EVALUATION OF FACTORS INFLUENCING MEMBERSHIP IN COFFEE
COOPERATIVES IN HUYE DISTRICT, RWANDA

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A thesis submitted in partial fulfillment of the requirements for the award of a Master of

Science degree in Agricultural and Applied Economics at the University of Nairobi

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This thesis is my original work and has not been presented for the award of a degree in any other academic institution.

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Dedication

This thesis is dedicated to my parents, brothers and sisters.

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Acronyms and abbreviations

CI:	Confidence Interval
GIS:	Geographic Information Systems
GoR:	Government of Rwanda
ISAR:	National Agricultural Research Institute (Institut des Sciences Agronomiques du Rwanda)
ITC:	International Trade Centre
LPM:	Linear Probability Model
MINAGRI:	Ministry of Agriculture and Animal Resources (Ministere de l'Agriculture)
MINICOFIN:	Ministry of Finance and Economic Planning (Ministere des Finance et de la Planification Economiques)
MINICOM:	Ministry of Trade and Industry (Ministere du Commerce et des industries)
NUR:	National University of Rwanda
OCIR Café :	Rwanda Coffee Board (Office National des cultures Industriels au Rwanda)
PEARL :	Partnership for Enhancing Agriculture in Rwanda through Linkages
PSTA:	Strategic Plan for Agricultural Transformation (Plan Stratégique pour la Transformation de l'Agriculture)
RCA:	Rwanda Cooperative agency
RwF:	Rwandan Francs
RWASHOSCCO:	Rwandan Small Holder Specialty Coffee Company
SLC:	Student Learning Centre
USA:	United States of America
VIF:	Variance inflation factors

ABSTRACT

The government of Rwanda adopted a new policy reform to improve coffee industry by building new coffee washing stations, organizing coffee farmers into cooperatives and training local farmers. Despite cooperatives' efforts to attract members through the provision of inputs, and other incentives, membership to coffee farmers' cooperatives in Rwanda has been reported to be low. This study evaluates the factors influencing membership of cooperatives in Huye District, Rwanda. It uses data from a survey of three cooperatives where a total of 184 farmers were interviewed. Among them, 105 are members of cooperatives and 79 are non members. A probit model was used in data analysis. Descriptive statistics results show that cooperative membership has been declining since 2000. This decline is explained by such requirements of cooperative membership as membership fees, number of coffee trees and coffee certification, lack of awareness of the functionality of the cooperatives, long distance from farmers' home to cooperative washing station and some farmers not appreciating the benefit of being coffee cooperative members. Results from probit regression show that factors such as age of household head, household size, distance to cooperative washing station, access to credit, experience in growing coffee and quantity of coffee produced were statistically significant as the factors that influence membership in coffee cooperative. Based on the findings, this study recommends that the Government and managers of the cooperatives should sensitize coffee farmers on the potential benefits of being members of the cooperatives and by facilitating easy access to cooperatives washing stations. Furthermore, the Government should support cooperatives in terms of providing credit and other facilities to act as incentives for coffee farmers to join cooperatives.

CHAPTER ONE

INTRODUCTION

1.1 Background

Coffee production in Rwanda dates back to 1904 with its first export occurring in 1917(Chemonics International, 2006). Since its introduction into Rwanda, coffee has played an important role in the economic development of the country. For many years, coffee has been the major source of foreign currency in Rwanda (Schluter *et al.,* 2001 and MINAGRI, 2008, OCIR Café, 2009). Coffee production was estimated at 16,000 and 20,000 tones in 2009 and 2010 respectively and its value accounted for 36 percent of the total export earnings in 2009 (Boudreaux 2010). Coffee revenue in rural areas is about 14.8 billion Rwanda francs (MINICOM, 2010). Coffee growing is mainly a smallholders' activity. Smallholders are mainly poor people who work in small and fragmented plots. In 2004, there were some 400,000 producers of coffee in Rwanda in 60 districts (OCIR 2005). Other actors in the sector include private traders, hulling and exporting companies, government institutions and, in the recent decade, many cooperatives.

In 1964, the Ministry of Agriculture and Animal Resources (MINAGRI) established OCIR-Café, a parastatal agency, with broad powers to organize the smallholder planters, purchase their crop in the form of parchment coffee and also organize for the processing of the parchment coffee through contracts with private factories. Parchment is processed into green coffee and the final product is sold on the international market. OCIR- Café as created in 1964 has a mandate of searching for marketing outlets for the coffee produced in Rwanda.

Since 1964 and up to 1988, only two coffee exporting companies, Rwandex and Etiru, had been granted exclusive marketing franchises. By far, Rwandex had the greatest share of the exports, by accounting for 60 percent of Rwandan coffee exports (Mutandwa *et al.*, 2009).

Efforts to introduce liberalization in coffee processing and marketing started in 1991, but it was only after the 1994 genocide that the licensing of several private coffee exporters and the installation of several parchment mills by companies such as Rwandex, Rwacof, Coffex, and Caferwa, occurred. Before liberalization, coffee merchants bought beans from farmers and sold them to Rwandex, which in turn sold them to foreign buyers. The coffee marketing chain has now changed and the Rwandex Company no longer enjoys monopoly power.

After the liberalization of coffee purchasing, new buyers of coffee cherries (coffee cooperatives and private entrepreneurs) have emerged, leading to a high competition in the raw coffee market in many parts of the country. Liberalization has resulted in high coffee cherry prices, which is playing an important part in helping thousands of farmers increase their income. This is helping create jobs and provide opportunities for new skills training. It is strengthening human and social capital and, in the process, is also generating valuable social benefits.

In order to improve coffee production in terms of quantity and quality, farmers are encouraged by the government to form and join cooperatives so that they can increase their bargaining power and earn higher prices for their produce. Cooperatives are established for multiple purposes. They are involved in the provision of services to growers, accessing and

managing inputs and monitoring their use; and production of high-quality coffee through processing at washing stations. The goal is to increase farmers' participation in coffee cooperatives and contribute to a positive change in the livelihoods of the members. Through the improvement of the quality and the quantity of their coffee they can earn higher prices for their produce (OCIR, 2005).

Until 2006, only 8.2 percent of coffee growers were organized into cooperatives (OCIR, 2006). Cooperatives in Rwanda coffee industry have not yet been able to attract many members. The agricultural cooperatives in general and coffee cooperatives in particular have performed poorly because their financial capital base, which correlates highly with membership, is low (MINICOM, 2006). The initial investment of coffee cooperatives does not allow them to get their expectations results. In any case, a sub-optimal use of the cooperatives' washing stations due to lack of sufficient supply of coffee cherries needed as raw materials for processing may be expected to contribute to financial problems.

Cooperatives and private processors have different economic objectives: cooperatives aim to maximize profits per member whereas the objective function of private processors is to maximize the overall financial profit (Mosheim, 2002). Mean that cooperatives are interested by benefit of their members whereas the private traders are looking for their own interest. The Strategic Plan for Agricultural Transformation (PSTA) in Rwanda has documented that lack of human, material and financial resources, low level of participation of members in the cooperative organizations and management are the major constraints facing the cooperatives (MINAGRI, 2004). This study investigated factors influencing low cooperative membership.

1.2 An overview of coffee cooperatives in Rwanda

In Rwanda, the government policy encourages farmers to be members of cooperatives. The Cooperatives Policy document (MINICOM, 2006) states that cooperatives movement in Rwanda started in the colonial period, mainly as a tool for promoting colonial interests. At the time of its independence in 1962, Rwanda had 8 registered cooperatives with 22,475 registered members. These cooperatives were mainly involved in social activities (such as community work and creation of strong sense of community), and in the development of the mining sector and cash crops (such as tea, coffee and pyrethrum). After independence, the Government of Rwanda used these cooperatives as instruments of implementation of its policies and plans.

In the 1960-1970 decade, new cooperatives emerged around development initiatives, especially in the handicrafts and artisanal activities supported by the Catholic mission. The 1970s decade experienced a strong intervention of the government in the cooperatives sector which led to the creation of other cooperatives, such as savings and credit cooperatives, to ensure security of savings and distribution of credit. By 1992, about 8,750 cooperatives had been registered (MINICOM, 2006). After 1994, due to political crisis, there were only about 100 cooperatives that were operational in Rwanda, mainly in the rural areas. Rural cooperatives continue to be conceived as organizations established by members "as vehicles to provide services to them" (Braverman *et al*., 1991). Cooperatives have helped substantially in supplying agricultural inputs and materials and the commercialization of agricultural and handicraft products (MINICOM, 2006). Cooperatives

In Rwanda's development cooperatives play a significant role by generating employment, they improve conditions of life of members, help reduce poverty, improve access to credit, assist in procurement and storage, helps in distribution of inputs and marketing products and raise employment like in agriculture.

1.3 Statement of the problem

Rwanda's strategy of fighting poverty, like in most African countries, is through the establishment of cooperatives, which is seen as a means to empower citizens economically (Nambi 2008). Formation of coffee cooperatives in Rwanda is promoted by the government as a means to improve the performance of the coffee sector and to improve farmers' social well-being. There are about 80 active producer cooperatives in Rwanda. However, only about 20 percent of the 390,000 coffee farmers have joined cooperatives. This low level of membership weakens the farmers' organizations and hinders coffee sector training and monitoring initiatives (Chemonics International, 2010). However, the Government of Rwanda has developed a new policy and created an agency called Rwanda Cooperative Agency whose purpose is to facilitate all round development of the cooperatives in the country in order to make a significant contribution to the national economy (RCA, 2006).

The fact that the cooperatives are being promoted through the Government policy does not guarantee immediate and satisfactory membership. The Coffee Census Report done in 2009 shows that the cooperative spirit within the coffee sector in Rwanda remains surprisingly fragile and is poorly developed. Available literature shows that no study has been undertaken before the adoption of the new policy on the promotion of cooperatives in Rwanda. Thus,

this study was undertaken to assess the factors that influence membership in coffee cooperatives in Huye District of Rwanda. The objective was to identify the barriers as well as opportunities to enhance farmers' participation in coffee cooperatives in order to address coffee development issues in Huye District of Rwanda.

1.4. Objectives of the study

1.4.1 Overall objective

The purpose of this study is to assess the factors that influence membership in coffee cooperatives including barriers as well as opportunities to enhance farmers' participation in coffee cooperatives in Huye District of Rwanda.

1.4.2 Specific objectives

1. To describe membership trends in coffee cooperatives in Huye District, Rwanda

2. To characterize the socio-economic and demographic profiles of the study households.

3. To assess the factors influencing farmers' decision to be a member of the coffee cooperatives in Huye District, Rwanda.

1.4.3 Research questions

- What has been the trend in growth of coffee cooperative membership?

- What are the socio-economic and demographic profiles of the members of cooperatives and those who are non-members of cooperatives?

1.5 Hypothesis to be tested

The main hypotheses tested in this study are that socio-economic and demographic factors, namely as age, gender, household size, experience in coffee farming,   coffee quantity, education, access to credit and distance to coffee washing stations, do not either individually or jointly affect farmers' decision on membership in the coffee cooperatives in Huye District, Rwanda.

1.6 Justification of the study

Rwanda, like other developing countries, has adopted the policy of strengthening the cooperatives due to their importance in economic development in terms of the significance they have gained in rural development and the role they play in the attainment of the basic needs for their members, and also in the development of regions and the nations (MINICOM 2006). Coffee has been one of Rwanda's most valuable and traded commodities. Coffee has played a key role in the development of Rwanda's economy by generating over 36 percent of total export revenue (Boudreaux 2010). It provides income to many rural households. However, there is limited information on the factors that influence membership in coffee cooperatives in Rwanda. The results of the study will provide the necessary information on the key factors which have motivated or demotivated farmers' membership in coffee cooperatives and thus help the policy makers in the design of new approaches that can increase membership of coffee cooperatives in Rwanda.

1.7 Organization of the thesis

This thesis is structured into five chapters. Chapter one gives the introduction which includes the background, problem statement, objectives, hypothesis, and justification of study. Chapter two presents the literature review that includes the theoretical and empirical review on factors influencing cooperatives membership decision. Chapter three gives the methodology applied in the study; this includes the theoretical framework, the empirical model, the study area, data

sources, sampling procedure and data analysis. Chapter four presents the results and discussion. The last chapter presents a summary of the main findings, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Analytical modelling

2.1.1 Types of approaches used in the analysis of decision making in the past studies

Different approaches have been used to evaluate factors that influence the membership decision. Membership behavior is a discrete choice phenomenon which as a dependent variable is of the type that elicits a yes or no response. According to Aldrich (1987), the most commonly used approaches in the estimate of such a model are the linear probability model, logit model, and probit model.

Linear Probability Model (LPM)

The Linear Probability Model (LPM) takes the form of a typical linear regression model, with a dummy variable as the dependent variable which can be used to analyze a choice process. The LPM poses several problems, such as non-normality of the disturbance terms, heteroscedastic variances of the disturbance term and questionable R^2 as a measure of goodness of fit (Aldrich, 1987).

Logit Model

Logit regression analysis is a multivariate technique which allows for the estimating of the probability that an event occurs or not, by predicting a binary dependent outcome from a set of independent variables. However, the main limitation of the logit model is that the logistic

regression does not make any assumptions of normality, linearity, and homogeneity of variance for the independent variables. The logit model uses the cumulative logistic function (Aldrich, 1984).

Probit Model

Probit analysis is based on the cumulative normal probability distribution. The Probit Model is a non-linear probabilistic model developed to address the shortcomings of the LPM. The Probit model has two categories in the dependent variable. The binary dependent variable Y takes on the values of zero and one (Liao, 1994).

Given the weaknesses of the other models described in this section in evaluating discrete choice phenomenon, the current study adopted the probit model to evaluate the factors influencing membership in coffee cooperatives in Huye District. The choice is also influenced by the fact that logit model assumes that error terms are IID (Independent Identically Distributed) extreme value whereby probit model assumes normal distribution of error terms (Greene 2003). Therefore, probit model was chosen over other model including logit model

2.1.2 Empirical framework

Batuhan (2009) analyzed factors affecting forest cooperative's participation in forestry in Turkey using probit model and found that the most important factors affecting forest cooperative's participation in forestry are: member involvement, forest ownership and administration, and harmony within cooperatives and between cooperatives and the state.

The result shows that these three factors explained 59 percent of participation within a cooperative. The current study was built on this finding when evaluating the factors affecting membership in coffee cooperatives.

In Germany, Stefano (2010) did an econometric analysis of farmers' relationships with agricultural cooperatives. Probit model was used to analyze cooperative membership and market choices for their products. The result shows that the greater the numbers of cooperatives relative to the number of private processors, the more the farmers are likely to be members of cooperatives and the greater the probability to participate in cooperative activities. To be settled in an area where the local economy is dominated by agricultural activities also increases the likelihood of farmers to be characterized by soft membership, being members but not selling their products to the cooperative. These insights were considered important in the current study.

The study done by Stefano (2010) found that, in a more agriculture oriented area, the presence of a cooperative is more likely to attract farmers' membership, probably due to cultural and socio-political reasons and due to local cooperative market or economic power. Farms with more assets are slightly less inclined to be members of a cooperative, but if they join a cooperative they are more likely to participate in cooperative activities. The results from Stefano (2010) confirm that both agricultural and social related networking have a significant positive impact on membership decisions. However, Stefano (2010) focused on the analysis of cooperative membership and market channel choices, but the current study focused on the evaluation of the membership of coffee cooperatives only.

A study on factors that affect the participation of Shirvan-Chardavol township's farmers in agricultural cooperatives' activities in Ilam Province in Iran was conducted by Bagher (2011). The stepwise multiple regression was used to evaluate the collective role of the independent variables on the level of participation of agricultural cooperatives' activities. The results of the study showed that membership history, income, amount of agricultural land, socio-cultural factors, the members' economical features, managerial factors, and members' psychological and communicational-cum-informational factors have direct impact on their level of participation in agricultural cooperatives. Bagher (2011) focused on the level of participation in agricultural cooperatives but the current study focused on factors affecting membership in coffee cooperatives.

Thomas and Fanaye (2012) adopted a Tobit model to analyze the determinants of the proportion of women in the membership of agricultural cooperatives and logit model to study the determinants of women membership in agricultural cooperatives in Ethiopia. The results from Tobit regressions show that the functions undertaken and the way the cooperatives are organized significantly affect women's proportion in cooperatives membership. The results from logit regression show that age and household size are likely to influence women's participation in cooperative. These results gave some insight into how the current study was modeled.

To analyze the factors that influence farmers' interest in marketing switchgrass through contracts and/or joining a cooperative that harvests, transports, stores, and markets their switchgrass in twelve southeastern USA Jensen *et al.,*(2011) using a probit model. They found that the interest in joining a cooperative is positively influenced by farm size, on-farm

storage and off-farm income. The study found that the farmers who are interested in growing switchgrass as a biomass feedstock are generally willing to grow it under a cooperative that harvest, transports, stores, and markets switchgrass. This willingness to engage in these alternative marketing arrangements was greater among the farmers who farmed more acres of land, had facilities in which they could store switchgrass, and had substantial off-farm income. The current study finds the approach adopted in Jensen *et al.* (2011) appropriate in the study of the factors that influence membership in coffee cooperatives in Rwanda.

A study by Saharkhiz (2009) used a probit model to evaluate the mechanisms of attracting popular participation in the cooperative entities, especially multi-purpose cooperatives, from the perspective of cooperative sector and the relevant organizations' executive directors. The results of that study showed that the government's supportive policies regarding the cooperative sector (especially in multi-purpose cooperative entities framework) played the most important and influential role in attracting popular participation. Promoting the scientific and technical capabilities of the cooperatives' managers and increasing the people's awareness of the cooperative sector were the next crucial factors in this regard.

Jenson (1990) evaluated the factors that influence the decision by dairy farmers to join cooperatives in milk marketing in Tennessee. The study found that the provision of quality services was the main criteria for choosing between membership and non-membership in a dairy cooperative. The study also found that factors such as better price and an assured market were also significant in influencing cooperative membership.

Bravo-Ureta and Lee (1988) compared the socioeconomic and technical characteristics of dairy cooperative members with those of non members to determine which characteristics influenced the choice to join cooperative membership in New England. The study used Cobb Douglas and logit models to compare the characteristics between the two groups. The findings showed that demographic characteristics, such as age and education, had little influence upon whether or not a dairy farmer was a member of a cooperative. However, the results of a logit analysis showed that the probability of being a cooperative member was positively related to extension service contacts and that operating a smaller farm had positive influences on the chances of a dairy farmer being a cooperative member. The current study finds the use of a probit model to evaluate factors affecting coffee cooperative membership in Huye District to be appropriate.

Othman *et al*., (2009) analyzed the factors that influence cooperative membership and increment in shares in Malaysian Cooperatives using a logit model. The results of that study showed that age, occupation, annual general meeting attendance and membership duration are important predictors in the model. Gender negatively influenced cooperative membership and that people in the older age group are more likely to become cooperative members. These insights are considered useful in the current study.

2.1.3. Coffee supply chain in Rwanda

The Rwandan coffee industry has experienced many changes. Before coffee sector reforms, farmers used to process their coffee and dry it before selling it to traders on a spot market.

Many farmers currently have alternatives and may sell coffee cherries to processing plants owned by coffee cooperatives or private investors, as shown in figure 2.1 below.

```
┌──────────┐   ┌──────────┐   ┌──────────┐   ┌──────────┐
│ Farmers  │───│ Farmers  │───│ Farmers  │───│ Farmers  │
└──────────┘   └──────────┘   └──────────┘   └──────────┘
                         │
              ┌────────────────────────────────────────┐
              │            Coffee cherries              │
              └────────────────────────────────────────┘
     │                                              │
┌─────────┐        ( Depulping & Drying ) ◄─────────┐
│ Traders │                  │                      │
│         │        ┌──────────────────────┐    ┌─────────────┐
│         │        │  Parchment/dry coffee │    │ Cooperative │
│         │◄───────│                       │    │             │
└─────────┘                  │                  │             │
     │          ( Hulling Machine ) ◄───────────│             │
┌──────────────┐             │                  └─────────────┘
│ Hulling      │             │
│ (exporting   │───┐  ┌──────────────────────────┐
│ companies)   │   └─►│       Green Coffee        │◄──┐
└──────────────┘      └──────────────────────────┘
        Domestic roasting            Exporting
              │                          │
        ┌──────────┐          ┌────────────────────┐
        │  Local   │          │ Europe, USA, Asia  │
        └──────────┘          └────────────────────┘
```
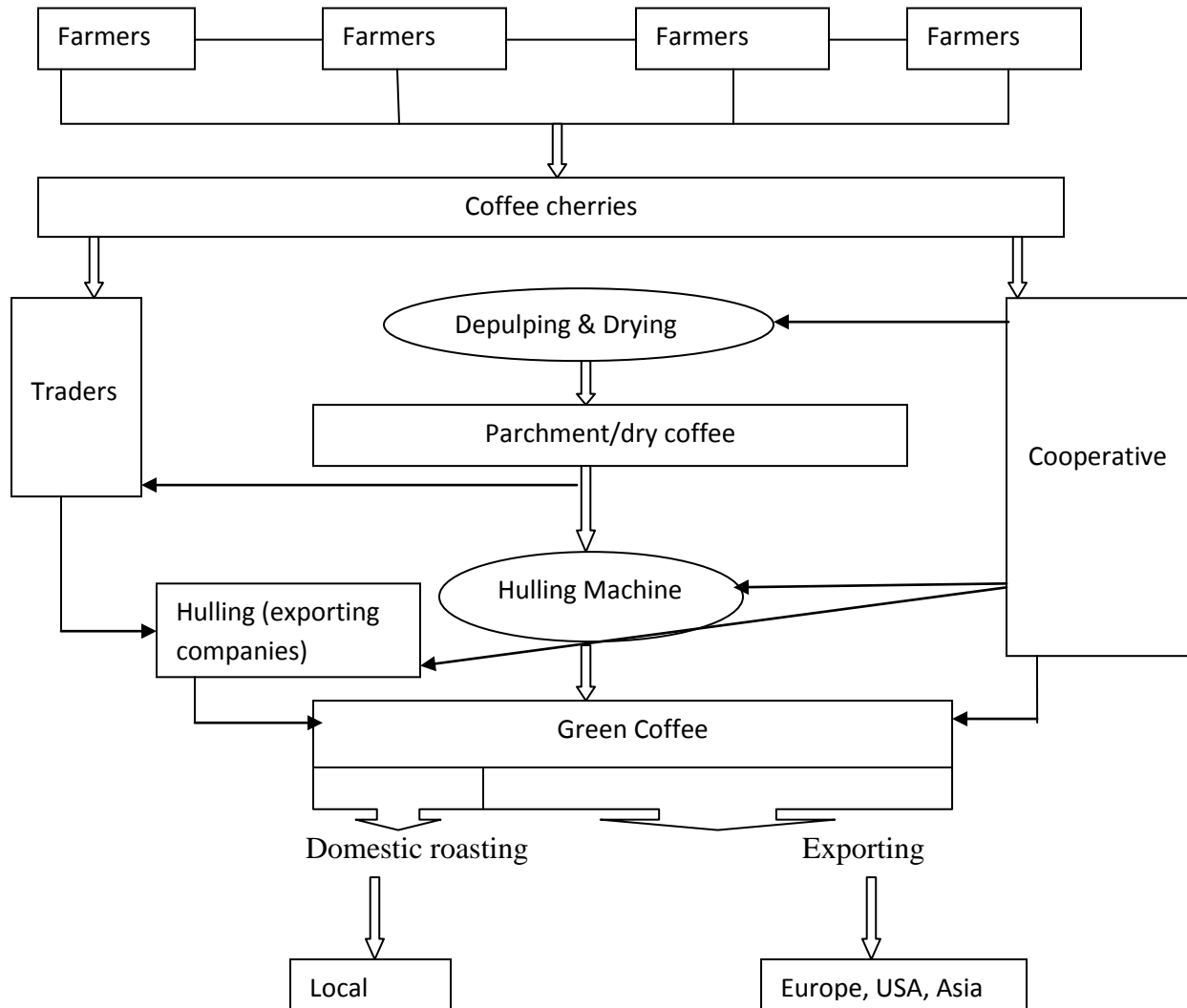
Figure 2.1: Alternative coffee processing and marketing channels in Rwanda
Source: OCIR-Café, 2005

Figure 2.1 shows that cooperatives receive cherries from farmers and process cherries into parchment coffee at the cooperatives' washing stations. Private investors who own coffee processing plants and do not produce coffee cherries purchase coffee cherries through spot

markets or through contract arrangements with farmers. Therefore, the catchment area of the coffee cooperatives is also an arena for other buyers, especially the private operators, who might own small coffee washing stations. Private operators mainly buy cherry from the coffee farmers who are non-members of cooperatives.

Transformation of coffee cherries into clean green bean involves harvesting, depulping, fermenting, washing, drying, dehulling, cleaning and sorting, grading, and storing of green beans. Depulping must be accomplished within 12 hours of harvesting in order to maintain the quality. During the peak coffee season, hand sorting of cherry before depulping becomes difficult and, as a result, most of cherry is depulped straight as it comes from the farms. Most of it reaches the factory well after sunset and darkness has set in. This results in poor quality green beans.

The transformation of cherries into parchment coffee takes place through the process of depulping and drying. The subsequent transformation of parchment coffee into green coffee involves dehulling (to remove the parchment) and this is performed either by cooperatives (few own the hulling machines) or by dehulling and exporting companies as is shown in figure 2.1. These companies include Rwacof, Rwandex, Sicaf, Coffee Business Center, Agrocoffee and Caferwa. Coffee is traditionally exported either to Europe (France, Belgium, Switzerland) or USA, but there are some new niches in Asia (For example China).

A small proportion of green coffee is roasted and domestically consumed, but the major share is exported. Domestic coffee consumption is negligible. Specialty coffee is produced in

washing stations owned by either cooperatives or private processors. In Rwanda, both farmer cooperatives and private firms process coffee to sell in the international market. Cooperatives sometimes operate through Fair Trade markets (where they are guaranteed a minimum price) and/or other international markets, depending on the markets they have access to through their marketing unions. Coffee is mainly exported either to Europe (France, Belgium, Switzerland) or USA, but there are a few niche markets in Asia (For example China).

CHAPTER THREE

METHODOLOGY

3.1 Theoretical framework

A farmers' decision on whether or not to join a coffee cooperative is modeled following a utility maximization framework (Cooper, 1997; Hanemann, 1984). The farmers face two choices or alternatives based on the expectation that the utility with a membership of the coffee cooperative is at least as great as without it. The responses Y to the question on membership choice, where Y=1 if "yes" and 0 if "no", represent the observed outcomes. These outcomes are hypothesized to be influenced by farm characteristics, farmer demographics, and farmer attitudes.

Following Holloway *et al.,* (2001), a farmer *i* will decide to be a member of a coffee cooperative if the utility derived from it is greater than that of not being a member. Let Y be the membership decision. Hence Y=1 if the farmer chooses to be a member in a coffee cooperative and Y=0 if a farmer chooses not to be a member. Thus, the farmer will choose to be a member if the utility of being a member of a cooperative (U_{1i}) is greater than the utility of not being a member of a cooperative (U_{0i}).

Let Y* be a latent variable which is a function of utility (U_{1i}) expressing the utility that a farmer who is a member in coffee cooperative has and U_{0i} being that for not being a member. Then:

$$Y^* = U_{1i} - U_{0i} > 0 \qquad\qquad (3.1)$$

and the probability of choosing to be a member in coffee cooperative is:

$$P_i = P(Y = 1) = P(U_{1i} > U_{01}), \tag{3.2}$$

and this can be estimated from:

$$P_i = P((\delta_1)F(Z_{1i,} W_{1i}) + \varepsilon_{1i} > (\delta_0)F(Z_{0i,} W_{0i}) + \varepsilon_{0i} \tag{3.3}$$

$$= P(\varepsilon_{10} - \varepsilon_{0i}) > F(Z_{i,}W_i)(\delta_0 - \delta_1) \tag{3.4}$$

$$= P(\mu_i) > -F(Z_{i,} W_i, \beta) \tag{3.5}$$

$$= F_i(\beta X_i) \text{ or } Y_i(\beta X_i) \tag{3.6}$$

Where: $P(\mu_i)$ = probability function

$\mu_i = \varepsilon_{1i} - \varepsilon_{0i}$ is a random disturbance term

$\beta = \delta_0 - \delta_1$ is a vector of coefficients

$F_i(\beta X_i)$ = cumulative distribution function for μ_i evaluated at βX.

This study assumes a normal distribution of μ_i, which in turn influences the distribution for F.

The Probit model is as follows:

$$P(y = 1) = aZ_{ji,} + bW_{ji} + \varepsilon_{ji} \tag{3.7}$$

where a and b are the unknown parameters to be estimated, P is the probability of membership, Z and W are explanatory variables and ε_{ji} is a random error.

3.2 Empirical model

To identify the factors influencing farmers' decision with regard to coffee cooperative membership, a probit model was applied.

Following Greene (1993) a probit model is specified as:

$$Y_i^* = X_i\beta + \varepsilon_i \tag{3.8}$$

where X_i is the observable vector of individual characteristics and Y_i^* is the underlying latent variable. The Probit model constrains the estimated probabilities to be between 0 and 1. What is observed is a dummy variable Y_i defined by:

$$Y_i = \begin{cases} 1: if \ Y_i^* > 0 \\ 0: 0therwise \end{cases}$$

The probit model is a statistical probability model with two categories in the dependent variable.

The probability P_i of joining a coffee cooperative or not joining a coffee cooperative can be expressed as in equation 3.9 (Uzunoz, 2012) which gives a cumulative normal distribution function:

$$p_i = prob \left[Y_i = 1/\chi \right] = \int_{-\infty}^{\chi_i\beta} \left(2\pi \right)^{-1/2} \exp\left(-\frac{t^2}{2} \right) dt = \phi \left(\chi_i'\beta \right) \qquad (3.9)$$

where ϕ represents the probability density function of a standard normal variable and X is the explanatory variable.

The relationship between a specific variable and the outcome of the probability is interpreted by means of the marginal effect, which accounts for the partial change in the probability. The marginal effect associated with continuous explanatory variables X_k on the probability P $(Yi=1|X)$, holding the other variables constant, can be derived as follows:

$$\frac{\partial p_i}{\partial \chi_{ik}} = \phi \left(\chi_i'\beta \right) \beta_k. \qquad (3.10)$$

3.2.1 The Dependent Variable

The dependent variable for the probit analysis is membership in coffee cooperative. The sample was divided into members and non-members of coffee cooperatives and the dependent variable takes value of "1" for members and "0" for non-members.

3.2.2 Independent Variables

Age of Household Head (AHH): This is a continuous variable defined as the farm household head's age at the time of interview, measured in years. The age of the head of the household is considered because the head of household is the one who makes decisions in the farm regarding whether or not to be a member of a cooperative. Age was hypothesized to have a positively influence on cooperative membership, which is consistent with the findings of the studies conducted by Joan (1993) and Bagher (2011).

Gender of Household Head (GHH): This is a dummy variable that assumes a value of "1" if the head of the household is male and "0" otherwise. Men might be more interested in becoming members of coffee cooperatives due to their culture of participating in cooperatives and clubs. Furthermore, they are the ones who attend meetings of campaigns for membership while women are left at home to attend to household chores. Gender as defined was hypothesized to be positively associated with cooperative membership decision.

Education of Household Head (EDHH): This variable was measured in terms of whether 1 has attained education beyond primary school level or not. Hence it was measured by dummy variable where it assumes a value of 1 if higher than primary school and 0 otherwise. At higher levels of education, farmers might have more awareness on the benefits and costs

associated with the membership choice. Therefore, education is expected to have a positive influence on membership in coffee cooperatives.

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Household Size of Household Head (HSHH): This variable was measure in terms of number of household members. In the rural agricultural context, larger households are associated with more labour for coffee cultivation. Proper maintenance and harvesting of coffee needs more labour. Hence, large households are more likely to become cooperative members because these households are more likely to meet the cooperative's high-quality coffee requirements which involve the need for more labour. For this reason, household size was hypothesized to positively influence membership in coffee cooperatives.

Distance to the cooperative Coffee washing stations (DCCWS): This variable was measured in terms of kilometers. Shorter distance from home of the farmer to the cooperative coffee washing station is expected to increase the likelihood of the farmer becoming a member of the cooperative and vice versa. Farmers who live far from the cooperative coffee washing station are more likely to sell their coffee to traders who are close to them. Therefore, distance to cooperative coffee washing station is hypothesized to decrease the probability of membership in coffee cooperatives.

Access to Credit (AC): This is a dummy variable which takes the value of "1" and "0" for coffee growers who have access and those who do not have access to credit respectively. Coffee farmers may be attracted by the credit that they can get from the cooperatives. Hence, access to credit was hypothesized to be positively associated with the decision to become a member of a coffee cooperative.

Experience in coffee growing (ECG): Experience was defined as the number of years of coffee growing by the household head. The longer the period of growing coffee, the more experienced farmers are assumed to be. More experienced farmers have more ideas on costs and returns associated with being a coffee cooperative member. Hence, farming experience is likely to influence positively the membership decision.

Quantity of coffee produced (QCP): This variable was measured in terms of kilograms. Farmers who produce significant quantities of coffee are more likely to become cooperative members especially because there is a minimum quantity required in order to be a cooperative member. Therefore, it was expected that this variable would positively influence farmer's decision to be a cooperative member.

Table 3.1 below gives the expected signs of the coefficients of the variables which were used in the study.

Table 3.1: Definition of Variables that affect membership choice

Variable	Defined on basis of:	Expected sign
Age of household head	Years	+
Households size	Number of people	+
Experience in coffee growing	Years	+
Distance to the cooperative office from the home of the Hh	Kilometer	-
Quantity of coffee output	Kilogram	+

Gender of household Head	Dummy (Female=0, Male=1)	-
Access to credit	Dummy (yes=1, otherwise=0)	+
Education	Dummy (Higher than Primary school=1, otherwise=0)	+

3.2.3 Econometric Models Diagnostic Tests

Diagnostic tests help to check for the validity of the model specification. Greene (1993) notes that research data rarely conform exactly to the theory underlying models. Therefore, before proceeding with the estimation of any models, it was imperative that diagnostic tests for multicollinearity and heteroscedasticity were undertaken. For cross-sectional data as used in this study, multicollinearity was the likely econometric problem that should be tested for.

3.2.3.1 Multicollinearity

To test for multicollinearity, correlation coefficients were determined to identify if any variables correlated. Multicollinearity refers to the presence of linear relationships (or near linear relationships) among the explanatory variables and is present in most sample data (Koustoyiannis 1973). Therefore, its degree of its severity in the exogenous variables should be tested for. According to Kennedy (1985), for non-continuous variables, a value of 0.8 or higher in absolute terms in one of the correlation coefficients indicates a high correlation between the two independent variables. Gujarati argues (1995) that if the Variance Inflation Factor (VIF) of a variable is 10 or higher, that variable is said to be highly collinear (rule of thumb) and it can be concluded that multicollinearity is a problem. Therefore, Variance Inflation Factors (VIF) was used to detect multicollineallity.

3.3. Data sources and sampling procedure

The study used primary data generated by use of semi-structured questionnaire. The sampling frame consisted of coffee growers in Huye District, while the sampling unit was the household head (member or non-member of a coffee cooperative). The study adopted multistage and random walk sampling procedure to select coffee farmers. Huye District was purposively selected. There are 18,404 (OCIR Café, 2009) coffee growers in Huye District, but coffee production is concentrated in three sectors (administration divisions) namely Maraba, Rusatira and Kinazi. The three sectors were purposively selected for the study. In each sector, three cooperatives were randomly selected, namely Abahuzamugambi, Kogimuwaka and Umuwaka. The size of the sample of farmers was determined using the following formula, as adopted from www.redalyc.org and the Lincoln University Student Learning Centre (SLC) 2006 in publication on Sample Size determination in USA:

$$n = \frac{z^2 . p . q . N}{E^2 (N - 1) + (z^2 . p . q)} \quad \text{where:}$$

n = Sample size (being determined)

N = Population size (known)

p = proportion of the attribute under investigation (assumed to be 0.02, if not known)

q = 1 − p

E= 0.02 (since the acceptable error should be 2%)

z = Standard deviation at a given confidence interval (CI) (z = 1.96 at 95% CI)

Since N = 18,404, then the sample size n was calculated as follows:

$$n = \frac{(1.96)^2 \, 0.02\,(1-0.02)\,18404}{0.02^2 \,(18404-1) + (1.96)^2 \, x0.02x0.98} = \frac{1385.2}{7.5} = 184$$

The 184 coffee farmers were distributed among the 3 sectors and the 3 cooperatives as shown in Table 3.2.

Table 3.2 Selection of households

Sector	Cooperative Name	Member	Non-Member	Total
Maraba	Abahuzamugambi	42	20	62
Rusatira	Kogimuwaka	30	30	60
Kinazi	Umuwaka	33	29	62
Total		**105**	**79**	**184**

Source: Author, 2012

Distribution was based on the need to get as many coffee farmers who were members of the coffee cooperatives as possible. This was to ensure that we could get a large enough sample from which to evaluate the factors influencing cooperative membership decisions. However, the selection was based on a random walking method. (Through this method, a sample consisting of 105 members of the 3 coffee cooperatives and 79 farmers who were not members of the 3 coffee cooperatives were selected to constitute the sample of 184 farmers, distributed as given in Table 3.2 above).

3.4 Data Analysis

The data collected was analyzed using SPSS (Statistical Program for Social Sciences) and STATA. The analysis includes both descriptive statistics and econometric models.

3.5 The study area

The area where the research was undertaken is located in Huye District, one of the 8 districts which make the Southern Province of Rwanda. The location of Huye District in Rwanda is given in Figure 3.3 while Figure 3.4 shows the location of the study area. Huye District has a total population of 290,677 people distributed in fourteen sectors (GoR, 2008). As for the whole country, more than 90 percent of the population of Huye District consists of farmers. Huye District is located on a central plateau which is hilly with an average altitude of 1700 m, but it drops to 1450 m in its Western part and rises as one moves towards the West and peaks at more than 2000 m at the top of the Huye mount. The Lowlands at an altitude of 1650 m are swampy.

The district is characterized by a sub-equatorial temperate climate, with an average temperature ranging around 20 ^{O}C. The average annual rainfall is around 1160 mm. As is the case for the whole country, the climate is marked by 4 distinct seasons: a long rainy season (mid February - May), a long dry season (June - mid September), a short rainy season (mid September -December) and a short dry season (January - mid February). Huye District has an average rainfall of 1400 mm per year. Agricultural production in Huye District is characterized by a diversity of such food crops as sweet potato, sorghum, beans, soya, cassava, and banana. These various crops are often grown on the same piece of land.

In general, Huye District is one of the poorest districts of the Southern Province in which the major economic activity is agriculture, and where the majority of coffee trees are located. The district also has more coffee firms due to its favorable environment for coffee growing.
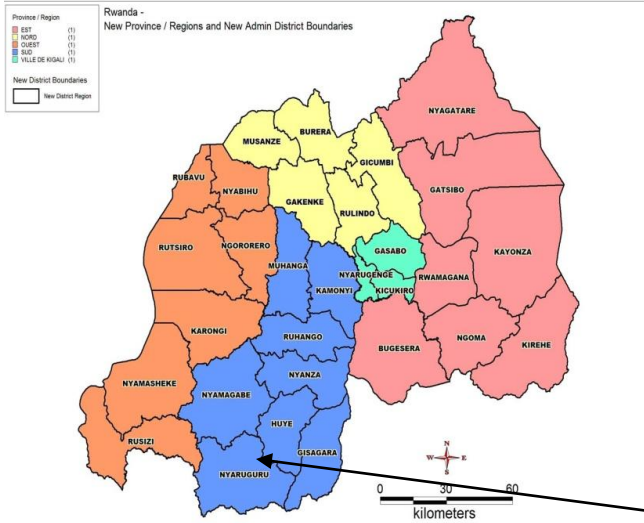
Figure 3.3: Map of Rwanda District

Source: GIS-NUR
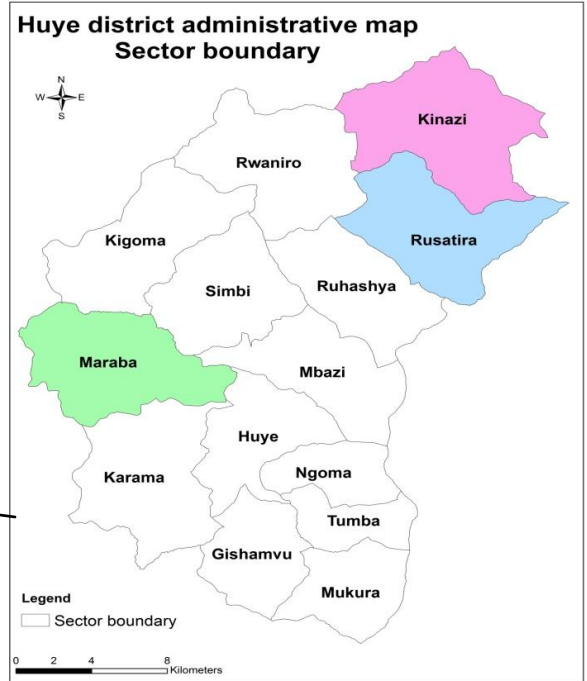
Figure 3.4: Map of Huye

Source: GIS-NUR

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1. Coffee Cooperatives in Huye District

There are 80 cooperatives registered with OCIR Café in Huye District. Three out of these coffee cooperatives were sampled. These are Abahuzamugambi ba Maraba, Kogimuwaka and Umuwaka. These cooperatives share some common features, such as the organization of structure and ownership of one or more washing stations. However, each cooperative remains unique, depending on such characteristics as location, membership evolution, production and growth.

Abahuzamugambi coffee cooperative is located in Shyembe cell in Maraba sector, the sector that has the highest number of coffee trees in Huye District. This cooperative started in July 1999 with 255 members and has 1,344 as of today. It has 4 Coffee Processing plants, a rural community internet café, two vehicles for product transport, and a cupping laboratory (coffee taste and quality).

Kogimuwaka cooperative is located in Rusatira in the Buhimba cell in the village of Gasaka. It started in 1997 as an association of coffee growers and became a Coffee Cooperative in 2002 with 110 members. Today, the Cooperative has 425 members. It has a Coffee processing plant with drying tables and deparchment machine.

Umuwaka cooperative is located in the Kinazi sector. It started in 2001 with 342 members and has 2 coffee processing plants with drying tables, two deparchment machines and 5 water tanks.

Abahuzamugambi, Kogimuwaka and Umuwaka cooperatives were initiated by farmers with a common objective of fighting against poverty by helping each other.

The trend in the growth of coffee membership in Abahuzamugambi, Kogimuwaka and Umuwaka is presented in figure 2.
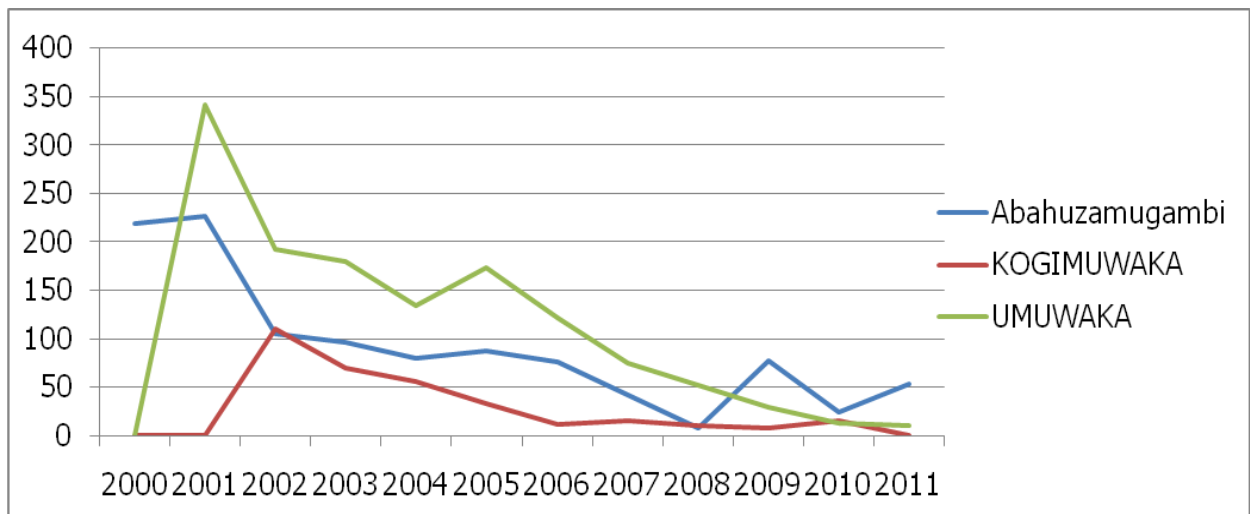
Figure 4.1: Trends in the growth of Cooperatives membership for the sample coffee cooperatives, 2000-2011
Source: Author, 2012

Figure 4.2 shows that membership in coffee cooperatives decreased between 2000 and 2011 in the three cooperatives under study. The decreasing membership in these three cooperative is due to the requirements of cooperative membership such as maintenance of the coffee plantation, coffee quality, membership fee, and coffee certification, lack of awareness of the functionality of the cooperative, long distances to be covered when delivering coffee to

washing stations, and failure of some farmers to see the benefit of being a member of a cooperative. For instance, to be a member of one of these three cooperatives, it requires ownership of at least 1,000 coffee trees and a membership fee of 5,000Rwandan Francs, 3,000Rfw and 2,000Rwf respectively in Abahuzamugambi, Kogimuwaka and Umuwaka Cooperatives. A significant decrease in membership at Abahuzamugambi and Umuwaka occurred in 2002 and this is attributed to the requirements of the system of certification. In 2002, after the completion of the first coffee processing plant in Maraba, the PEARL project worked closely with Abahuzamugambi coffee cooperative and OCIR CAFÉ to organize the producers to bring high quality coffee cherries to the station. In order to do this, they decided to create the system of certification for coffee farmers to be registered as members of the cooperative. These requirements for certification were the main barriers to coffee farmers willing to join Abahuzamugambi and Umuwaka coffee cooperatives.

4.2 Reasons for not joining the cooperatives

Table 4.1 below gives a summary of the reasons for coffee growers not joining cooperatives.

Table 4.1: Reasons for coffee farmers not being cooperative members

Reason for not joining Cooperatives	Number	Percent
No benefit	12	15.2
No clear idea about Cooperative function	15	20
High cooperative requirements	42	53.1
The cooperative is far away from Household homestead	7	8.8
Still thinking about it	3	3.8
Total	**79**	**100**

Source: Survey data, October, 2012

The majority of non-members of coffee cooperatives (53 percent) said that the reason for being a non-member is the high membership requirements of coffee cooperatives, such as the subscription fee. Others coffee growers (20 percent) said that they are not interested in joining coffee cooperatives because of lack of information on the functionality of those coffee cooperatives. Among the interviewed non-members, 15.2 percent do not appreciate the benefit of being a member of a cooperative and they do not see any loss from not being coffee cooperative members.

4.3. General description of farmers' characteristics by membership status

Age of household Head

Table 4.2 below gives the structure of age for cooperatives members and non- members.

Table 4.2: Age household heads distribution of household heads surveyed in Huye district broken down by cooperative membership status

	Member		Non Member	
Age group	Number	Percent	Number	Percent
below 30	12	11.4	16	20.2
31-40	20	19.1	21	26.6
41-50	33	31.4	14	17.7
51-60	28	26.7	15	19
above 60	12	11.4	13	16.5
Total	105	100	79	100

Source: Survey data, October, 2012

Table 4.2 shows that the biggest proportion of households belong to the age range of 30 to 60 years. Upper bounds can be explained by lower life expectancy in Rwanda (44 years for males and 47 years for females). The lower bound can be explained by the fact that the younger people are pursuing their college and university studies and/or occupations other than farming. Many prefer to move from rural to urban areas to look for employment in off farm activities.

Education level

In terms of education, the households were classified into 4 categories as shown in Table 4.3 below.

Table 4.3: Farmer's education level by cooperative membership status

Education Level	Non-Member	Member	Percent
No formal schooling	14	23	20.1
Primary school	64	65	70.1
Secondary school	1	17	9.8
Total	**79**	**105**	**100**

Source: Survey data, October, 2012

Among the interviewed farmers, 20.1 percent have no formal schooling and 70.1 percent have not attended school beyond the primary school level and those who have attained secondary school are 9.8 percent. In general, many of the interviewed farmers have low levels of education.

However, the proportion of those who attained secondary school level was higher among cooperatives members.

Gender

This study shows that men are more involved in cooperatives as members than women, as shown in Table 4.4 below.

Table 4.4: Gender of household head by cooperative membership status

		Non-Member		Member
Gender	Number	Percent	Number	Percent
Male	51	64.5	61	58
Female	28	35.5	44	42
Total	79	100	105	100

Source: Survey data, October 2012

Overall, Table 4.4 shows that the sample has more men being members and non-members of cooperatives than females. This is due to the fact that women tend to be busy with household activities and they do not have time to participate in cooperatives activities.

Household Size

From the sampled households, the average household size is 7 and 4 for cooperative members and non-members respectively. This shows that large households are more likely to join cooperatives. Large households are able to contribute more family labour so that they can produce coffee according to the cooperative requirements.

Experience in growing coffee broken down by membership status

Table 4.5 shows that cooperative membership increased with farming experience.

Table 4.5: Experience in coffee growing

	Non-Member		Members	
Experience (yrs)	Number	Percent	Number	Percent
1-5	22	27.8	8	7.6
6-10	25	31.7	23	22
11-15	8	10.1	31	29.4
15+	24	30.4	43	41
Total Sample size	79	100 79	105	100 105

Source: Survey data, October 2012

Table 4.5 shows that 41 percent of cooperative coffee farmers had more that fifteen years of experience in growing coffee. The longer the period of growing coffee, the more likely it is for farmers to become member of a cooperative.

Credit access

Credit accessibility by cooperative members and non-members is shown in table 4.6 below.

Table 4.6: Credit access by cooperative membership status

	Non-Member		Members	
Access to credit	Number	Percent	Number	Percentage
No	74	93.7	44	42
Yes	5	6.3	61	58
Total	79	100	105	100

Source: Survey, October, 2012

Table 4.6 shows that more than a half (61 percent) of the members of cooperatives has access to credit, while only 6.3 percent of the farmers who are not members have access to credit. Credit access thus increases the likelihood of joining the cooperatives since they facilitate access to reliable and cheaper credit compared to that from formal lending institutions like banks and their associated collateral requirements.

Type of Coffee sold by Farmers

Cooperatives buy only cherries while traders buy cherries and dry coffee. A 100 percent of members and 22 percent of non-members had sold only cherries to the cooperatives. 16 percent of non-members had sold only cherries to traders; and 27 percent of non-members had sold only dry coffee, while 35 percent of non- members had sold both cherries and dry coffee to traders.

Income received by members and non-members of cooperatives

On average, cooperatives members have been making more money than non-members. The average amount of income made by the cooperative members is 61,784Rwf while that made by non-members is 18,473Rwf. Hence there appear to be some benefits associated with being a member of a coffee cooperative.

Purpose of growing coffee

Coffee farmers have different motivations for growing coffee. Among the reasons given for growing coffee is that it has become part of the culture, following the compulsory nature of its cultivation as inherited from the colonial period. Therefore, farmers have been cultivating coffee because their fathers and grand-fathers had been doing so. In addition to this, coffee was found to be the most important source of income in those geographical areas where its production is suitable in the rural area. The various reasons indicated by respondents are shown in Table 4.7.

Table 4.7: Purpose of growing Coffee

Purpose of growing coffee	Non-Member		Members	
	N	Percent	N	Percentage
No other alternative	2	2.5	7	6.6
Tradition	24	30.4	26	24.8
Income	53	60.1	72	68.6
Total	79	100	105	100

Source: Survey, October, 2012

Table 4.7 shows that the main reasons for growing coffee are to earn some income (68.6 percent) and to follow the tradition (24.8 percent) as many farmers inherited the plantations from their parents. However, a small proportion (6.6 percent) asserted that the main reason was the lack of better alternatives in terms of other cash crops.

Hiring of Labour

Coffee farming needs more labour, both for maintenance of the coffee plantation and during harvest. Both family and hired labour is used. Hired labour is used either continuously in coffee production and other household chores and paid monthly or as casual labour on daily basis. The cost of hiring labour is between 600Rwfs and 700Rwfs for one person per day. Table 4.8 gives the information on labour hiring by membership status.

Table 4.8 Hired labour by cooperative membership status

	Non-Member		Members	
Hiring Labour	Number	Percent	Number	Percentage
No	55	69.6	37	35.2
Yes	24	30.4	68	64.8
Total	79	100	105	100

Source: Survey, October, 2012

Table 4.8 shows that about 65 percent of cooperative members hire labour while non-members who hired labour are 30.4 percent.

Location of processing Coffee

All of the 105 members of coffee cooperatives and 17 non-members process their coffee at cooperative wash stations while 62 farmers are still attached to the tradition of doing their own home processing and selling to traders.

Gains from the cooperatives

The benefits gained from the cooperatives are different. All the coffee cooperatives members interviewed (100 percent) had received some inputs from their coffee cooperatives (pesticides and fertilizers) which are given on credit which and paid after selling their coffee cherries. Among the cooperatives members, 60 percent said that becoming members of coffee cooperatives have helped them to improve their livelihood due to the high price given by the cooperatives than what they were receiving by selling to private traders. Some of coffee cooperatives members also received bikes provided by Rwanda bike project in order to facilitate the transportation of coffee cherries from the field to washing stations. The bikes were given to cooperative members on credit to be paid over a three years period.

Transaction preferences: Traders vis-a-vis Cooperatives

Table 4.9 and table 4.10 below show the factors that influence coffee growers to transact with private traders vis-à-vis cooperatives.

Table 4.9 Preference of transaction with traders

	Non-Member	
	Number	Percentage
Payment date	63	80
Distance to traders	16	20
Total	79	100

Source: Survey, October, 2012

Table 4.10 Preference of transaction with cooperatives

	Member	
	Number	Percentage
Credit	61	58.1
Distance to coop washing station	33	31.9
Trust	11	10
Total	105	100

Source: Survey, October, 2012

The date of payment after transactions was one of the main factors influencing most of non-members of cooperatives (80 percent) to transact with traders. With traders, the payment is straightforward and is made after sale, and this gives farmers the incentive to sell their coffee to traders. However, cooperatives payments are not made immediately after the transaction. On the other hand, shorter distances to washing station, access to credit and provision of inputs are the elements that motivate about 90 percent of the members of cooperatives to

prefer transacting with the cooperatives. Thus, traders are linked with payments certainty, whereas delays in payment are common in the case of cooperatives.

4.4. Regression results

4.4.1 Summary statistics of variables hypothesized to influence respondents' decision on membership status

This section presents the results of the probit model regression analysis. The result from the table below shows that the explanatory variables explain the dependent variable at about 30 percent. Even though the R^2 is 0.29 and may appear low, the F-value is highly significant at 1 percent which confirms that the independent variables explain the observed variations in cooperatives membership. Table 4.11 provides the results on the factors that affect membership to coffee cooperatives.

Table 4.11: Results from Probit Regression of the factor affecting membership in coffee cooperatives

Variables	Units	Coefficients	Standard Error
Age	Year	0.0275**	0.0121
Gender	Male/Female	0.2563	0.2272
Education	Primary School/Beyond Primary School	-0.1154	0.1979
Household Size	Number of people	0.1315***	0.0456
Distance to washing station	Kilometer	-0.1617*	0.0891
Experience	Years	0.5467*	0.2851
Access to Credit	Yes/No	1.6462***	0.2800
Quantity of Coffee	Kilograms	0.9827*	0.3841

*significant at 10 percent, **significant at 5 percent and *** significant at 1 percent

Pseudo R^2 0.2932 n=184

LR chi2(8) = 62.47

Prob > chi2 = 0.0000

Log likelihood = -88.841459

$F_{(8, 184)}$ = 65***

Source: Author work, October 2012

The estimated coefficients of the variables included in probit models show the direction and statistical significance associated with the variables. Based on Table 4.11 results, the significant factors that influence membership to coffee cooperatives at 10 percent or higher levels of significance are (i) age of household, (ii) household size, (iii) distance to

cooperative washing station, (iv) experience in coffee growing, (v) access to credit, and (vi) quantity of coffee produced. However, one cannot tell by how much the change in these variables will affect the probability of becoming a member of coffee cooperatives (Green, 2002). To determine this kind of situation, one undertakes an estimate of the marginal effects of these changes.

Marginal effect of the probit regression

Table 4.12 gives the marginal effect of the changes in the variables included in the probit regression. It shows by how much the probability of a change in the dependent variable is expected to increase or decrease for a unit change in an explanatory variable (Maarten, 2010).

Table 4.12: Estimation of Marginal effects after probit regression

Variables	dy/dx
Age of household	0.0076
Household size	0.0416
Distance to cooperative	-0.0582
Experience in coffee growing	0.1685
Access to credit	0.4960
Quantity of coffee	0.0001

Source: Author's work, October, 2012

The results presented in Table 4.11 and Table 4.12 shows that:

(i) Age of household positively influenced membership to coffee cooperatives in Huye district and was significant at the 5 percent level. This implies that older coffee farmers are

more likely to join cooperatives than younger coffee farmers. An increase in the age of household head by one year increases probability of joining a cooperative by about 0.76 percent.

(ii) Household size is significant at 1 percent and thus positively influences membership in coffee cooperatives. This implies that the larger the size of the farmer's household, the bigger is the probability of becoming a cooperative member. Larger households have more labour available for coffee maintenance and harvesting, thus enabling households to meet the cooperatives requirements to deliver quality coffee that needs more labour to prepare. An increase in household size by one person increases the probability of joining a cooperative by around 4.2 percent.

(iii) Distance to the cooperative washing station also significantly affected the decision of becoming a member of a cooperative. The coefficient of distance to the cooperative washing station is negative and significant at 10 percent, indicating that the probability of being a member of a cooperative is negatively affected by the distance to the cooperative washing station. Shorter distances to the cooperative washing station would increase the likelihood of becoming its member. An increase of distance by 1 kilometer decreases the probability of becoming a cooperative member by about 6 percent.

(iv) Experience in coffee growing is significant at 10 percent and positively influences the farmer's decision to be a member of cooperative. The result shows that farmers with more experience in growing coffee are more likely to join cooperatives. Increasing the experience

by 1 year increases the probability of membership in coffee cooperative by about 17 percent. This may due to the fact that farmers with more experience are better informed on the costs and returns associated with membership and non membership of a cooperative.

(v) Access to credit also influences positively the likelihood of membership in coffee cooperative. Availability of credit at cooperatives increases the likelihood of farmers joining the cooperatives since cooperatives can be regarded as a source of reliable and cheaper credit in comparison to that from traders and formal lending institutions like banks and their associated collateral requirements. The result presented in table 4.11 shows that the likelihood estimate of the access to credit is positive and highly significant at 1 percent level. Improving access to credit by one unit leads to about 50 percent increase in the probability of becoming a member of coffee cooperative.

(vi) Quantity of coffee produced is significant at 10 percent and thus positively influences the choice of becoming a member of a coffee cooperative. This means that the probability of being a cooperatives member is higher for farmers who produce more coffee than those who produce less. This is due to the fact that there is a minimum quantity of coffee required to be supplied to the cooperative in order to be eligible for membership. Even then, the marginal effect of quantity of coffee produced is very small. Increasing the production of coffee by 1 kilogram will increase the likelihood of becoming a cooperative member by 0.01 percent.

(vii) Level of education and gender of head household do not have statistically significant effects on participation in coffee cooperatives.

4.5. Test of Multicollinearity

Two measures are often suggested to test for the presence of multicollinearity. These are: (i) Variance Inflation Factor (VIF) to test for association among the continuous explanatory variables, and (ii) contingency coefficients to test for dummy variables (Gujarati 2003). Table 4.13 gives the variance inflation factors for the explanatory variables included in the model.

Table 4.13: Variance inflation factors for continuous explanatory variables in the model

Variable	VIF	1/VIF
Experience	2.81	0.35
Age of household	2.71	0.35
Household size	1.23	0.81
Distance of coop washing station	1.41	0.79
Quantity of coffee	1.23	0.81
Mean VIF	1.59	

Source: Author's computation, 2013

According to Gujarati (1995), the presence of multicollinearity among variables is indicated by a VIF greater than 10. Based on the results presented in Table 4.13, the hypothesis that there is mulicollinearity among the explanatory variables was rejected, implying that the data were not collinear meaning that there was no correlation among independent variables.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMANDATIONS

5.1 Summary and conclusions

The purpose of this study was to analyze the factors that influence membership of coffee cooperatives in Huye District, Rwanda. The study specifically aimed at describing the trends in cooperatives membership and the key factors affecting membership in coffee cooperatives in the study area. The probit model was used in the analysis. Secondary and primary data were used. Primary data were collected using semi-structured questionnaires. Data was analyzed using STATA Program and SPSS (Statistical Program for Social Sciences). A total of 184 coffee growers were interviewed in October 2012. Out of the 184 households interviewed, 105 households (57 percent) were members of cooperatives, while the remaining 79 (43 percent) were non-members.

This study shows that there was a general decline in membership in coffee cooperatives between 2000 and 2011. The main reasons for this decreasing membership are: (i) high requirements for cooperatives membership, (ii) lack of awareness of the functionality of the cooperatives, (iii) long distances to cooperative washing station, and (iv) some farmers not appreciating the benefit of being a member of a cooperative.

The probit regression analysis results show that among the eight explanatory variables which were included in the model, namely age of household head, gender of household head, education, experience in coffee growing, size of the household, quantity of coffee produced,

distance to cooperatives coffee washing station and access to credit, six variables (Age of household head, household size, distance to cooperatives coffee washing station, experience in coffee growing, quantity of coffee produced and access to credit) were statistically significant. The two remaining variables (gender and education of household head) were not significant in explaining the variation in membership to coffee cooperatives.

This study thus concluded that: (i) easy access to labour, as reflected by the size of household size, (ii) expectations regarding access to cheap and reliable credit to enhance investments in coffee, (iii) distance to the cooperatives coffee washing station, (iv) age (the study shows that the high number of members is concentrated around the farmers who are above forty years old), (v) the number of years the farmers have been growing coffee, and (vi) the quantity of coffee cherry produced are the key factors that influence the probability of being a member of coffee cooperatives.

Cooperatives impose some requirements that have to be met by farmers, such as ownership of many coffee trees, membership fees and timely delivery of cherries. Accordingly, farmers may not want to be members of a cooperative because the above requirements are not easily met nor are they costless. This factor may explain the observed decline in membership of coffee cooperatives between years 2000 and 2011.

5.2 Recommendations

This study found that old farmers are more likely to join cooperative than younger coffee farmers. Therefore, the government and the managers of cooperatives should focus on

sensitization of coffee farmers, especially younger farmers, on the benefits of being members of cooperatives so that they can have a clear understanding and be fully informed on the potential of cooperatives.

It was found that the distance from home to cooperative coffee washing stations negatively influences cooperative membership. Therefore, cooperatives should promote policies aimed at assisting the coffee farmers who live far from the cooperatives coffee washing stations, such as by providing transport to facilitate access to these stations.

Coffee farmers are more likely to join the cooperatives in expectation of access to cheap credit which helps them to meet costs related to coffee processing. Government should promote policies aimed at supporting credit facilities for cooperatives so that coffee farmers can benefit from such supportive facilities, including access to farm inputs such as fertilizer and pesticides.

This study found that coffee cooperative membership eligibility requires that a farmer must produce a certain minimum amount of coffee cherry. It is therefore not surprising that coffee farmers who produce a significant quantity of coffee are more likely to be coffee cooperative members. To strengthen membership, the coffee cooperatives should relax this membership requirement in order to allow coffee farmers producing low quantities of coffee to become members.

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Appendix I: Research Questionnaire

I. General information

I.1. Interviewer (Initials):

I.2. Date of interview:

I.3. District:

I.4. Sector:

I.5. Name of respondent:

I.6. Age:

II. Individual identification

II.1. Sex of respondent

    1. Male   0.Female

 II.2. Education

    0. No formal schooling: 1. Primary school: 2. Secondary School:

II.3. Number of respondent's Household permanent members:

II.4. Number of dependents (Children under 12 years and elders):

III. Farming system

III.1. What is the size of your farm (in acres)?

Category of land	Size of land
Less than 2 acres/ < are 2	
2 - 5	
6 – 10	
11 – 15	
16 – 20	
21 – 30	
31 – 40	
41 – above	

III.2. What kind of crops (other than coffee) do you grow and their respective land (in

hectares)

No	Crops grown	Land attributed (hectares)
1		
2		
3		

III.3. Number of years growing coffee:

III.4. Purpose of growing coffee

    0. No other alternative:

    1. Tradition:

    2. Income:

    3. All above:

    4. Other (Specify).

III.5. Do you hire labour in your coffee farming?

    0. No: 1. Yes:

III.6. What is the cost of hiring labour (in man day)?

III.7.Is credit accessible to you?

    1. Yes: 0. No:

III.8. What kind of credit services?

1. Formal credit: 2. Informal:

III.9. From which financial institutions do you receive the credit?

Institution	Informal credit	Formal credit
1.		
2.		
3.		

III.9. Are you member of a coffee cooperative?

0. No: 1. Yes:

IV. Transaction partner

IV.1. To whom did you sell your coffee this year?

      0. Cooperative (Washing station)

      1. Traders

      2. Other (Specify)

IV.2. What type of coffee did you sell?

      0. Cherries: 1. Dried: 2. Both:

VI.3. What quantity do you produce in a year (Kgs)?

VI.4. What is the average amount of money made from coffee?

      Last year: This year:

IV.5. What is the distance from your home (Minutes by walk)?

      1. To the plot of coffee

      2. To cooperative washing station

      3. To depulping center

      4. Trader

      5. Other buyer

IV.6. Do these factors influence your preference for transaction partnership

With the cooperative	Not at all (1)	No (2)	Neutral (3)	Yes (4)	Very Much (5)
0.Payment date					
1.Trust					
2.Price					
3.Relationship					
4.Credit					
5,Distance to coop washing station					
6. Burden					
7.Quality					
8.Risk to be cheated					
9.Other (Specify)					

With the Trader	Not at all (1)	No (2)	Neutral (3)	Yes (4)	Very Much (5)
0.Payment date					
1.Trust					
2.Price					

3.Relationship					
4.Credit					
5.Distance to traders					
6.Burden					
7.Quality					
8.Risk to be cheated					
9.Other (Specify)					

IV.7. What do you plan to do in your coffee in the near future?

    0. Noting in particular

    1. Replace it with another crop

    2. Maintain the same area but practice mixed cropping with other crop

    3. Increase the area of coffee-add on more trees

    4. Evaluate better whether it's necessary to keep the coffee

    5. Other (Specify)

IV. 8. Where do you get market information?

    1. Neighbours

    2. Local market

    3. National newspaper

    4. Radio/Television

5. Cooperative

6. Community leaders

7. Government agents

8. Others (Specify)

V. Cooperatives members

V.1. Which cooperative do you belong to?

V.2. When did you join the cooperative?

V.3. Why did you join the cooperative?

    1. Compulsory

    2. Expected benefits

    3. Followed others

    4. Others (Specify)

V.4. Has the coop helped you to get access to any of the following services or reach the

    following benefits?

    1. Improves household's current livelihood welfare

    2. Important in time of emergency

    3. Reduced burden/risk of

    4. Access to technical advice and training

    5. Higher prices

    6. Access to input

    7. Access to credit

    7. Other (Specify)

VI. Non-member

VI.1. What is the reasons for not joining the coop?

      1. No real benefits:

      2. No clear idea about the coop function:

      3. High membership fee:

      4. The coop washing station is far away from household home

      5. Requirements are high:

      6. Bad coop leadership:

      7. Still thinking about it:

      8. Other (Specify):

VI.2. Where do you process your coffee?

      1. Own wash station

      2. Cooperative wash station

      3. Private wash station

      4. Other (specify)

VI.3. Do you perceive any loss of benefits for not having joined the cooperative?

      0. No   1. Yes (Specify)