

**SOCIO-ECONOMIC FACTORS AFFECTING FARMERS
PARTICIPATION IN VERTICAL INTEGRATION OF THE
COFFEE VALUE CHAIN IN HUYE DISTRICT, RWANDA**

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University or any other award.

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DEDICATION

This work is dedicated to my uncles François Rwakazina, François Karangwa, Celestin Kabagamba, Antoine Karega, Révoat Gatsigazi, Claude Kayigi, Nestor Rurangwa, Aunt Gloriose Uwanyirigira and my beloved fiancée Hyacinthe Benemariya. I also dedicate it to my late family who lost their lives during the Rwanda Tutsi' Genocide; parents, sisters and brothers. I am blessed to have been part of your family and you still remain my family.

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ABBREVIATIONS AND ACRONYMS

ACDI-VOC	Agriculture Cooperative Development International/Volunteers Overseas Cooperative Assistance
Coops	Cooperatives
CWS	Coffee Washing Station
EDPRS	Economic Development and Poverty Reduction Strategy
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GoR	Government of Rwanda
ICA	International Cooperative Alliance
ICO	International Coffee Organization
MINAGRI	Ministry of Agriculture and Animal Resources
MINALOC	Ministry of Local Government
MINECOFIN	Ministry of Finance and Economic Planning
MINICOM	Ministry of Trade and Industry
NAEB	National Agricultural Export Board
NGO	Non-Governmental Organization
NIE	New Institution Economics
NIS	National Institute of Statistics
NUR	National University of Rwanda
OCIR-Café	The Office des Cultures Industrielles du Rwanda
PEARL	Partnership for Enhancing Agriculture in Rwanda through Linkages)
RDG	Rwanda Development Gateway
RDI	Rwanda Development Indicator
RwFs	Rwandan Francs
SNV	Stichting Nederlandse Vrijwilligers
SPREAD	Sustaining Partnership to Enhance Rural Enterprise and Agribusiness Development
SPSS	Statistical Package for Social Sciences
UNIDO	United Nations Industrial Development Organization
USA	United State of America
USAID	United States Agency for International Development

ABSTRACT

Coffee farming in Rwanda is an important sector that contributes significantly to the economy in terms of employment and income, especially for the smallholder coffee farmers in rural areas. In order to improve coffee production in terms of quality and quantity, farmers are encouraged to form and join cooperatives so that they can increase their vertical integration within the coffee value chain. Despite this strategy, level of participation of farmers in cooperatives is still low (21%) and slow. The objectives of this study were; (1) to determine the social and economic factors influencing farmers' decision to participate in coffee cooperatives; (2) to investigate the socio-economic factors influencing the intensity of coffee production (coffee growing) and (3) to identify and analyse agronomic challenges that smallholder farmers' face in production of coffee. The study was conducted in Huye District. A stratified sampling technique was used to select two strata with sample size of 230 comprising of 170 and 60 members and non-members of coffee cooperatives, respectively. The study relied on both primary and secondary data. The results revealed that farmers who joined cooperatives had yield of coffee equivalent to 759 kgs/ha compared to 635 kgs/ha for members and non-members respectively and an annual average farm net income corresponding to 223,000 RwFs and 193,000 RwFs for members and non-members respectively. Probit regression results revealed that off-farm income, access to credit, keeping farm records and trust positively influences farmers' decision to participate in coffee cooperatives while female headed household, higher education level and large farm size found negatively influenced farmers' decision to participate in coffee cooperatives. For Tobit regression, results showed that higher educational level, off-farm income and experiences in farming positively influenced the intensity of coffee production while female headed household and farm under other crops were found to negatively influence the coffee intensity. Results regarding agronomic problems showed that 19.4% and 13.3% found lacking mulch both members and non-members respectively while 13.5% members and 18.3% non-members showed to lack fertilizers. Based on the above results the study recommends support in the development of farmers' cooperatives as a channel of being vertically integrated by the farmers thus increase production and income from their coffee. There is a need to intercrop coffee trees with annual crops which give mulches since lack of mulch has shown to be a major problem for coffee production. Also, the government should allow the farmers' cooperatives to import fertilizers with tax exemption since the farmers delay to apply them or do not use them because of their costs or delayed distribution.

CHAPTER ONE: INTRODUCTION

1.1 Background

Agriculture dominates both the economy and livelihoods of Rwandese in rural area and therefore their participation is very important in this sector. For example in Rwanda 500,000 and 3,200,000 people gain their livelihood directly and indirectly from coffee sector (USAID, 2010) while in Kenya 5.9 million and 20 million directly and indirectly derive their livelihood from the coffee movement (Njuguna, 2012). Rwanda is a landlocked country in Eastern Africa. The country has 26, 338 sq. km of total area, of which 24, 950 sq. km (94.7%) is made up of land; and only 8, 600 sq. Km (32.7%) is suitable for agriculture (Mujawamariya, 2007). According to Gourou (2010), the population of Rwanda is estimated at 10,277,212 million with a density of 390.2 inhabitants per sq. km. This makes Rwanda one of the most densely populated countries in Africa (RDG, 2005). The agriculture sector absorbs 79% of the labour force and contributes 41% of Gross Domestic Product (World Bank, 2010). It generates more than 45% of the country's export revenues. Agriculture is also important for national food self-sufficiency, accounting for well over 90% of all food consumed in the country. Furthermore, coffee and tea are the major export products, contributing more than 90% of the value of export crops (World Bank, 2011).

Coffee is one of Rwanda's most important official sources of foreign exchange and an important source of income among smallholder farmers (Schluter & Finney, 2001). Approximately 500,000 smallholder farmers grow Arabica coffee on a total area of 33,000 ha, each owning less than one hectare of land (OCIR-Café¹, 2008). Rwanda

¹ OCIR-Café: Office des Cultures Industrielles du Rwanda (National Coffee Board)

possesses excellent agro-ecological conditions for cultivation of Arabica coffee of *bourbon* and *typica* species (Mujawamariya, 2007). Coffee in Rwanda is commonly produced in all provinces of Rwanda but high production is found along the shores of Lake Kivu (Appendix 1.1) in the western part of the country, as well as in the central and southern provinces of the country (Rukazambuga, 2008).

Since 1995, the Government of Rwanda (GoR) and its partners began to target a specialty coffee in gourmet markets. So to achieve this target, each activity in coffee chain has to be taken care of from input supply to end consumer. Therefore, coffee growers were encouraged to form and join cooperatives and building Coffee Washing Stations (CWS) throughout the country. The CWSs are units specialized in depulping, washing and drying cherries, in order to obtain high quality coffee (fully washed coffee). Fully washed coffee is transformed in CWS, but the production still remains insignificant, it presents approximately 10% (OCIR-Café, 2008). The lower production of fully washed coffee is explained by few numbers of coffee growers who joined cooperatives and therefore coffee washing stations are underused which leads to lower quantity of fully washed coffee. For instance, in 2009, washing stations utilized only 43% of their capacity (Figure 1.1).

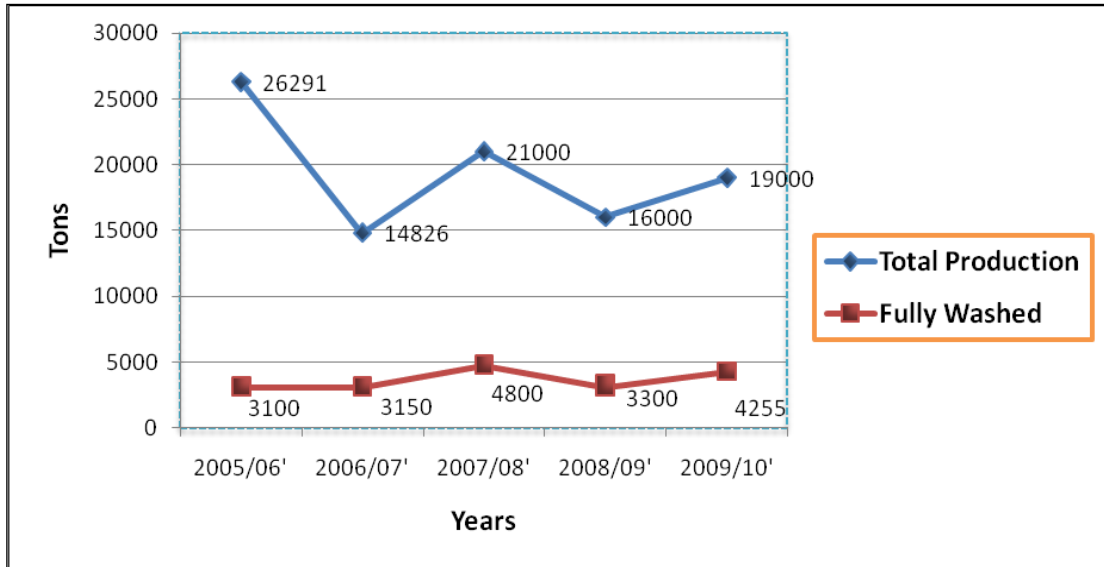


Figure 1.1: Five Years Coffee Production Trends, Rwanda

Source: NAEB, (2010)

Vertical integration is viewed as a strategic tool in creating competitive advantage. It has considerable benefits, reduces risks and costs in the value chain. Vertical integration is the number of chain activities a farmer undertakes from farming, processing, transport to trading Aduke *et al.* (2006). Therefore, there is substantial literature and significant contributions that have been published about the cooperative being vertical integration (Helmberger & Hoos, 1962; Sexton & Iskow, 1988). The extent to which a cooperative is vertically integrated depends on closeness between the allocation of ownership rights and control allocation rights (Minerd, 2007). The (NCBA, 2005) agrees that cooperatives are established by their members when the marketplace fails to provide need goods and services at affordable prices and acceptable quality. These cooperatives continue to play significant economic and social roles in their communities. Cooperative or farmers' associations have been found to play a vital role in providing support to farmers in order to adopt quality market standards (Bacon, 2005).

The GoR has put much effort in strengthening cooperatives as a channel of quick accessibility to trainings, farm inputs, credits, market and other services thus uplifting the status and well being of people (Nambi, 2008). According to the Ministry of Economic planning and Finance (MINECOFIN, 2008) strategy document, the government stipulates that cooperatives contribute to the achievement of vision 2020 and Millennium Development Goals (MDG's). Cooperatives are formed for many purposes: These include (1) provision of services to growers such as accessing and distribution of farm input, managing and monitoring their use, (2) production of high-quality coffee through washing station and coffee laboratories and (3) enhancement of farmers' participation in the coffee sector (Mujawamariya, 2007).

According to OCIR-Café (2009) coffee census, Rwanda had 160 cooperatives in the coffee sector out of which 21% of the farmers were members in all provinces of Rwanda (Table 1.1). This low level of participation by farmers weakens farmers' organizations and hinders coffee sector development because it is difficult for them (farmers) to receive extension service, input subsidies, or any other service related to coffee production.

Table 1.1: Membership of Coffee Farmers in the Cooperatives in Rwanda in 2009

Province	All Coffee Producers	Member of Cooperatives	%	Non Member of Cooperatives	%
Northern	58,858	21,557	37	37,300	63
Southern	133,781	17,058	13	116,722	87
Eastern	51,140	12,709	25	38,431	75
Western	143,150	28,370	20	114,779	80
Kigali City	7,277	890	12	6,386	88
Total	394,206	80,584	21	313,618	79

Source: OCIR-Café, 2009

Generally, coffee production face a number of challenges such as agronomic, social and economic constraints such as low level of participation of coffee growers in

cooperative organization, poor cooperative management, poor agronomic practices, lack of access to agricultural credit, high cost of farm inputs, low market prices, small farms (FAO, 2008).

1.2 Problem Statement

Despite low world market prices, there is a growing market for Rwandan high quality coffee in the USA, Europe and Japan (Marijke *et al.*, 2012). The current market demands coffee of high quality that is graded 80% out of 100 in cupping taste and Rwanda has the capacity to produce it because of its favourable agro-ecological zone. But the quantity of Rwanda's coffee is very small in the international market compared to countries with large scale producers. However, it is among the best in taste. To increase quantity of Rwandan coffee in the international market, Rwandan coffee stakeholders' are trying to target specialty coffee markets that provide price premiums. To achieve this, the Government of Rwanda issued a national coffee strategy that outlined a plan for capturing a larger share of the specialty coffee sector through motivating smallholder farmers to form and join cooperatives in 2002, this is because; farmers within cooperatives can easily obtain extension services, technical assistance, increase their bargaining power and earn higher prices for their coffee.

In addition, cooperatives establish CWSs for the purpose of producing competitive coffee at the international markets. For instance, in 2010 the targeted production was 44,000 tons; 63% of which would be fully washed. However, this production targets have not been met due to small number of coffee farmers who have joined cooperatives (Boudreaux, 2011). Referring to the recent coffee census of 2009 and 2012, only 21% of farmers were in cooperatives. This adversely affects the vertical integration of the farmers in the chain. So it is in this context that this research

attempted to find out the socio-economic factors that affected farmers in Huye District of Rwanda to participate in vertical integration (cooperatives) activities of the coffee value chain and the socio-economic factors that influence the decision to join and if not what were the limiting factors and constraints in coffee production.

1.3 Research Objectives

1.3.1 Main Objective

The overall objective of the study was to analyse the socio-economic factors influencing farmers' participation in vertical integration in the coffee value chain in Huye District of Rwanda.

1.3.2 Specific Objectives

Specifically the study aimed at:

- 1) Determining social and economic factors influencing farmers' decision to participate in coffee cooperatives.
- 2) Investigating the socio-economic factors influencing the intensity of coffee production.
- 3) Identifying and analysing agronomic challenges that smallholder farmers face in coffee production.

1.4 Research Hypotheses

- 1) Farmers' decisions to participate in coffee cooperatives of Huye District are not influenced by socio-economic factors.
- 2) The intensity of coffee production is not influenced by socio-economic variables.
- 3) Agronomic challenges faced by smallholder are not affecting their coffee production.

1.5 Justification for the Study

The information generated from this study provides useful insights and recommendations to farmers, extension agents, researchers, policy makers among other stakeholders in the coffee sector. It could also be used for the formulation of policies and programs towards sustaining farmers' participation in vertical integration of the coffee value chain in Rwanda. This is envisaged to increase income from coffee and improve livelihoods of the smallholder farmers.

1.6 Limitations of the Study

The sample size was made up of small-scale farmers in the Huye District where the population comprised the coffee growers who are members and non-members of cooperatives. The sampling units were households chosen from three sectors in the District which includes Maraba, Kigoma and Simbi. The study required a huge amount of money for data collection, analysis and results presentation which was a constraint due to limited budget. Comparisons with other studies haven't been conducted in the Sub-Saharan Africa region on the socio-economic factors affecting farmers' participation in vertical integration. This limited the research due to lack of materials for effective comparison of this study with other studies.

1.7 Conceptual Framework

This study was conceptualized as farmers' participation in vertical integration in order to determine socio-economic factors that affect farmers' decision to participate in cooperatives. Ortmann & King, (2007) explained that the idea of the cooperative is derived from the economics of vertical integration. Sexton and Iskow (1988) defined Agricultural cooperation as the coordination of producers to achieve mutual vertical

integration. Bijman (2007) noted that cooperatives in developing countries are seen as institutional arrangements, involved in the organization of often smallholder farmers with the advantages of reducing transaction costs of accessing input and output markets, as well as improving the negotiating power of smaller farmers vis-à-vis large transaction partners (Kherallah & Kirsten, 2001). Transaction costs can also be classified into information, negotiation, and monitoring or enforcement costs (Hobbs, 1997).

According to (Jaffee & Morton, 1995), there are several ways that collective action through cooperatives can reduce transaction costs and support commodity market development and coordination. First, cooperatives can overcome smallholders' barriers of access to assets, information and services. Second, cooperatives allow for the provision of certain public goods like product promotion that may be neither possible nor profitable on an individual basis. Third, cooperatives reduce risks by guaranteeing commodity purchases and sales on behalf of members and provide insurance, credit, or both to members. Fourth, cooperatives lower transaction costs for both members and non-members trading with members by settling disputes and obtaining, interpreting and disseminating information about production, markets, farmer and trader competence and creditworthiness. Lastly, cooperatives can establish a collective reputation for quality that will engender better output prices that may not be easily feasible under individual farmer conditions (Aduke *et al.*, 2006). Thus, this study wanted to find out at what extent the socio-economic variables affect the decision to participate in vertical integration (Figure 1.2):

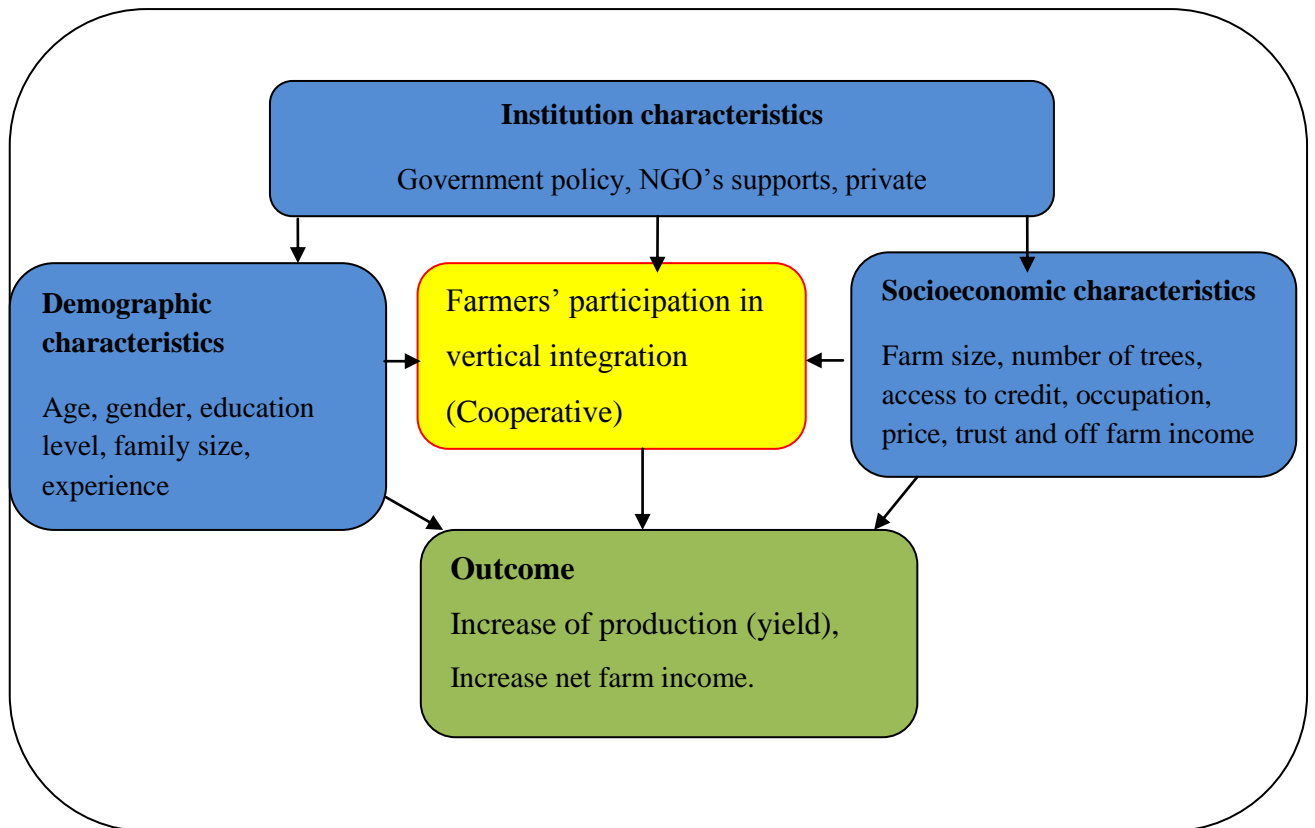


Figure 1.2: Conceptual Framework

Source: Adopted and modified from Lazzarini *et al.* (2001).

1.8 Definitions of Key Terms

Socio-economic factors: are indicators looking at both social and economic conditions relevant to the well being of the farmers.

Vertical integration: is a strategy used by a company to gain control over its supplier or distributors in order to increase the firm's power in the marketplace, reduce costs and secure supplies or distribution channels.

A Cooperative: is an autonomous association of persons who voluntarily cooperate for their mutual social, economic and cultural benefit.

Intensity of Coffee Production: is the share of land dedicated to coffee cultivation

Value Chain: is a chain of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter reviews the literature related to the subject matter of the study. It begins with the core definitions of the relevant concepts of vertical integration, socio-economic factors determining decision to participate and gaps identified from selected empirical studies relevant to the present study (Table 2.2). It focuses on vertical integration efforts in Rwandan coffee sector, coffee supply chain in Rwanda, the role of development partners on coffee production, concepts of coffee quality and agronomic challenges affecting production of coffee.

2.1 Vertical Integration

2.1.1 Definition

Vertical integration can be understood in various ways and its definition has evolved in the literature during the past several decades (Table 2.1). The term first emerged in the economics literature as early as 1930's.

Table 2.1: Definitions of Vertical Integration

Definitions	Authors
Vertical integration is the “coordination of the various factors of production” which is “carried out without the intervention of the price mechanism”.	Coase, (1937)
Vertical integration is the combination of two or more stages in the process of production and marketing that are effectively controlled by single management.	Rehber, (1998)
Vertical integration is defined as the number of chain activities farmer undertakes from farming into processing, transport and trading.	Aduke <i>et al.</i> (2006)

Vertical integration may be backward or forward. Backward integration occurs when a firm decides to make rather than buy an input from an independent supplier. Forward integration occurs when a firm decides to use rather than sell one of its products to independent customers (Olasunkanmi & Bamiro, 2006). It has been seen as an opportunity for firms to improve their position in a chain by:

- (i) Putting additional demands on producers and exporters and requires organizational and financial strength or support from other actors (inside or outside the chain);
- (ii) Enabling producers to carry out value adding activities and increase revenues (Le Nguyen, 2007). According to (Barney, 1991), vertical integration is a strategic tool in creating competitive advantage and has considerable benefits, and also reduces risks and costs in the chain.

Peterson & Wysocki (1997) found that there are different factors that can be controlled through vertical integration such as price, quantity, quality and terms of exchange. Thus, integration may require joint commitments and investments in the chain. Some firms may vertically integrate their activities with the objective of minimizing transaction costs, increasing their control over resources, capturing more rent, increasing entry barriers and foreclosing competitors. In general, vertical integration might benefit small producers by increasing income, productivity, product quality, providing guaranteed prices and sales, and improving access to capital. Furthermore, vertical integration in the processing stage aims at obtaining higher prices for farmers by circumventing middlemen (Aduke *et al.*, 2006).

2.1.2 Factors affecting smallholder farmers participating in vertical integration

Individual smallholders in developing countries face numerous constraints in the marketing of their products resulting from high transaction costs in the market chain

(Froukje *et al.*, 2007). First, they have limited access to physical and financial resources. This restricts their opportunities to increase their scale of production in order to reduce transaction costs and to invest in efficiency increasing and value adding technologies. Secondly, smallholders have limited technical skills, no access to training on production and processing, or to information on market requirements. Lastly, individual farmers lack bargaining power and as a result there is no equal distribution of value added among the actors in the market chain.

However, farmers' cooperatives or associations are often described as an effective way to solve most of the above mentioned problems (Froukje *et al.*, 2007). Szabó (2002), indicated that the main incentives for the establishment of cooperatives as a form of vertical integration were as follows: First, traditionally cooperatives provide access and secure markets for the long term. Secondly, they can increase technological and market efficiency and carry out activities with a higher added value. Thirdly, cooperatives can decrease and internalize transaction (information) costs, with a better flow of information on consumer demand. Asokan & Sight (2003) found that vertical integration through cooperatives is a phenomenon used for high-value and perishable commodities. Similarly, Wollni & Zeller (2006) found that small-scale farmers are more likely to market their coffee through cooperative channels and participation in cooperatives serves to increase prices received by producers. USAID & World Bank (2002) showed that cooperatives constitute an important link between small scale farmers and specialized markets. To develop the cooperatives, training on organisational management was recommended to ensure that the associations would prevent or minimize problems such as embezzlement or conflict. Moreover, their links with other agents, particularly input suppliers was to be strengthened so that the

traders and farmers could work with together in provision of needed services (Bingen & Munyankusi, 2002).

2.2 Development of Farmers' Cooperatives in Rwanda

Like many other African Countries, cooperatives were first introduced in Rwanda by the Belgians in the colonial period as instruments for driving the agenda of the government's socio-economic goals (Mukarugwiza, 2010). In the agricultural sector, African cooperatives were strictly controlled by the colonial administration to the point of fixing the prices that cooperatives could pay their members for their produce, which was lower than what private European entrepreneurs paid (Wanyama, 2009). At the time of independence in 1962, these cooperatives were mainly involved in social activities (Mutual assistance, offering insurance for health hazards and life, and so on). After the independence, the GoR used these cooperatives as mechanisms for implementing policies and development plans, thus becoming a tool for political control (MINICOM, 2006).

The government viewed cooperatives as institutions that help small farmers to produce cash crops such as coffee, tea and pyrethrum (Murekezi, 2009). After the genocide, different NGOs that supported the recovery of the country recognized the important role that cooperatives could play in social reconstruction and began to encourage the establishment of these organizations. In addition, in 2005, the GoR recognized cooperatives as a tool for alleviating poverty and started drafting the document policy. It is in this context that the government put in place a taskforce with overall mission of promoting cooperatives in order to develop a legal framework for the registration and promotion of these cooperatives. Therefore, cooperatives in Rwanda are regulated by the law specifically number 50/2007 of the September 18/2007 determining the

establishment, organization and functioning of cooperative organizations in Rwanda (MINECOFIN, 2008).

2.2.1 Advantages of Cooperatives in Vertical Integration

Farmer based organizations may link producers to the market by helping them to overcome information deficiencies with respect to production standards and consumer preferences. These organizations can collect information about production technologies and consumer preferences and provide it to their members in the form of extension visits and demonstration sessions. This could be explained by the fact that farmers' associations have the potential to shorten the marketing chain by directly connecting small producers to markets; a better coordinated production and marketing activities facilitate farmer to have access to production inputs at fair prices (Shiferaw *et al.*, 2006). According to Barton (2000), farmers form cooperatives with the goal to generate greater profits (1) by obtaining inputs and services at lower costs than they could obtain elsewhere or that were not available, and (2) by marketing the products at better prices or in markets that were previously not accessible.

There are several non-economic reasons that can be crucial factors in the success of vertical integration by cooperatives (Hakelius, 1996). First, trust between the member and cooperative staff is a major cooperative advantage (Spear, 2000). Second, the social and informal network of members or potential members is also relevant as a determining factor in reducing transaction costs and in the process of establishing the activity of a cooperative. In addition, having better knowledge, skills and confidence among members is vital to how cooperatives can be highly efficient in terms of the management of human relations, despite the lack of necessary capital to invest. Human asset specificity (acquired skills and knowledge of certain workers which are valuable

within a particular relationship than outside it) may become more and more important in the process and success of flow of information (Røkholt, 1999).

2.3 Socio-economic Factors

Factors determining farmers' decision to join cooperatives are more complex in case of perennial crop like coffee (which requires special care from the farm to the cup) than in the case of annual crops. This is because of the difficulties in securing the benefits associated with delivering high quality and quantity coffee, which is required at the international markets. In a study conducted on the determinants of small scale farmers' decision to join farmers based organizations in Ghana, the results revealed that farm size, farming as a major occupation, access to credit/loan and access to machinery services influenced farmers' decision to join farmer based organization in the Eastern region of Ghana (Asante *et al.*, 2011). According to Frayne *et al.* (2008) education level, farm size and gross income variables play important roles in determining the probability of participation. They revealed that smallholder farmers are likely to become members' of the agricultural cooperatives than the large scale farmers. This is associated with a study by Karli *et al.* (2006) who found that the probability of the membership decreases with the increase in the farm size. Furthermore, Okwoche *et al.*, (2012) reported that farmers joined the farmers' cooperative societies mainly to have access to credit. Lerman & Ruben (2012) reported that access to non-farm income encourages peasant farmers to join the cooperatives because they are less exposed to risks.

Aazamil, *et al.*, (2011) in a study conducted on socio-economic factors affecting rural women participation in productive cooperation revealed that trust, number of family members, economic motivation and land ownership were among socio-economic factors influenced the participation of women in the Paveh ball-making cooperative. In

another study, Nugussie (2009) showed that the main variables that strongly and significantly influenced rural people to join agricultural cooperatives were male head household; attending public meeting or workshop; accessibility to credit services, family size and access to information.

Table 2.2: Gaps Identified from some of the Selected Empirical Studies

Gaps Identified from some of the Selected Empirical Studies

No	Author(s) and year	Study title	Analytical methods	Summary of findings	Gap identified
1	Olasunkanmi and Bamiro (2006)	Vertical integration and Technical efficiency in poultry (Egg) industry in Ogun and Oyo States, Nigeria	Descriptive statistics and stochastic production frontier function.	The higher the level of vertical integration the greater technical efficiency.	Did not determine socio-economic factors causing higher level of vertical integration.
2	Wollni & Zeller (2006)	Do farmers benefit from participating in specialty markets and cooperatives? The case of coffee marketing in Costa Rica.	A two-stage model.	The participation in cooperatives has a positive impact on the probability that a farmer chooses to grow specialty coffee and analogously the prices that they receive.	Did not investigate the factors influencing farmers' decision to participate in cooperatives.

3	Rendani (2005)	Integration of Emerging cotton farmers into the commercial Agricultural Economy	Descriptive and logistic regression.	Cotton plays important role in the farmers' livelihood in terms of employment, income, household gender in relations and food security	Need to examine the factors both internal and external that limit cotton highly production in rural area.
4	Benifica (2006)	An analysis of income poverty effects in cash cropping economies in rural Mozambique: blending econometric and economy-wide models.	Standard sample selection model and the treatment effects model.	Farm level profitability in cotton is significantly lower than in tobacco.	The study did not consider the challenges cotton farmers face during production .
5	Ferto & Beniface (2006)	The choice of supply channels in Hungarian fruits and vegetables sector	A multinomial Logit model.	The farmers sell their product to marketing cooperative is influenced by the age and information costs positively, whereas by asset specificity and bargaining power negatively.	Did not examine factors influencing fruits and vegetables intensification

6	Benifica (2006)	An analysis of income poverty effects in cash cropping economies in rural Mozambique: blending econometric and economy-wide models.	Standard sample selection model and the treatment effects model.	Farm level profitability in cotton is significantly lower than in tobacco.	The study did not consider the challenges cotton farmers face during production .
7	Ismat (2005)	An Assessment of vertically integrated contract poultry farming: A case study in Bangladesh	Descriptive and inferential statistics.	The Contract farmers get several incentives from vertically integrated firm such as credit, production and price risk reduction, marketing assistance, technical know-how.	Did not explore the causes why farmers have contract and others not.

2.3 The Concept of Value Chain

Value chain is a system of interlinked activities which various actors perform to transform inputs into outputs through value addition at each stage and with the assistance of other parties who provide supportive services (McCormick & Schimizitz, 2001). This is the set of value-adding activities through which a product passes from the design to the consumption stages. The value chain is thus an alliance of collaborators. Value chain approach was developed by Michael Porter in the 1980s in his book “competitive advantage: creating and sustainable superior performance.”

According to Kaplinsky and Morris (2008) a value chain helps to identify key bottlenecks to economic growth. According to Aduke *et al.* (2006) value chains are specific types of supply chains, one where the actors actively seek to support each other so that they can increase their efficiency and competitiveness. They invest time, effort and money, and build relationships with other actors to reach a common goal of satisfying consumer needs and in this increase producer profits. It focuses on value creation via innovation in products or processes, marketing and the allocation of incremental value. The value of a product increases at each point of the process, hence the term value chain (McCormick and Schimitz, 2001). For a farmer, value-addition has a particular importance in transforming an unprofitable enterprise into a profitable one. A coffee grower can add more value on the produce through participating in different activities along coffee value chain (Kent, 2005).

2.3.1 Global Coffee Value Chain

Coffee is one of the most important primary export commodities of developing countries, especially in Africa. In most developing countries, coffee production provides an important option for income generation for resource poor households and is thus essential in socio-economic development of these countries (ICO, 2002). There are a number of coffee species, but only *Coffea arabica L.* (arabica) and *Coffea canerphora* (robusta) are widely cultivated because they are economically and commercially viable (DaMatta, 2004).

The world coffee market has undergone dramatic transformations over the past couple of the decades due to changes in international policies and new requirements both on supply and demand sides. On the supply side, coffee roasters prefer to sign contracts with coffee exporting countries that guarantee a reliable minimum quantity of supply. For Arabica coffee, the required quantity is about 60,000 tons (Ponte, 2001). On

demand side, new market trends such as specialty/ gourmet, fair trade and flavoured coffee have developed, making traceability of origin, as well as economic, social and environmental conditions, important elements for the establishment of long term partnerships between producers and roasters (Murekezi, 2009).

The value chain approach has been developed by the world system and has been used as main analytical tool in studies of the coffee market. According to (Kaplinsky, 2006), the coffee value chain can be upgraded through product development and positional consumption. Producers have focused mainly on productivity improvement, whereas roasters and retailers have emphasized on products innovation.

2.4 Vertical Integration Efforts in Rwandan Coffee Sector

Coffee production in Rwanda started in 1904 and the first export was in 1917. Since 1927, the colonial administration required Rwandese farmers to grow coffee. Coffee cultivation was made compulsory and it was prohibited to uproot their plantation. After independence, OCIR-Café was created under the Ministry of Agriculture and Animal Resources; in 2008 OCIR-Café became the National Agricultural Export Board (NAEB) whose mission is regulating, monitoring and promoting agency in the sub-sector (OCIR-Café, 2008).

In 2002, Rwanda began to target specialty coffee because the higher value coffee was very attractive to global markets (USAID, 2006). Its coffee was unknown in the specialty coffee market until 2002 when fully washed coffee from Maraba cooperative was exported to USA and achieved high quality scores (USAID, 2006). In May 2008, the coffee from Buremera washing station won the second price in a cupping completion organized by the Specialty Coffee Association of America (SCAA) (MINAGRI & MINECOFIN, 2008). In the same year, Rwanda organized the first Cup of Excellence (CoE) competition ever hosted in Africa. In addition, cupping taste

indicated that Rwanda have significant potential to produce specialty coffee, that could compete with higher-end producers such as Ethiopia and Kenya (Webber and Labaste, 2010). These are the results adopted in last ten years, the government of Rwanda has played a big role in developing the country's specialty coffee industry. The GoR developed; two national coffee strategies and many other government programmes have been set up with the assistance of development partners such as USAID, IFAD, and so on. In 2002 GoR developed a strategy of targeting production of specialty coffee and entering a new niche market for which the price does not follow the downward trend of conventional coffee (SPREAD, 2007).

In 2008, GoR developed a new National Coffee Strategy (2009-2012), in which it stated that "improved profitability and competitiveness of the private sector will result from implementation of the coffee strategy". Under the above strategy, Rwanda was targeting the production of 33,000 tons of coffee by 2012, with 19,000 tons (58%) of fully washed coffee. In turn, it was expected to generate exports of US \$ 115 million by 2012 (MINAGRI and MINICOFIN, 2008).

Similarly, the EDPRS 2008-2012 target was to have 240 coffee washing stations (representing 37% fully washed coffee) fully operational by 2012, and 100% fully washed coffee by year 2018 (Lyambabaje *et al.*, 2011). The GoR aimed at increasing value addition by encouraging and supporting investment in washing stations and processing, as well as increasing sales by improving marketing (EDPRS, 2007).

However, coffee producers have acquired training on proper timing of harvesting cherries, the process of wet milling of cherries and coffee cupping. The ultimate goal of these efforts was to increase the quality of coffee and meet the demand of the specialty coffee market (Goff, 2006). Regarding sale of cherries by coffee growers to

cooperatives or private washing station; NAEB sets a minimum price weekly in consultation with stakeholders as a basis from which a sale price per kilo may be negotiated for both coffee cherries and parchment coffee for the farmers (Mutwandwa *et al.*, 2009). One of the advantages stated by farmers selling coffee cherries is that they no longer feel “cheated” by coffee traders, for instance, some farmers reported that traders used to downgrade the quality of coffee to justify paying a price below the GOR mandated price (Murekezi, 2009).

2.4.1 Rwandan Coffee Supply Chain

The Country has gradually established itself as a source of speciality coffee, producing world-class coffees and sold internationally through fair trade (Mutwandwa *et al.*, 2009). The coffee market chain in Rwanda is segmented into three types of coffee namely cherries, parchments and green coffee. Selling cherries offers more benefits to farmers compared to selling parchments because farmers who sell cherries often get paid promptly, with relatively high prices (Murekezi, 2009). Parchment or dry coffee is usually a small proportion of the produce that is of low quality and which is rejected by cooperative members or sluggish cherries harvested towards the end of the season. The parchment is most of the times bought by middlemen whereas cherry is sold through two channels, farmers’ cooperatives or private processors (NAEB, 2010). Many operators, particularly private processors and cooperatives’ coffee washing stations compete in buying more quantities of raw coffee to cover their operating costs (Murekezi, 2009).

After obtaining cherries then cooperatives and traders start its transformation in parchment coffee through the process of depulping and drying (Figure 2.1). The subsequent transformation into green coffee by hulling (to remove the parchment) is

performed both by cooperatives (few own the hulling machines like Maraba) or by exporting companies, such as Rwacof, Rwandex, Sicaf, Coffee Business Center, Agro-coffee and Caferwa. A small proportion is roasted and domestically consumed and 99% of coffee is exported (OCIR-café, 2008).

After obtaining certificate from NAEB, coffee is exported to the USA, Europe and Asia. The small cooperatives built a union which is called Rwanda Smallholders Speciality Coffee Company (Rwashoscco) and Misozi of which they sell their produce through. The role of these unions is to act as intermediaries between cooperatives and international buyers (Murekezi, 2009).

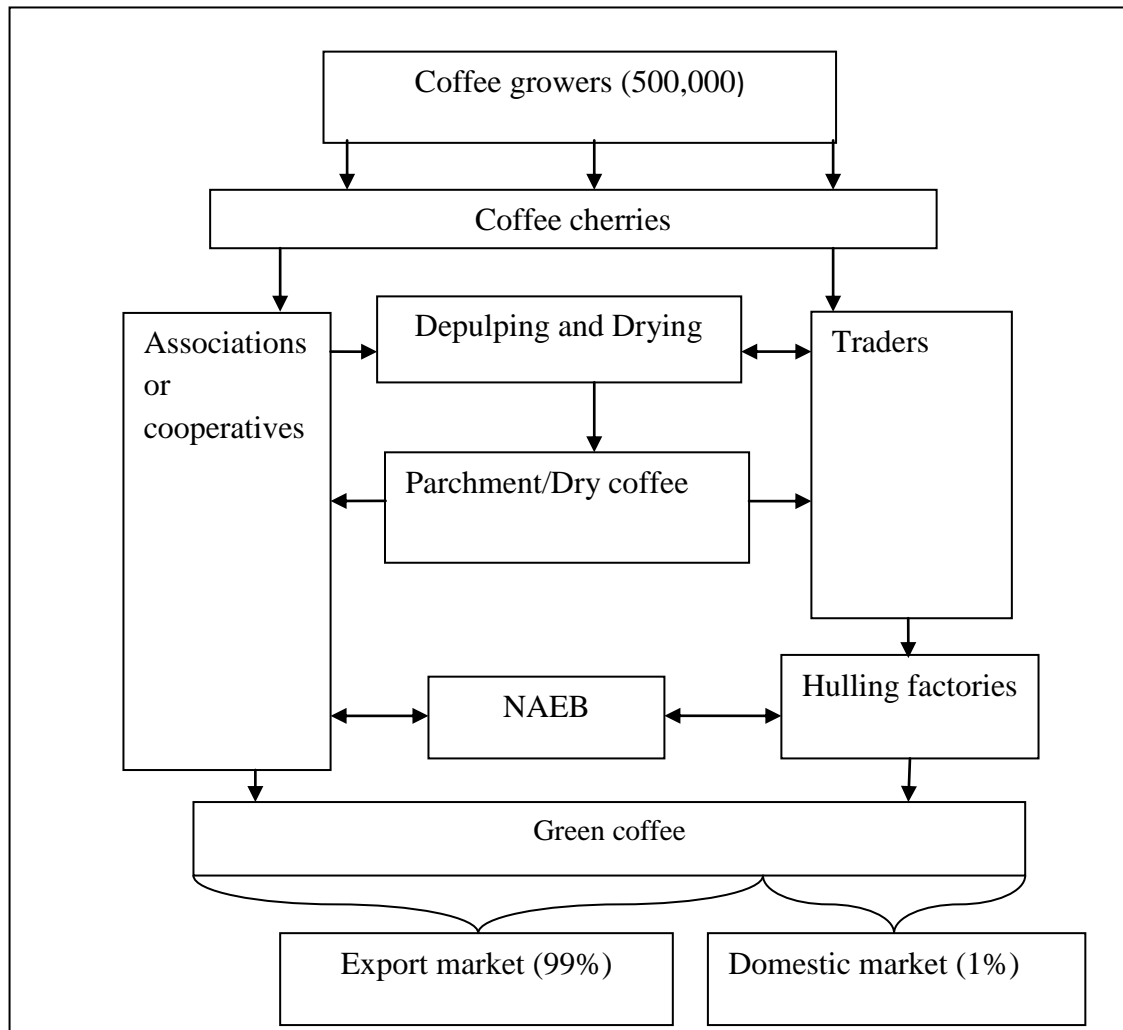


Figure 2.1: Coffee supply chain in Rwanda

Source: Adopted and modified from Murekezi (2003)

2.5 The Role of Development Partners (DPs) on Coffee Production

The DPs (USAID and SNV) have had a big impact in the process of promoting the Rwandan specialty coffee industry. They assisted different coffee cooperatives by training them on specialty coffee production and processing. Before year 2000, Rwanda counted only two state-run washing stations and by 2007 there were about 100 washing stations (SPREAD, 2007) which increased to about 200 in 2012. USAID has been the principle promoter of specialty coffee through technical assistance, training, and financial support. The project was implemented through, ACDI-VOCA; the ADAR Project and the PEARL Project which was executed by Michigan State and Texas A&M Universities (SPREAD, 2007). STICHTING NEDERLANDSE VRIJWILLIGERS (SNV) Rwanda, together with OCIR-Café, have played a significant role in promoting the sector, improving quality, and strengthening management of producer groups, resulting in increased revenues for coffee farmers (SNV RWANDA, 2010).

2.6 The concepts of quality in the coffee sector

In recent years, different coffee producing countries have tremendously expanded their production and export volume (Behailu *et al.*, 2008). In the current context of overproduction and low prices of the coffee market, improvement and valorisation of coffee quality could provide the coffee chain with a new impetus (Lorey *et al.*, 2006). According to ISO (2000), quality is described as “the ability of a set of inherent characteristics of a product, system or produce to fulfil requirements of customers and other interested parties.” These inherent characteristics can also be called “attributes”. The quality of coffee in the accepted sense of the term includes the physical, chemical, and organoleptic properties mainly sought after by the consumer

(Lorey *et al.*, 2006). These properties which manifest themselves in flavour, aroma, odour, strength, lingering, taste, acidity, astringency, homogeneity, appearance, shape and size, may be very different according to the type of coffee (Arabica, Robusta), the country of origin, and the method adopted for processing, roasting, and even preparation of the brew (Barel & Jacquet, 1994).

According to the ITC (2002), coffee quality is a combination of many factors, including the botanical characteristic of the variety grown, topographical conditions, weather conditions, the care taken during growing, harvesting, processing, storage, export preparation and transport. Growing, harvesting, processing, storage and export preparation are the most variable factors that can influence the determination of quality since varietal and topographical conditions are constant. According to OCIR-Café (2008), the quantity and quality can decline if the maintenance of the farm and trees are not well maintained (Figure 2.2)

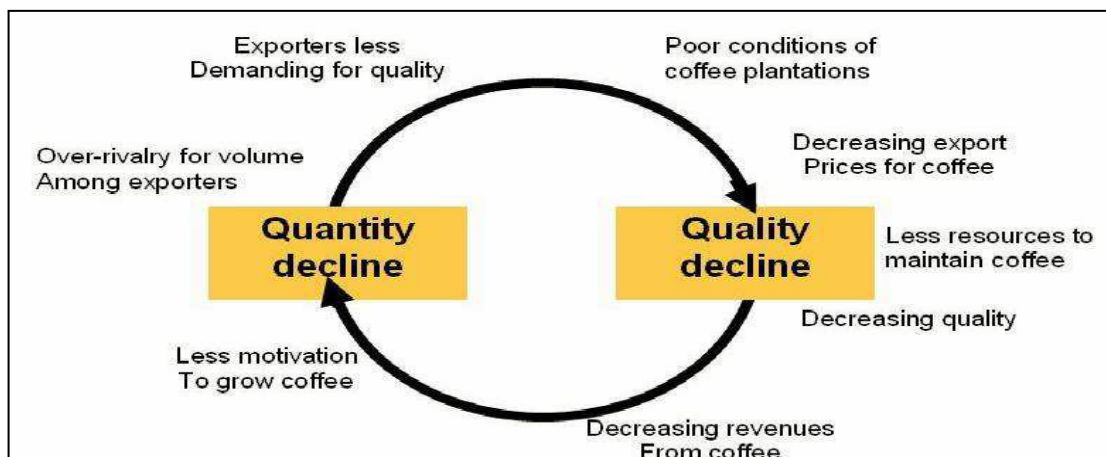


Figure 2.2: Rwanda's Coffee Low Quality and Low Quantity Trap

Source: OCIR-Café, 2008

2.6.1 Agronomic Factors Affecting Coffee Production

a. Effects of Farm Inputs and Mulch on the Quality of Coffee

Several studies have shown that coffee bean is a nutrient rich fruits and its production requires a considerable amount of nutrients. It involves nutrients coming from fertilizers, the atmosphere and waterways and without fertilization, this nutrient balance is negative (Wintgens, 2004). According to Van der Vossen (2005), sustained coffee production requires regular application of organic or inorganic fertilizer. Smallholder farms with no access to external inputs often produce less than 300 kg/ha/year green coffee beans, while intensively managed plantations of Arabica coffee at conventional spacing may yield annually 2 t/ha/year (SÖndahl *et al.* 2005). As many studies have reported, the amounts applied are quite minimal to sufficiently supply the crops with adequate nutrients since the fertilizers are expensive and many farmers in SSA cannot afford them due to their low incomes even though they are easy to use (Mwangi, 2010; Wegulo *et al.*, 2009). Other study found that fertilizer was just as important as improved seed, contributing as much as 50 percent of the yield growth in Asia (Tomich *et al.* 1995).

Many studies have revealed that Mulching is an important cultural practice for Arabica coffee as it controls erosion, regulates soil temperature, minimizes evaporation and supplies organic nutrient latter lone after decomposition. According to Mitchell (1988) mulch from grasses helps to control soil erosion, weeds and is highly effective in soil moisture preservation. It is also an important source of organic matter and nutrients.

b. Effects of Pests Control on the Quality of Coffee

Pests and diseases affect the cherries directly or cause them to deteriorate by debilitating the plants, which will then produce immature or damaged fruits. Disease and insect attack (such as leaf miner and mites) may also result in low quality beans (Wintgens, 2004). Healthy bushes always give a better quality product. The health of a bush depend primary on proper growing methods (Mburu, 1999). Although fungicides and insecticides are efficient, suitable growing methods also reduce the impact of diseases and pests. Coffee bushes have a number of enemies therefore besides the suitable growing methods; pesticides must always be used with care.

c. The Concept of Specialty Coffee

Specialty coffee is defined in the cup. It takes many steps to deliver that cup into customers table. Each of those steps can uphold the classification of specialty if quality has been maintained throughout all preceding steps. The specialty market is a high value, stable market. Sometimes called ‘gourmet’ or ‘premium’ coffee, coffees are made from exceptional beans grown only in ideal coffee producing climates like Rwanda’s (Marijke *et al.*, 2012). They tend to feature distinctive flavours, which are shaped by the unique characteristics of the soil that produces them. Rwanda has all potential to produce specialty coffee.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter describes the following sections: study area, research design, sampling technique, data collection, data preparation and data analyses.

3.1 Description of the Study Area

The study was conducted in Maraba, Kigoma, and Simbi sectors² in Huye District of Southern Province of Rwanda (Figure 3.1). The selection of this area was based on suitability condition for growing Arabica coffee as demonstrated by the number of coffee trees grown in this area ranging between 500,001- 849,267 in some sectors (Maraba and Kigoma) and 200,001- 400'000 (Simbi) and also number of coffee washing stations (9) found in the area of the study (Figure 3.1). And the case study has two best coffee cooperatives in Rwanda known as Abahuzamugambi and Koperative y'Abahinzi ba Kawa ba Karaba (KOAKAKA) (Dusenge, 2009). In addition, the district hosts two institutions that carry out research in various field namely Rwanda Agricultural Board (RAB), former Rwanda Agricultural Research institute (ISAR) and National University of Rwanda (NUR).

The region is also characterised by sub-equatorial temperate climate with an average temperature fluctuating around 20°C throughout the year with an altitude of 1200 m above sea level. The area has four climatic seasons: long period of rainfall (mid-February and May); long dry period (mid-June and September); short rainy period (mid-September and December) and a short dry season (January-mid February). The

² Sectors are the third level administrative subdivision in the African nation of Rwanda (MIBALOC web, 2012)

rainy season is characterised by heavy rainfall of about 1,400 mm per year. Its soils are the *kaolisol* type, inherently fertile but prone to infertility due to erosion (MINALOC, 2012).

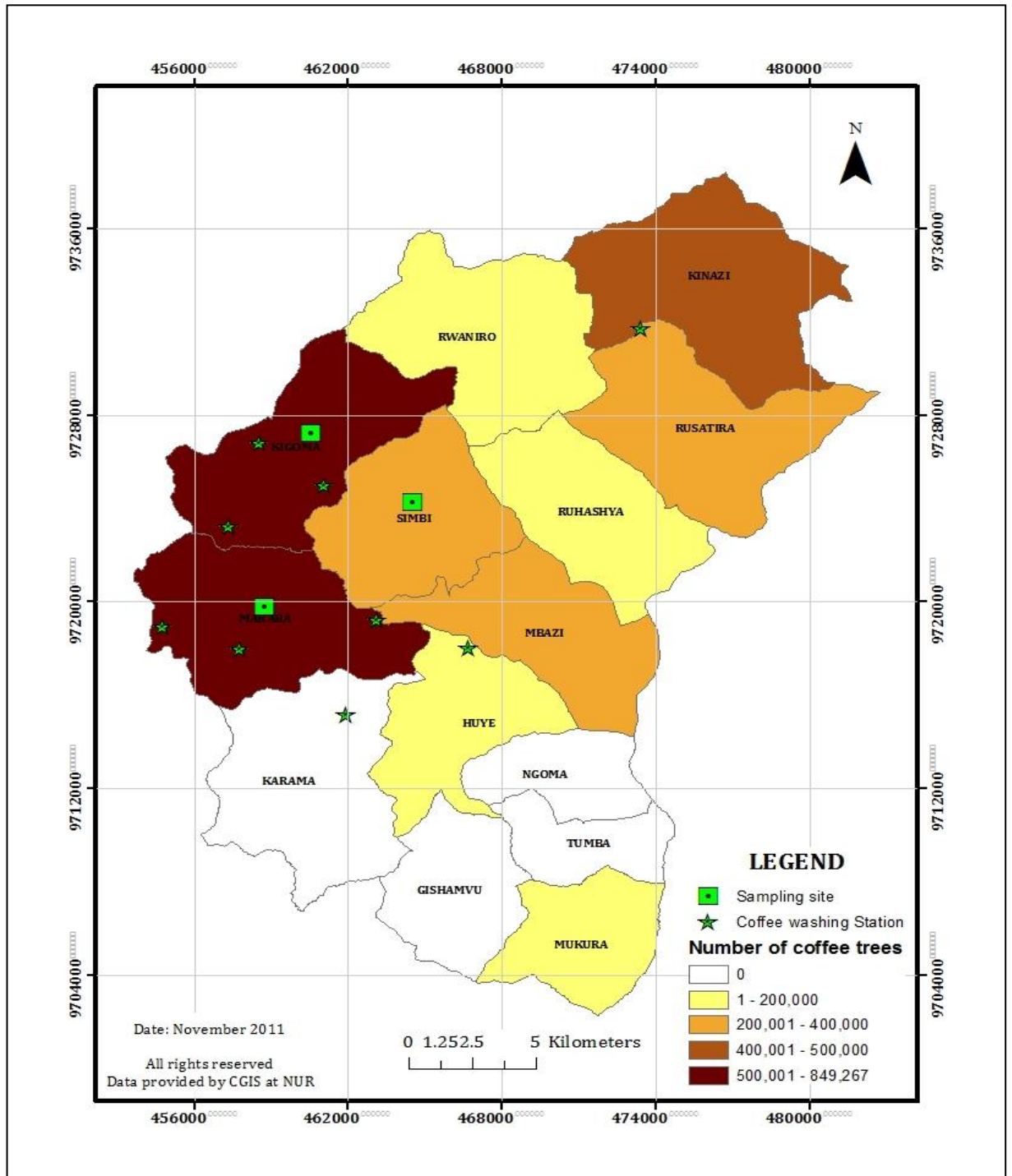


Figure 3.1: Study Area and Coffee Trees Distribution in Huye District

Source: Data from OCIR-Café, 2009 modified by the author, 2012.

3.2 Research Design

A survey design involving administered questionnaires and interviews of respondents was adopted to enable an in-depth investigation. The study used both primary and secondary data. Primary data were collected through household surveys and these were supplemented by focus group discussions. To make sure that seasonality was systematically captured the cross sectional data covered a whole year. Secondary data were collected from published books and unpublished, journals, thesis, records from Rwanda National Coffee Board and Ministry of Agriculture and Animal Resources, website and other relevant resources.

3.3 Sampling Techniques

The target population composed of smallholders coffee farmers from Huye district in Southern province of Rwanda. Several sampling procedures (stratified sampling, simple random sampling and systematic sampling) were used to select the required sample size. Selection of 170 and 60 members and non-members of coffee cooperatives respectively were done using stratified sampling³. The population size for Maraba, Kigoma, and Simbi sectors were 3834, 3794, and 2118 household, respectively (NAEB, 2010). Table 3.1 shows the population and sample size distribution. Lists of all members of cooperatives were obtained from the leaders of the cooperatives and lists for non-members were obtained from agronomists of sectors (divisions). However, to get a starting point simple random sampling was used and thereafter systematic sampling was used for sample size selection. A total of 230 respondents were selected from three sectors of Huye district for the study. The

³ Stratified sampling is a method of sampling, that involves the division of population into subpopulation (strata) and random sample are taken of each stratum (Kothari, 2004).

following formula, proposed by Glen (1992) was used to calculate sample size for the study of this nature

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n: sample size

N: size of the farmers in cooperative

e: precision level chosen (for confidence interval of 95%, equal to 5 percent).

Table 3.1: The Distribution of Sample Size per Sectors of Huye District

Sector name	Numbers of coffee coops members⁴	Sample size coffee coops	Numbers of non-coops members	Sample size of non-coops members	Sample size in total per each sector
Maraba	1,898	87	4,025	40	127
Kigoma	1,222	56	1,408	14	70
Simbi	589	27	604	6	33
Total		170		60	230

Source: OCIR-Café, 2009

3.4 Data Collection

Both qualitative and quantitative data were collected using open and closed-ended questions (Appendix 3.1). Data were collected with trained enumerators supervised by the researcher using structured questionnaires and supplemented by focus group discussions. The data collected from the farmers included social and economic characteristics such as education level, access to credit, off farm income, coffee yield,

⁴ Coffee coops Members: Coffee cooperative participants

farm net income, gender, and so on, and agronomic challenges that smallholder farmer's face in the coffee production.

3.4.1 Focus Group Discussion (FGD)

To improve the reliability of the data collected in the household survey, more consultation with cooperatives members (Abahuzamugambi, KOAKAKA, Abakunda kahwa ba kigoma, Imbereheza Cyendajuru, and Ryohakahwa Shyembe) and non-members were held using focus group discussion (FGD) approach. The FGD was attended by 12 coffee growers who were selected by cooperative and local leaders. This FGD approach was used to get detailed information through brainstorming on the various socio-economic factors affecting farmers' decision to participate in coffee cooperatives in Huye District of Rwanda. A list of selected participants is shown in appendix 3.2.

3.5 Data management and analyses

The completed questionnaires were examined to ensure they were complete and consistently filled. The response questions were numerically coded, entered and cleaned (to ensure accuracy, consistency, uniformity and completeness) using Statistical Package for Social Sciences (SPSS) version 16 computer software. A summary of descriptive statistics were generated. The data were then transferred into STATA version 11 in which Econometric analyses were carried out. To take care of assumptions of econometric modelling (Probit and Tobit) STATA was used for data pre-testing to test multicollinearity and correlation. The summary of analytical models are shown in Table 3.2

Table 3.2: The Summary of Analytical Models

Research question	Method	Dependent variable	Independent variables
Farmers choice to participate	Probit	Dummy:- In cooperative (1), not in cooperative (0)	Experience of the household head (in years), the size of the farm (number of hectares), amount of coffee harvested per hectare (in kgs), education level of the household heads, gender of the household head, keeping farm records (0/1), paid on time (0/1), age of farmer (years), number of coffee trees, motivation, off farm income, access to credit, trust, etc
The intensity of coffee	Tobit	Land share (ratio)	Education level of the household head, farmer keeps records (0/1), farmer is paid on time (0/1), selling price (Rwf), farm size, access to credit, Land under other crops, off farm income.
Agronomic challenges	Descriptive (Frequency and percentage)	Quality of coffee	Lack of fertilizer, lack of chemical (pesticides), mulching, mix cropping, low technical skills of farmers, old coffee trees.

Source: Author, 2013

3.5.1 Analytical Models

I. Farmers Choice to Participate

Before using probit model, descriptive statistics (percentages, means, fisher-test, chi-square and t-test) were carried out to describe socio-economic characteristics of coffee cooperative members and non-members at the time of the study.

Probit model was used to determine socioeconomic factors influencing farmers' choice to participate in coffee cooperatives. Probit model was chosen because it allows estimating maximum likelihood of socioeconomic factors influencing farmers' choice to participate in coffee cooperatives. According to (Sanchez, 2005) the Probit model to analyse the decision to participate in cooperatives is estimated by means of the

following Probit regression. Probit model stand for cumulative normal probability function.

$$\mathbf{P}(\text{yes/no}) = \beta_0 + \beta_1 (\text{Edu}) + \beta_2 (\text{Gender}) + \beta_3 (\text{Exp}) + \beta_4 (\text{Occ}) + \beta_5 (\text{familysize}) + \beta_6 (\text{farmsize}) + \beta_7 (\text{Offfarminc}) + \beta_8 (\text{Accessloan}) + \beta_9 (\text{Keeprec}) + \beta_{10} (\text{Trust}) + \beta_{11} (\text{sellprc}) + \mu_i$$

Where: P (yes/no) is the probability of participation by members and non-members of coffee cooperatives, β_0 is the intercept; β_{in} (1, 2, 3, 4,.....,n) is the vector of parameters and (Edu), (Gender) ,....., (sellprc) are exogenous explanatory variables and μ_i is the error term. The variables definitions are shown in Table 3.3.

Many authors have used probit model in their studies. Beyene (2008) used probit model to account for the simultaneity of participation decisions of both male and female members of farm households. The results showed that availability of credit and transfer income have a positive impact on the decision of male members to participate in off-farm activities. Matshe & Trevor (2003) had used probit model to determine the characteristics that influenced the probability that a farm household member will participate on off farm work. The results of the study revealed that some of included variables like age, level of education and five other variables significantly determine the participation in an off-farm work. According to Sanusi & Adedeji (2010) in a study on "A Probit analysis of accessibility of small-scale farmers to source of credit in Ogbomoso zone, Nigeria, the result of the study revealed that level of education, membership of cooperative, contact with extension agent and present of collateral security positively and significantly determine the likelihood of farmers access to credit.

Table 3.3: Hypothesized Relationships of Variables

Objective 1-Probit model variables		
Variable	Definition	Expected sign of the variables
Dependent variable		
Cooperative membership	1=member; 0=non-member	
Independent variables		
Gender	Gender of household head (female=1, 0=male)	+
Educ	Education level of household (1=no formal education, 2=Primary, 3=secondary, 4=University)	+
Occup	Occupation of household head (1= farming, 2= commerce, 3= paying job, 4= craftman)	+
Familysize	Family size of household (continuous)	+
Yield	Coffee production(kg/ha)	+
Farminc	Farm income (Rwf)	+
Farmsize	Farm size of household (continuous)	+
Sellprc	Selling price per (kg)	+
Exp	Experience in farming (1= <5 yrs, 2=6-10 yrs, 3=11-15 yrs, 4=16-20 yrs, 5= > 20 yrs)	±
Offfarminc	Off farm income (0=yes, 1=no)	-
Accessloan	Access to loan (0=yes/taken, 1=no/not taken)	+
Keepingrec	Keeping farm records (0=yes/kept, 1=not/kept)	+
Trust	1= not, 2= low trust, 3= middle trust, 4=high trust	+

Source: Author, 2013

II. The Intensity of Coffee Production

To determine factors associated with coffee production intensity, Tobit regression model was chosen for this analysis because it can measure the probability and intensity of coffee land (Tobin, 1958). The model was generally formulated by Cragg (1971) and applied in many studies including (Wakulira, 2005) estimated factors influencing hulling coffee among farmers in Masaka District, Uganda. Specified the model as;

$$\text{Land share (0 to 1)} = \beta_0 + \beta_1 (\text{Gender}) + \beta_2 (\text{Accessloan}) + \beta_3 (\text{Farmsize}) + \beta_4 (\text{Offfarminc}) + \beta_5 (\text{Familysize}) + \beta_6 (\text{Educ}) + \beta_7 (\text{Exp}) + \beta_8 (\text{contractfar}) + \beta_9 (\text{Othercrops}) + \mu_i$$

Where P (*land share*) is ratio of land under coffee production over total land owned by a farmer, β_0 is the intercept, β_{in} ($1, 2, 3, \dots, n$) is the vector of parameters to be estimated and μ_i is a vector of independently error terms with zero mean and Constance variance δ^2 . A vector of explanatory variables are, (*Gender*), (*Accessloan*), (*Farmsize*), (*Othercrops*) The variables definitions are shown (Table 3.4).

Table 3.4: Hypothesized relationships of variables

Objective 2-Tobit model variables		
Variable	Definition	Expected sign of the variables
Dependent variable		
Land share	(0 to 1)	
Independent variables		
Gender	Gender of household head (female=1, 0=male)	±
Accessloan	Access to loan (0=yes/taken, 1=no/not taken)	+
Farmsize	Farm size of household (continuous)	+
Offfarminc	Off farm income (rwf)	+
Familysize	Family size of household (continuous)	-
Educ	Education level of household (1=no formal education, 2=Primary, 3=secondary, 4=University)	+
Exp	Experience in farming (yrs)	+
contractfar	Contract farming (0=yes, 1=no)	±
Othercrops	Land other crops (ha)	-

Source: Author, 2013

III. Agronomic challenges

The data were analysed using descriptive statistics (percentage and pearson chi-square) were used to test for the association between agronomic challenges and cooperative membership using SPSS.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Demographic Characteristics of Farmers in Huye District

The results on gender showed that females who were involved in coffee farming were lower in numbers compared to males (Table 4.1). The reason of this lower number of female in coffee farming was because many females were committed to cultivate food crops which bring cash in a short period (personal communication with women farmers).

Majority of the farmers in the study area had primary education and followed by the farmers who had no formal education. Farmers who had secondary school level of education were found to present a small number in coffee industry as coffee growers (Table 4.1). This explained that people who finished their secondary school went to look for white collar job (such as teaching) other than farming.

In terms of occupation of the farmers the results showed that majority of farmers had farming as their main occupation (Table 4.1). This is explained by lack of small industries or other companies in this area that can provide jobs to the farmers, apart from coffee CWSs owned by cooperatives that give works for few members during coffee season.

The results on access to loan showed that farmers who had access to loan in Kigoma and Simbi sectors presented high percentages (Table 4.1) because these sectors have had some important development infrastructures such as micro-finances and commercial banks, markets, schools and churches compared to Maraba sectors. This

could be an opportunity for Kigoma and Simbi of having many people who have access to loan.

Table 4.1: General Descriptive of Farmers' Characteristics in Three Sectors of Huye District

Comparison of farmers' characteristics in three sectors of Huye district in % (n=230)				
Characteristic		Maraba	Kigoma	Simbi
Gender	Male	52	61	55
	Female	48	39	45
Education level	No formal education	31	24	6
	Primary education	64	66	85
	Secondary education	5	10	9
Main occupation	Farming	79	86	91
	Commerce	4	7	6
	Paying job	17	7	3
	Craftman	1	0	0
Access to loan	Yes/taken	39	60	67
	Not/taken	61	40	33

Source: Survey data (2013)

4.2. Sources of Credit for the Coffee Farmers in Huye District

Sources of credit for the farmers in Huye District was from various sources, such as cooperatives which get money from the contribution of its members and small saving after coffee sales, relatives, friends, micro-finances and other farmers (Figure 4.1). The results showed that the main sources of credit for the members of cooperatives were from their own cooperatives and followed by micro-finance institutions. For instance, cooperatives contributed 48%, 31% and 33% of credits given to the members in Maraba, Kigoma and Simbi sectors, respectively, while the farmers who obtained credit from micro-finance were 27%, 36% and 27% of the credits given to the members in Maraba, Kigoma and Simbi sectors, respectively. While for no-

cooperative members in Maraba sector the main source of credits was from micro-finance 44% and 57% in Kigoma sector, but for Simbi sector, the results showed that the main source of credits for no-members of coffee cooperatives were 50% from relatives and 50% from other farmers.

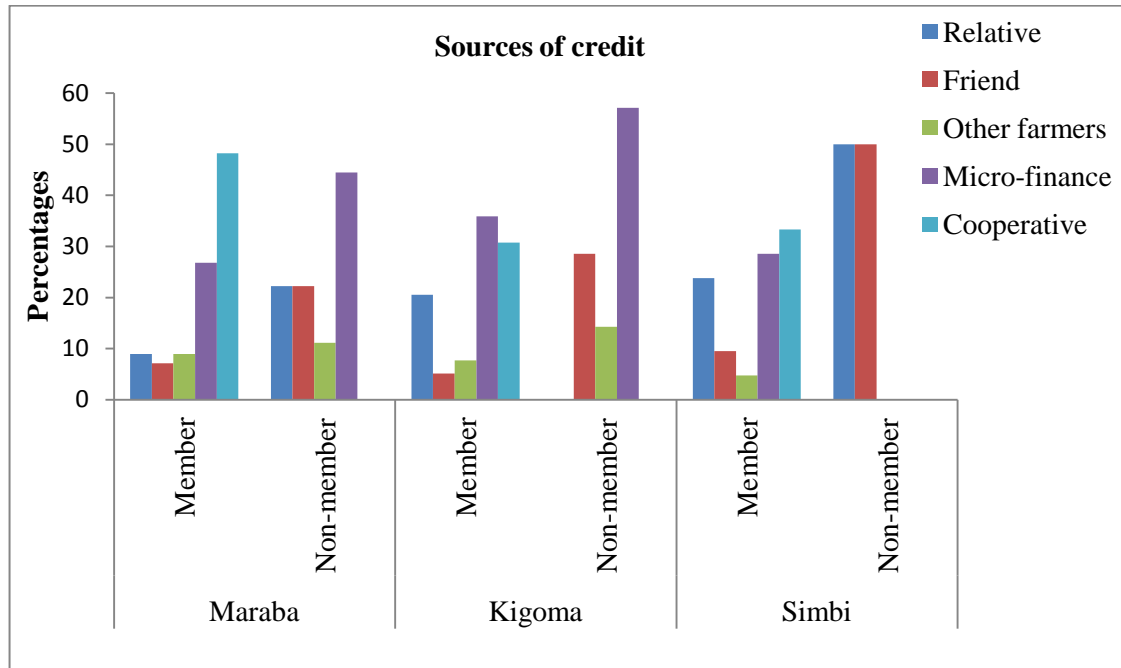


Figure 4.1: Sources of Credits for the Coffee Farmers in Huye District

Source: Survey data (2013)

These findings showed that accessibility to credit from formal source such as, commercial banks was low. The low availability of credit could be explained by lack of awareness by small scale farmers on how to open bank account, lack of information regarding procedures for accessing credit, collateral requirements and lack of commitment by the small scale farmers to take risks. According to Agnet (2004) the complex mechanism of commercial banks are least understood by the small-scale farmers and hence limits access to credit. Lack of credit for the small scale farmers to buy farm inputs (fertilizers and chemicals) that are required to increase the production could be a major limiting factor to increasing coffee production. Similarly Sanusi and Adedeji (2010) showed that access to credit is crucial to small scale farmers especially

in less developed nation of world. Hence credit is a necessary ingredient in the various aspect of farming operation. Lack of credit for the small scale farmers to buy required farm inputs (fertilizers and chemicals) to increase the production could be a major limiting factor to increasing coffee production.

4.3. Comparison between Participant and Non-participants

As a starting point to compare participant in coffee cooperative categories, chi-square, fisher-test and t-test procedures were used for those variables, which were hypothesized to influence participation (Table 4.2). The results showed that participant were significantly different from their counter parts because the findings revealed that participant were mainly males, had low level of education, had access to loan, had high yield, trusted cooperatives, had higher Off-farm income than the non-participants. During field survey, non-cooperative members were found to have much information on cooperatives, the requirement to join cooperatives and its roles. In addition they were aware on how to keep farm records because some of them sell their produce to cooperative CWS. To establish further relationship, the variables were subjected into probit regression analysis and results are presented in Table 4.3.

Table 4.2: Univariate Results of Socio-economic Factors Influencing Farmers' Decision to Participate in Coffee Cooperatives

Characteristic		Member (%)	Non-member (%)	test ^a
Education level	No formal education	40	15	0.183
	Primary education	56	68	
	secondary education	4	17	
Gender	Male	62	35	0.001*
	Female	38	65	
Experience	<5 years	20	17	0.309
	6-10 years	10	22	
	11-15 years	16	15	
	16-20 years	19	18	
	Over 20 years	35	38	
Access to loan	Yes/taken	46	27	0.022*
	Not/taken	54	73	
Trust	Not	0	22	0.001*
	Low trust	15	68	
	Medium trust	62	10	
	High trust	23	0	
Off-farm income	Yes	42	20	0.03*
	No	58	80	
	Yes/kept	53	32	
Keeping records	Not/kept	47	68	
		Mean	Mean	T- test
Family size		6	5	0.118
Farm size		0.5	0.8	0.01*
Yield		759	635	0.000*
Selling Price		311	303	0.435
Net farm income		2.23E5	1.93E5	0.000*

n=230, * association significant at $\alpha= 0.05$, ^a test more than five chi-square, less than

five fisher test

Source: Survey data (2013)

4.4 Socio-economic Factors Influencing Farmers' Decision to Participate in Coffee Cooperatives.

Probit regression analysis was used to estimate the maximum likelihood of socio-economic factors that influence farmers' decision to join coffee farmer' cooperatives in Huye district of Rwanda. Before subjecting data for analysis it was tested for multicollinearity and correlation. The multicollinearity results showed that Variance Inflation Factors (VIF) range from 1.47 to 1.04 and a mean of 1.26, thus absence of multicollinearity since VIF was less than 10 (Appendix 4.1). The correlation test showed high positive coefficient ($r=0.72$) between cooperative membership and other variables showed positive and negative coefficient (Appendix 4.2). However, probit model results indicated log likelihood for the fitted model was -84.18 and log likelihood chi-squared was 95.67 which indicated that all variables are jointly significant at 5% (Table 4.3).

Table 4.3: Maximum Likelihood Estimate of the Choice of Cooperative Membership as Related to Socio-economic Characteristics of Coffee Farmers in Huye District, Rwanda

Probit regression		
Cooperative membership	Coef.	Std. Err.
Female	-0.37*	0.22
Education level	-2.62*	1.38
Occupation	0.05	0.37
Family size	1.27	54.69
Farm size	-2.2**	0.99
Selling price	0	0.01
Experience	0.2	0.49
Off farm income	0.49*	0.28
Access to credit	0.41*	0.23
Trust	0.62**	0.15
Keeping records	0.59**	0.24
Constant	3.02	2.28

Observation= 230
 LR Chi-square=95.67
 Log likelihood =-84.18

Legend: * $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Survey data (2013)

4.4.1 Influence of Female Headed Household on Cooperative Membership

The findings revealed that female households head found negatively and significantly influenced the decision to participate in coffee cooperatives. This implies that male headed households are more likely to join and participate in farmer's cooperative than female headed households. Likely explanation for this is that male farmers' have free time and are the ones who mostly attend meetings on coffee campaigns unlike females who are busy with family duties (i.e. taking care of the children and other household chores). This reflects that participation of males in the meetings can enhance their awareness on the importance of joining cooperative than females. In a study conducted on why some rural people become members of agricultural cooperatives while others do not in Ethiopia, Nugussie (2009) showed that the probability of male headed households to become member of the cooperatives were 22% higher than female headed households. Similarly Fanaye & Thomas (2012) showed that participation in agricultural cooperatives for both male and female headed households were 76% and 24% respectively. Habtemariam, (2004) found that male headed households had better access to agricultural information because of higher participation in organizations than female headed households. During field survey females seemed to be interested in joining the cooperatives which produces food crops such as vegetables, sweet potatoes, maize and handcrafts, which are traditionally seen as women enterprises (personal communication with the farmers).

4.4.2 Influence of Education level of Household Head on Cooperative Membership

The findings showed that education levels of the household heads negatively and significantly influenced decision of a farmer to become cooperative members. The more the educated the household heads were, the lower the likelihood for them joining

the cooperatives. These results are inconsistent with the expectation since education provides farmers with more information pathways (Faturoti *et al.*, 2006). Higher level of formal education equips farmers with more knowledge and skills hence facilitate the awareness of importance to work in a cooperative. However, the implication of these results is that a farmer with lower level of education is likely to join cooperatives than the farmers with high level of education. This could be because the educated farmers are usually in formal employment or are in large scale production while the ones with low education qualifications are usually smallholder farmers who joins the cooperatives in order to put together their individual efforts for survival and get a high bargaining power for inputs as well as markets for their produce. These results agree with those of Steven (2012) in a survey conducted in Kenya's coffee cooperatives the results showed that only 2% of cooperative members had college or university education, while the rest had primary and no formal education. However, the lack of educated members limits the ability of cooperative members to negotiate profitable deals with international coffee retailers. Fischer & Qaim (2011) found that better educated members are less likely to sell through the group, once they have made decision to do so they actually sell significantly more.

4.4.3 Influence of Farm Size on Cooperative Membership

The size of the farm possessed by a household negatively and significantly influenced the decision of the farmers to join coffee cooperatives. These results are in consistent with the findings showed that non-members had higher mean of farm size 0.8 hectare while members had 0.5 hectare. A 1% increases of farm size decrease the probability of joining cooperative by -2.2%. These explain that farmers who have large farm size were less likely to join cooperatives as compared to the farmers with small farm sizes. This could be because small farmers may wish to benefit from cash, input subsidies,

and service provided by the agricultural cooperatives since the risks associated with intensive high-return crops are high. The results concur with a study of Karli *et al.* (2006) in the South Eastern Anatolian Region of Turkey which reported that the probability of the membership decreases with the increase in the farm size. These results are also in agreement with that of Tursinbek & Karin (2010) who found that farm size has greater impact on farmers' decision to join cooperatives in Zhejiang in China. Other studies such as Mussie *et al.* (2001) and Gockowski & Ndoumbe (2004) found a negative relationship between farm size and decision to join or adopt farmer based organization.

4.4.4 Influence of Off-farm Income on Cooperative Membership

The findings revealed that off farm income positively and significantly influenced the participation of farmers in coffee cooperatives. These results imply that likelihood of becoming cooperative member increased with the availability of incentives such as employment, etc. This could be explained that cooperatives employ its members as permanent staff or temporary jobs for instance during coffee processing period to undertake different activities such as cherries sorting, floating, pulping, drying, grading, transporting, packaging and so on. This can show why off farm income is significantly associated with cooperative membership; in fact this earning opportunity for the cooperative members and their family members can influence the decision of farmers' being cooperative members. This finding is consistent with the results of a study by Murekezi (2003) who noted that off-farm income opportunities and formal wages were associated with increasing household income and thus be able to be affiliated with cooperatives. Similarly, in a study of Frayne *et al.* (2008) reported that members of new generation cooperatives in northern plains had more off farm income than non-members, and had higher net worth than non-members.

4.4.5 Influence of Access to Credit on Cooperative Membership

Access to credit by households positively influenced the decision of farmers to join coffee cooperatives. The more the farmers accessed credit from their own cooperative, the more they were likely to be attracted to become a cooperative member. On a daily basis, farmers need money that they can use to buy farm input or for other uses. If a farmer is sensitized to join a cooperative and be given the opportunity to get a loan without collateral requirements, there will be a high likelihood to apply for cooperative membership. The greater access to credit at lower interest is of significant importance to producers for their production and family needs (Murray *et al.*, 2003). Fridell (2007) noted that small scale farmers generally suffer from a lack of access to adequate short or long term credit since coffee production is seasonal. Nzomoi *et al.* (2007) have found a positive relationship between access to loans and the decision to join a farm based organization.

Moreover, lack of access to credit and capital is one of the biggest hurdles for farmers looking to expand their production or create a higher quality product. It is therefore important that credit constraints to smallholder farmers be facilitated to access loans at a reasonable rate in order to purchase farm inputs, such as, fertilizers and pesticides. Idris (2011) showed that timely credit provision facilitates the timely acquisition of farm inputs, which helps farmers to increase production and improve their livelihood. In a study conducted on technical efficiency in Kenya's maize production the results showed that farmers who accessed agricultural credit through cooperatives recorded a higher level of agricultural productivity thus increasing the participation than those that did not (Kibaara, 2006)

4.4.6 Influence of Trust of Household head on Cooperative Membership

The results presented in (Table 4.3) indicated that level of trust in cooperative significantly influenced the decision to become member. The higher the farmers' trust in coffee cooperatives, the higher the likelihood of farmers' participation. The results are in agreement with Dakurah *et al.* (2005) who reported that high trust levels by members are more likely to support their cooperative by participating in all cooperatives activities. According to Timothy *et al.* (1998) showed that the more positive attitude one holds towards an organization, the more likelihood to patronize and use its service. Likewise, Hansen *et al.* (2002) found that trust among members and between members and management of the agricultural cooperative are important predictors of group cohesion, which is a measure of the strength of members' desire to remain in a group (co-op) and, thus, their commitment to it. Similarly, Hakelius (1996) reported that a vital part of any cooperative organization is its members; and that their active participation, and loyalties to the cooperative are integral for its success. Therefore, trust is important factor in the cooperative success and development.

4.4.7 Influence of Keeping of Farm Records on Cooperative Membership

There was a significant relationship between keeping farm records and decision to join cooperatives. The members of cooperatives had high chance of keeping farm record compared to non-members. During harvesting season, when farmers want to deliver their cherries to coffee washing station owned by their cooperatives they register the quantity they supply and keep a copy for later claim of payment. Moreover, a farmer that kept records was more likely to use the records for monitoring, planning, culling and selection decision and improving management efficiently than those who do not keep records. These results concur with those of a study by Hoffman (1996) who

concluded that well managed small farms, based on farm records, are better able to compete in per unit profitability with farms many times larger.

4.5 Factors Influencing Intensity Coffee Production in Huye District of Rwanda

This section explores the factors influencing the intensity of coffee growing and expansion with the dependent variable being land shared while independent variables are off-farm income, access to credit, farm size, female headed household, education level of the household heads, family size, farming experience, income from other crops and contract for farming. Pre-data analysis was done for multicollinearity and correlation before running Tobit model regression. The multicollinearity results showed that Variance Inflation Factors (VIF) range from 1.31 to 1.03 and a mean of 1.14, thus absence of multicollinearity since VIF was less than 10 (Appendix, 4.3). The correlation test showed that access to loan had negative coefficient ($r=-0.17$) toward coffee intensity (Appendix 4.4). However, Tobit regression results indicated log likelihood for the fitted model was -95.39 and log likelihood chi-squared was 108.4 which indicated that all variables are jointly significant at 5%. The results revealed five factors significantly influencing the intensity of coffee (Table 4.4).

Table 4.4: Factors influencing the intensity of coffee growing in Huye District of Rwanda

Tobit regression		
Land share	Coef.	Std. Err.
Off farm income (Frw)	0.05**	0.02
Access to loan (Binary)	0.02	0.02
Farm size (continuous)	0.03	0.07
Female	-0.03*	0.02
Educ. level (Categorical)	0.06***	0.02
Family size (number)	0.0	0.01
Experience in farming	0.03***	0.01
Other crops (number)	-0.01*	0.01
Farm contract (binary)	0.02	0.02
Sigma	0.15	0.01
Observation= 230		
LR Chi-square= 108.40		
Log likelihood = -95.39		

Legend: * p<0.1; ** p<0.05; *** p<0.001

Source: Survey data (2013)

4.5.1 Influence Off-farm Income of Household Head on Intensity Coffee Production

Off farm income of the households positively and significantly influenced the intensity of coffee growing and expansion. These results imply that households getting off-farm income were more likely to invest in activities which expand coffee production than households without off farm income. This could be because the non-farm income is used for buying farm or is considered collateral by banks and informal lenders. This may contribute to the access to credit, which can be used to buy food, or farm inputs. These results agrees with those of de Janvry *et al.* (2005) who noted that the income obtained from non-farm activities helps enhance the investment capacity in farm activities, mitigate income fluctuations and thus favour household agriculture production as well. Likewise, Salgado (1994) found that nonfarm income presents important sources to finance land acquisition and the purchase of farm inputs and food.

4.5.2 Influence of Female headed Household on coffee intensity Production

The results revealed that female headed the household found negatively influencing the intensity of coffee growing and expansion. This implies that the male households head were more likely to have the intensity of coffee production than female headed households. This could be explained by the fact that female heading households may have inadequate farm size while male headed household have large farm that can be used for coffee intensification. This implies the issue on land pressure. This result is consistent with the findings of Ekenta *et al.* (2012) in the study conducted on gender analysis of land ownership structures and agricultural production in Imo State, Nigeria. The results reveal that 74% of males had farm size of 4 hectares and above against 16% of females. The same authors found that land inheritance 75% is the most common ownership structures among males while females 67% purchased land used in agricultural production. This also explains the smaller farm size that can be owned by females compared to males. This result agrees with findings of Onyemauwa (2012) and Osugiri (1996). These results also agree with Okwoche *et al.* (2012) who noted that females are often married to the males and so might not out rightly own the lands. Similarly Adesina *et al.* (2000) pointed out that male headed households tend to be more likely to adopt innovation in their lands than female headed households because African women are marginalized and have low access to critical resources such as land and are also deprived of education opportunities.

4.5.3 Influence of Education Level Households head on intensity coffee Production

The findings revealed that higher educated household head significantly and positively influenced the intensity of coffee growing. These results imply that the more educated the farmers, the more likely they were to expand their activities for coffee production.

These results are justified by the fact that farmers with higher level of education are in a better position to assess the profit and cost associated with expansion of coffee production. This is in agreement with Cicek *et al.* (2007) who noted that education level of the farmers may be an indicator of their ability to adopt appropriate technologies and agricultural management practices. According to Marenya & Barret (2006), education enhances managerial competencies and successful implementation for improved production, processing and marketing practices by making it possible for the farmers to meet quality standards of the sustainable coffee production. Similarly, Elzo *et al.* (2010) noted that farmers that had a higher education level may have superior ability to access and understand information and technology, and may have been able to apply them more appropriately to their conditions than farmers with lower education.

4.5.4 Influence of Experience in Farming of Household Head on Coffee Intensity

The results revealed that experience in farming of household was found to significantly influence the intensity of coffee production. The results imply that the more the years of experience in farming a household has, the more the likelihood of the household expanding this/her activities for coffee production. Farmers with more years of experience in farming coffee could be easier in comprehending the accrued benefit from coffee better than the farmers with less years of farming experience hence do many activities for coffee production. More so the old households may not be having many off activities and hence have more time to work on their coffee farms. Farmers with more years of experience are likely have a better understanding and knowhow of appropriately managing their coffee farm under tough economic conditions than less experienced farmers. These results are in agreement with those of Elzo *et al.* (2010) who noted that more experienced farmers fed and managed their

herds better, produced more milk, received higher revenues and expanded their production better than less experienced farmers. According to Mishra *et al.* (2004) old farmers have more experience and can better allocate resources where they are needed and keep them fully utilized.

4.5.5 Influence of Farm under other Crops on Intensity of Coffee Production

Farming of other crops for instance beans, sweet potato, Irish potato, cassava, maize and vegetables were found to negatively and significantly influence the intensity of coffee. A 1% increase in farming other crops in a farm size decrease the probability of the intensity coffee production (probability of reducing farm size under coffee production) by -0.01% all else held constant. This indicates that the intensity of growing coffee reduces with an increase in planting of other crops for instance beans, sweet potato, Irish potato, cassava, maize and vegetables. The implication of these results is that the crops mentioned above enter into competition with coffee farming, hence affect coffee intensity production by reducing the farm size under coffee production because farmers need to get food and cash in a short period of time. These results could indicate the opportunity cost of allocating resources, such as, land to coffee production as other than fast growing cash crops. If the sale of other crops other than coffee provides a lucrative economic opportunity, farmers may allocate production resources away from coffee in pursuit of this profitable opportunity. These results indicate an existence of a possible competition for production resources (farm, labour, farm input, and so on) between coffee production and other crops. These results agree with those of Marennya *et al.* (2003) and Kydd (2001) who noted that other crops income divert resources such as labour from coffee production. In another study looking at income and nutritional indicators found that as the production of

beans, cassava and Irish potatoes increased the production of cash crops such as coffee and banana declined (Mckay & Loveridge, 2005).

4.6 Descriptive analysis of Agronomic Challenges encountered by Smallholder Coffee Farmers

This section of the study focuses on challenges faced by the farmers' coffee in their coffee production. The results showed that there was no significant association between agronomic challenges farmers joined cooperatives or not ($\chi^2=7.082$; $p=0.313$) (Figure, 4.2).

4.6.1 Agronomic Challenges Facing Coffee Production

The results showed that 19% and 14% members and non-members respectively were found lacking mulching in their coffee fields (Figure 4.2). These results imply that farmers own small land they are overused thus lack of mulch and where they find mulching were expensive to buying and transporting. These influenced them (farmers) not to use mulching.

The results showed that 14% and 18% (Figure 4.2) both members and non-members reported lack of inorganic fertilizers in their coffee farms. This was due to the higher price of fertilizer (personal communication with the farmers). On the other hand 7% and 10% members and non-members respectively pointed out a problem of lacking chemicals to spray on coffee trees. Lack of chemicals for the coffee growers in this region is explained by lack of agro-shop pharmacy around the area and also being expensive in the place that are found. Farmers who showed to apply fertilizer and chemicals in their farms, 9% and 15% members and no-members respectively said fertilizers and chemicals were inadequate (Figure 4.2). This explained the delay of NAEB to supply farm inputs to the farmer' cooperatives and agronomists at sectors

level and therefore outreach smallholder farmers' too late (Personal communication with the farmers). On the other hand farmers diverted fertilizers given for coffee growing to be used to grow other crops such as vegetables, maize, beans, and so on. These foods are cultivated to supplement income from coffee earned by small-scale farmers (personal communication with coffee growers).

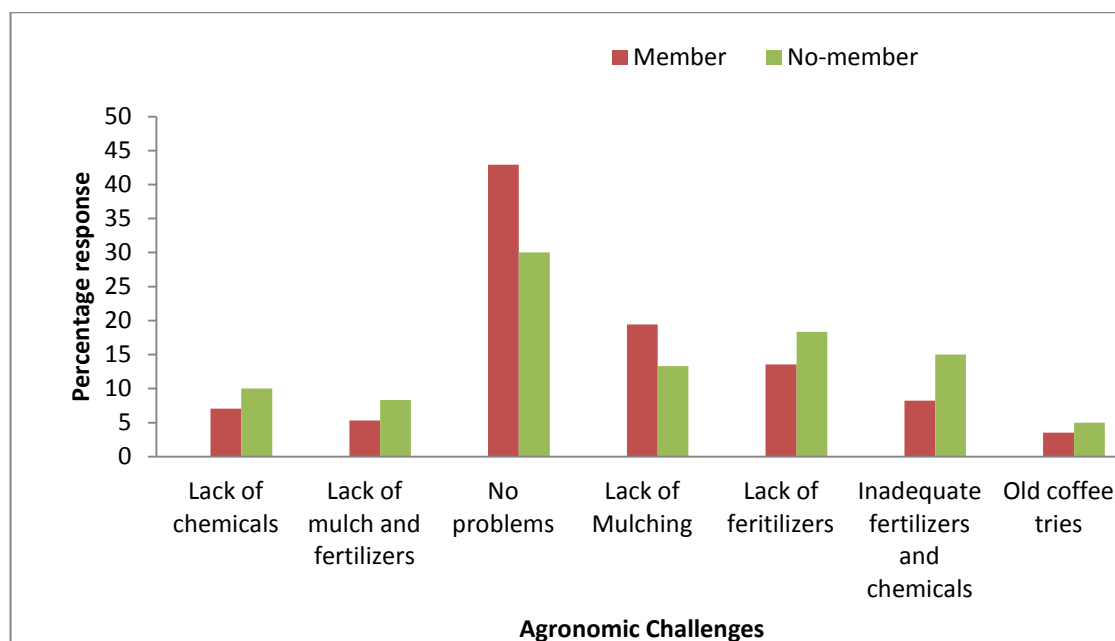


Figure 4.2: Agronomic Challenges Encountered by Smallholder Farmers in Coffee Production

Source: Survey data (2013)

Majority of coffee growers are much aware the role of fertilizers and spraying chemicals but they lack money to purchase them. In a study conducted on quality and value chain analysis of Ethiopian coffee showed that diseases can cause crop losses of 75% or more (Tirufat, 2011). Conroy *et al.* (1996) revealed that the use of fertilizers and Chemicals has become necessary overtime in order to maintain productivity and control pests.

4.6.2. Lack of mulch

In this study, farmers noted that lack of mulches in coffee farms lessen cherry density consequently resulting to low quality and quantity of coffee produced. This in agreement with Glaser *et al.* (2002) who noted that application of mulches have been shown to increase soil fertility through its capacity to provide nutrients, especially N, P and K. These findings agrees with the one of Svetlana (2010) who found that in Arabica coffee, annual mulching in alternate rows reduces costs while maintaining the coffee trees' productivity at a high level. Similarly, Mitchell (1988) reported that mulch from grasses helps to control soil erosion, weeds and is highly effective in soil moisture preservation and source of organic matter and nutrients.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

This section presents the conclusion of this study. In the first objective of this study that sought to determine socio-economic factors influencing farmers' decision to participate in coffee cooperatives, the results revealed that members had average yield of coffee equivalent to 759 kgs/ha compared to 635 kgs/ha for non-members and had annual average farm net income corresponding to 223,000 RwFs and 193,000 RwFs for members and non-members respectively. The study showed factors that influenced decision to join cooperatives as; farm size, off-farm incomes, access to credit and keeping records, while education, female households head and farm size negatively influenced the decision to join cooperatives. This means there are various socio-economic characteristics that influence the decision to participate in cooperatives and others commonly thought to do not.

The second objective of this study was on determining factors influencing the intensity of coffee production. The results indicated that off-farm income, credit access, experience, education level, while female households head and land under other crops cultivation was found to negatively influence the intensity of coffee growing. Therefore this means that there are socio-economic factors that influence intensity of coffee production and others do not.

The third objective was to determine the agronomic challenges which were found to have no significant difference between members and non-members respectively. This means that lack of mulching, fertilizers (organic and inorganic), chemicals and as well

as old coffee trees were major challenges encountered that affect quantity of coffee produced in this area.

5.2: Recommendations

Based on the findings of this study the following recommendations can be drawn;

- The cooperatives management committee together with the government should organize trainings on gender sensitivity in coffee sectors therefore level of participation of male and female will be seen in the coffee cooperatives.
- Cooperatives should put strategies in place that will attract educated farmers to join cooperatives by minimizing number of meetings during working days.
- Coffee growers in the study area should intercrop coffee trees with annual crops (beans, soya beans) that give residues to overcome mulching issues for coffee production
- Agricultural extensions agents should create more awareness on availability of credit to the farmers and its impact in improving agricultural productivity.
- The government and its development partners in coffee sector and farmer' cooperatives should encourage the farmers to grow coffee in well managed cooperatives by providing trainings to make them understand the role of intensity of coffee production and creating other jobs in surrounding area where they will get off-farm income to supplement income from coffee. These will avoid the farmers to grow other crops which will reduce the size of farm under coffee production therefore coffee land will be expanded.

- The government should allow the cooperatives to import farm inputs with tax exemption by themselves. This will solve the problem of inadequate fertilizers and chemicals caused by delay distribution, weak demands of farm inputs by farmers because of the cost will become lower and sharing farm input with other crops will be reduced, hence farmers can use farm input efficiently.

Suggestion of further studies:

- ❖ Determining factors influencing technical efficiency smallholder coffee production in Rwanda.
- ❖ Profitability analysis of coffee cup of excellence competitions for coffee cooperatives in Rwanda.

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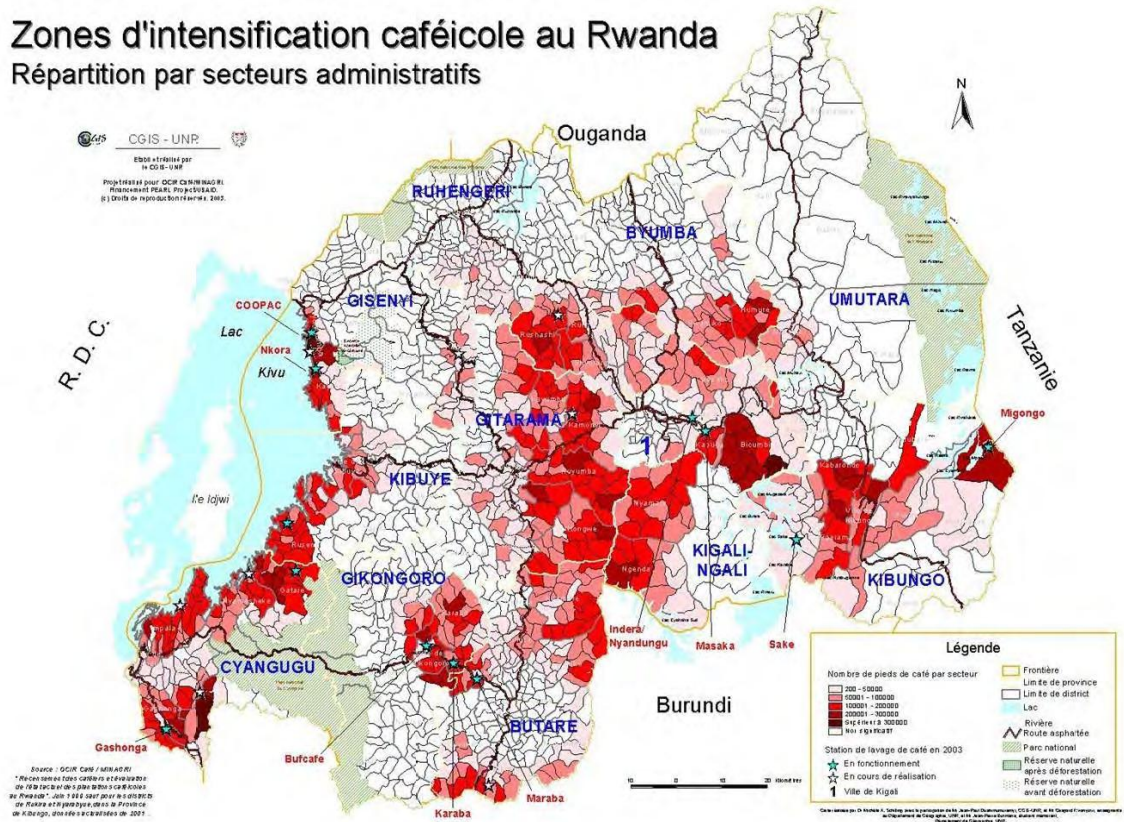
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APPENDICES

Appendix 1.1: Coffee growing regions in Rwanda

Zones d'intensification caféicole au Rwanda
Répartition par secteurs administratifs



Source: CGIS-UNR, 2008

Appendix 3.1: Questionnaires

Serial no.....Name of Enumerator.....

A. Identification

1. Name of respondent.....

District: -----

Sector: -----

Cell: -----

Date of interview: Day: ----- Month: -----

B. Household characteristic

1. Gender of respondent

Female=0, Male=1,

2. Age of respondent.....years.

3. Education level of respondent

No formal education =1, Primary school education =2, secondary school Education =3, University=4

Other,

specify.....

4. Number of members in the HH:

How many children are aged less than 18 years?

How many adults (More than 18 years) are in the family?

What is your main occupation: 1= farming, 2= commerce, 3= paying job, 4= craftman

C. Farm characteristics of the household head

5. What is the size of your farm? Hectares (ha)

6. Do you own it?

Yes=1, No=0

7. If the answer is yes, how did you acquire it?

Bought=1, Inheritance=2, leased=3

Other, specify

8. Are you member of any group (cooperative or association)?

Yes=1, No=0

9. If the answer is No, why?

High membership fees=1, I'm not interested=2,

Other,

specify.....

10. If your answer above is yes, indicate year of joining, the membership and annual fees?

Membership fees.....RwF, Annual feesRwF, Year of joining.....

11. What is the name of your cooperative?

.....

12. How does membership to the cooperative benefit your coffee farming? Rank in order of importance:

Bargaining higher prices....., Ensuring compliance of quality standards.....,

Opening new market outlets Training on business management.....,

Other, specify.....

13. How does the cooperative assist to improve coffee productivity? (Rank in order of importance starting with most important)

Extension of credit....., offering farm extension services....., Provision of market information, Offering transport services to the markets, Offering coffee storage and processing facilities.....

13.1. At what extend you trust your cooperative?

1= not, 2= low trust, 3= middle trust, 4= high trust

14. What are five most important crops that you grow?

crop	Size of land in hectuare
1.	
2.	
3.	
4.	
5.	

15. What is the estimated size of your land under coffee cultivation?

<1 acre= 1, 1-2acres= 2, 2-5acres=3, above 5acres=4

17. How long have you been a smallholder coffee farmer?

Less than 5yrs = 1, 6-10 yrs=2, 11-15 yrs =3, 16-20 yrs = 4, Over 20 yrs =5

18. How many trees do you have in your coffee farm?

What is the spacing of the coffee trees?

Which year did you plant coffee?

19. What kind of cropping do you practice?

Mixed cropping=1, Mono cropping (coffee) =2

20. What are the types of activities you normally do?

Farm activity codes	Type o fertilizer:	Agrochemicals	Labour types
1= Land preparation 2= Manure application 3= Mulching 4= Fertilizer application 5= Pesticide application 6= Weeding 7= Harvesting 8= Transport to market 9=others (specify)	1=Planting (basal) 2=Topdressing 3=Manure 4=others (specify)	1= Pesticides 2=Herbicides 3=Fungicides 4=others (specify)	1=Casual 2=permanent 3= family

21. What yield of coffee cherries harvested in Kgs Last season?

22. When through with cherry picking what you do you do?

Sorting=1, Floating= 2, Grading=3, De- pulping=4, Milling=5

Other, specify

23. Where do you sell your produce for processing?

None=1, Farmers' cooperative=2, private processor=3, Middlemen=4

Other, specify.....

25. How do you transport cherries to the coffee factory?

By head=1, Bike=2, Pick up=3

Others specify.....

D. Trading

Coffee crop	Harvest (Cherries)		Sales	Quantity sold		
	Unit	Quantity	1=None 2= farmers' cooperative 2= Middlemen 3=private processor 4=Others	unit	Quantity	price

25. a. Do your buyers pay you on time

Yes=0, No=1

25.b.What are the benefits of growing coffee?

Gain enough income=1, Be able to save=2, Facility of getting credit=3

Other,

specify.....

E: Financial information

26. Do you do any off- farm jobs for income?

Yes =1, No=0

26 (a) if yes how much money have earned last year?,,,,,,,,,,,,,,,,,,,,,,,,,,,,,rwf

27. Do you have access to credit that you use in coffee production?

Yes=1, No=0

28. If yes, indicate the sources:

Loan from Commercial bank = 1, loan from microfinance institution =2,

Loan from cooperative =3, Credit from farmers' cooperative =4, loan from

Neighbours =5, loan from Relatives/friends = 6

Others,

specify.....

29. If no, can you give reasons?

No collateral=1, Expensive to pay=2, not available=3,

Other, specify.....

30. What are other sources of finance for coffee production expansion?

Savings from salary income=1, Profit from other farming activities =2, Profit from coffee farming =, Remittances by employed family members=4

31. What are the requirements for you to get credit from your financier?

Collateral = 1, Business plan =2, Deposit of percentage of loan = 3, References from friends =4, Membership to a group = 5

32. Are you given the loan equal to amount applied?

Yes =1, No =2

33. If the answer is no, indicate the most appropriate reason?

Collateral not adequate = 1, Collateral adequate but denied amount =2, Cash flow okay but denied amount =3, Membership to a group but denied amount = 4, Unable to pay cost of processing loan =5

34. What is other kind of credit do you get?

Name of other credit	source
1.	
2.	
3.	

F. Source of market information

35. From what source do you receive information about consumer demand for coffee products? OCIR-Café =1, Informal milk traders =2, Radio =3, Bulletins =4, Newspapers and magazines =5, other farmers=6, none=8

Other, specify.....

36. How do you receive information on the market prices for coffee products?

Farmers’ cooperative=1, Radio =2, T.V =3, Public meeting =4, other farmers =5, Informal coffee traders= 6, Bulletins=7, none=8

Other, specify.....

37. Would you be interested in getting information on market prices and consumer demand?

Yes=1, No=0

38. Does access to market information assist in increasing quantity and quality of cherries delivered to your cooperative?

Yes=1, No=0

39. If the answer is No, explain your answer.....

.....
.....

40. If the answer is yes, would you be willing to pay for the information?

Yes =1, No=0

41. If yes indicate how much you pay per week per lot of information on market prices and demand.

>2500 RwF=1, 5000 RwF =2, 7500 RwF =3, 10000 RwF =4, above 10000 RwF=6

H. Coffee processing and value addition of coffee

42. Do you participate in coffee processing and value addition of coffee?

Yes=1, No=0

43. If No what are the reasons?
.....
.....

44. If yes what coffee products do you make?

- 1.
- 2.

45. Who are the other key players involved in coffee processing and value addition?

- 1.
- 2.
- 3.
- 4.

I. Please list in order of priority, the most important challenges as far as coffee production is concerned: Problem analysis

Do you have any specific problems/challenges related to coffee production that hinders you from undertaking your activities efficiently? List them	What are the causes of the problems you have listed in column 1?	What are the effects of the problems on your coffee production?	What do you think are the possible solutions to these challenges?
1.			
2.			
3.			
4.			

I kindly thank you for your time.

Appendix 3.2: List of participants of FGDs

Name	Sector	Cooperative name
NTAGANDA Laurent	Maraba	Abahuzamugambi
MUKANDORI Jacqueline	Maraba	No membership
UWERA Nema	Maraba	Abahuzamugambi
HABIMANA Bonaventure	Simbi	Abahuzamugambi
MUKAMPAYANI Epiphane	Kigoma	Abakundakawa ba Kigoma
KANYABIKARI Bernard	Maraba	Ryohakawa shyembe
UZABAKIRIHO Josephine	Kigoma	No membership
UWIZEYIMANA M. Chantal	Kigoma	Abahuzamugambi
RUHATSI Mathieu	Kigoma	KOAKAKA
MUKAMUGWERA Aloysie	Simbi	Abahuzamugambi
KABERUKA Pauline	Simbi	Imbereheza Cyendajuru
NIKUZE Fortunee	Simbi	Abahuzamugambi

Source: Author (2013)

Appendix 4.1: Multicollinearity Test for Variable Expected to Influence Decision to Participate

a) Multicollinearity test for objective 1

Variable	VIF	1/VIF
Keeprec	1.47	0.682363
Exp	1.43	0.699782
Trust	1.33	0.752814
Farmsiz	1.3	0.766617
Ed	1.3	0.767524
Occ	1.26	0.792431
Offfarminc	1.26	0.796023
Acessloan	1.25	0.799501
Familysize	1.15	0.869984
Sellprc	1.11	0.897202
Gender	1.04	0.957152
Mean VIF	1.26	

Source: Survey data (2013)

Appendix 4.2: Correlation Test for Variable Expected to Influence Decision to Participate

(obs=230)

	Ed	Occ	Familys	Farmsiz	Sellpr	Exp	Offfar	Accloa	Keepr	Tru
Ed	1									
Occ	0.41	1								
Familys	-0.02	-0.01	1							
Farmsiz	0.07	0.09	0.19	1						
Sellpr	0.2	-0.01	0.04	0.04	1					
Exp	0.11	-0.03	0.29	0.36	-0.14	1				
Offfarm	0.09	-0.19	0.21	-0.27	-0.08	0.24	1			
Acessloa	0.12	-0.07	-0.16	0.28	-0.09	0.21	0.23	1		
Keepr	-0.1	0.11	-0.13	0.25	0.08	-0.3	0.33	0.36	1	
Trust	0.08	0.05	0.03	0.31	-0.03	0.31	-0.22	-0.22	-0.4	1
Gender	0.02	0.06	-0.05	-0.01	-0.06	-0.1	0.05	0.14	0.1	-0.1
Coop.	-0.12	0.01	0.09	-0.28	-0.05	0.24	0.23	0.25	0.35	0.1

Source: Survey data (2013)

Appendix 4.3: Multicollinearity Test for Variable Expected to Influence the Intensity of Coffee Production

Variable	VIF	1/VIF
Exp	1.31	0.761508
Farmsize	1.28	0.784189
Acessloan	1.17	0.854022
Offfarminc	1.16	0.862863
Familysize	1.13	0.88262
Ed	1.07	0.937191
Contract	1.06	0.940255
Othercrops	1.03	0.966467
Gender	1.03	0.970732
Mean VIF	1.14	

Source: Survey data (2013)

Appendix 4.4: Correlation Test for Variable Expected to Influence the Intensity of Coffee Production (obs= 230)

	Ed	Family	Farmsiz	Exp	Offfarm	Acessloa	Gend	Contra	Otherc	Landsha
Ed	1									
Familysize	-0.02	1								
Farmsize	0.07	0.19	1							
Exp	-0.11	0.29	0.36	1						
Offfarm	0.1	0.21	0.27	-0.24	1					
Acessloa	0.12	-0.16	0.28	0.21	0.23	1				
Gender	0.02	-0.05	-0.1	-0.05	0.05	0.14	1			
Contra	-0.06	-0.12	-0.1	-0.2	0.10	0.13	0.05	1		
Othercr	0.1	0.02	0.09	-0.05	0.04	0.02	-0.05	-0.06	1	
Landsha	0.11	0.03	0.003	0.1207	0.24	-0.15	0.01	0.26	-0.17	1

Source: Survey data (2013)