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The contribution of Land Use Consolidation policy to food and nutrition security of women farmers

- A case study of the farmers involved in potato farming,
food availability in Nyabihu district, Rwanda

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DEDICATION

This work is dedicated to my daughter, Atete Nissi Maeva.

Abstract

The overgrowing population in Rwanda and the persistent fragmentation of households' plots induced the land use designs to be restructured. The Government of Rwanda introduced the Land Use Consolidation (LUC) policy to manage land fragmentation, and shift from subsistence to a market oriented agriculture. This thesis explores the contribution of LUC policy to food and nutrition security of women farmers, a case study of the farmers involved in potato farming in Nyabihu district, Rwanda. The empirical data was collected through a variety of qualitative research methods during field work in Nyabihu district. These data were analyzed through the agriculture – nutrition conceptual framework. Stories on how women farmers in the district perceived the LUC policy Vis a Vis their food security are the central pillars of the thesis discussion. However, the focus of analysis is on the food production and women's empowerment pathways. Further, the concept of institution helped to explore the roles played by different institutions in the adoption of LUC policy in this thesis.

The findings of this thesis revealed that access to inputs, trainings, and a stable market are the most important institutions in the adoption of LUC policy in Nyabihu district. The findings also revealed that LUC improved the availability of food in this region through the increase in potato productivity. However, the food and nutrition security at the household level was not achieved due to the high cost of potato production. LUC had positive impacts on well off women farmers in this district than the poor ones; its implementation plan was a bottom up approach and women farmers participated in all decision making. LUC also helped many women farmers to shift from subsistence to business farming. Therefore, they were able to have access on money and participate in other off-farm activities.

Key words: Land Use Consolidation, Food and Nutrition Security, Institution, Women farmers, Potato, Nyabihu, Rwanda.

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Acronyms

CFSVA	Comprehensive Food Security and Vulnerability Analysis
CIP	Crop Intensification Program
DFID	Department of International Development
FAO	Sustainable livelihood Framework
FG	Focus Group
FIVIMS	Food insecurity and Vulnerability Information and Mapping Systems
GoR	Government Of Rwanda
KI	Key Informant
LTR	Land Tenure Regularization
LUC	Land Use Consolidation
MINAGRI	Ministry of Agriculture and Animal resources
MINICOM	Ministry of Trade and Industry
NGOs	Non-Government Organizations
RAB	Rwanda Agricultural Board
SLF	Sustainable Livelihood Framework
UNICEF	United Nations of International Children’s Emergency fund
WSFS	World Summit on Food Security

1. Introduction

The economy of Rwanda is to a large extent agrarian as 33% of the Gross Domestic Product (GDP) comes from the agriculture sector and around 70% of the working population are employed in agriculture (GoR, 2015). Coffee and tea are the major crops for exports while potatoes, maize, cassava, sweet potatoes, plantains and beans are mainly grown for local consumption (Giertz et al., 2015, World Bank, 2011). Both women and men engage in agriculture activities; however, 82 per cent of women work in the agriculture sector compared to 63 per cent of men (CFSVA, 2015). In rural areas, women outnumber men (53 per cent). Households headed by women are more likely to be food insecure than those headed by men (GoR, 2015). This implies that Rwanda's agriculture development, economic growth and food security can best be strengthened and accelerated by building on women's contribution (FAO, 2011).

Agriculture in Rwanda is mainly performed on the subsistence level with 70% of cultivated land covered with food crops (GoR, 2015). 80% of the food consumed in Rwanda comes from the agriculture sector. The average farm size is estimated at 0.5 ha, which is too small to earn a living (Ibid, 2015). To reduce poverty and improve food security, the government of Rwanda ascertains that there is a necessity to shift from subsistence agriculture to modern farming practices. Therefore, the Government of Rwanda encourages its population to modernize farming practices through land use consolidation (LUC), increased use of fertilizers and improved seeds (Kathiresan, 2012).

LUC is presented as the unification of land parcels with an estimated easier and productive farming than the fragmented plots (Hughes et al., 2016: 12). In Rwanda, land fragmentation is associated with increased population, which impacts negatively on the size of land holding and the effectiveness of the land. Therefore, LUC has been implemented since 2008 by the Ministry of Agriculture and Animal Resources (MINAGRI) to improve rural livelihoods and the country's food security situation (Official Gazette, 2010). It is a large-scale initiative that has been implemented across 30 districts in Rwanda (Nyamulinda et al., 2014). In order to meet its target, the Ministry of Agriculture and Animal Resources (MINAGRI) determines based on the agro-ecological potential, the priority crops to grow in each district. Priority crops in the consolidated areas include beans, potatoes,

cassava, maize, rice, soy, wheat, and banana. Among the selected crops, potato comes as the second most important food crop in Rwanda after Cassava (Gatemberezi and Mulwa, 2015).

The Rwandan potato production is continually increasing and represents a significant contribution to food security, nutrition, employment and improvement in socio-economic status of rural communities (Gatemberezi and Mulwa, 2015:32). Its production is mainly located in the Northern and Western provinces in Rwanda (Ferraria *et al.*, 2017). The five administrative levels in Rwanda are Province, district, Sector, Cell and Village. Nyabihu, Musanze, Rubavu and Burera districts, due to their favourable climatic conditions, are the four most potato productive districts in Rwanda. However, because of the low quality seed use by farmers and low soil health, yields remain low with 11.6 t/ha (Ferraria *et al.*, 2017:1). Nyabihu district alone produces almost 45% of the total annual potato consumed in the country (Gatemberezi and Mulwa, 2015). Its sectors Bigogwe, Kabatwa, and Jenda have been selected purposively in this study as places where agriculture is the main activity, with potato as the dominant farming activity. This study will analyze the contribution of LUC to the food and nutrition security in Nyabihu district.

1.1. Problem Statement

Rwanda is challenged with the problems related to high demographic pressure, low level of farm effectiveness, severe land scarcity (Bizoza & Havugimana, 2013). As a result, securing food for the growing population from the limited and degraded soil of Rwanda poses a challenge. Land fragmentation and mixed cropping were considered as a coping strategy for securing food to the population (Ibid, 2013:4). However, the farm fragmentation and the mixed cropping are not counterproductive to maximize farmers' production output, because of the lack of efficient inputs (improved seeds and chemical fertilizers).

For this reason, the government of Rwanda introduced the land use consolidation program to promote agricultural transformation and improve the lives of Rwanda's people in rural areas (Official Gazette, 2010). With a national density of 415 habitants per square meter, MINAGRI envisaged that the focus on farm effectiveness and increase of production of selected crops in the land use consolidation policy is paramount to food security (GoR, 2015). Therefore, land use consolidation introduced new ways of farming: firstly, through the introduction of mono- cropping systems of farming; and secondly, through the use of improved seeds and chemical

fertilizers (Kathiresan, 2012). However, it is not explicit on the contribution created by the LUC policy to the food and nutrition security of the population. Therefore, this research seeks to explore and understand the contribution of land use consolidation policy to the food and nutrition security of women farmers. A Case study of the farmers involved in potato farming, food availability in Nyabihu district, Rwanda.

1.2. Thesis aim, objectives and research questions

The aim of this research is to explore and understand the contribution of Land Use Consolidation (LUC) policy to the food and nutrition security of women farmers involved in potato farming activities in Nyabihu district. The specific objectives are as follow:

- Objective 1: To identify the key factors that motivate women farmers in Nyabihu district adopt LUC policy.
- Objective 2: To evaluate the contribution of LUC to improved food and nutrition security of women farmers in Nyabihu district.
- Objective 3: To determine how LUC empowered women farmers in Nyabihu district.

In exploring the research objective 1, I hope to determine and the role of different institutions in the adoption of a policy for rural development. From the objective 2, I hope to determine farmers' experience of LUC policy; how this policy supported them achieving or not achieving the food and nutrition security. Lastly the objective 3 will help to evaluate the opportunities or risks for women farmers to adopt this policy.

1.3. Significance of the study

In order to complement the previous studies on LUC in Rwanda, this study will investigate the contribution of LUC policy to the food and nutrition security of women farmers in Nyabihu district. From the various readings on LUC so far, very little is known on the impact of LUC on women's food and nutrition security in rural Rwanda. Most of the studies on LUC were focused on its implementation; for instance, Rubanje (2016) explored the link between land use, tenure and land consolidation in Rwanda, whilst Bizosa and Havugimana (2013) highlighted the factors that influenced the adoption of LUC at the household level.

The output of this study will be significant to women farmers in Nyabihu district as their views on the LUC policy to their food and nutrition security

status will be presented explicitly in this report. Furthermore, different agriculture organizations and stakeholders in the implementation of LUC will also use the information gathered in this thesis as a reference material for improving their performance. There are important knowledge gaps around how well LUC policy can contribute to food and nutrition security of women farmers. I aim to contribute to addressing these gaps in this thesis.

1.4. Scope of the study

1.4.1 Study area

In order to carry out this research on the contribution of LUC policy to the food and nutrition security of women farmers, I identified the province with the lowest rate of food secure households in Rwanda. The statistics shows that the western province is more food insecure and is home to more than a third of all food insecure households. I chose Nyabihu district with 39% share of food insecurity households. However, this district is among the best in Rwanda in terms of fertile soil. The focus in this study is also on the potato crop as one of the priority crops in land use consolidation policy; but also as the crop that dominates other food crops in terms of production in Nyabihu district. I took data in 3 sectors Bigogwe, Kabatwa and Jenda qualified to be the main producers of potato in Nyabihu district. The focus was on women farmers as they play significant contribution in potato production in Nyabihu district. However, I also talked to few men as a control group in this research.

1.4.2 Women Farmers

Women farmers in this study are women that adopted LUC policy and has experience in potato farming activities in Nyabihu district. This selection was due to the fact that I needed to get their views about the potato production per ha in different years. Also, women farmers in this study are farmers who defines agriculture as their main source of income. In Nyabihu district, female farmers contribute more than male farmers in the overall potato production (Nyabihu, 2013). However, the market size determines the management of income from the potato sale. In Nyabihu district the larger sales are handled by men in most of the cases, whereas small sales are handled by women (Nyabihu, 2013).

1.5. Outline of the study

The study is organized into six chapters, namely:

1. Introduction of the study

This chapter presents the problem statement, objectives and the research questions that guided this study. It also explains the significance and justification for conducting the study and its limitations.

2. Understanding the context

This chapter provides detailed presentation of the study area and its context in relation to agriculture in general and potatoes farming in particular. It also provides information about the LUC policy and the food and nutrition security status in Nyabihu district. I aim to provide key conceptual issues for understanding the contribution and the influence of LUC to the food and nutrition security of women farmers.

3. Theories and concepts

This chapter provides a detailed information on concepts used to view at the empirical material.

4. Research methodology, design and process

Outlines materials used, describes the study area and the methods which were used to collect and analyze data.

5. Empirical findings and Discussion

In this chapter, I present respondents' perceptions and experiences on the contribution of LUC policy to the food and nutrition security of women farmers and discusses on the findings in relation to the concept of food and nutrition security and institution. This chapter is divided in 3 sections categorized according to how the research objectives of this study were responded.

6. Concluding remarks

In this chapter, I made conclusion on the major findings of the study and describe suggestions for future policy and development interventions. In this chapter, I also made a reflection on the methodological approach and theoretical framework used.

2. Understanding the context.

This chapter provides background information about the agriculture sector, women empowerment, food and nutrition security, land use consolidation policy in Rwanda with emphasis on these situations in Nyabihu district.

2.1 The Agriculture sector in Rwanda and in Nyabihu district

Rwanda is primarily rural in its landscape with 98% of the total land area categorized as rural and around 54% classified as arable (Nash & Ngabitsinze, 2014). Rwandan agriculture presents a strong dependence on rainfalls and vulnerability to climate shocks (GoR, 2015). The low-level use of water resources for irrigation makes seasonal agricultural production unpredictable. Rwanda has an acidic soil on sloppy areas, this makes the soil unsuitable for high productivity of food crops (Giertz et al., 2015).

In Nyabihu district, the annual average rainfall is 140mm and peaking occasionally to 150mm in March and May. With a mean temperature varying between 10°C and 15°C, the climate is advantageous to rich and diverse agriculture production. The Agro-ecological conditions are very diverse and include rich, volcanic soils (Gatemberezi and Mulwa, 2015). However, the soils in Nyabihu are vulnerable to erosion and 74% of its population depend on subsistence agriculture for a living and the majority of households are smallholders (Nyabihu, 2013). The main food crops that are grown in Nyabihu are potatoes, maize, pyrethrum and beans; with potatoes representing 83, 7% of total agriculture production (Nyabihu, 2013).

2.1.1. Agricultural Seasons in Rwanda

The agricultural year in Rwanda has three seasons: Agricultural Season A starts in September of a calendar year and ends in February of the following calendar year. Agricultural Season B starts in March and ends in June of the same calendar year. Agricultural Season C starts in July and ends with September of the same calendar year. These seasons can sometimes be subject to climate uncertainties and present some differences from one province to another (NISR, 2015:1). Below is the agriculture seasons calendar for Nyabihu district.

Table 1: Season Calendar for Nyabihu district

Season	Month	Activities
Season A	September	The first 2 weeks they start weeding their fields, the following weeks they are involved in watering the plants and diseases control.
	October	Diseases control. They are also involved in other off- farm activities that contribute to their income generation such as trade jobs and livestock (mostly women) construction and casual labor (mostly men).
	November	Diseases control, crop maturing and getting ready for the harvesting period (looking for sacs, baskets and some spaces to keep their harvest before taking them to the market and preservation for household consumption).
	December	During this period farmers are busy harvesting and this is when the biggest sales activities occur. During this period most of time farmers are solely involved in farm activities.
	January	The sales keep on going and at the same time they start getting ready for the next season.
	February	Land preparation (Bush clearing), preparing the ground for ploughing and they start sowing seeds.
Season B	March	Start weeding their fields, the following weeks they are involved in diseases control and also the crops are maturing.
	April	Crop maturing, continuous disease control
	May	Harvesting and sales. They also start preparing for sowing seeds if the soil is still in good condition, if not they rotate Irish potato with pyrethrum or vegetables depending on the location.
	June	Start weeding some of the fields, watering the crops, disease control
Season C	July	During this period, they harvest crop but the sales are not huge compared to the ones in December and May due to the climate condition.
	August	Land preparation (Bush clearing), preparing the ground for ploughing and they start sowing seeds.

Source: Women farmers Interviews (June, 2018)

2.1.2. Potato production in Rwanda and in Nyabihu district

Potato is classified by MINAGRI as a priority crop for development. With potato, it was proven that the agriculture sector transformation can take place rapidly (Crissman, 2002). Potato is a crop produced intended to be used as food in Rwanda, especially for urban areas. The annual

consumption is about 125 kg per person. With a shorter production cycle, it takes only 4 months between sowing and harvesting. The Potato grows better in light soils and adapts to a range of climates. The highest potato production in Rwanda comes from Nyabihu district, followed by Musanze district with production of 291.5MT or 44.5 % and 178.045 MT or 27.28% respectively (Gatemberezi and Mulwa, 2015).

These two districts produce 2.3 % of national level production (Gatemberezi and Mulwa, 2015:32). Improving potato productivity and reducing poverty is a major policy objective for the Rwandan Government because this crop has a significant role as a food (Gatemberezi and Mulwa, 2015). While several efforts were undertaken by the Government of Rwanda to increase production food crop, potato still faces a declining trend in yield. The declining of potato production is due to several factors, such as, scarcity of arable land, reduction of soil fertility and the rapidly increasing demand for food due to a high rate of population growth (Ibid, 2015: 34).

2.1.3. Agriculture commercialization in Rwanda

Rwanda made considerable effort to transform the agriculture sector. This effort is made for poverty reduction, food security as well as for the overall economic growth (Ingabire. C et al., 2017). The transformation in the agriculture sector is mainly considered as shifting from subsistence farming, characterized by low productivity to a business-oriented production system. It is accompanied by using improved inputs (seeds and fertilizers), which are central to higher agricultural production for food self-sufficiency and commercialization (Ingabire. C et al., 2017:3).

Agricultural commercialization in Rwanda is characterized by an individual or a household's economic transactions with others (Von Braun *et al.*, 1991). Transactions are related to some harvests being directed to market not for subsistence purposes. They are also related to inputs; showing that a farm's production technology depends to a certain extent on external inputs not the ones harvested in the farmers plots (Von Braun *et al.*, 1991). Transactions in agricultural sector are done with the purpose to allow an increase in a household or individual's income. They may also improve the nutritional situation because they allow the individuals to have access to a variety of food. It is important to mention that in Rwanda, the access to market and the realization of food preferences are achieved through strong market institutions and strong pricing policy (Von Braun *et al.*, 1991).

2.1.4. Driving forces of the agriculture commercialization process

The agricultural sector is responsible for mapping out strategies on which to maintain broad self-sufficiency in basic food and at the same time be able to expand export earnings by promoting Coffee, Tea and other horticultural products, thus increasing yield per acre (IPAR, 2009:10). Shifting from subsistence to commercial agriculture has been on the Rwanda's agriculture development agenda since 2000. Working in the footsteps of this agenda, the government of Rwanda through its Ministry of Agriculture and Animal Resources introduced the crop intensification program (CIP) in order to increase the agricultural produce per ha and satisfy the food demand of its population.

Efforts have been made to facilitate access to inputs, access to market and also creation of farmers' organizations. Some crops were identified with high priority than others; potato crop is among the prioritized crops. However, poor access to institutions, public infrastructure and lack of incentives affected the farmers' behavior towards commercialization (RAB *et al.*, 2017). The decision to adopt a profit-oriented agriculture is influenced by gender, access to institutional and physical infrastructures, land size, education, income and training (RAB *et al.*, 2017).

2.1.5. Potato commercialization in Nyabihu district

The potato value chain in Nyabihu district is simplified to inputs, production, harvest and sale as there is very limited storage capacity and no processing industries to take care of the farmers' harvest (Nyabihu district Report, 2013). Potato commercialization is handled exclusively by the private sector: small traders who buy directly from potato producers and sell to larger, urban-based traders. The small traders collect potatoes in areas where accessibility is difficult on steep hills and bad roads (Niyitanga E., 2017). In order to improve the trade flows, Potato growers in Nyabihu district are encouraged to join cooperatives so that they can build potato collection centers and storage facilities. These will help to undertake collective activities for sale and transportation of the harvest (Ibid, 2017).

These collection centers are managed by the leaders of the farmers' cooperatives, monitored by the Ministries of local government, trade, agriculture and security organs as well as the districts' authorities. Often, the farmers involved in the potato production, traders, producers, Government entities and transporters, agree on a fixed price per kilogram for Potato (Niyitanga E., 2017). Nowadays, the production of potato crop increased incredibly; and this, negatively influenced the price of potato.

In order to cope with the potato price fluctuation, dealers struggle to stabilize the prices and avoid losses to farmers by regulating the quantity of potato harvest to supply to the market. 480 tons per day is considered as the maximum quantity of potatoes taken to the market (Ibid, 2017). The estimation of the supply quantities was established based on the amount of production available in each district and to avoid the over flow of potato produce at the market.

Despite the aforementioned challenges, the 2012 Comprehensive Food Security and Vulnerability Analysis (CFVA) noted that markets are functioning relatively well and food is flowing easily within and outside the country thanks to the well-connected road network and market infrastructure (CFSVA, 2012) However, for the twelve sectors of Nyabihu district, there are only five markets. The trade of small articles and the trade of agricultural products are predominating in Nyabihu district. The majority of commercial operators are not legally recognized. Fewer have an official authorization document to operate as traders (Nyabihu, 2013:15).

2.2 Women Empowerment

In our time, the notation of empowerment is one of the commonly discussed terms in the discourses concerning women's relation to development. Its importance lies not only in the promotion of women's status but also in its close relation to the development of society in general and the women in particular.

According to Dandona (2015), empowerment can be viewed as means of creating a social environment in which one can make decisions and make choices either individually or collectively for social transformation. Importantly, the process of empowerment will not only be able to enrich women's skills and access to productive resources, but also succeed in enhancing quality, dignity and work in the society status. Women empowerment is therefore considered as the process of enabling or authorizing individual to think, take action and control work in an autonomous way. It is the process by which one can gain control over one's destiny and the circumstances of one's live (Dandona, 2015). Empowerment includes control over resources (physical, human, intellectual and financial) and over ideology including beliefs, values and attitudes (Ibid,2015).

In Rwanda women empowerment is defined as the process through which women are given the ability to expressively participate in the economic, social, and political lives of their societies. Empowerment of women permits them to take control of their own lives, set their own agenda, organize to help each other and make demands on the state for support and on the society itself for change (GMO, 2018:9).

The government of Rwanda prioritized the agricultural sector and women in agriculture as the majority of people engaged in agriculture are women more than men. Since women are over represented in agriculture, one key achievement in this sector is the mainstreaming of gender equality and women's empowerment across all intervention. In Rwanda and in Nyabihu district efforts to empower women in agriculture may be grouped into the following categories: access to and control over assets (mainly land), use of inputs and access to extension services, participation in markets and agricultural institutions, including farmer cooperatives (GMO, 2018:12).

2.3 Land Use Consolidation Policy

LUC policy was implemented for the first time in 2008 by the Government of Rwanda, through the Ministry of Agriculture, as part of the Crop Intensification Program (CIP). Different stakeholders are involved in the implementation of LUC in Rwanda. These include: the Ministry of Agriculture and Animal Resources, Ministry of Local Government, Ministry of Infrastructure, Rwanda Agriculture Board, NGOs, Private Sector, Province and district authorities, local farmers (Mbonigaba and Dusengemungu, 2011).

The LUC policy was developed by the Ministry of Agriculture and Animal Resources. However, the technical plan is drawn by the Ministry's implementing agency, the Rwanda Agriculture Board; the implementation of the policy is done in conjunction with the local administration authorities (Kathiresan, 2012). MINAGRI determines, based on the agro ecological potential, the priority crops and estimates the area available for consolidation in each district (Ibid, 2012). The agronomists and farmer promoters in districts mobilize farmers for growing the priority crops identified by MINAGRI as best suited to local conditions (Ibid, 2012). Priority crops include beans, potatoes, cassava, maize, rice, soy, wheat, and banana (Mbonigaba and Dusengemungu, 2011). Crops like Irish potato, cassava, beans and maize have shown a competitive advantage with a

positive trade balance, according to the recent cross border trade study (MINAGRI, 2010).

2.3.1. Women land use and land rights

Securing women's land rights in the case of Rwanda can be understood in this research as additional rights given to women since inheritance law of 1999 allowing access to land and property equally with their brothers and spouses (Mukahigiro, 2015:13). The government of Rwanda recognizes the challenge of land ownership and introduced the Land Tenure Regularization (LTR) as a system of land registration program. The program started in November 2008 and ended in 2013 registering all land in the official land registries. It provided land titles to all rightful claimants, women and men, without any discrimination based on sex; children are also included as legal beneficial (Mukahigiro, 2015:13). This was done to ensure that all household members enjoy equal rights to land use (Minagri, 2010:7).

Land Tenure Regularization (LTR) program has resulted to the formal land ownership by women. The study of gender desegregated land tenure regularization in 2012 showed that 81% of land was owned jointly by men and women; 11% owned by only women and 6% only by men (Dillingham, 2014 cited by Mukahigiro, 2015:13). Linking land rights and women roles in agriculture sector in Rwanda is argued to play a major role in delivering food security; because lack of rights on land reduces the ambition to invest in long term land use plans (Rubanje, 2016). One of the techniques to change land use practice in Rwanda is the promotion of Land use consolidation as Guo et al. (2014 cited in Rubanje, 2016:9) explained that land use consolidation makes land more capable for higher production of crops; it improves crop yields and is more likely to ensure food security.

2.3.2. Land Use consolidation in Nyabihu district

In Nyabihu district the introduction of LUC came as remedy to the degradation and fragmentation of soil due to its geographical location and the big number of population (295,580 inhabitants) on a very limited land. Nyabihu district has access to organic fertilizer because it has potential as livestock area. However only 14% of households use organic fertilizer in their plots and 12.7% of households use improved seeds which are expensive and sometimes inadequate to the climate in this area, particularly for potato seeds (Nyabihu district Report, 2013).

In Nyabihu district, 61.6% of households use inorganic fertilizers in order to increase their production per ha and 59% of households use pesticides in order to deal with crops diseases. LUC was introduced in this area in order to properly manage the small land and increase the production per hectare so that farmers get the food to consume and also food to take to the market. More importantly, the promotion on the use of improved seeds in LUC policy in Nyabihu is principal to the increment of farmers revenue and improve their food and nutrition security (Nyabihu district Report, 2013).

LUC policy in Nyabihu district empowered women farmers. The new land law (2005 Rwandan Land law) contributed to equal right of land for men and women in enhancing food production; therefore, women had access to land. Land is used by women farmers in Nyabihu district as collateral to access financial institution. However, in Nyabihu district women distribution of access loans, is evaluated to 0.3 % compared to 1 % of men (Nyabihu, 2013). Customary land tenure systems in Rwanda are seen as purely individual by nature frequently by a man (Musahara & Huggins, 2005) , however women play important roles in agricultural production. The policy of Land use consolidation helped farmers to be grouped in cooperatives for better management of the distribution of LUC subsidies. Cooperatives empowered women farmers in Nyabihu district economically and enhanced their confidence in bargaining on the price of their production (Nyabihu district Report, 2013).

2.4. Food and nutrition security status in Rwanda and in Nyabihu district

In Rwanda the majority of food consumption comes from agriculture. Food sustainability is envisioned as an ongoing process of identifying and striking a balance between agriculture's social, economic and environmental objectives, and between agriculture and other sectors of the economy (FAO, 2014: P 13). The Government of Rwanda envisions that this will be possible if small scale farmers are supported with crucial tools and seeds, while expanding irrigation and supporting environmentally sustainable production methods to tackle the endemic problems of soil erosion in the country (Kathiresan, A., 2011).

Food and nutrition security improved in Rwanda and most parts of Rwanda are witnessing the improvement. Rwanda has committed at least 10% of its national budget to agriculture and this almost doubled agriculture production between 2000 and 2012 (CFSVA, 2015). Food is generally

available in markets, and Rwanda has a notable number of markets (about 450), with at least one main market per district (CFSVA, 2015: 25). As the market dependence for foods is high, increasing food prices have a significant impact on the food security of people with low purchasing power (CFSVA, 2015). Therefore, rural households in Rwanda, especially in the western part of Rwanda claimed to have difficulties in accessing food at the markets (Ibid, 2015). In rural areas three to four households are more likely to be food insecure due to the low purchasing power of other staple food; not the one cultivated in their areas (Ibid, 2015).

In Rwanda, food insecure households are typically in rural areas and they are dependent on daily agricultural labor, agriculture or external support for their livelihoods (CFSVA, 2015). By comparison with food secure households, food insecure households working in agriculture have less livestock, less agricultural land, grow fewer crops, are less likely to have a vegetable garden, have lower food stocks and consume more of their own production at home (CFSVA, 2015:62). High percentages of households with unacceptable food consumption are especially located in the rural areas of Western Province bordering Lake Kivu (42%) and alongside the Congo Nile Crest and in several other districts of Southern Rwanda (NISR, 2014c).

According to CFSVA (2015), having a higher number of livelihood activities is significantly associated with better food consumption and food security in Rwanda. Also, the education level of the household head is strongly related to the food and nutrition security status of the household; very few household heads with secondary education are found among the food insecure households (Ibid, 2015). The province where in 2012 had the highest proportion of households with relatively acceptable levels of food consumption was Kigali (CFSVA, 2012).

In Nyabihu district, the number of women (53 %) outnumbered the number of men (47%) and 53.2% of households are headed by women. Also, 62.5% of households have children less than 7 years (Nyabihu, 2013) and 39% of households' food insecure in Rwanda live in Nyabihu (CFSVA, 2015). Nyabihu district is densely populated which makes their soil more fragmented and therefore impeding the agricultural production and their food and nutrition security in general. The rate of malnutrition of children under 5 years is also high (51%) with high rate of stunting children (Ibid, 2015).

2.5. Impact of LUC on food production

The LUC has a growth effect on the productivity of priority crops as it implicitly promotes the extension services and the use of improved inputs by farmers (Kathiresan A, 2012). The increase of land area under cultivation of priority crops and the rise in yields were significant mostly after the implementation of LUC (GoR, 2015). Since its introduction in 2008, LUC is always associated with the significant increase in food production on the related consolidated priority crops by 5 folds. Soybeans, potatoes and beans by about 2 fold, cassava and wheat by about 3 folds and rice by 30% (Mbonigaba & Dusengemungu, 2013).

LUC has been the main driving factor of the success of the implementation of CIP and this improved considerably the food and nutrition security status in the country. With regard to the daily energy availability, in the year 2007, out of 30 districts, 21 were qualified as vulnerable to food insecurity but this changed drastically in the year 2011, when all districts were considered food secure basing on the criteria above (Mbonigaba & Dusengemungu, 2013).

2.6. The role of women in agriculture production in Rwanda

After the 1994 genocide in Rwanda, women were 70 percent of Rwanda's population since men, who have been the sole breadwinner of their families, were either deceased or disappeared. To overcome this situation, women started to take role of men, becoming the breadwinners by cultivating their lands (Nzayisenga, 2014:3). However, food insecurity amongst rural women and children continued to elevate, threatening the development of rural populations who are also vulnerable to diseases (Ibid, 2014). For these reasons, the Rwandan government launched extremely ambitious programs to rebuild the country, including programs related to agriculture, resettlement and poverty alleviations, all of which have major implications for the food security of the population. Those programs were particularly interesting to boost women's capacity to contribute to the rural development, since women outnumbered men substantially right after the genocide in the agricultural sector (Nzayisenga, 2014:4).

In Rwanda, rural women play key role in agriculture sector by working in production of crops from the soil preparation to post-harvest activities (Minagri, 2010). Their activities also include tending animals, processing and preparation of food. It is estimated that in Rwanda, women do most of agriculture work and they provide between 60% and 80% of agriculture labour (Ibid, 2010). However, the asymmetries in ownership of access to

and control of livelihood assets (land, water, energy, credit, knowledge, and labor) affect negatively women's food production in most of the cases in Rwanda (Nzayisenga, 2014: 9).

In developing countries securing women's access to land is the basis of sustainable food production, because women get power to decide regarding the needs of food, mainly what crops to grow and they are motivated to invest in sustainable agriculture by using selected seeds and technologies; and this is also the case in Rwanda (IFAD, 2010).

3. Theories and Concepts

This chapter provides a detailed information on the concept of food and nutrition security and the concept of institution used to view at my empirical material. It also details the linkage between the institution concept and the food and nutrition security concept as the base of this research.

3.1 Food and nutrition security definition and background

In the mid-1970s scholars and practitioners acknowledged that the term food security has been actively used in many aspects of people's livelihood to signify many things. Food security was defined as "access by all people to enough food to live a healthy and productive life" (FAO, 2006). This definition was afterwards magnified by FAO to include the nutritional value and food preferences. Thus the definition agreed upon at the World Food Summit in 1996 is, that " food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life" (FAO,2006). Nutrition security means access by all people at all times to adequate utilization and absorption of nutrients in food, in order to be able to live a health and active life (Ibid, 2006).

3.1.1 Drivers of food security

Food security as a concept is a multifaceted issue that has lots of contributing factors to suitable nutrition and food produced in a sustainable, social and cultural purposefulness (FAO, 2014). The definition of the 2009 World Summit on Food Security (WSFS) mentioned above is used in this study. Therefore, four main dimensions of food security are identified: availability, access, utilization and stability of food (FAO, 2008).

Availability refers to sufficient quantities of available food, consistently to individuals, from domestic production or import. This explains that at the household level, there should be capacity to produce enough food, or to have resources to purchase foods (Verhart *et al.*, 2016).

Access refers to each household having physical, social and economic access to sufficient resources (capital, labor, knowledge) to obtain appropriate foods for a nutritious diet (Verhart *et al.*, 2016).

Utilization refers to an individual's dietary intake and nutritional needs. It also covers the quality of the diet: food processing, food storage and

decisions around what food is purchased, prepared and consumed and its allocation in the household (Verhart *et al.*, 2016).

Stability refers to a reasonable level of stability in food supply, access and utilization. This evolves two main factors: First, the vulnerability which is the probability of a household becoming food and nutrition insecure after a shock. Second, the resiliency defined as the time needed for the household to get back to its food and nutrition status as it was before the shock (Pieters *et al.*, 2013: 4).

3.1.2 Tools to analyse food and nutrition security

Food and nutrition security is a complex concept that no one indicator can adequately describe the food security status at the individual, national or international level. Therefore, conceptual frameworks are tools to help us comprehend the linkages between different dimensions of food security in a simplified schema (FAO, 2008).

The importance and the use of a well-designed framework is that it assists in the interpretation of food security indicators by identifying appropriate entry points for monitoring changes over time and adjust interventions accordingly (FAO, 2008). Therefore, in this study, the adoption of LUC policy in Nyabihu district have been used as an entry point to draw on conclusion on the food security of women farmers in this district.

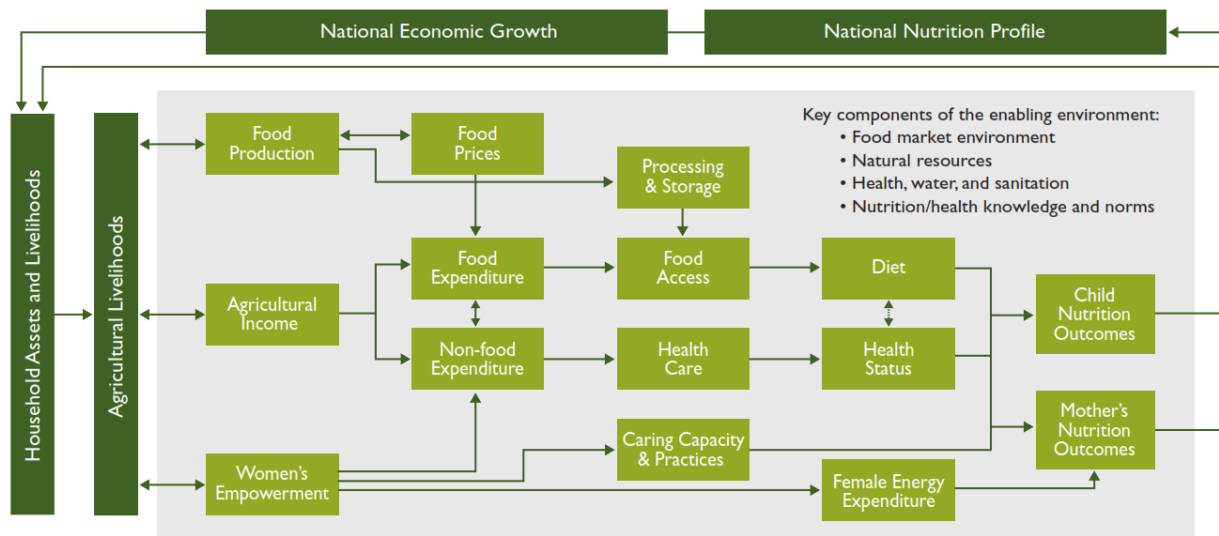
Given the complex nature of the food and nutrition security concept, different conceptual frameworks were elaborated to help understand linkages among various food security dimensions, while also explaining linkages with underlying causes and outcomes, as well as related concepts and terms (FAO, 2008). There are many types; UNICEF Framework, SLF (Sustainable livelihood Framework) developed by DFID (Department of International Development), FAO-FIVIMS (Food insecurity and Vulnerability Information and Mapping Systems) framework and pathways between agriculture - nutrition conceptual framework.

This study draws on the pathways between agriculture – nutrition conceptual framework to analyze the contribution of land use consolidation to the food security of women farmers in Nyabihu district. Below is the detailed description of this framework.

3.1.3 Pathway frameworks linking agriculture and nutrition

Agricultural development is seen as the main pathway to contribute to food and nutrition security (Verhart *et al.*, 2016). Different reviews indicated a need for a well-designed study to understand how agriculture interventions can connect the potential to improve nutrition entirely (Herforth and Harris 2014). Below, is the simplified diagram showing the ways to use agriculture to improve nutrition.

Figure 1: Conceptual pathway between Agriculture and Nutrition

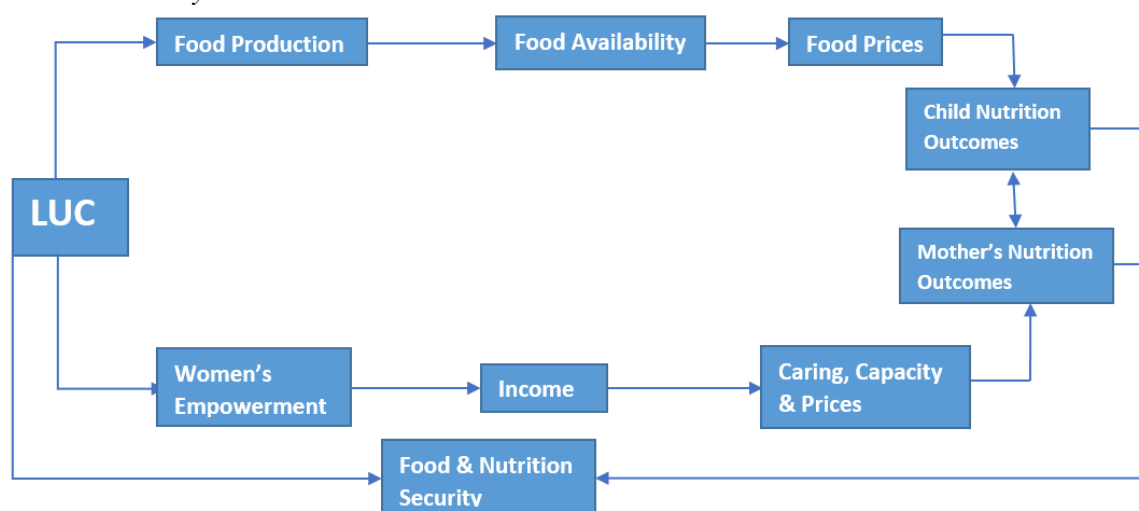


Source: (Herforth and Harris 2014:1)

Following Herforth and Harris (2014:2), the pathways are not always linear, and can be divided into three main routes at the household level: 1) food production, which can affect the food available for household consumption as well the price of diverse foods; 2) agricultural income for expenditure on food and non-food items; and 3) women's empowerment, which affects income, caring capacity and practices, and female energy expenditure.

Therefore, the study covered by this report used pathway frameworks linking agriculture and nutrition for the analysis of food and nutrition security of women farmer in Nyabihu district. However, it elaborates more in details on food production contexts and women's empowerment context to generate the conceptual subjects to view at the empirical findings. Below is the framework derived from Herforth and Harris (2014) showing how LUC can interlink with the food and nutrition security concept to view at the empirical material.

Figure 2: Analytical Framework showing how LUC links to food and nutrition security.



Source: This Thesis.

3.2 Institution

The concept of institution has multifaceted implication in the agricultural livelihoods; and could improve food security of the rural households. Following Ostrom, E (2005); institutions mean different things in different context. Elinor Ostrom (2005) and North (1990) define institutions as a set of rules and regulations. The former refers to institutions as the rules of the game in a society; the main role of a rule in this definition is to clearly define the way the game is played. The later refers to institutions as the rules that give guidance in the society; its roles here is to denote regulations, instructions, precepts, and principles in the society (Ostrom, E, 2005:16). Based to Hodgson's (2006) definition of institutions, as the systems of determined and frequent social rules that structure social interactions, this concept is used in this research to explore which institution matters in the adoption of LUC policy.

I will look at different roles of institution that are imbedded in the adoption of LUC and that helped improve the food in Nyabihu district. With the use of different definitions and different literature on institution I will draw on some conceptual issues and examples to analyze the role and influence of institution in the adoption of LUC. The conceptual issues are derived from North (1991) who defines institutions as rules and constraints to direct the economic change, Otto (2013) who stress the role of institutions in order to facilitate transaction cost, and Seidler (2011) who highlighted the roles of informal institutions in low income countries.

3.2.1 Role of institution in the food and nutrition security discourse

Institutions have been conceived by human beings to enable ordered thoughts, expectations and actions by imposing form and consistency in the society (Hodgson 2006:2). Their presence in the society draws direction of economic change towards growth, stagnation, or decline (North, 1991). In societies with strong institutions, individuals can enter into a number of complex agreements and exchanges with low transaction costs (Otto, 2013: 79). Therefore, in agricultural activities the most obstacle to the profitable income generation is the cost of production which is high especially for smallholder farmers (Otto, 2013).

People in high income countries rely on highly developed formal rules (such as the laws) but also on informal institutions to facilitate transactions (Seidler, 2011:4). In low income countries informal institutions prevail, either because formal institutions have not been established yet or because they are ineffective (Jütting 2003: 11 cited in Seidler, 2011). In other words, human behavior tends to be organized by informal institutions (e.g. moral codes based on kinship) before formal institutions (e.g. the written law) are considered (Seidler, 2011).

Following Hansen (2017), informal land ownership and inheritance in Global South helps the descendants to have access to land on which they can do agricultural activities. This is also true of Rwanda, and Nyabihu district in particular. Institutions in rural areas in Rwanda are critical to agricultural productivity of small-scale farmers and their profitability. Different Scholars understand institutions as a unique social structure with the potential to change people's preferences and purposes in life (Otto, 2013:79). Therefore, institutions play considerable impact on the rural development through increase in agricultural production. Moreover, women in rural areas sustain community resilience through informal and traditional social protection mechanisms such as participation in local saving groups called 'Ibimina', mutual assistance schemes and active social groups amongst others. However, all these mentioned activities are not defined as economically active employment in national accounts yet there are essential for food security and the wellbeing and sustenance of the rural households.

In the low-income countries, the kinship mode of production is a very popular informal institution which helped to overcome some of the challenges of food security in that area. It refers to how family and household relations enhance division of labour in agricultural activities.

As argued by Bartholdson (2017), it considers the reciprocity of rights and obligations in the labour force. This is also the case in Rwanda because farm labor is expensive and, in some cases, you would see all family members including children working on the field in order to cut down the labor cost.

In Rwanda farmers have monetary problems, this weakens their ability to purchase improved inputs, which weakened indirectly their access to food security. The rise of the financial informal institution in Rwanda stemmed from the fact that farmers lack assets to provide to the formal financial institutions as collateral and their low level of experience to deal with procedure in accessing the loans (AFR, 2016). A strong formal institution would be the utmost solution to overcome this challenge but in this case they are still inefficient because in rural areas and especially in Nyabihu district farmers prefer informal institution instead of formal institution however the interest rate is higher for the informal institution compared to the formal institutions (Nyabihu district Report, 2013).

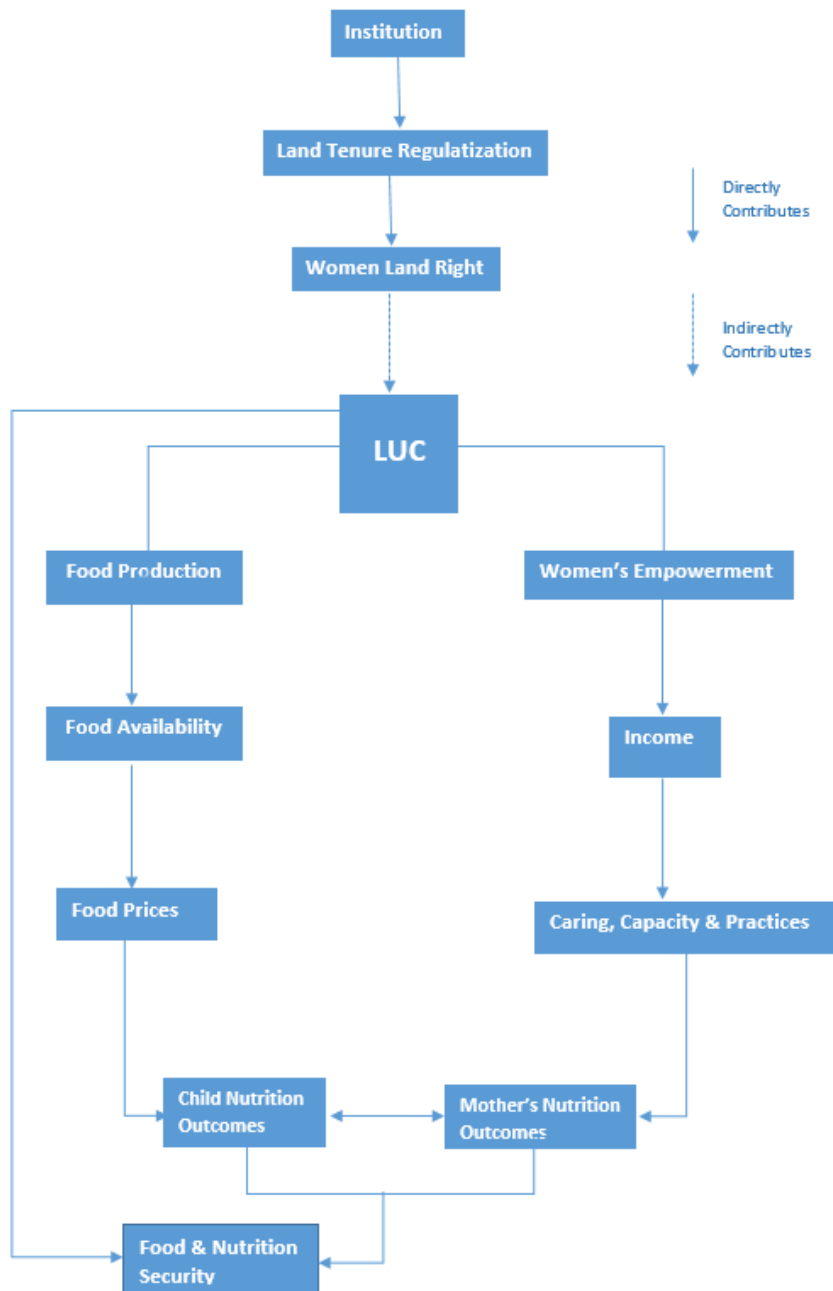
In Nyabihu district, land is essential for agricultural activities, hence a central asset that determines other economic activities and rural livelihoods (Ellis, 2000). Therefore, strengthening rural institutions in the context of access to land and service distribution locally would be a salient aspect in ensuring food security for the Rwandese women farmers. In this context institution could help to produce and distribute services such as infrastructural development, access to credit, which helped local farmers to do the investment in subsidies, inputs or increase land holdings (Hansen, 2017).

Formal and informal institutions are interconnected, and one needs the other to attain food security. Subsequently, access to informal and formal institution plays crucial role in rural development when it comes to food security through economic growth and development policies (North, 1991, 2006; Otto, 2013; Hodgson, 2006). In Rwanda and particularly in Nyabihu district, farmers rely on informal institutions for their agricultural activities such as buying seed, fertilizer and plots (Nyabihu district Report, 2013).

3.3 Framework used for analyzing the research questions

The concepts of LUC, institution, food and nutrition security have multidimensional inferences for women farmers' food security in Nyabihu district. An analytical framework linking LUC, Institutions, Food and nutrition security for interpreting my empirical evidence is drawn below. It shows some of the linkages between these concepts in this particular study and should be read as follow: Institutions led to Land Tenure Regularization (LTR) in Rwanda. LTR defines the women land rights which indirectly would lead to household and individual food and nutrition security through the food production and women empowerment pathways.

Figure 3: Conceptual Framework that links LUC, Institution, and food and nutrition security



Source: This Thesis.

In order to clarify the boundaries, the actual research investigates on how institution directly contributes to land tenure regularization; which resulted to formal land ownership by women. Women land rights are therefore

recognized and registered officially through the implementation of land law determining the use and the management of land in Rwanda. The area of interest for this research is on which extent the LUC policy directly contributes to the aim of this research. Through a thick description on how women farmers in this area perceive and understand the LUC policy; this framework will serve as an anchor for the study and is referred at the stage of data interpretation.

4. Methodology and description of study area

Creswell (2014) defines a research approach as plans and procedures to conduct a research, it provides a framework structure from general assumptions to narrowed methods of data collection, their analysis and interpretation. He argues that the researcher needs to divide an approach to have either a qualitative, quantitative or mixed methods character. Following Creswell's definition of research approach in this chapter; I discuss the research approach used and give a thick description of the study area. I will also discuss the ethical consideration for this study and ends by giving some conclusion for the research.

4.1 A social constructivist view for the study

Diverging ideas from different stakeholders on the implementation of LUC policy in Rwanda bring confusions; this motivates me to draw this study on the constructivism worldview. In the constructivism worldview the emphasis is put on knowledge generation or the validation of the existing one by defining both the roles and the responsibilities of the researcher and the participants in the study (Creswell, 2014).

How social realities are produced, how they are assembled and maintained are the risen questions in the constructivism paradigm, with the aim to give a thick description of how realities are brought into being (Silverman, 2015). According to Guba & Lincoln (1994), an interactive relationship between the researcher and the responded is needed in order to reduce bias and to allow professional judgment. In this study, I worked closely with the participants by allowing them to describe their views of reality and experiences of LUC policy. This helps in getting a better understanding or interpretation of their actions vis-à-vis this policy.

4.2 Qualitative research methodology

Following Creswell (2014), a qualitative research studies real-life situations and in a natural setting. Therefore, I talked directly to people and observed their behavior and actions within their context. A case study is the main methodology of this thesis. I believe that taking Nyabihu district as the site of the study and women farmers in Nyabihu as the unit of analysis will help in describing and exploring the LUC policy implementation in their context. Baxter & Jack (2008) highlight the importance of using a case study methodology in a research as it provides tools for researchers to study complex phenomena and explore them within their actual context; when applied correctly, it becomes a beneficial method to evaluate programs, develop theory and develop interventions.

Additionally, Gillham (2000) defines a case study as a unit of human activity which is embedded in the real world. This unit can only be studied or understood in context and by defining the objectives of the study. Therefore, the nature of this case study research is referred as explanatory and descriptive. According to Yin (2003), an explanatory type of case study explores situations in which the evaluated intervention has implicit and diverging outcomes whereby a descriptive type of case study describes an intervention and its occurrence in the real life context.

The research methodology based on Phenomenology was used to describe the women farmers experience on LUC policy as it is actually lived by them in Nyabihu district. Phenomenology is concerned with the study of experience from the perspective of the individual. They are based in a paradigm of personal knowledge and subjectivity, and emphasize the importance of personal perspective and interpretation (Inglis, 2012).

4.3 Methods of data collection

As the policy of LUC in Rwanda have many stakeholders, a case study on the site generated primary data (field work) and participants were selected with a purposive sampling. The advantage of this technique, is to choose participants that best provide information to understand the research problem and questions (Creswell, 2014). In Nyabihu district and its three sectors: Bigogwe, Kabatwa and Jenda were purposively selected based on the fact that farmers in these sectors are mainly involved in potato farming activities and Nyabihu district is among the top five districts in Rwanda with high problem of food insecurity yet they have a very fertile soil.

I used semi structured interviews (with the selected women farmers and key informants) to capture in depth information on the contribution of LUC to the food security of women farmers in Nyabihu district. Through the use of an interview guides, I managed to prepare some probing questions that can better contribute to answer the research questions.

The focus group discussions (with women farmers and some men farmers) in this study also helped, to understand the participant's knowledge about LUC, how LUC contributed to the availability of food in Nyabihu district and how it affected women farmers in general. In the focus group, men farmers were used as control group.

The Participant observation on the study site helped to understand the context in which women farmers in Nyabihu district live and work. Finally, a comprehensive analysis to assess their farming practices was carried out.

The secondary data were collected through the review of relevant literature on key concepts related to the research topic using the following materials: articles, journals, internet sites, book from the libraries and different reports from Nyabihu district.

Prior to the interactions with the respondents, Rwanda agricultural board was informed on this research and accord me a collaborative support letter. They introduced me to the district authorities and the agronomists both at the district and sector levels. Farmers were identified and contacted through the agronomists, based on the advice from the RAB focal person in Nyabihu district that these agronomists would be familiar with the majority of farmers who adopted LUC in their areas. All the interviews were performed in Kinyarwanda language, which is my mother tongue and I consider this as a salient aspect in my research because I was getting easily the farmers perceptions and expressions of their views about LUC policy towards food security. However, in most of the cases farmers were not expressing freely their views on LUC and food security till I accentuate that I am an independent research and that I am performing this research for academic purposes.

4.4 Research process

4.4.1 Description of the study area

Nyabihu District is located in the western province of Rwanda its town is Mukamira. It has a total population of 294,740 with a density population of 555 Inhabitants/Km². Its surface equals to 531.5 Km². Nyabihu District is divided into 12 sectors (Bigogwe, Jenda, Jomba, Kabatwa, Karago, Kintobo, Mukamira, Muringa, Rambura, Rugera, Rurembo Shyira), 73 cells and 473 Villages (Nyabihu 2013).

This study was conducted more precisely in its 3 sectors (Bigogwe, Kabatwa, and Jenda) that have been selected as best fitted for the cultivation of potato in Nyabihu district. The study dealt mainly with the potato crop as it is one of the crops in this area that showed a high productivity more than other selected crops (maize, beans and pyrethrum).

Subsistence farming is the main activities of women farmers in Nyabihu district where the majority of households are small holders. Approximately 74% of the population in this district work from farm activities and hold an area less than 0.3 ha (Nyabihu, 2013). Women farmers in Nyabihu district have lowest levels of schooling and highest rates of illiteracy (Ibid, 2013). As results, these women remain in subsistence farming and they receive low prices for their products due to lack of harvest management; they lack capacities to participate in agri-business (Minagri, 2010).

Generally speaking, in Nyabihu district food crops are tendered and managed by women while men are heavily involved in cash crops. Potato farming in Nyabihu district is considered, in most of the cases, as men farming activities as it requires a lot of financial capital and are also labour intensive which has some implications on the gender equality (Nzayisenga, 2014: 6).

Women contribute immensely to the agriculture value chain of potato production in Nyabihu district by providing labour for planting, weeding, harvesting, processing and trading. In addition to the farming activities women in Nyabihu district are in charge of food preparation and other productive activities and community work. However, this contribution is rarely recognized at household or in national statistics (Minagri, 2010).

Assigning contributions to potato production by gender is problematic because in most situations the question of women's contribution to

agricultural and food production cannot be answered with a high degree of accuracy (FAO, 2011:13). Women do not usually produce food separately from men; and it is also the case in Nyabihu district. In Nyabihu district, potatoes are produced with labor contributions of both men and women in a collaborative process. However, women in Nyabihu district play a fundamental role in all the stages of potato production as they spend over three hours more than men on farming activities (Nyabihu, 2013).

4.4.2 Sampling techniques

I talked to 5 women farmers in each of the 3 sectors in Nyabihu district for the individual interviews, and I also had 3 focus groups and 1 focus group in each sector where the majority of the members were women and a few of them were men. The maximum and minimum of members in the focus group were respectively 8 and 7 farmers. I also talked to ten key informants including: 1 director of agriculture and natural resource at the district level, 1 district agronomist, 3 district sectors, 1 nutritionist at the district level, 3 farmer promoters at the sector level and 1 focal person of RAB in Nyabihu district.

For women farmers, the purpose of selection was based on a) women farmers who have been practicing agriculture before and after the implementation of LUC (b) women farmers having agriculture as their main source of income (c) women farmer cultivating potato in their consolidated land. The respondents were farmers who have been participating in the implementation of LUC policy and most importantly who have been cultivating potato in their consolidated plots.

The key informants were selected depending on their role in ensuring food security of women farmers, having knowledge on the land use consolidation policy in Nyabihu district and on their involvement in the implementation of LUC.

Women farmers in the group discussions were selected based on the same criteria as farmers in semi structured interviews. The first group was made of 7 farmers (2 men and 5 women), the second group was made of 8 women farmers and the third group was made of 8 farmers (2 men and 6 women). I made sure that the number of women was more than men in order to get more valid information to my research questions.

Table 2. Farmers' identity in individual and focus groups interviews

	Farmer identity in The text	Gender	Age	Marital Status	Nr of Children	Level of education	Main source of Income	Size of farm In Ha	Period of cultivating potato Referencing to the implementation of LUC(2008)	Date of interview	Interview Format
Kabatwa Sector	WF1K	F	45	Married	6	S1	Agriculture	5	3 years after up to now	14/2/2018	Semi- structured Interview
	WF2K	F	46	Married	5	P3	Agriculture	2	Since 2008	14/2/2018	Semi- structured Interview
	WF3K	F	49	Married	4	-	Agriculture	1	Since 2008	15/2/2018	Semi- structured Interview
	WF4K	F	52	Widowed	5	P2	Agriculture	0.18	Since 2008	15/2/2018	Semi- structured Interview
	WF5K	F	47	Married	5	P2	Agriculture	1	3 years after up to now	16/2/2018	Semi- structured Interview
Jenda Sector	WF1J	F	36	Married	4	-	Agriculture	0.75	3 years after up to now	20/2/2018	Semi- structured Interview
	WF2J	F	41	Widowed	3	S1	Agriculture	0.18	3 years after up to now	20/2/2018	Semi- structured Interview
	WF3J	F	47	Single	1	-	Agriculture	0.25	3 years after up to now	21/2/1018	Semi- structured Interview
	WF4J	F	60	Married	8	-	Agriculture	3	Since 2008	22/2/2018	Semi- structured Interview
	WF5J	F	43	Married	5	P4	Agriculture	0.18	3 years after up to now	22/2/2018	Semi- structured Interview
Bigogwe Sector	WF1B	F	54	Widowed	3	-	Agriculture	2	Before 2008	27/2/2018	Semi- structured Interview
	WF2B	F	43	Divorced	2	P3	Agriculture	0.2	3 years after up to now	27/2/2018	Semi- structured Interview
	WF3B	F	49	Married	5	S1	Agriculture	1	Since 2008	28/2/2018	Semi- structured Interview
	WF4B	F	49	Married	4	-	Agriculture	0,55	Before 2008	1/3/2018	Semi- structured Interview

	WF5B	F	45	Widowed	3+3 Orphans	P3	Agriculture	3	3 years after up to now	7/3/2018	Semi- structured Interview
Focus Group 1 in Kabatwa Sector	WF1 F1 K	F	45	Married	2	P6	Agriculture	2	3 years after up to now	19/2/2018	Semi- structured Interview
	WF2 F1 K	F	50	Married	4	-	Agriculture	0.36	Since 2008		
	WF3 F1 K	F	51	Married	5	S3	Agriculture	2	Since 2008		
	WF4 F1 K	F	30	Married	2	-	Agriculture	0.45	3 years after up to now		
	WF5 F1 K	F	45	Single	2	-	Agriculture	0.60	3 years after up to now		
						orphans					
	MF1 F1 K	M	48	Married	3	-	Agriculture	0.25	Before 2008		
	MF2 F1 K	M	46	Married	4	-	Agriculture	0.18	3 years after up to now		
Focus Group 2 in Jenda Sector	WF1 F2 J	F	45	Married	3	-	Agriculture	1	3 years after up to now	26/2/2018	Semi- structured Interview
	WF2 F2 J	F	47	Married	6	P2	Agriculture	0.70	3 years after up to now		
	WF3 F2 J	F	42	Divorced	2	P3	Agriculture	0.55	3 years after up to now		
	WF4 F2 J	F	51	Married	7	P3	Agriculture	3	Since 2008		
	WF5 F2 J	F	40	Widowed	4	-	Agriculture	0,18	3 years after up to now		
	WF6 F2 J	F	49	Married	5	-	Agriculture	0.25	3 years after up to now		
	WF7 F2 J	F	40	Widowed	3	-	Agriculture	0.18	Since 2008		
	WF8 F2 J	F	45	Single	-	-	Agriculture	1	3 years after up to now		
Focus Group 3 in Bigogwe Sector	WF1 F3 B	F	50	Married	5	P5	Agriculture	1	3 years after up to now	5/3/2018	Semi- structured Interview
	WF2 F3 B	F	41	Married	4	P2	Agriculture	0.18	Since 2008		
	WF3 F3 B	F	47	Married	5	-	Agriculture	0.25	3 years after up to now		
	WF4 F3 B	F	51	Widowed	4	-	Agriculture	0.36	3 years after up to now		
	WF5 F3 B	F	45	Single	2	P3	Agriculture	0.40	3 years after up to now		
	WF6 F3 B	F	39	Married	2	S3	Agriculture	1	3 years after up to now		
	MF1 F3 B	M	52	Married	7	-	Agriculture	0.36	3 years after up to now		
	MF2 F3 B	M	50	Married	5	P4	Agriculture	0.80	3 years after up to now		

Table 3. Key Informants identity

Identity in the Text	Interview date	Interview format
KI-1	16/2/2018	Semi- structured interview
KI-2	13/2/2018	Semi- structured interview
KI-3	21/2/2018	Semi- structured interview
KI-4	14/2/2018	Semi- structured interview
KI-5	23/2/2018	Semi- structured interview
KI-6	19/2/2018	Semi- structured interview
KI-7	19/2/2018	Semi- structured interview
KI-8	2/3/2018	Semi- structured interview
KI-9	9/3/2018	Semi- structured interview
KI-10	13/2/2018	Semi- structured interview

4.5 Data analysis and ethical considerations

I draw on Miles & Huberman (1994) tactics for an interpretative analysis to the different sources of data, by noting patterns, themes, making metaphors (connecting findings to the concepts), counting (isolating something that happens a number of times and consistently happens in a specific way), and finally making conceptual coherence. The findings in this study are presented using percentages and mostly in a narrative way. I ensured that the results are coherent and systematically related (Miles & Huberman, 1994).

The validity of data is based on triangulation method through cross verification of data from the primary and secondary data. For reliability purpose I clearly presented the research questions and the objectives of the study to all respondents in this study. The roles and rights of both the participants and I before any fieldwork and on the different stages of the research were defined in a clear way. The techniques for data collection are explicitly highlighted in the previous chapters. Privacy, anonymity and a self-decision participation were ensured throughout this research.

4.6 Conclusion

In order to answer the research questions, the constructivist worldview is the philosophical assumption that I brought to the study. A case study qualitative research based on phenomenology helped to broadly understand LUC policy and the subjective meaning assigned to it by the women farmers in Nyabihu district. The collection of data from women farmers, agronomists, farmer promoters and different authorities from the central and local were analyzed in an interpretative way and the findings are presented using tables, percentages and mostly in a narrative way. The triangulation process has been used to ensure the validity of this study.

5. Empirical findings and discussions

In this chapter, I present respondent's perception and experience on the contribution of LUC policy to the food and nutrition security of women farmers in Nyabihu district. The findings of this study are grouped in seven main themes that appeared during the interviews. The themes are presented as follow in this report: 1) Food consumption and Cost of production, 2) Participation in Decision making, 3) Acquired Skills, 4) Access to off-farm activities and land, 5) Subsidies, 6) Trainings, 7) Price fluctuations.

In the last section of this chapter I discussed key findings of the study in relation to the theories used and different literature.

5.1. Implications of LUC for improved food and nutrition security of women farmers in Nyabihu district

5.1.1. Food consumption and production cost

All women farmers (100%) in this study revealed that the productivity of potato increased after the adoption of LUC in Nyabihu district; however, women farmers still have unbalanced food and live in poverty. When considering the evolution in food security at the household level, it was found that 70.6% of women farmers are still food insecure.

I used to cultivate this same field but I had never harvested 10 tons of potato per ha before LUC. This program just came to save our life (WF1J, 20/2/2018).

Table 4. How Women farmers perceive the importance of practicing LUC

Importance of practicing LUC in agriculture sector	Frequency			Percentage		
	Yes	No	Total	Yes	No	Total%
Is it essential to practice LUC	29	5	34	85.3	14,7	100
It helps to reduce the hunger	24	10	34	70.6	29.4	100
It helps to know where we go and where we come from	30	4	34	88.2	11.8	100

It helps to modernize Agricultural activities	33	1	34	97	3	100
Yes, it increases the production in Agriculture	34	0	34	100	0	100
It allows the women farmers to highly invest themselves	29	5	34	85.3	14,7	100
Because it helps to achieve quick development of the farmer side	15	19	34	44.1	55.9	100
Promote food and nutrition security at the household level	10	24	34	29.4	70.6	100

Source: Interviews

The findings in this study disclosed that, at the beginning of the LUC program, farmers hoped that the increase in productivity shall address their financial and nutrition needs. However, their hope got twisted to a different reality where they spend a lot of money in buying improved seed and fertilizers.

After selling my harvests, I cover the loan of the bank to qualify for funds for the next season. I also make sure I pay my health insurance (mutuelle de santé) and the school fees of my children. The remaining little money is for food and can barely cover the following 2 months (WF3K, 15/2/2018).

Before LUC I used to cultivate my small land and make sure I have potatoes, beans and vegetables that I could eat until the next harvest. I was not supposed to rely on market food to feed my children. But this policy of cultivating on crop has disturbed our nutrition; potato is the only food available. Other crops are really expensive, and we prefer eating what we have grown then save some money to buy soap to wash our clothes (WF4B, 1/3/2018).

Table 5. How women farmers conceptualize LUC towards food and nutrition security

Conceptualization of LUC	Frequency			Percentage		
	Yes	No	Total	Yes	No	Total %
LUC shows the ability and competence of women farmers	34	0	34	100	0	100
It is a positive transformation in rural development	29	5	34	85.3	14.7	100
It helps to effectively achieve government objectives	19	15	34	55.9	44.1	100
Improved food and nutrition security through food availability in the region	20	14	34	58.8	41.2	100
The institutions become stronger with LUC	28	6	34	82.4	17.6	100
The storage capacity for farmers has improved	2	32	34	5.9	94.1	100
Reduced importation of food	29	5	34	85.3	14.7	100

Source: Interviews

Farmers explained that, the combined expenses on inputs and labor cost made the production cost very high resulting on little return on investment. As this program promotes the mono cropping system, the money gained from the high production was supposed to cover other nutritional needs. However, after selling their production at the market and pay the bank loans to get ready for the next season, many farmers said that they were not able to buy any other food from the market because the remaining money was little to sustain them up to the next harvest. This is due to the fact that other staple food, not grown in their areas, are more expensive at the market compared to the price they sell their production. Therefore, farmers prefer not to sell all their production as it will serve as their primary source of food because money gained is not enough to ensure a healthy and balanced diet.

**Table 6. The Cost of production per ha and revenue per ha
Cost of production for potato in Nyabihu district**

Input required	Cost per kilo (Rwf)	Quantity required per hectare(kg)	Total cost per Ha(Rwf)
Labor(ploughing, sowing, weeding and harvesting)	-	-	500,000
Seeds	500	2500	1250000
NPK(fertilizer for sowing)	520	300	156000
Value of land per season + Guardians(1ha)	-	-	700000
Transportation	-	-	10,000
Total cost	-	-	2.616.000

Source: Interviews

Calculation of output from potato

Cost of potato production per ha(Rwf)	Producti on per ha	Selling price per kg(Rwf)	Selling price per ha(Rwf)	Revenu per ha (Rwf)
2616000	15000	200	3,000,000	384000

Source: Interviews

Before LUC, potato would set its price on the market. However, this program came with some unpleasant policies that do not consider the farmers expenses saying that farmers have to grow the same crop and sell it to the same person and at the same time. I don't understand how educated people think... with an angry voice (WF5K, 16/2/2018).

88.2% of women farmers interviewed in this research said that, the selling price of the potato is not fair compared to their efforts and the production cost. Women farmers said that they incur a lot of loss while middle men who buys their harvest sell them at a profitable price at the market.

Table 7. Problems faced by women farmers regarding LUC

Problem faced by the farmers regarding LUC	Frequency			Percentage		
	Yes	No	Total	Yes	No	Total (%)
Insufficiency of agricultural skills	30	4	34	88.2	11.8	100
Thieves	34	0	34	100	0	100
Lack of good markets	30	4	34	88.2	11.8	100
Small farm size	28	6	34	82.4	17.6	100
Lack of finances	19	15	34	55.9	44.1	100
Access to inputs	30	4	34	88.2	11.8	100
Climate change	30	4	34	88.2	11.8	100
Poor institution	30	4	34	88.2	11.8	100
Storage capacity	34	0	34	100	0	100

Source: Interviews

Farmers in this research (100%) confirmed that the limited storage capacity is a problem to potatoes' growers as it creates instability on potatoes selling price. WF3J (21/2/1018) said that modern storage capacity would be a good solution to the price fluctuation; instead of selling their production to a price that does not favour them, they could store them and sell them when the market is stable.

This LUC program is for rich people who have enough food and want money; how can a poor person like me who doesn't even have food for my children think of selling the production? (WF5J, 22/2/2018).

Farmers with smaller plots have difficulties in buying improved inputs. Therefore, they remained in the former subsistence farming of cultivating many crops in order to have food for a living.

Women farmers (88.2%) in this study said that LUC can be the solution to their food security issues through the increase in productivity if only the

government puts effort in stabilizing the potatoes market. Otherwise they will always have the unbalanced food because they cannot afford to buy other staple food available at the market from what they made in selling their potatoes production. They will eat only what they produce because they are cheap at the market.

According to the key informants (Farmer promoters & Agronomists), LUC supported the improved food and nutrition security of women farmers in Nyabihu District because their farm productivity increased considerably, compared to the situation before. This increment is due to the fact that farmers have been sensitized on the new policy of LUC and have voluntarily decided its adoption. The farmers who willingly adopted this policy were provided the inputs at the beginning of the program and a follow up was assured by the farmer promoters together with the district and sector agronomists. These combined efforts on the side of farmers, local authority and the provision of inputs lead to an increase in productivity to which they strongly believe is a noticeable aspect to the improvement of the farmer's food and nutrition security.

LUC changed the living standard of our farmers. The high increment of productivity availed food in our area and improved the food security in general. In Nyabihu, people used to eat once per day or not eat at all but LUC came as an answer to that hunger and it reduced poverty (KI-1, 16/2/2018).

LUC is paramount to food security of farmers. The overall purpose of LUC is to increase the productivity so that quality and sufficient food is always available at the household level and the rest is brought to the market. The feasibility of this permanent availability of food is justified by the fact that the increase in productivity will help the farmers to get money at the end of each harvest and be able to diversify their need in food and invest in other activities that generate income.

In this sector we have an example of a farmer who is successful thanks to land use consolidation. Before LUC the farmer WF1K had a farm of 0.5 ha in size but now she has 5ha in consolidated areas. From her potatoes productivity she was able to expand her farm, feed her family members 3 times a day, take all her children in private schools and she managed to buy one truck that help in transportation of her harvest (KI-4, 14/2/2018).

I have been working as a sector agronomist even before LUC but I have never seen before a farmer harvesting 26 Tons of potatoes per Ha; which is normal these days. From this reason, I can freely say that this policy has even done miracles to their food and nutrition security; currently, we no longer have people who sleep with an empty stomach as it used to be. In this sector the person who eats less have at least 2 meals per day. The remaining issue is to teach them how to balance food. I can confirm that food is available now (KI-4, 14/2/2018).

All key informants (KI) in this study, link the issue of malnutrition at the household level to the low level of education of farmers in Nyabihu district. The Key informant 9 explained this issue saying that the household income management is not allocated in way that is profitable to their nutritional needs and most of the time the knowledge about nutrition is not advanced.

They don't give importance on having a full meal that contains carbohydrate, fats, proteins, vitamin, and minerals. In one word, they fail to diversify their food intake (KI-9, 9/3/2018).

Even if they have access to food, they lack knowledge on how to properly cook some food. A farmer who manages to get vegetables on her meal overcooks it to the extent that all the essential nutrients are lost (KI-9, 9/3/2018).

Different discussions in the focus group (FG) revealed that before LUC program, the productivity of potatoes was very little compared to what they are harvesting now. The farm size was very small and unproductive. The LUC policy has a lot of positive impacts in their agricultural livelihood; however, negative points can be highlighted.

Farmers in the focus group 1 (FG-1) said that growing one variety crop will be a problem as long as the government is not playing the important role of stabilizing the price for their production.

I prefer eating my potatoes on a daily basis, rather than giving them for free to rich people who did not even buy a plough for me to cultivate (WF4 F1 K, 19/2/2018).

Many farmers in the focus groups said that the production is higher than the demand on market and they don't even have the capacity to store their harvest until the market is stable.

This problem can be solved if we had the ability to store our production for a long period. For example, if you harvest in August, December and March you are quite sure that the market is stable and that you are going to sell them on a profitable price but up to now the storage facilities is still a challenge (WF3 F1 K, 19/2/2018).

Six women farmers out of 8 in focus group two (FG-2) agreed that LUC is a good policy but it only benefits people who were well off. They explained that the biggest challenge is in the beginning because most of the farmers do not have enough land. The fact that they have to hire land in order to abide by the rules of LUC increases the production cost. They also said that the cost of inputs to upgrade their agricultural practices is also problematic. Farmers in this study usually refer to “magic seeds” when talking about improved seeds and believe that they can do whatever it takes to get to them. However, the biggest challenge is the access to the inputs; they are very expensive. Farmers in the focus groups explained this situation saying that the return on investment is very little because they spent a half of it in buying the inputs.

5.2. Responsiveness of LUC policy to women farmers in Nyabihu district

5.2.1. Participation in decision making

Many women farmers revealed that before LUC, they were not used to be in possession of money. They would produce for family consumption and for the other needs, they used to rely on their husband’s income. The productivity has increased thanks to this program and women farmers are slowly becoming economically independent. This freedom increased their bargaining power over some decisions in their respective families. Many women said that they, nowadays have a say on the education of their children and that they decide on the food consumption in their families. One farmer had this to say, “...before LUC, I used to stay at home and waiting for what my husband brings for family consumption but now, thanks to the high production of potato I am able to provide food to my kids and pay their school fees without relying on my husband’s income (WF2K, 14/2/2018).

All key informants (KI) said that LUC played enormous role in empowering women farmers in Nyabihu district. Before LUC program, land was something that you could attribute to male most of the time in terms of ownership and activities. Nowadays women are the ones that spend too

much time on farm while most men are involved in other activities such as retail, construction and other non-farm jobs. Thus, this program have promoted women in most of the time.

Firstly, LUC is like a gender policy because we have more women than men in agriculture; therefore, they benefit from it than men. Women farmers now have a say because they have money to sustain their families without relying on their husband's income. They have started do be involved in other business. Nowadays they are everywhere in retailing, livestock and some are better off as they managed to build houses (Key informant 8, 2/3/2018).

All KI approved that women farmers were participating comprehensively in the implementation of LUC policy as the process was bottom- up.

My husband used to think that I go out for my personal appointment with other men because I used to stay home and waiting for him to bring food. Nowadays, we are the one that are going out for community meeting because we ought to decide together in cooperative about crops to farm in the consolidated area (WF3 F1 K, 19/2/2018).

All KI said that farmers sit together with the farmer promoters at the sector level and decide which crop they would like to grow in the next season. The farmer promoters help them to think in the line of LUC program that they have to choose at least among the best crops suited to their agro-ecological condition. The selected crops in each sector is now mentioned at the district level so that the district agronomists give their advice and guidance basing on the market situation and weather forecast.

The priority crops in this area are chosen by farmers themselves and they present those crops to the farmer promoters and to us in order to get advice on whether the selected crop is favorable to the ecological condition, the weather forecast and the market. I can say that our role here is just to provide coaching and advice but with little influence on what farmers want to grow in their plots (KI-3, 21/2/2018).

Women farmers in the focus group 3 said that with this LUC policy, they usually sit together to discuss about LUC practicability with the authorities at the sector and district level, which creates some level of confidence and knowledge about the policy itself and the national politics in the agriculture sector in general. Before land use consolidation, women were condemned to stay at home cooking and taking care of the children. Nowadays women are

involved in decision making. Also, women have improved their farming practices.

5.2.2. Acquired Skills

All women farmers in this study were happy that within this program they learn by doing. They appreciated the facts that the trial of the LUC was done in their fields and one could decide either if she is going to follow the rules of the program or not.

Women farmers in the FG-3 said that they become aware of different government policies thanks to this policy. They have regular meetings deciding on what is better for their region in terms of agriculture production. From those meeting they gain confidence to express their needs and they share experiences which as results made them knowledgeable to different agriculture practices and land management in a sustainable way.

We are now aware of what we do, and we can estimate what we can get from our fields. Everything is calculated. We are now all mathematicians {she said that, proudly} before we could cultivate and that was just for our living, we couldn't think beyond that (WF1 F3 B).

The KI-6 and the KI-7 said that the advantages of land consolidated on the women farmers' side is that, through the bottom-up approach of implementation of land use consolidation, farmers become aware of the national agriculture policies. Also, the fact that they work together on a daily basis with the agronomists and farmer promoters, increases their skills and knowledge about modern and productive agriculture practices.

The KI-9 (9/3/2018) said that, this policy promotes the mono cropping system of farming, therefore in each sector there is a nutritionist who helps and gives advice to farmers on the balanced diet, how food is properly prepared and how to diversify their food in order to make sure the food security of the farmers is maintained. That equipped especially women farmers with knowledge and skills of nutrition.

5.2.3. Access to off-farm activities

All most all women farmers interviewed have the same way of spending the income from their production. The first thing they do is to clear the bank loan; after, they pay for the health insurance and the school fees of the children. They do not save money however, they prefer to buy assets like

plots or livestock like cows, goat and chicken that could be easily be sold once the need of money arises. Other farmers invest in retail business.

I am a widow; I adopted this LUC policy since 2010. From the production of my potatoes, I managed to build a small house, bought 2 cows and opened a retail business. Now all my children are in good schools and I can assure you that I live a better life than many of women in this sector who even have husbands... she said it very proudly... “This program gave me power in the society. They use to call me a widow but nowadays they call me Madam” (WF5B, 7/3/2018).

Women farmers in this study said that in most cases, LUC favored farmers who already had land and could have access to the financial institution to get loans for buying the inputs. Land is the most valuable asset in this program because almost all farmers understand the benefit of land consolidation (85.3%) but lack the land. Women farmers highlighted that access to land is crucial in order to have the profitable income to invest in order off farm activities.

We all know where food comes from, the government should avail land to cultivate before teaching us how to cultivate (WF2 B, 27/2/2018).

Women farmers in the focus group discussions said that, they no longer fear to invest in other activities. Nowadays, women farmers are having side businesses even if their main source of income comes from agriculture. They said that they also try other business that help in getting money to buy things like chairs, clothes and other small stuff needed at the household. The KI-2 had this to say “this policy also gave women farmers access to cash. They harvest and one part is kept for food consumption and the other part is taken to the market. The money gained from the market brought many changes to their living standard including the good schooling of their children and investment in other off-farm activities (KI-2, 13/2/2018).

5.3 Willingness on the adoption of LUC by women farmers in Nyabihu district

5.3.1. Subsidies

Nearly all farmers (88, 2%) interviewed in this research said that, access to inputs is a challenge. Inputs are needed in order to smoothen the adoption and the implementation of LUC. At the beginning of this policy, women farmers said that they were receiving some inputs free of charge; but since

2010, farmers were obliged to buy them, and the price was high. The proposed solution is that the Government should help farmers by providing trainings on how to make and keep their own improved seeds. Some emerging powerful cooperatives are able to multiply seeds at a very low scale which reduces their cost in production.

The KI-2 said that, the Government should think of increasing the number of agro dealers in each district. They should work together with the inputs importers in order to have the needed inputs on time and at an affordable price. Farmers still believe that the government contribution is needed and agro dealer's capacity should be strengthened to meet the seeds request and avoid delays to happen frequently; as asserted by KI 2, *“Especially for potato, we have a problem that the seeds are expensive and not given on time. The number of multipliers are still few and don't satisfy the market”* (KI-2, 13/2/2018).

Women farmers in all the focus group discussions raised an issue that the access to inputs is still a challenge. They are not yet on a level to buy inputs without any kind of loans. They said that the Government of Rwanda surely knows the capacity of their farmers, but the financial institutions charge a high interest rate to those who afford to work with them in order to get loans for buying the inputs. The interest rate is between 18 and 20 % per year, which they really think is higher according to their capacity. Most of farmers prefer to go for solidarity schemes because they don't have a lot of requirement in order to work with them.

5.3.2. Trainings

Farmers in Nyabihu district said that mobilization and technical assistance are the most important institutions that farmers need in the implementation of LUC. This policy has new ways of cultivation and farmers need constant follow up to achieve success. As this policy promotes the mono cropping system, its success relies on the mobilization and coaching of farmers on how to access other crops that are not grown in their plots and more importantly to control the market demand. Sometimes, farmers want to cultivate crops without thinking broadly about the market. It is the responsibility of the farmer promoters and the district agronomist to mobilize about crops that are needed at the market and that be processed by local industries. For example, in Nyabihu District there is good number of industries that can proceed maize, but it is not easy to find industries locally that will process sweet potatoes.

WF1J (20/2/2018) gave a testimony that once she wanted to cultivate seed of maize called hybrid 628, and was well prepared about the seeds and the fertilizers. Upon receiving the technical assistance from the agronomist, she realized that this seed required a lot of water and the weather was not going to be favorable at that time. She was convinced by that advice and changed to other seed that did not require a lot of water.

Trainings to farmers are also needed especially on how to fight against crop diseases, said most women farmers in Nyabihu. Farmers in this district associate the crop diseases to the use of improved seeds and inorganic fertilizers and this discourages many people to adopt this policy.

The use of improved inputs in our fields exposed our crops to diseases and this makes people think about the traditional ways of farming. We were not having the kind of crop diseases we are experiencing nowadays (WF1K, 14/2/2018).

Training especially on preventive measures on how to fight against crop diseases is of higher importance in this matter. Farmers in the focus group discussions said that, it is not appropriate to buy the pesticides as they also increase the cost of the production. They would rather prefer to have trainings and coaching on how to fight against those diseases even before crops are contaminated.

5.3.3. Cooperatives and farm security

All respondents in this study raised an issue about the security of their fields. They explained that, LUC engendered a difference between the well-off farmers and the poor farmers. Farmers in this area were used to mixed cropping systems of farming; in one small plot one could find sorghum, peas and potato and the productivity was weighted on subsistence. This policy promoted a different way of farming (mono cropping systems of farming) targeting the market through the increase of production per hectare. This is profitable to people who can at least have access to land. Therefore, landless people in this area are affected in this way and some farmers link this issue to the insecurities of their fields. Therefore, there is a need to hire a security guard to look at the fields until harvest and this generates another cost.

People are dying of hunger in Nyabihu district, it is shameful that people are going in field to steal food. This was never present before LUC; but these days as the productivity increases the number of thieves also increases

in our areas. This is a very serious issue that the local authority should consider because people are going to kill each other because of food. Security of our field is really needed. This could only stop if the policy of LUC would be applicable to farmers with small land because there many in this area and they don't have food (WF5B, 7/3/2018).

Women farmers in Nyabihu district said that they appreciate the contribution of cooperatives to make this policy more successful. The importance of cooperatives is that farmers are working together, and the production is harvested together; therefore, it becomes easy for the government to work together with the leaders of the cooperatives to look for market. Farmers said that in their cooperatives, they think that to address the issue of price fluctuation, the government should set rules and regulations. If the law says that the prices of their production should be decided in their respective cooperatives, it would motivate farmers to produce more because they are certain that their harvest will be brought at a profitable price compared to other years back.

Farmers in the FG-1 said that the fact that farmers were in cooperatives qualified them as professional farmers. They were registered at the local level and this allowed them to work with financial institutions like micro finances. The KI-6 also had this to say *“LUC allowed farmers in the consolidated areas work in cooperatives. This helped a lot in the sensitization process and in convincing farmers that showed resistances in adopting this policy. Most farmers were convinced by their neighbors after seeing that they are cultivating the same size of land but the production is higher for the ones that are in the program of LUC (KI 6, 19/2/2018)”*.

In the focus group discussions women farmers said that Land use consolidation policy made farmers working in cooperative and the benefit is that, they cultivate together, sow together and harvest together. Therefore, the benefits and the loss are shared by all the members. Most importantly in cooperatives challenges and experiences are shared by all the members and the production cost is reduced on the transportation part because members in the same cooperative share the cost.

5.3.4. Price fluctuations

The KI-2 (13/2/2018) said that, the Government should work closely with institution such as MINAGRI and MINICOM (Ministry of Trade and Industry) to stabilize the price of potatoes and look for the market at the national and international level. Otherwise, the production of the farmers

will continue to perish in their field because farmers don't have the capacity to store their harvest for long time or to look for the market elsewhere.

We have seen that having a high productivity is possible because we have moved from 5Tons to 23 Tons per hectare. With more effort, 37tons per hectare is possible to be reached. But the problem is how to always sell the production on a profitable price for the farmer? (KI-1, 16/2/2018).

The storage facility is also a challenge because; they sell their production to price which is not profitable because they are unable to store them for more than five days. The lack of appropriate storage facility makes them sell to whatever price is available (KI-7, 19/2/2018).

Women farmers in Focus groups said that LUC is very relevant to their food security and they strongly believe that it can lift them from food insecurity as long as the government sets reasonable price for their potato production so that they can be able to buy other staple food that are needed in order to have a balanced diet.

Business man are the one that are getting money. We sell our production to little money but the price of 1 kg in Kigali cost a fortune said farmer (WF4 F2 J, 26/2/2018).

5.4 Discussion

5.4.1 LUC, agricultural productivity and food and nutrition security

The findings of this study show that LUC has some positive impacts to the food and nutrition security of women farmers compared to how they used to live before its adoption. The first success of LUC in this area is the increase of potatoes production and this justify the availability of food in this area. However, after analyzing the farmer's ways of living, it is important to note that high productivity only, does not fully contribute to the household's food and nutrition security. These findings conform to the statement made by Hannah (2013) that the increase in food production does not necessarily lead to food security. The intervention in increasing the household income is also counterproductive. Also, in this study, a small number of farmers who were able to move faster with this program from the beginning, have managed to make some other source of income (off- farm income). They are the ones that are well off already. They can cope with the biggest challenge of price fluctuation faced by women farmers who have adopted LUC.

However, most of other farmers are food insecure because they rely on agriculture as source of income. Some farmers are even becoming more vulnerable as they are occasionally obliged to sell their livestock to buy the inputs. However, well-off farmers keep buying livestock that will help in the provision of organic farming.

In the focus group discussions, it was noted that there was at least one farmer in each group who took one meal per day (referencing 1 week before the interview). But most of them take 2 meals per day and very few of them have 3 meals a day. From the observation the last group is for the ones that have other source of income.

5.4.2 Women Empowerment through LUC

The average farm size now in Nyabihu is estimated at 36 acres compared to 18 acres at the beginning of this program (Said the KI-2). This increase in farm size is indirectly beneficial to women farmers because most of farmers in Nyabihu district are women and their access to land have increased accordingly. It has been noticed that for landless women farmers, the cost of production is higher compared to the ones that own land. The average amount to hire a plot (1 ha) per season is almost 13% of the total cost of production. The inaccessibility to land is therefore a challenge to the food security of small-scale farmers in this study because they had to spend extra money to hire land. These findings conform to Tim Lang's (2010) statement that, the majority of households become food secure through direct production from land.

The increment of potato yield made women farmers in this study have access to money through participation in other non-farm activities such as retailing and livestock. The access to money also increased women's bargaining power in their respective households including decision making to the education of their children and the number of meals to take per day. These findings also conform to the Ellis's (2000) note that income obtained from own account activities is barely used to buy input however it is most of time used for family consumption needs.

It was noticeable that in this district, many children are finishing secondary schools late at the age of 24 to 26. The reason for this could be attributed to the fact that before land use consolidation, children were dropping school easily due to the lack of school fees. But with this policy, women became more independent on the use of income at the household level. Many

women farmers in this study prioritize the education of their children when spending their agricultural income.

As mentioned by the key informants in this study most farmers in this area used to have one meal per day but with this LUC program many women farmers said that they can provide two meals per day. The above mentioned findings conform to the statement made by Herforth and Harris (2014) that when a woman income increased, it boosts the amount of food for consumption at the household level and the health care especially of children.

The fact that most women farmers hardly read and write also affects their wellbeing. In this particular study, we have noticed that primary 3 is the most common level of education of the respondents. Hence, they don't have smooth flexibility to deal with financial institutions in order to have loans to help them access the inputs and increase their productivity. As well as their health, and as key bread winners this affects their agricultural activities negatively. When the soil and the nature is not well maintained, no matter what practices one can adopt, it will not secure the food availability for the future. These findings conform also to the statement made by Tim Lang (2010) that women farmers confront many obstacles, including access to education, land and credit, which weakens their competence to make effective use of available resources and thus diversifying their farm.

In general land use consolidation policy have increased a good relationship between women farmers and their authorities because farmers noticed that the advices provided by the authorities towards the adoption of LUC helped them move from one financial level to another. The fact that they are involved in the decision-making process about what crop to grow in the next season, increased the level of confidence in the adoption of this policy. However, in the household some households still have challenges to understand the women's freedom towards income.

5.4.3 Institution, LUC and women farmers

Access to inputs is perceived by many women farmers in this study as the most important institution in the adoption of LUC. It is, therefore, perceived as a significant constraint to the attainment of a profitable income (North, 1991). Many farmers said that in the first years of the implementation of LUC, MINAGRI and RAB were providing some inputs (seeds and fertilizers) in form of subsidies. This attracted many people to opt for this policy.

Farmers said that the purchase of improved seeds and fertilizers covers almost half of the cost of production. These findings on the inputs also conform on what Christina H. Gladwin et al. (2001) mentioned in their article that the Government programs which attempt to address a deficit in the consumption of food at the household level should take in consideration of providing safety net to the vulnerable farmers. In this case one could say that landless women in this area are the most affected. In addition to the money they spend to buy seeds and fertilizers; they also have to hire land to nearly one third of the production cost.

The high cost of production makes farmers in this study more vulnerable to food security because the revenue they gain is not sufficient to cover their needs in food consumption. This can be softened in presence of formal institutions in order to provide incentives so that farmers do not run at loss (McMichael, 2013). This statement contradicts with the reality on fields because women farmers in this study claim that cooperatives are not strong enough or do not have the capacity to negotiate profitable prices for their production. It requires the government involvement in order to make this institution stronger. Farmers in this study propose that the government could at least strengthen the cooperatives capacity through creation their storage facilities. The storage could help to store some part of potatoes and deal with the price fluctuation at the market.

High interest rate is also something that is reflected in the findings of this study where many farmers found difficult to work with financial institutions in order to get loans in their agricultural activities. Most farmers in this study depend on informal institutions in their agricultural activities because the requirements are not favorable according to them. These findings conform to the statement made by Seidler (2011) about informal institutions and the way that they play crucial roles when formal institutions are weak.

6. Concluding remarks

6.1 Key findings

In relation to the first objective in this research, the findings revealed that strong institutions are the most important aspect in the implementation of LUC in Nyabihu district. Women farmers in Nyabihu district said that access to improved seeds, fertilizers, pesticides, trainings and the price stabilization of their productions matter most in this program. The key informants mentioned that the access to market and the increase of processing industries are of utmost importance in this policy because imported products are still less expensive than the local production.

Based on the fact that the production cost is seen as the most challenging aspect in this policy, the government of Rwanda together with the Rwanda Agricultural Board should do the advocacy of the farmers to financial institutions so that the interest rate on loans for farmers are calculated per season rather than per month as their income comes after a season. To cope with the climate change issue, RAB also should consider advocacy to insurance companies so that the farmers' crops are insured in case of floods or other uncertainty.

In relation to the second objective, the research on the contribution of LUC to the food and nutrition security of women farmers found that LUC improved their food and nutrition security at 58.8% when looking at the availability of food in the region. The fact that food is available in the region through high productivity compared to the situation before LUC, does not affirm the availability of food at the household level. The findings uncovered that LUC improved the food and nutrition security at the household level only at 29.4% because when talking about food and nutrition security, it is important to consider the four dimensions of food security at a time. The challenge to the attainment of food and nutrition security, particularly the availability of quality and sufficient food at the household level was attributed to the fact that the production cost of potato became expensive compared to the return on investment which is supposed to help in the provision and diversification of other staple food at the household level. Farmers were supposed, with this LUC program, to grow crops that can give high productivity according to the agro-ecological condition and buy other crops that are not grown in their fields or areas at the market.

In relation to the third objective, this research indicates that LUC program was beneficial to women farmers in Nyabihu district due to the fact that its implementation was an inclusive approach. Women farmers had the opportunity to sit with local leaders and the agronomists to collaborate on its implementation. Through that process, women acquired knowledge and skills in their agricultural practices. However, it is important to highlight that well-off women farmers benefited more than poor women farmers because they are well positioned vis-a-vis access to physical (land), financial (loans) and social (farmers cooperatives) capital.

The LUC program helped women farmers to have access to the land because before its implementation; every land had to be registered in the national system. Therefore, women farmers had opportunity to register land in their names. The national land law was improved that the women also can have full access to the land which was not the case before; the acquisition of land was predominantly patrilineal. The access to land does not necessary affirm full right to its use. Men mostly have the last say to the land use and management.

Women farmers in LUC managed to participate in off-farm activities such as retailing and livestock at 85.3%, thanks to the increase in productivity which generates income and thus, increased their bargaining power within households. Women are now able to participate in household decision making, especially education and nutrition of their children.

Based on the above findings the government should help poor women farmers to have access to land as they understand the policy and see the benefit of consolidated land from the well-off farmers within the program.

Measures to the erosion should be taken by the government by providing strong agricultural technologies in order to save the land that are in sloppy areas mostly affected by the high intensity of rain, and therefore reduce the productivity.

As the policy of LUC promotes the mono cropping system, women farmers rely on market in order to diversify their food intake at the household level. This is a challenge to most of women farmers due to the inability to properly manage the money allocated to food consumption until the next harvest. The training on household income allocation could help to the access of quality food from the beginning to the next harvest. More importantly, the government of Rwanda should work together with the

MINAGRI and MINICOM to stabilize the market of the farmers' production.

The findings from my personal observation are that LUC program support more women farmers who have managed to use well the income from their production in the early years of LUC consolidation implementation by acquiring more land and by investing in other business such as open small business in town. And a big number of women farmers are the one that are still struggling with the program and therefore, their food security is threatened. LUC creates job opportunities for many landless women; I noticed that many women farmers are on casual work in Nyabihu district doing either land clearing, sowing, weeding or harvesting. More importantly LUC empowered women because they no longer do their farming on the subsistence level their projection is on making their agricultural practices more business oriented, however the challenges are still present.

To conclude, this study was delimited to Nyabihu district and in only 3 sectors where potato was selected as the main crop in consolidated areas. Therefore, I encourages other scholars to focus a similar research to other selected crops in the program in order to add knowledge on the contribution of LUC policy to the food security. Also, I am aware of the small sample used in this study due to financial and time limitation. It would be more beneficial, if a similar study was carried out on a big sample of respondents.

6.2 Methodological and theoretical reflections

The research approach used in this study matched the nature of the main research objective. With the qualitative research method, I managed to understand and explore the contribution of LUC to the food and nutrition security of women farmers in Nyabihu district. The semi structured qualitative interviews helped me to get the broader perspectives of the farmers and the key informants on how the social realities around LUC are perceived and interpreted in the study area. This method of data collection was very fruitful because I managed to get information which was not even expected when drafting my questionnaire. Farmers would answer the question and from their responses I extorted ideas that generated more knowledge about the subject. Another method used to collect data was through participant observation; this technique was of much interest because I managed to understand the context in which farmers live in this area. During field observation, I would meet people and talk to them and get some fruitful information. One of the most interesting ones was about their

child education. One could ask a simple question about their education status and that question helped me to discover some realities or distinction in the lifestyle of households that adopted LUC and those that are not participating in the program.

Moreover, as mentioned in the early chapters, I was introduced to the local authorities by the RAB focal person in Nyabihu district. In the first interviews I noticed that farmers were not being free to talk when the RAB focal person is around. Therefore, I decided to go alone and plan the previous interviews without the intervention of the RAB focal person nor that of the local authorities. This modification was very beneficial in a sense that farmers became free to express their views and critics on LUC policy. More importantly through this modification I managed to get other potential respondents apart from the ones listed by the district agronomists. Nonetheless, there were some contradictions between the interview responses, which I think this could be better investigated if one makes a comparative study between women farmers who adopted LUC and those who have not adopted the policy.

My decision to use the food and nutrition security concept and the institution concept were based on the fact that these two concepts are well positioned to highlight and analyze how an agricultural policy or activities could lead to improved food and nutrition security of the population. Through the analysis of the four indicators of food security, I analyzed the challenge to the attainment of the food and nutrition security of women farmers in Nyabihu district. The prerequisite for this, was to look at all the indicators at a time and see how one influence another. However, the choice to the use of a well-designed framework is that it assists in the interpretation of food security indicators by identifying appropriate entry points for monitoring changes over time and adjust interventions accordingly (FAO, 2008). Talking about intervention that is where the ideas of the concept of institution stemmed. This concept helped to analyze how agriculture interventions can connect the potential to improve food and nutrition security of the population entirely. However, by asking to the women farmers in Nyabihu district one comes to highlight institutions that matter most in the adoption of LUC in this area. The outcomes to this question is the center of the discussion in this research.

7. References

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