account was introduced to avoid misuse of money and for the safety of the producers in the community. The system helps the farmers to plan for the money before withdrawing. These transactions are also helping to introduce the farmers to the bank and encourage them for saving and ask for bank loans. The system is still being adopted, some farmers are still resisting and are still selling their products on the local market where sometimes they are paid less than the price at the cooperative.

The research is conducted to assess socio-economic factors hindering the food accessibility of Irish potato farming households since they managed to increase productivity.

CHAPTER 4 RESEARCH FINDINGS

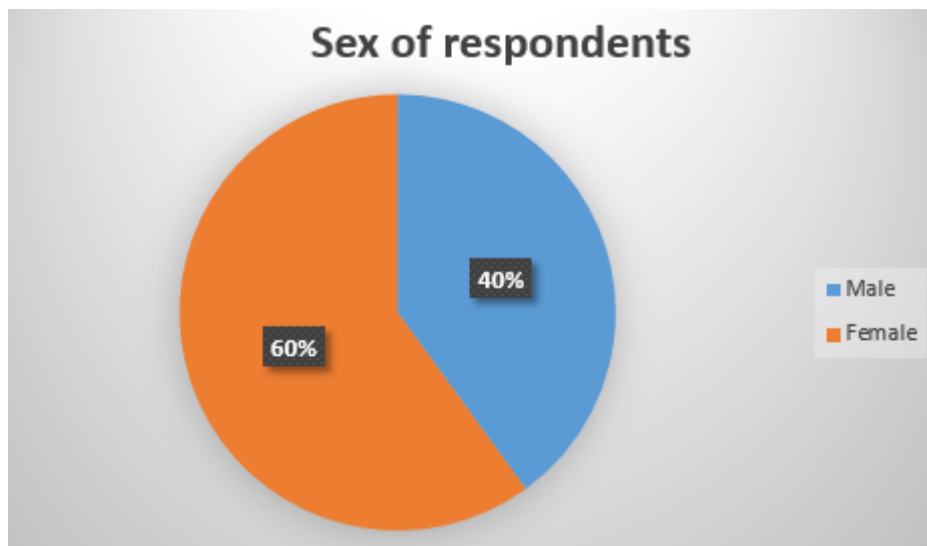
This chapter is presenting results from data collection done in Rubavu district, Bugeshi sector, Buringo cell, and Butaka, Mutegengeri, and Gahira villages with a total population of 20 small scale potato farming households. The results are from the combination of household semi-structured interviews, focus group discussion, Key informant interview and also from observation.

4.1. Respondent identification

Sex of the respondents

From the simple random sampling done to select respondents at the household level, equal opportunity to both males and females to be selected were respected, out of 20 respondents interviewed 40% were males while 60% of the respondents were females as shown in the pie chart below.

Figure 3. Sex of the respondents

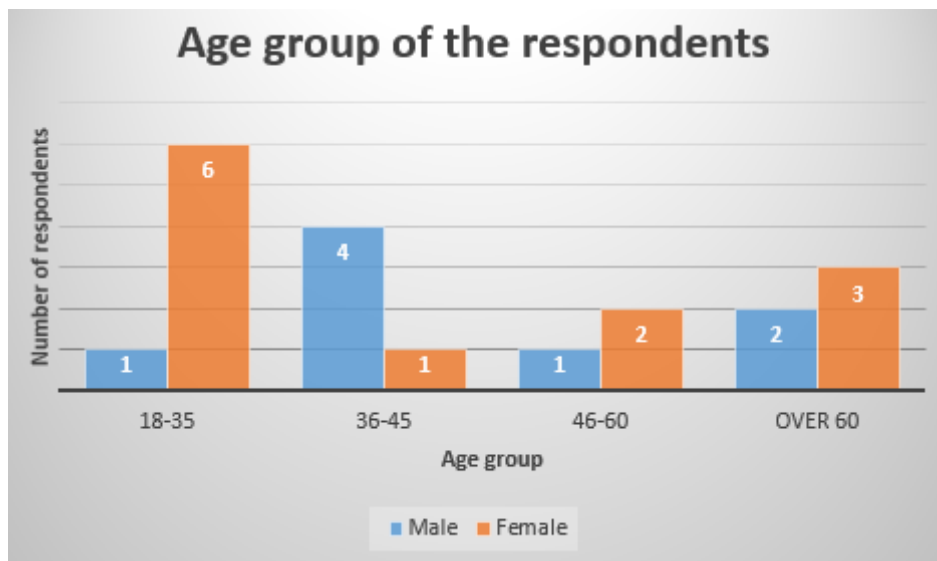


Source: fieldwork, 2019

Age of respondents

The results of contacted respondents show that among 20 respondents, 35% were youth (between 18-35 years) with one male and six females this age group was giving the highest number of respondents, respondents within the middle-aged range (between 36-45) were 25% with four males and one female, 15% of respondents were aged between 46-60, with one male and two females. Finally, over 60 years old respondents were representing 25%, with two males and three females. The bar chart below shows the age range of respondents.

Figure 4. Age of the respondents

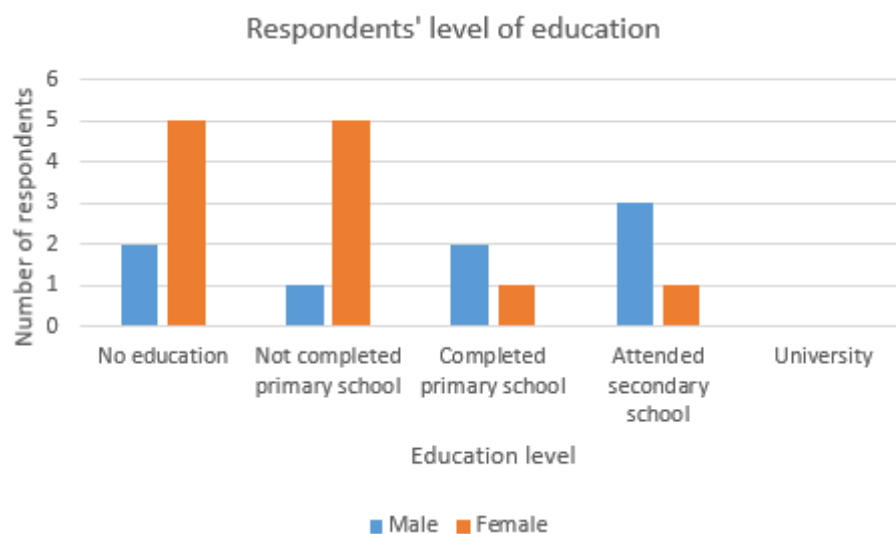


Source: fieldwork, 2019

Level of education

The results show that during the data collection period, out of 20, a big number of respondents represented by 35% (2males and 5 females) have not attended school, 30% (1male and 5 females) have not finished primary school, 15% (2males and 1 female) of respondents have completed primary school, while 20% (3males and 1 female) have attended secondary school. No respondent in the study area has attended university. Results show that women's level of education is lower than men's. The bar chart below is clearly showing the level of education of respondents in the study area.

Figure 5. Respondents' level of education



Source: fieldwork, 2019

Type of household

Out of 20 respondents, 85% were from male-headed households while 15% were from single-headed households (precisely female-headed households) as shown in the table below. It was realised that in the study area there were few female-headed households, where the researcher would walk the long distance to find the known female-headed household in one village.

Table 1. Type of respondents' household

| Household | Respondent(n=20) | Percentage |
|-------------------------|------------------|------------|
| Male-headed household | 17 | 85% |
| Single-headed household | 3 | 15% |
| Total | 20 | 100% |

Source: fieldwork, 2019

Size of household and people who can work and generate income within the household

The findings from 20 respondents show that the mean of the family size per household is 4.6 people in Buringo cell, Butaka, Gahira, and Mutgengeri villages that are depending on the above-mentioned source of income. And 1 to 3 people are the ones that can work per household.

Table 2. Size of household

| Family size | Repetition(n=20) | Percentage |
|-------------|------------------|------------|
| 1 | 0 | 0 |
| 2 | 2 | 10 |
| 3 | 3 | 15 |
| 4 | 5 | 25 |
| 5 | 4 | 20 |
| 6 | 3 | 15 |
| 7 | 3 | 15 |

Mode= 4

Mean= 4.6

Source: fieldwork, 2019

Table 3. Number of people who are able to work within the household

| Who can work | Repetition(n=20) | Percentage |
|--------------|------------------|------------|
| 0 | 3 | 15 |
| 1-3 | 16 | 80 |
| 4-6 | 1 | 5 |

Mode= 1-3

Source: fieldwork, 2019

Size of arable land

The results proved that 95% of the respondents own land of between 1-36 acres, while 5% own between 37-72 acres of land. No respondent's household was owning above 72 acres as they were all from small scale farming households. The size of the land is one of the determinants of productivity and also determines farmers' categories such as smallscale and large scale farmers. The table below clarifies the results of the size of land for research respondents.

Table 4. Size of arable land for respondents

| Type of household | 1-36 Acres | 37-72 Acres | Above 72 Acres | Total(n=20) |
|-------------------|------------|-------------|----------------|-------------|
| Male-headed | 17 | 0 | 0 | 17 |
| female-headed | 2 | 1 | 0 | 3 |
| Percentage | 95% | 5% | 0 | 100% |

Source: Fieldwork, 2019

4.2. Influence of Income from potato production on food accessibility

Change in Irish potato productivity as compared to three years ago

The results from Bugeshi sector, Buringo Cell, Gahira, Butaka, and Mutegengeri villages have shown that most of the respondents at 75% grow Irish potato twice a year, while 25% of respondents grow potato 3 times a year.

At the household level, 75% of respondents have confirmed the increase of Irish potato production compared to three years ago (from 2016); 20% of respondents confirmed the decrease in Irish potato production; while 5% of respondents consider the production to be the same as compared to three years ago(see table 5 below).

The period of three years was taken as a reference to help farmers remember well since the program of Crop Intensification Program started in 2007 which is very far, it would not be easy to ask and get information about before the program. From the focus group discussion, the group participants have confirmed the increase of production and the group linked this increase to the use of organic fertiliser and

sometimes due to the rotation of Irish potato with pyrethrum that is helping the soil to regenerate. Some respondents mentioned the decrease of production which appears in some fields for an unknown reason and they suspect unknown pests that are causing a decrease of yield. Through observation done by the researcher during focus group discussion, the increase of yield is generally confirmed by group participants. They were really convincing with their body language using their hands to explain how they are experiencing this increase and some were nodding their heads while others were giving reasons supporting their views on this change in productivity) the use of organic fertiliser was highlighted as playing a big role in this increase of productivity. From the key informant interviews, They have all confirmed the increase of potato productivity from 25 to 35tons per hectares and sometimes up to 40 tons per hectare depending on the season and the effort done by farmers.

The main cause of production increase as mentioned from the household level was confirmed in FGD and also by the key informants to be the use of organic fertilisers.

The Irish potato being sold on the market was confirmed through observation done by the researcher where lots of bags full of potato were on the road waiting to be packed and transported to the big market in the capital city of Rwanda(Kigali) as clarified by the sellers. It was seen that farmers in the region are producing for consumption and for selling. See figure 6 below.

Figure 6. Produced potato ready for the big market and local market



Source: Own source, 2019

Table 5 below shows respondents' views on Irish potato productivity change within three years.

Table 5. Potato yield comparison to three years ago

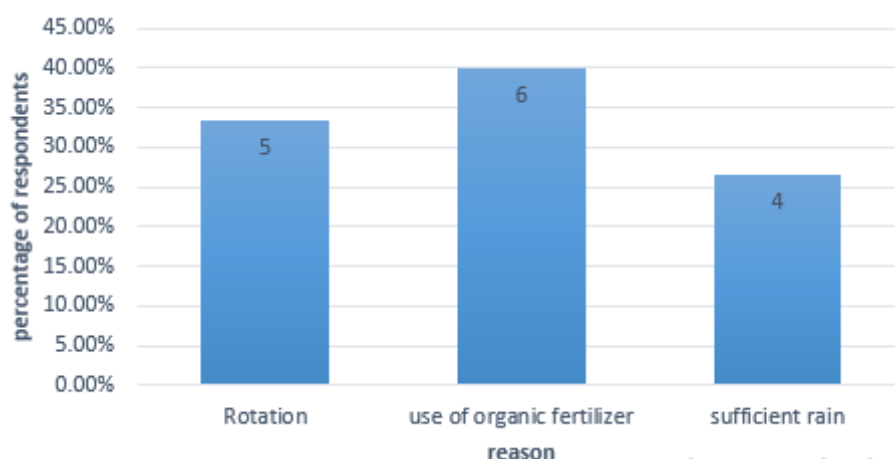
| comparison | Respondents(n=20) | percentage |
|------------|-------------------|------------|
| Decrease | 4 | 20% |
| Increase | 15 | 75% |
| Same | 1 | 5% |

Source: fieldwork, 2019

[...] Before I used to put only NPK17-17-17 but these days I mix NPK with organic fertiliser which I found helping to increase Irish potato production because this time I can get 95 bags while before only getting 80bags (1bag=100kg) [...] Respondent 10

From focus group discussion and also from different key informants, an increase in the use of organic fertilizer was also mentioned to be the main cause of the potato yield increase. One of the key informant's point of view is that mobilization of the use of organic manure especially through Farmer Field School (FFS), played a major role in the increase of potato yield in this sector (Bugeshi) as they have a lot of facilitators in the sector that are installing FFS in different villages. The bar chart below is clearly showing respondents' views.

Figure 7. Reasons for the increase in Irish potato productivity



Source: fieldwork, 2019

40% of the respondents (means 6 out of 15) who have confirmed an increase of Irish potato productivity, find the use of organic fertiliser to be the main cause of this increase.

All the respondents(100%) confirmed that they sell Irish potato during harvesting time and 90% have confirmed that the price of potato has increased which is an advantage for potato producers as it helps to increase income from potato production, 10% of respondents view the price of potato to remain the same as compared to three years ago due to the cost of inputs they don't see change in output.

[...]Before I was producing 150bags of 100kg and now I am getting 145bags and I think it is because of climate change. I am applying the same fertilizers but I don't know why it reduced because at the beginning they grow well and during the last month they get dry and you can't see the reason maybe there are some pests in the soil [...] Respondent 7

[...] I used to produce 75 bags of 100kg before but this time I can even get more than 85 when the season goes well, this is because this time I am applying a lot of organic manure which I buy from my neighbors who have a lot of cows and sometimes I use manure from Poultry. As soon as I harvest and sell potato, I try to save a small amount of money to buy manure for the next season. The price has increased from 120Frw/kg in the year 2016 to 150Frw/kg in 2019[...] Respondent 10

Source of income

Buringo cell is a zone of Irish potato where 100% of the population are potato farmers. 45% of the contacted respondents are much depending on Irish potato production as their livelihood while 35% are practicing livestock (of sheep, goats, and cows) with Irish potato farming where some families have like one goat or one sheep or sometimes one cow (as shown in figure 8 below), and 20% depend much on potato farming in combination with other activities such as trading, masonry, Cycling. Table 6 below is showing results on the source of income in the study area.

Table 6. source of income

| Activities | Respondents | Percentage |
|--|-------------|------------|
| Irish potato farming | 9 | 45% |
| Irish potato Farming and livestock farming | 7 | 35% |
| Irish potato Farming and other non-farm activities | 4 | 20% |
| Total | 20 | 100% |

Source: fieldwork, 2019

Figure 8. Irish potato farming and Livestock farming in the study area



Source: Own source, 2019

The results highlighted the Irish potato production contribution to food accessibility of many of the respondents' households in a way that they sell potato at the harvesting time and the income is used to buy other food items that are not grown in the region, to buy other basic needs and sometimes used to buy livestock animals such as sheep, goats, cows which at the end contribute to food accessibility through milk production, meat production and sometimes source of income in a way that they sell them when they have problem of food shortage and get money to buy other food items as well. Income from this livestock farming is still very low as most of the respondent's households have one sheep or one goat or even one cow in a household of 4 to 7 people.

[...] we cannot live without selling potato. We grow Irish potato only but we also need to eat beans. That's how we sell some of the potatoes to get beans, meat, and rice. Our land is small but we try to sell some of the production to get other food items so as to balance the diet[...] Respondent 13.

[...] Irish potato production is helping a lot, we eat them, sell some and the money is used to buy beans (as you can see we don't grow beans here) and other needs. The money from Irish potato production helps a lot especially during Pyrethrum season even though it cannot cover the whole season (we are allowed to grow potato for one season and Pyrethrum for the other season) where we will have to buy all the food since we can't eat Pyrethrum[...] Respondent 8.

The same main source of income was confirmed from both focus group discussion and the key informant interviews where they all highlight potato production to be the main source of income in the study area then comes livestock of mainly small domestic animals such as sheep and goat which is still at a low level. Through the observation method, the researcher also confirmed this livestock farming mainly of sheep that are seen in almost all the respondents' households.

The results showed that 80% (16 out of 20) of the respondents revealed that between 1 to 3 people are able and allowed to work within their households, 15% (3 out of 20) of the respondents don't have anyone who is able to work especially due to physical disability and elderly. 5% (1 out of 20) respondent have 4 to 6 people who can work within the household

4.3 Control over income at the household level

Participation in potato production

To understand the control over income at the household level which mainly comes from Irish potato production in the area of study, the researcher started by asking people who are involved in this production. The results from household interviews showed a big rate of 50% of respondents who revealed that both men and women in the household are equally involved in Irish potato production and sometimes children and labors are involved as for female-headed households and also for households with old or disabled people. Table 7 below, shows the detailed number of people who are involved in Irish potato production at the household level in Buringo cell.

Table 7. People involved in Irish potato production at the household level

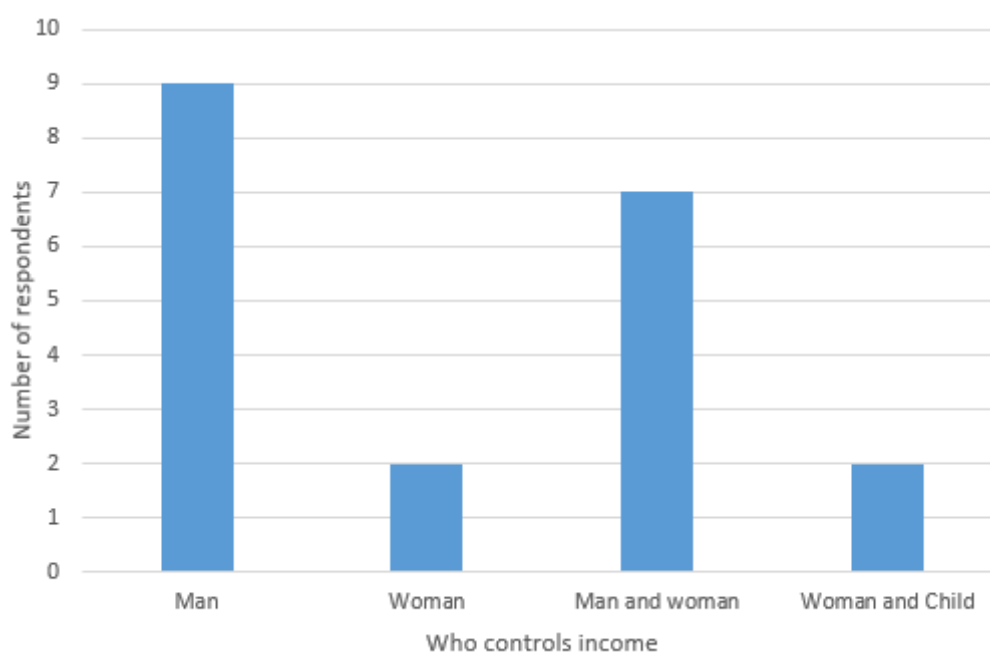
| Who | Respondents(n=20) | Percentage |
|--------------------------|-------------------|------------|
| Man and Woman | 10 | 50% |
| Man, Woman, and children | 3 | 15% |
| use of labors | 4 | 20% |
| Man | 1 | 5% |
| Woman | 2 | 10% |

Source: fieldwork, 2019

Control over income

Many of the respondents revealed that control over income at the household level is done by men where 45% of respondents (means 9 respondents out of 20) have confirmed that men are the ones who take the lead in the control over income at household level where some respondents said that the man is the one who decides what to use money for and the woman will be executing rules, 35% of the respondents confirmed that men and women have equal control over income where they say that the man of the house is the one who is the head of the household but cannot decide what to do without his woman's consent. On the other hand, results from the FGD highlighted that men and women control income equally. Participants were emphasising on how the man and woman sit and discuss how to use the received income but also pointed on how when they disagree on what to buy, most of the time the man is the one who has a final say than the woman has. From both the household and focus group discussion views, the researcher realised that men are the ones who control income as they are the ones who have a final say even when they try to involve women in. Figure 9 below illustrates the results of control over income at the household level in the area of study.

Figure 9. Control over income at the household level



Source: fieldwork, 2019

Priority needs at the household level

The respondents were asked to rank nine given household needs starting from the most important up to the least important. The results from the first 3 rankings were taken to be enough to represent the priority needs at the household level. Each ranking was given points starting from 9 points for the first ranking up to 7 points for the third-ranking as shown in table 8.

From the list of some household needs (Housing(construct or renew); buy food; buy beer; saving; child education; livestock(buy domestic animals); buy land; visit friends and organise parties), the results from household interviews highlighted the most mentioned need of “buy food” that appeared several times in the first three ranking.

From focus group discussion, “buy food” was the most mentioned at the first rank where group participants were explaining more how other needs come after buying food items that are not produced in their region and participants highlighted how during the harvesting time each household fights to get beans that will be eaten with produced potato.

This information was also confirmed by the key informants (district and sector agronomists)where they confirmed how farmers during the harvesting time look for beans and store them in their houses for the coming days.

The findings after combining data from different methods proved that small scale Irish potato farming households’ first priority need is “buy food”. Table 8 below shows the results from ranking of household priority needs.

Table 8. Results from household priority need ranking

| Household Needs | Ranking 1 | 9 Points | Ranking 2 | 8 Points | Ranking 3 | 7 Points | Total Points |
|-------------------|-----------|----------|-----------|----------|-----------|----------|--------------|
| 1)Housing | 5 | 45 | 3 | 24 | 2 | 14 | 83 |
| 2)Buy food | 5 | 45 | 4 | 32 | 3 | 21 | 98 |
| 3)Buy beer | 0 | 0 | 0 | 0 | 1 | 7 | 7 |
| 4)Saving | 4 | 36 | 3 | 24 | 3 | 21 | 81 |
| 5)child education | 2 | 18 | 4 | 32 | 3 | 21 | 71 |
| 6)Livestock | 1 | 9 | 1 | 8 | 4 | 28 | 45 |
| 7)Buy land | 2 | 18 | 4 | 32 | 3 | 21 | 71 |
| 8)Visit friends | 1 | 9 | 1 | 8 | 1 | 7 | 24 |
| 9)Parties | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 20 | | 20 | | 20 | | |

Source: Fieldwork,2019

The highly mentioned need

In Bugeshi sector, Buringo cell, Mutegengeri, Gahira, and Butaka villages, 25% of respondents ranked at the first place “buy food” and “housing” equally. For contacted respondents, “buy food” is their first priority, the second is “housing” while “organising parties” comes at the last stage as shown in table 8 above.

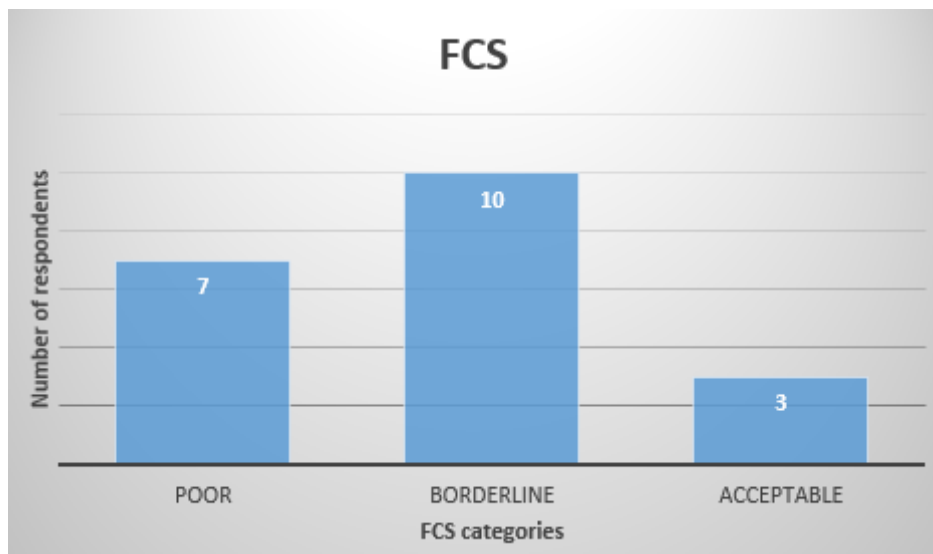
Results revealed that in the households where the man has more control over income than the woman, the first household priority need was “housing”, the second was “child education” and the third was “buy food”. In the households where woman or woman with the child have control over income, The first household priority need was “buy food”, the second was “buy land” while the third was “saving”. Finally, the results of household priority needs from the households where man and woman have equal control over income showed the first priority need of “saving”, the second was “buy food” while the third was “housing” (see appendix 7,page 52)

4.4 Food Consumption Score and food sources

The household food consumption score

The results showed that half (50%) of the respondent's households have food consumption score that falls under “borderline” category, 35% are under the “poor” category, while 15% of the respondent’s households have “acceptable” FCS as shown on the bar chart below.

Figure 10. Food consumption score



Source: fieldwork, 2019

Most of the food items consumed were under main staples such as Irish potato, beans, and sometimes rice. Fruits and vegetables were also consumed but not as much as the main staples. Some food groups were found to be rarely consumed in general. such food groups include meat and fish, milk, sugar. Some respondents find those food groups to be expensive consider them to be eaten once a year for the poor families (as they cannot afford to buy them) they consider these foods groups to be “food for the rich families”.

[...] fishes and meat are very expensive, we eat them on Christmas day. We cannot buy them while we still struggle to get other foods such as beans, rice, vegetables, and others[...] Respondent 14

Food sources

The results revealed that the main food source is “purchase” (95% of respondents said). The study area is an Irish potato production zone, during harvesting time they sell potato to get other food to mix with remained potato. The availability of different foods is not reliable as it goes with the season: during harvesting period different foods items are available and cheap at the market while one month after harvesting foods start reducing and prices are going up for the small amount that is available at the time. The household income that is mainly from potato production gets finished early as prices keep changing while income is reducing.

Table 9. Food sources for small scale potato farming households in Buringo cell

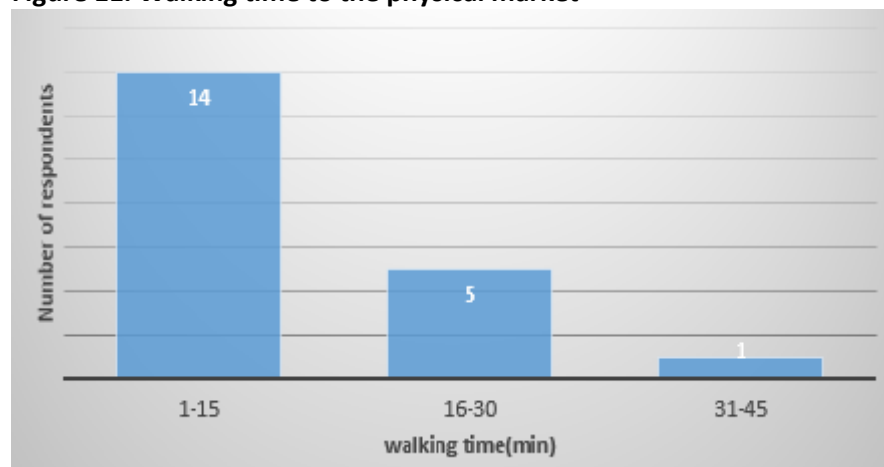
| Food source codes | Respondents (n=20) | Percentage |
|--------------------|--------------------|------------|
| Purchase(1) | 19 | 95% |
| Own production (2) | 1 | 5% |
| Barter(3) | 0 | 0 |
| Borrowed(4) | 0 | 0 |
| Gift(5) | 0 | 0 |
| Food aid(6) | 0 | 0 |
| Other(7) | 0 | 0 |
| Total | 20 | 100% |

Source: fieldwork, 2019

Market location

The results from different interviews, focus group discussion, and researcher's observations revealed that the local market is closer to many of the respondents in the community where most of them do walk for 1 to 15min by foot to reach the market. The roads in the community are good as well. This is allowing farmers to bring their products to the market and to buy needed items in case the resources are available. Figure 11 below is showing the distances spent to get to the local market in the study area.

Figure 11. Walking time to the physical market



Source: fieldwork, 2019

The results on availability of food period and food shortage period was found to be a problem from household interviews, Focus group discussion and also from key informants interviews where it was confirmed that different food items are available during the harvesting time and as storage capacity, skills are still limited(See figure 12 below),farmer prefer selling a big part of their production to avoid damage and be able to solve some other household needs such as health insurance, buying fertiliser for the next season, etc. instead of storing a lot that would help during the period of food shortage.

The results from household interviews, FGD and key informant interviews proved that food is mainly available in January, February, July, and August and the food shortage period was mentioned to be seen mainly in March, April, May, June, September, October, November, and December. Income from Irish potato production got from 4 months of harvesting period is hardly enough to cover 8 months of food shortage period.

[...] Farmers in this sector are rushing to sell the whole production to avoid damage but still the gained income is used to cover all the household's needs and cannot last up to the next harvesting time, during harvesting period prices are low compared to a few months after harvesting [...] Key informant (district agronomist).

[...] During harvesting time almost all the food items can be found to our local market which is not even far from here(5 to 15min from my home), and the price at that time (Harvesting period) is affordable but after sometimes (like one month after harvesting) we can't afford to buy some of the food which is still available to market as prices increase. It becomes now difficult for us and easy for the rich people. The problem now is we are not able to store for our future because we don't have that capacity, Irish potato gets spoiled when we try to store in our home[...] Respondent 16

Figure 12. Spoiled potato due to poor storage skills and capacities



Source: own source, 2019

CHAPTER 5 DISCUSSION OF RESULTS

Variables that were found to explain factors hindering food accessibility for small scale farming households in Rubavu district, Bugeshi sector, Buringo cell, Mutegengeri, Gahira, and Butaka villages are income sources, control over income, food sources and physical market.

5.1. Influence of income from potato production to food accessibility

The income from Irish potato production has increased as the production increased compared to three years ago. It has contributed to increasing the ability to buy other food items that are not produced in the area of study (Bugeshi sector, Buringo cell), this income alone seems not enough to improve food accessibility of small scale Irish potato farming households. Their land is small and the income they get is proportional to land and not enough to cover all the household's needs as the needs are many compared to the available income and other sources of income are limited. This finding can be compared to the results of UNICEF where they stated that the increased income doesn't mean the improvement in nutrition, there are many factors playing in between (UNICEF, 2011).

This finding can also be compared to the results from the study done by Pinstrup-Andersen where he highlighted that producing enough food to meet demand at reasonable prices is necessary but not enough to achieve good nutrition and not enough to achieve food security. Food security at the household and individual level depends on access to food (Pinstrup-Andersen, 2013).

The results on sources of income from Bugeshi sector, Buringo cell revealed that a large number of households in this region is depending on agriculture farming where 45% of the respondents are only depending on Irish potato production, 35% are Irish potato and livestock farming dependent while 20% are at the same time Irish potato farming and non-farm (business) dependent (see table 6). Similar results on the main source of income were confirmed in a study done by the National Institute of Statistics of Rwanda on the household income shares in Rubavu district. It shows that household income is driven by agriculture (29%) and wage income (27%), followed by business with 22%. All other household income sources shares vary between 7% and 8% (National Institute of Statistics of Rwanda, 2011).

Most of the respondents (95%) own small land of between 1 and 36 acres means less than 0.5ha and they are mainly depending on Irish potato production. These results are similar to the results in terms of land possession and limited crop diversification from the study done by Browne and Lecumberri, where they found that most farmers in Rubavu district own small plots and that poor people in this zone cultivate less than 0.5ha of land (smallholder farmers) which limits crop diversification capacity (Browne & Lecumberri, 2011).

5.2. Influence of Control over income on food accessibility

After compiling the results of control over income being done mainly by man at 45%, done by both man and woman at 35%, done by mainly woman at 10%, and done by woman and child at 10% as shown from findings (figure 9), and the results on household priority needs as shown from appendix 7, the researcher realised that control over income may have an influence on food accessibility in a way that men and women may not use the income in the same way.

A similar observation was confirmed from the study done by UNICEF with a highlight on how increased income doesn't define improve in nutrition as there are many factors playing in between such as who is controlling the income, as women and men use income in different contexts" (UNICEF, 2011).

Frank Ellis, (2000) also confirmed that “with cash in the hands of women they are utilised for primarily family welfare purposes while in hands of men, income is often retained for personal consumption expenditures”.

In the study area, Households’ food accessibility is not improving may be because men have more control over income than women, even where men and women are equally controlling income, still men are the ones making the final decision on what to buy especially when there is disagreement on some needs (as said by many of the respondents from focus group discussion). The researcher reflected on how the control over income may influence household food consumption of the household and this may affect food accessibility thus food security in a way that food may not be a priority need in a household where the man is the one controlling income.

5.3. Influence of Food sources to Food accessibility

From the findings, a large number of 50% of the respondents in the study area have borderline Food Consumption Score (as shown in figure 10) and the main food source in the study area is “purchase” (see table 9) as they mainly produce potato, they need more income to get other food to balance their diet. Food access is ensured when households and all individuals within households have adequate resources to obtain appropriate foods for a nutritious diet. Access depends on income available to the household, on the distribution of income within the household, and on the price of food (USAID, 1992). By comparing these USAID findings with the research findings where the income at the household level in the study area seems insufficient compared to the household needs and the findings of some food items rarely consumed (meat and fishes), The researcher realised that the food source is negatively influencing food accessibility since income is not sufficient and there is no other alternative to get food.

Level of education of any household member, the number of people that can work within a household; household location; formal and informal social networks are factors that can influence income diversification of rural households which at the end may contribute to household food accessibility (Xu, et al., 2015). By comparing these results with the research findings, the researcher realised that the level of formal education of the respondents in the study area which is low where 35% did not attend school (see figure 5), maybe one of the factors hindering food accessibility in a way that limited income diversification reported earlier may be caused by limited skills. with a big number of females having a very low level as compared to the men’s (see figure 5), this also may limit the ability to diversify in small businesses that would help women to increase access to income, control over income, reducing high dependence on “purchase” and then improving food security of their households as they are the more concerned by food for their home than men.

Physical market influence on food accessibility

The available physical market in the community is closer to many of the respondents where they walk for 1 to 15min to reach the market (see figure11), which is an opportunity especially during harvesting season where all farmers are selling potato at a low transport cost and find almost all kinds of food. The market distance influence was also confirmed by Wiklund & Shepherd,(2005) that the location of the farm with long distance to the market can be a barrier to market access and therefore lower the opportunities of farmers to be market-oriented. In the study area, farming households are selling a big part of their production maybe because the market(even Irish potato collection centers “amakusanyirizo”) is not far from respondents’houses and farms and the roads are good for any transport.

Small scale Irish potato farming households are not buying some nutritious foods may be because of high prices while their income is limited. From the findings, food is available on the market(see figure15) but prices on the market keep changing depending on the season while income is not growing. This can be compared to the results of USAID, 1992 highlighting the price of food to be among factors that may affect food accessibility within a household.

Food insecurity exists when people are undernourished as a result of the physical unavailability of food, their lack of social or economic access to adequate food, and/or inadequate food use (FAO, 2012). Many of the small scale Irish potato farming households in Buringo cell don't have an acceptable food consumption score maybe because their main food source is "purchase" not "received as a gift" or "received as food aid" even "barter" that would have helped to solve the issue of limited income that was mentioned at the household level.

Limitations

The researcher found limitation in getting secondary data on the current situation of potato production situation in Rwanda where the available data was only for 2016. To handle this problem, the researcher tried to contact people from the study area via email and phone calls. From the Rwanda Agriculture Board focal point person in Rubavu district, I managed to get some data on yield even though these data were not published yet. From this, I learned how sometimes what we want may not be available but we have to find a way of getting something else instead of giving up.

The results of the research are from smallscale farming households that depend mainly on potato farming, the drawn conclusions may apply for smallscale farmers mainly depending on agriculture farming and may not apply for all the smallscale farmers in the whole district as their livelihood may not be the same.

The findings on household food consumption score show a higher margin of households with the borderline profile. Since data collection was done during harvesting season, as Irish potato farming households were still having food stocks and access to income from produced potatoes, it may not be a true reflection of food security during the off-season period (food shortage period). To understand how the situation is during the off-season period where farmers experience food shortage problems, The researcher was asking respondents about the situation during that crisis period and how they deal with it. This information helped to understand some difficulties in being market-oriented for small scale farming households.

Reflection as a researcher

When the research topic came in my mind I started doing desk study on it and designing a research proposal, as I was struggling to find literature, I was anxious whether I will find something concrete. Afterwards I managed to find some literature from different countries done on the food accessibility. From there, I started feeling more relieved. Yet the work was still tough but doable. The assignment done in the mini-research module helped a lot because from there I managed to understand some of the research parts (such as methodology part and analysis part) that I was not during the research module theory. The first day of data collection in the mini-research, I and my group went to the field without a proper plan, then came with lots of confusions, we were collecting data in different ways (as we didn't discuss on how we will proceed) and we were going all over in velp. From this mistake we realised that by going without a plan, you will get tired with nothing as relevant data. From this experience, I learned a lot and it helped to design a proper plan for the fieldwork for my research that worked well when I reached my country for fieldwork. and I would verify daily progress.

Before leaving for the data collection, I talked to my supervisor and one of my peer to share ideas on my data collection tools such as interview guide, checklist, and FGD topics. This was found more helpful, because it helped me to think about some of the overlooked issues such as access to income that may contribute to control over income, in my case there was no question about access to income but when we discussed with the peer I realised how strong the point was. From this peer review, I realised the essence of having a peer reviewer as it plays an extra- eye role. When I reached the country it was on the 23rd of June 2019, two days later I booked appointment to meet the commissioner and the district representative so as to explain well my research plan. Before data collection, I went to the cell and village leaders to introduce myself and my research. The introductory part was also insightful as I was welcomed in all offices. And this made my work easy especially in getting to my target group.

After this introduction, I started to test my interview guide with respondents to revise questions that might be confusing. As a researcher, for the first household interviews, I saw how respondents when they hear that you are studying abroad, start being confused like you are bringing funds for their farming, while others were showing the eagerness of receiving incentives in exchange for information. With this I had to find a way to release their expectations and at the same time get reliable information: I started to introduce myself as a student doing research for my degree so as to give recommendations to the RAB. With the help of village leaders, we managed to make participants take the research as a source of income but as an advocacy chance for them.

From this, they started giving information that was linked to their real-life with some facts as they really want advocacy to be done. As a researcher, I realised that bias may also come from this motivation of advocacy and they may give only bad experiences. From there, I started probing on some of the answers they were giving to ensure reliability. This made me reflect on the role of communication skills as a key to conduct research and be able to collect information.

During data collection I also experienced the role of flexibility, neutrality and communication skills, respondents would start the conversation not comfortably but as long as I keep myself neutral, they don't see any sign of judgment in my face when they answer, they feel more of comfortability and much relaxed and you would see change in their way of answering. At the end of the interview the researcher would experience a change in a way of answering.

During data analysis as a researcher, I saw an interesting point where I would want to present data and discuss, while discussing some results, one point else would come in mind with a supportive role. like when I was discussing food source data lots of new ideas/assumptions came and I would add them. From there I realised research is a process that help to think even beyond what we see and we know.

CHAPTER 6 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study aimed to find out factors hindering food security (with more focus on the food accessibility dimension) of small scale potato farming households in Rubavu district, Bugeshi sector, Buringo cell, and Butaka, Gahira, Mutegengeri villages.

The sub-question 1 “what is the influence of income from Irish potato production on food accessibility of small scale Irish potato farming households in Rubavu district?”

The income from potato production was confirmed by respondents to be essential as it helps to buy other food items to balance their diet since they are mainly producing Irish potato. However, this income is not enough compared to the needs of the household. It was found that some of the households diversify in small livestock farming that would serve as the source of income but this livestock is also at a low level to provide income.

The sub-question 2 “How does control over income influence food accessibility of small scale Irish potato farming households in Rubavu district?”

A big number of respondents (45%) confirmed that men have control over income (see figure 9) than women at the household level in the study area. While women are likely to spend more on food than men, men being involved in the control over income may not view food as the first priority. Income which is mainly from small scale Irish potato production once deviated to other household's needs may affect food accessibility thus Food security.

The sub-question 3 “How do different food sources contribute to food accessibility of small scale Irish potato farming households in Rubavu district?”

Food consumption calculations were to discover different kinds of food and food groups consumed and then their sources at the household level in the area of study. The household FCS was found to be mainly “borderline” with “the purchase” being the main food source for about 95% of the respondents. It was found that if “purchase” is the main food source with insufficient income at the household level, and market prices that keep changing depending on the crop season, food accessibility may not be achieved since farmers are relying on Irish potato production as their source of income. The limited choice of food source/ depending on one food source may also limit food accessibility in case it encounters limitations.

The main question “what are socio-economic factors that affect food accessibility of small scale Irish potato farming households in Rubavu district?”

- 1) Limited sources of income at the household level. Income from Irish potato production done on a small land for small scale farming households is not enough to buy food and cover other household needs and there are very limited other sources of income to upkeep Irish potato income. This income is only used few months after harvesting then finishes.
- 2) Control over income done mainly by men. Control over income in the study area is mainly done by men. This may have an influence on food accessibility in a way that men and women may view food needs in a different way.
- 3) Lack of crop diversification(Irish potato production dependence) is pushing small scale potato farming households to sell a big part of production (even what they would have stored for their future consumption) during the harvesting period to be able to buy some other food. The small income spent on food (as the whole income is not used only for food) is likely to be used for cheap

food items that are affordable and may not be used to buy nutritious food as some of them are expensive such as fishes, red and white meat. With this limited food accessibility, their food security becomes a problem as well.

- 4) Lack of storage skills and capacities. Small scale Irish potato farming households sell a big part of the production at a low price during harvesting periods to avoid potato damage, a few days later the main food source becomes purchase. With price changing and limited income, the ability to buy food becomes limited for these small scale Irish potato farming households.
- 5) Limited options for the food source. Small scale Irish potato farming households are rarely consuming some nutritious food such as fish, meat and sometimes milk may be due to limited income since they are available to the market but may also be due to lack of awareness on food and nutrition security as it may also be due to the household food preference.

6.2 Recommendations

The researcher would like to address the following recommendations to the Rwanda Agriculture Board(RAB) especially to the unit of research and extension, that may contribute to solving a lot of problems found to be factors hindering food accessibility and thus food security of small scale Irish potato farming households in Rubavu district. Skills should be increased through training, Capacity building on different agri-business topics to help farming household members to be able to diversify income for their food accessibility capacity. Recommendations are clearly detailed below:

- The findings highlight and reinforce the need for increased business skills(through the capacity building) which may be a good solution for smallscale farming households in order to be able to diversify income and improve household food access thus food security in Rubavu district. Women being involved in business training may be an opportunity for them to increase their control over income from small businesses and decision making on food purchase since men will remain focused on Irish potato production. These small businesses may also help to increase social networks through women association(self-help women groups) and this may improve food accessibility.
- The introduction of kitchen gardens in each small scale farming household may be a good solution not only for income diversification but also for solving the issue of limited crop diversification which leads to much dependence on purchase. This kitchen garden intervention can also address the issue of control over income dominated by men at household level as most of the time women are the one concerned by vegetable production, this may allow them to increase their access and control to income and be able to buy food for their household food security. This can be done through field demonstration extension services provided in Farmer Field School (FFS).
- Increasing storage skills and capacities would be a good solution for small scale Irish potato farming households to reduce the food shortage period and also to increase income by waiting for the right time to sell potato instead of selling when they are a lot during the harvesting period.
- Increasing processing skills and capacities would be a better solution to avoid the issue of selling a big part of the production at once and also to increase income diversification. As capacities may not be easy to get at the household level, this may be done by mobilising farmers to work in

cooperatives where they combine their shares and may receive advocacy as well as a fund in an easy way than working in isolation.

- Further research should be done on nutrition awareness before any nutrition intervention because it would be better to know what they know about nutrition and what and where is the knowledge gap in small scale farming household to be able to buy and produce nutritious food as some of their expenses seem to be far from nutritious food.

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APPENDIXES

Appendix 1. Irish potato productivity in Season 2014 A; 2015 A and 2016A

| Irish potato productivity in Rubavu district(Tons per hectare) | | | | |
|---|---------------|---------------------|---------------------|---------------------|
| No | Sector | Season 2014A | Season 2015A | Season 2016A |
| 1 | BUGESHI | 32.7 | 35.28 | 36.3 |
| 2 | BUSASAMANA | 29.3 | 32.61 | 36 |
| 3 | CYANZARWE | 23 | 23.5 | 32 |
| 4 | GISENYI | 0 | 0 | 0 |
| 5 | KANAMA | 25 | 30 | 30 |
| 6 | KANZENZE | 25 | 26.58 | 31.2 |
| 7 | MUDENDE | 30 | 30 | 31 |
| 8 | NYAKILIBA | 21.1 | 21.28 | 23 |
| 9 | NYAMYUMBA | 0 | 0 | 0 |
| 10 | NYUNDO | 0 | 0 | 0 |
| 11 | RUBAVU | 0 | 0 | 0 |
| 12 | RUGERERO | 0 | 0 | 0 |
| Average | | 26.58571429 | 28.46428571 | 31.35714286 |

Source: (Rubavu district, 2014; Rubavu district , 2016; Rubavu district , 2015).

Appendix 2. Food Consumption Score

Calculation steps for FCS

- I. Using standard 7-day food frequency data, group all the food items into specific food groups (as shown in figure 13 below)
- II. Sum all the consumption frequencies of food items of the same group, and recode the value of each group above 7 as 7.
- III. Multiply the value obtained for each food group by its weight and create new weighted food group scores.
- IV. Sum the weighed food group scores, thus creating the food consumption score (FCS).
- V. Using the appropriate thresholds (see figure 14, next page), record the variable food consumption score, from a continuous variable to a categorical variable.

Figure 13. Food consumption score sheet 1

WFP's Food Consumption Score

9.1 Food consumption data collection module

The following table presents an EXAMPLE of the Food Consumption module, which should be adapted to each context.

The question should be phrased like the following¹⁰:

*I would like to ask you about all the different foods that your household members have eaten in the last 7 days. Could you please tell me how many days in the past week your household has eaten the following foods?
(for each food, ask what the primary source of each food item eaten that week was, as well as the second main source of food, if any)*

| Food item | DAYS eaten in past week (0-7 days) | Sources of food (see codes below) | |
|--|------------------------------------|-----------------------------------|-----------|
| | | primary | secondary |
| #.1 – Maize | | | |
| #.2 – Rice | | | |
| #.3 – Bread/wheat | | | |
| #.4 – Tubers | | | |
| #.5 – Groundnuts & Pulses | | | |
| #.6 – Fish (eaten as a main food) | | | |
| #.7 – Fish powder (used for flavor only) | | | |
| #.8 – Red meat (sheep/goat/beef) | | | |
| #.9 – White meat (poultry) | | | |
| #.10 – Vegetable oil, fats | | | |
| #.11 – Eggs | | | |
| #.12 – Milk and dairy products (main food) | | | |
| #.13 – Milk in tea in small amounts | | | |
| #.14 – Vegetables (including leaves) | | | |
| #.15 – Fruits | | | |
| #.16 – Sweets, sugar | | | |

Food source codes:

| | | |
|--------------------|---------------------|----------------------------------|
| Purchase =1 | Own production =2 | Traded goods/services, barter =3 |
| Borrowed = 4 | Received as gift= 5 | Food aid =6 |
| Other (specify) =7 | | |

Figure 14. Food consumption score sheet 2

The Food Consumption Score (FCS)

| | Food Items (examples) | Food Groups (definitive) | Weight (definitive) | Sum of consumption frequencies - see data sheet(s) (max value is 7) | Food group scores (a times b) |
|---|---|--------------------------|---------------------|---|-------------------------------|
| | | | a | b | c |
| 1 | Maize, maize porridge, rice, sorghum, millet pasta, bread and other cereals | Main staples | 2 | | |
| 2 | Cassava, potatoes, sweet potatoes, other tubers, plantains | | | | |
| 2 | Beans, peas, ground nuts and cashew nuts | Pulses | 3 | | |
| 3 | Vegetables, leaves | Vegetables | 1 | | |
| 4 | Fruits | Fruit | 1 | | |
| 5 | Beef, goat, poultry, pork, eggs and fish | Meat & Fish | 4 | | |
| 6 | Milk, yoghurt, other dairy | Milk | 4 | | |
| 7 | Sugar, sugar products, honey | Sugar | 0.5 | | |
| 8 | Oils, fats and butter | Oil | 0.5 | | |
| 9 | Spices, tea, coffee, salt, fish powder, small amounts of milk for tea. | Condiments | 0 | | |

The food Consumption Score

(sum of column c)

0

The Food Consumption Group

Typical threshold values

| Food Consumption Score | Profile |
|------------------------|------------|
| 0-21 | Poor |
| 21.5-35 | Borderline |
| > 35 | Acceptable |

As discussed in the Technical Guidance Sheet, these thresholds need to be tested and possibly modified based on the context and dietary patterns of the population in question.

Appendix 3. Household interview guide

Greetings, I am UWERA Blandine a Rwandan lady working in COFAR (Cooperative des Facilitateurs Agricoles de Rubavu), currently studying Master in Management of Development with specialisation in Food Security at Van Hall Larenstein University of Applied Sciences in the Netherlands. In order to complete my study, I am required to conduct research in the area of Food Security. I have therefore decided to assess the factors hindering food security of small scale potato farming households in Rubavu district in this sector.

As you are all working under the CIP program and are small scale potato farmers, I would like to discuss with you in 30 to 45 minutes on the following topics: the source of income, control over income, and food sources. so as to understand the food security situation in this community and design appropriate recommendations to the RAB that is implementing the CIP program.

I therefore kindly request your permission to proceed.

You are free to quite the interview any time you wish.

Respondent Identification

Province:.....

District:.....

Sector:.....

Cell:.....

Village:.....

Name of respondent:.....

Sex:.....

Age of the respondent: a) Between 18-35, b) Between 36-45, c) Between 46-60, d) 61 and over

Level of Education

a) No education, b) Not completed Primary, c) Completed Primary, d) Secondary, e) University

Type of household: Male-headed household ☐ Single-headed household ☐

Q1. What is the size of your land?

1) 1 to 36 acres (less than 2 sols), 2) 37 to 72 acres (2 to 4 sols) 3) 73 acres and above (4.5 sols and above)

INTERVIEW QUESTIONS

Section 1: Irish potato income and other sources of income

Q1. How many times do you grow Irish potato a year?

Q2. How is potato productivity this year compared to three years ago (2016)?

- a)Productivity has increased, b)Productivity is the same, c)Productivity has reduced
- What is the cause of the above answer /why is the situation the way it is?

Q3. Do you sell potatoes during harvest time? Yes/No

- If yes, how is potato price varying these days compared to three years ago?
A)The price is high B)The price is the same C)The price is low
- If No, why?

Q4. Source of income:

1)Farming ☐ 2)Trading☐ 3)Masonry ☐ 4)Livestock☐ 5)Teaching ☐ 6.Other specify.....

Q5.Number of Household members:..... M:..... F:.....

Q6. How many people are working (generating income) in your household?

a)None b) 1-3 c) 4-6 d) More than 6

Q7. How does Irish potato production contribute to access to food in this household?

.....
.....
.....

Section 2: Control over income

Q8. who are involved in potato production, selling and collecting money?

a) Man ☐ b)Woman ☐ c)Children ☐ d)someone else ☐

Q9. Who has control over the potato and other income in your household?

a) Man ☐ b)Woman ☐ c)Child ☐ someone else ☐

Q10. In the following list, what are your household priority needs?

1) Housing ☐ 2) Buy Food ☐ 3) Buy Beer ☐ 4) Savings ☐ 5) Child education ☐
6) Livestock ☐ 7) Buy land ☐ 8)Visit friends ☐ 9)Parties ☐

Section 3: Food consumption score and food sources

Q11: Food Consumption Score

WFP's Food Consumption Score

9.1 Food consumption data collection module

The following table presents an EXAMPLE of the Food Consumption module, which should be adapted to each context.

The question should be phrased like the following¹⁰:

*I would like to ask you about all the different foods that your household members have eaten in the last 7 days. Could you please tell me **how many days** in the past week your household has eaten the following foods?*

(for each food, ask what the primary source of each food item eaten that week was, as well as the second main source of food, if any)

| Food Item | DAYS eaten in past week (0-7 days) | Sources of food (see codes below) | |
|--|------------------------------------|-----------------------------------|-----------|
| | | primary | secondary |
| #.1 - Maize | | | |
| #.2 - Rice | | | |
| #.3 - Bread/wheat | | | |
| #.4 - Tubers | | | |
| #.5 - Groundnuts & Pulses | | | |
| #.6 - Fish (eaten as a main food) | | | |
| #.7 - Fish powder (used for flavor only) | | | |
| #.8 - Red meat (sheep/goat/beef) | | | |
| #.9 - White meat (poultry) | | | |
| #.10 - Vegetable oil, fats | | | |
| #.11 - Eggs | | | |
| #.12 - Milk and dairy products (main food) | | | |
| #.13 - Milk in tea in small amounts | | | |
| #.14 - Vegetables (including leaves) | | | |
| #.15 - Fruits | | | |
| #.16 - Sweets, sugar | | | |

Food source codes:

| | | |
|--------------------|---------------------|----------------------------------|
| Purchase =1 | Own production =2 | Traded goods/services, barter =3 |
| Borrowed = 4 | Received as gift= 5 | Food aid =6 |
| Other (specify) =7 | | |

The Food Consumption Score (FCS)

| | Food Items (examples) | Food Groups (definitive) | Weight (definitive) | Sum of consumption frequencies - see data sheet(s) (max value is 7) | Food group scores (a times b) |
|--|---|--------------------------|---------------------|---|-------------------------------|
| | | | a | b | c |
| 1 | Maize, maize porridge, rice, sorghum, millet pasta, bread and other cereals | Main staples | 2 | | |
| 2 | Cassava, potatoes, sweet potatoes, other tubers, plantains | | | | |
| 2 | Beans, peas, ground nuts and cashew nuts | Pulses | 3 | | |
| 3 | Vegetables, leaves | Vegetables | 1 | | |
| 4 | Fruits | Fruit | 1 | | |
| 5 | Beef, goat, poultry, pork, eggs and fish | Meat & Fish | 4 | | |
| 6 | Milk, yoghurt, other dairy | Milk | 4 | | |
| 7 | Sugar, sugar products, honey | Sugar | 0.5 | | |
| 8 | Oils, fats and butter | Oil | 0.5 | | |
| 9 | Spices, tea, coffee, salt, fish powder, small amounts of milk for tea. | Condiments | 0 | | |
| The food Consumption Score (sum of column c) | | | | | 0 |

The Food Consumption Group

Typical threshold values

| Food Consumption Score | Profile |
|------------------------|------------|
| 0-21 | Poor |
| 21.5-35 | Borderline |
| > 35 | Acceptable |

As discussed in the Technical Guidance Sheet thresholds need to be tested and possibly modified based on the context and dietary patterns of the population in question.

Q12. When are these food sources reliable/what is their availability year-round?

Section 4: Access to the physical market

Q13. How long does it take to reach the physical market(the market for sale and purchase)?

1)1-15min; 2)16-30min; 3)31-45min; 4)46-1hour; 5)More than 1hour

Q14. How do you or your family members get to the market?

1)By foot; 2)Own bicycle ; 3)Own Motorbike; 4)Private car; 5)Public transport

Q15. How do food items(tubers, vegetables, meat, fruits,...) prices vary in the physical market?

Appendix 4. Topic guide for focus group discussion

Greetings, I am UWERA Blandine a Rwandan lady working in COFAR (cooperative des facilitators Agricoles de Rubavu), currently doing a Master in Management of Development with a specialisation in Food Security at Van Hall Larenstein University of Applied Sciences in the Netherlands. In order to complete my study, I am required to conduct research in the area of Food Security. I have therefore decided to assess the socio-economic factors hindering food security (main focus being on food accessibility) of small scale potato farming households in Rubavu district, Bugeshi sector, and Buringo cell.

As you are all working under the CIP program and are small scale potato farmers, I would like to discuss with you in 45minutes to 1hour on the following topics: the source of income, control over income, and food sources so as to understand the food security situation in this community and design appropriate recommendations to the RAB that is implementing the CIP program.

I therefore kindly request your permission to proceed.

You are free to quite the interview any time you wish.

Topic 1. Discussion on how income from potato production affects food accessibility of small scale Irish potato farming households in Rubavu district.

a) I want you to think about potato production in your village from 2013 up to now, and tell us whether it has increased or decreases and the reasons for your judgment.

b) Are people from this community making income from potato production?

If Yes, explain why you think they are making income

If No, explain why you think they are not

c) What are other sources of income in the community?

d) *If question b is Yes*, I would like us to discuss how income from potato production affects the food accessibility of small scale potato farming households in Rubavu district?

Topic 2. How does control over income for small scale potato farming households in Rubavu district affect their food accessibility?

a) Who is involved in Irish potato production at household level?

b) The number of people who can work within a house in the community?

c) How is the income controlled at the household level in this community?

d) What are the priority household needs in this community? Rank (Make your choice) from the first up to the last.

- | | | | | |
|---------------------------------------|--------------------------------------|---|-------------------------------------|---|
| 1) Housing <input type="checkbox"/> | 2) Buy Food <input type="checkbox"/> | 3) Buy Beer <input type="checkbox"/> | 4) Savings <input type="checkbox"/> | 5) Child education <input type="checkbox"/> |
| 6) Livestock <input type="checkbox"/> | 7) Buy land <input type="checkbox"/> | 8) Visit friends <input type="checkbox"/> | 9) Parties <input type="checkbox"/> | |

e) How can control over income influence food accessibility?

Topic 3. How different food sources from small scale potato farming households in Rubavu district contribute to food accessibility?

1) What are the main food sources at the household level in this sector?

2) Are these sources available year-round?

- If No why?

3) Are the physical market available? if so how long does it take for many households?

1-15min; 16-30min; 31-45min; 46-1hour; More than 1hour

4) What are challenges do you face with physical markets in this community?

Appendix 5. The key informant interview guide

Greetings, I am UWERA Blandine a Rwandan lady working in COFAR (cooperative des facilitateurs Agricoles de Rubavu), currently studying Master in Management of Development with specialisation in Food Security at Van Hall Larenstein University of Applied Sciences in Netherlands. In order to complete my study, I am required to conduct research in the area of Food Security. I have therefore decided to assess the socio-economic factors hindering food security (main focus being on food accessibility) of small scale potato farming households in Rubavu district in this sector.

As you are working in this district and you are familiar to the CIP program, I would like to discuss with you in 15 to 30 minutes on the following topics : Irish potato production situation in Bugeshi sector, source of income, food sources, and control over income for small scale Irish potato farming households,so as to understand their food security situation in order to design appropriate recommendations to the Rwanda Agriculture Board.

I therefore kindly request your permission to proceed.

You are free to quite the interview any time you wish.

1. How is potato production in Bugeshi sector compared to 3years ago?
2. Do you see any improvement in sources of income?
 - 2.1. If yes, do you think it has to do with the increase/decrease in Irish potato production?
 - 2.2. If no, what do you think are the causes?
3. How is the situation of food security in small scale Irish potato farming households?
4. What challenges do small scale Irish potato farming households face that may affect their food security?

Appendix 6. Observation Checklist

| What to observe/ to pay attention to | when | How | Comments |
|--|--------------------------------|----------------------------------|----------|
| Behaviours of respondents/ Body language | HI FGD KII | Eye-contact | |
| source of income activities in the community.(such as farms,livestock animals,tailoring machine,...) | HI | Take photos | |
| Food availability(both in houses and at the market) | HI | Take photos | |
| Distance to the physical market | After conducting the interview | Walk to the market while timing. | |

HI: Household interview

FGD: Focus Group Discussion

KII: Key Informant Interview

Appendix 7. The link between type of household, control over income and household's priority needs

[illegible]

Source: fieldwork, 2019

The link between control over income done by the man and priority needs

| Household needs | 1st ranking | 9 points | 2nd ranking | 8 points | 3rd ranking | 7 points | Total points |
|-------------------|-------------|----------|-------------|----------|-------------|----------|--------------|
| 1)Housing | 3 | 27 | 2 | 16 | 0 | 0 | 43 |
| 2)Buy food | 2 | 18 | 1 | 8 | 2 | 14 | 40 |
| 3)Buy beer | 0 | 0 | 0 | 0 | 1 | 7 | 7 |
| 4)Saving | 1 | 9 | 1 | 8 | 1 | 7 | 24 |
| 5)child education | 1 | 9 | 4 | 32 | 0 | 0 | 41 |
| 6)Livestock | 1 | 9 | 1 | 8 | 2 | 14 | 31 |
| 7)Buy land | 1 | 9 | 0 | 0 | 2 | 14 | 23 |
| 8)Visit friends | 0 | 0 | 0 | 0 | 1 | 7 | 7 |
| 9)Parties | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total households | 9 | | 9 | | 9 | | |

Source: fieldwork, 2019

The link between control over income done by woman or both woman+ child and priority needs

| Household needs | 1st ranking | 9 points | 2nd ranking | 8 points | 3rd ranking | 7 points | Total points |
|-------------------|-------------|----------|-------------|----------|-------------|----------|--------------|
| 1)Housing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2)Buy food | 1 | 9 | 1 | 8 | 1 | 7 | 24 |
| 3)Buy beer | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4)Saving | 2 | 18 | 0 | 0 | 0 | 0 | 18 |
| 5)child education | 1 | 9 | 0 | 0 | 1 | 7 | 16 |
| 6)Livestock | 0 | 0 | 0 | 0 | 1 | 7 | 7 |
| 7)Buy land | 0 | 0 | 2 | 16 | 1 | 7 | 23 |
| 8)Visit friends | 0 | 0 | 1 | 8 | 0 | 0 | 8 |
| 9)Parties | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total households | 4 | | 4 | | 4 | | |

Source: fieldwork, 2019

The link between control over income done by both Man+Woman and priority needs

| Household needs | 1st ranking | 9 points | 2nd ranking | 8 points | 3rd ranking | 7 points | Total points |
|-------------------|-------------|----------|-------------|----------|-------------|----------|--------------|
| 1)Housing | 2 | 18 | 1 | 8 | 1 | 7 | 33 |
| 2)Buy food | 2 | 18 | 2 | 16 | 0 | 0 | 34 |
| 3)Buy beer | 0 | 0 | 0 | 0 | 1 | 7 | 7 |
| 4)Saving | 1 | 9 | 2 | 16 | 2 | 14 | 39 |
| 5)child education | 0 | 0 | 0 | 0 | 2 | 14 | 14 |
| 6)Livestock | 0 | 0 | 0 | 0 | 1 | 7 | 7 |
| 7)Buy land | 1 | 9 | 2 | 16 | 0 | 0 | 25 |
| 8)Visit friends | 1 | 9 | 0 | 0 | 0 | 0 | 9 |
| 9)Parties | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | |
|------------------|---|--|---|--|---|--|
| Total households | 7 | | 7 | | 7 | |
|------------------|---|--|---|--|---|--|

Source: fieldwork, 2019

Figure 15. Some food items available to the physical market



Source: Own source, 2019