ANALYSIS OF FACTORS INFLUENCING WOMEN PARTICIPATION IN COFFEE VALUE CHAIN IN HUYE DISTRICT, RWANDA

By

UMUHOZA GENEREUSE
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DECLARATION

I, UMUHOZA Généreuse, hereby declare that this thesis is my original work and has not been presented for a degree in any other University.

Signature: ---------- Date: ----------

This thesis has been submitted with our approval as university supervisions

Signature: ---------- Date: ----------
Professor C. Ackello-Ogutu
Department of Agricultural Economics
University of Nairobi

Signature: ---------- Date: ----------
Dr. F. I. Mugivane
Chairman of the Department of Agricultural Economics
University of Nairobi

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DEDICATION

This thesis is dedicated to my almighty God for His grace; to my husband and my sons for their gratitude and affection.

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ABBREVIATIONS AND ACRONYMS

ACIAR: Australian Centre for International Agricultural Research

CEP: Center for Public Research

CIMMYT: International Maize and Wheat Improvement Centre

COOPAC: « Coopérative pour la Promotion des Activités- Café »

EDPRS: Economic Development and Poverty Reduction

EFTA: Europe Fair Trade Organization

EICV: "*Enquête Intégrale sur les Conditions de Vie des Ménages*" Households Living Conditions Survey

FHH: Female headed household

IFAT: International Federation of Alternative Trade

ISAR: *Institut Scientifique Agronomique de Recherche* : National Agricultural Research Institute

ICM: International Coffee Market

MCGA: Maraba coffee growers 'association

MINAGRI: Ministry of Agriculture and Animal Resources

MINECOFIN: Ministry of Finance and Economic Planning

mm^3: Cubic millimeter

NUR: National University of Rwanda

OCIR Café: *Office National des Cultures Industriels du Rwanda* (At the time of surve named: Rwanda Coffee Development Authority)

RWASHOSCCO: Rwandan Small Holder Specialty Coffee Company

SISR: State Institute of Statistics of Rwanda

US: United States

WMS: Welfare Monitoring Survey

ABSTRACT

Women constitute the majority of the population of Rwanda, their role in decision making should therefore be important in the development of the country. However, in rural areas women empowerment is still low while their significant contribution is greater in politics. Women have very low purchasing power in male dominated cash crops and as a consequence it has potentially negative impact on the family income and poverty reduction. The need for analysis of their participation is vital in order to assess barriers as well as opportunities in the coffee value chain. This study aimed at characterizing women in the coffee value chain by examining the extent of their participation and the key factors that influence intensity of participation in Huye District of Rwanda. Data was collected randomly from 246 households where 134 were participants and 112 non-participants. A double-hurdle model was used, whereby at step one, the Probit regression model was used to assess factors influencing participation decision and at step two, a truncated regression model was used to analyze the factors influencing the intensity of participation.

The findings indicated that, in Huye District, women were mostly in production of coffee while in processing, women generally participated in lower income generating activities. No women owned coffee stations but some were members of coffee washing station cooperatives. The findings revealed that socio-economic factors that influence women's participation in coffee production were land size, access to credit and training and key factors that influence the intensity were land size, extension, training and membership to farmer groups. Thus, there is need for policies aiming at enhancing women's participation in coffee production by promoting land use consolidation, improved access to coffee training and providing extension services as well as facilitating access to credit services.

CHAPTER ONE: INTRODUCTION

1.1 Background

1.1.1 Agricultural sector in Rwanda

Like many other developing countries, particularly those in Sub-Sahara Africa, Rwanda depends heavily on agriculture. The sector contributes close to 40 percent of GDP and employs about 90 percent of Rwanda's population that is scattered in rural areas and villages. Figure 1.1 shows that since 2003, the contribution of agriculture to real GDP has been well above 35 percent, only surpassed by the services sector.

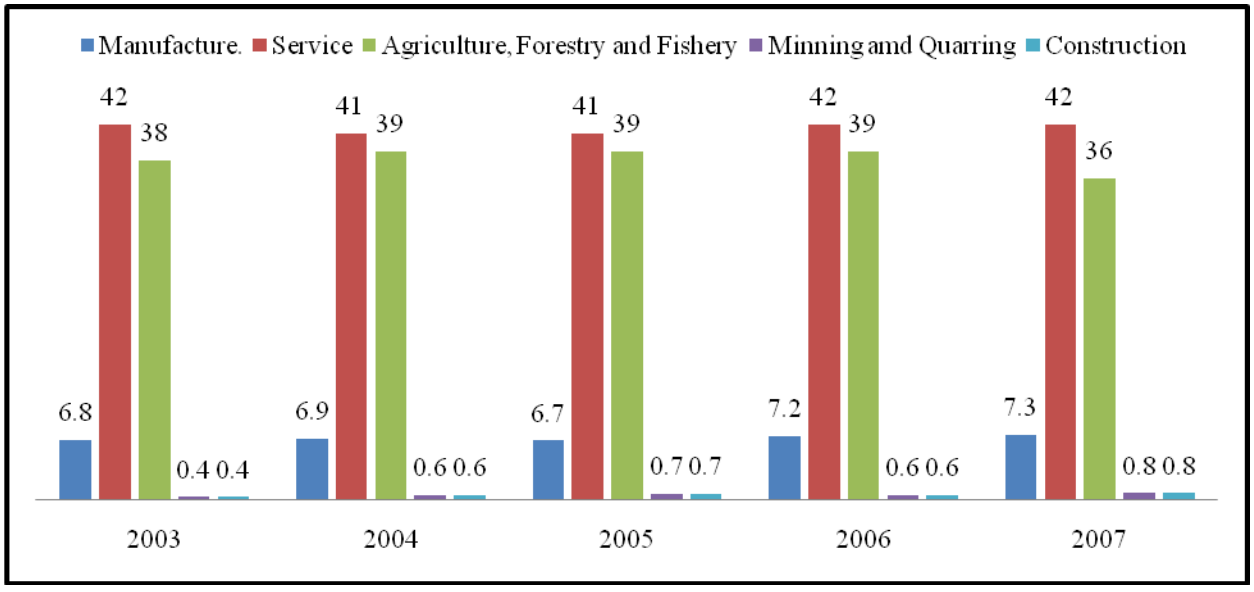

Figure 1.1: Contribution of Agriculture to real GDP (2003-2007)
Source: National Bank of Rwanda (2010)

Though still high relative to other sectors, the contribution of agriculture seems to have stagnated since 2003 as shown by the Figure 1.1. Agriculture's contribution to real GDP increased modestly from 2003 to 2004, stagnated between 2004 and 2006 and finally showed a downward trend between 2006 and 2007, perhaps due to the negative effects such as lack of sufficient funds

to purchase inputs. Nonetheless, agriculture is still the backbone of the Rwanda's economy and it employs at least 90 percent of the labor force (GoV, 2007).

Until now, the agriculture sector in Rwanda was dominated by subsistence farming where food crops such as maize, beans, Irish potatoes, rice and bananas are grown. However, the agrarian reforms undertaken by the government that aimed at commercializing agriculture have induced farmers to target local markets and be able to earn higher incomes from the surplus produce. Although Rwanda's agriculture is dominated by subsistence farming, cash crop farming is also practiced. A few cash crops, mainly coffee, tea, cotton, fruits and vegetables, are produced for export. Over the past, coffee and tea have been the major sources of foreign exchange for Rwanda. Tea is cultivated by large scale farmers in estates whereas the majority of coffee farmers are small scale. Tea exports have performed relatively well since 2005 while coffee exports showed mixed patterns Figure 1.2, and as shown in Figure 1.3, the crops' percentage contribution to total value of exports has been decreasing since 2006

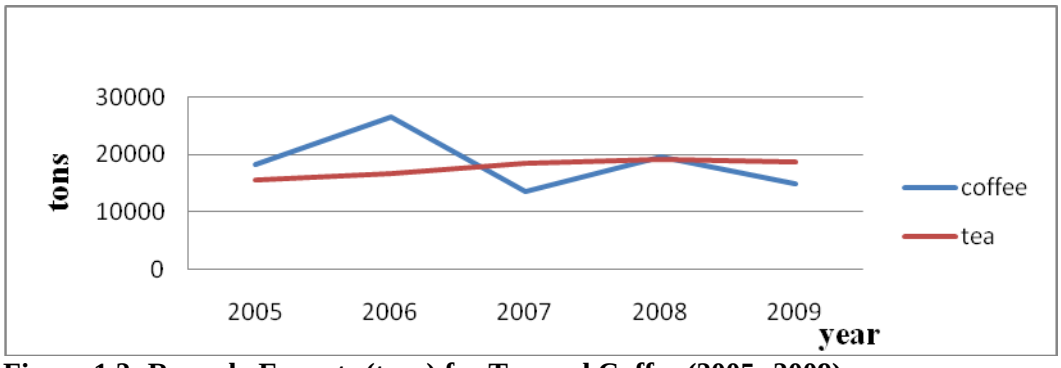

Figure 1.2: Rwanda Exports (tons) for Tea and Coffee (2005 -2009)
Source: Rwanda Coffee Authority (OCIR Café) (2009)

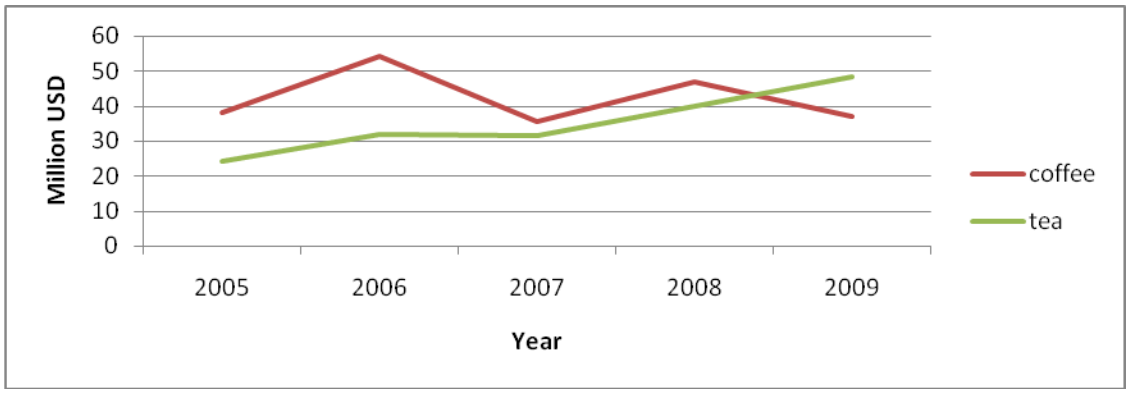

Figure 1.3: Coffee and Tea exports (values in Millions USD (2005-2009)
Source: National Bank of Rwanda (2010)

Although coffee exports have not performed well over the last 10 years, its acreage has increased substantially over the period Figure 1.4. The acreage under tea has remained stagnant at 11.7 million of hectares per year.

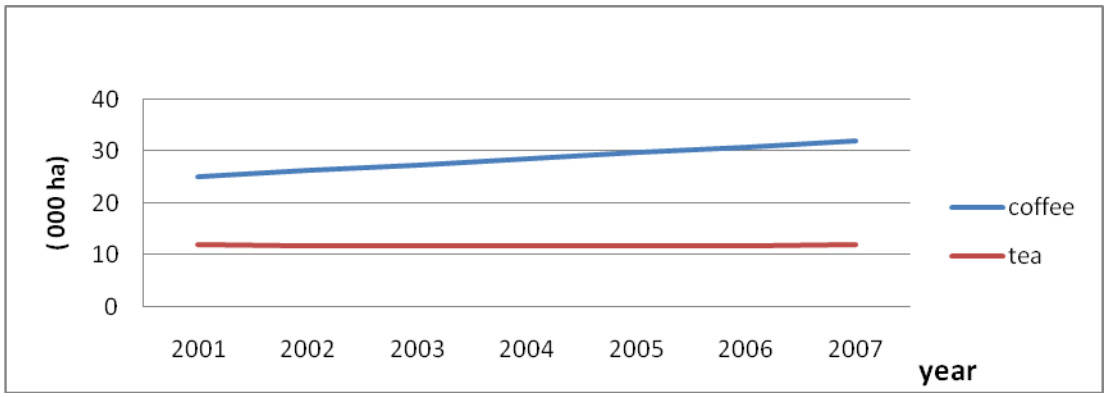

Figure 1.4: Land size under tea and coffee in Rwanda (2000-2008)
Source: Rwanda Coffee Authority (OCIR Café, 2009)

This phenomenon can be explained by the fact that coffee is cultivated by many farmers on their often fragmented land holdings while tea is cultivated by tea estates and a pool of farmers clustered around the estates and working in highly organized associations. A closer look at the production of coffee shows that the output has shown fluctuations almost similar to those shown by coffee exports Figure 1.5:

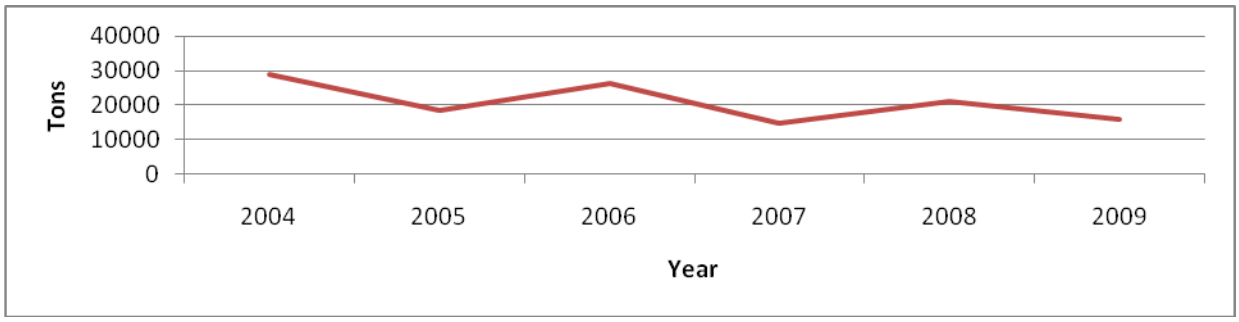

Figure 1.5: Coffee Production (2004-2009)
Source: Rwanda Coffee Authority (OCIR Café, 2009)

According to OCIR Café (2009) poor performance of coffee sector in Rwanda is attributable to a number of factors: the difficulty of monitoring the smallholder coffee sub-sector; fluctuation in coffee production is linked to poor agricultural practices and coffee production cycle trends; rising cost and insufficient application of inputs which partly prevents trees from reaching their full yield potential and leads to high cost of production relative to the price of coffee; poor and low utilization of inputs such as fertilizer and pesticides, which leads to low productivity; farmers, washing stations, and exporters do not sufficiently invest in quality; skills and capacity gaps among the coffee production support officers; and, low cooperative management capacity (OCIR CAFÉ, 2009).

Coffee farmers in Rwanda produce coffee on their own farms but are organized into two major groups to enable them access input and output markets. The major groups are Rwandan Small Holder Specialty Coffee Company (RWASHOSCCO), representing farmer cooperatives; and, Rwanda Fine Coffee Association (RFCA), representing privately owned enterprises. There are approximately 14 coffee growers associations in the country (Boudreaux, 2007). The three major cooperatives are: Maraba Coffee Growers's Association (MCGA, also called "Abahuzamugambi

Bakawa") in the Southern Province, the "Abakundakawa" (Meaning "people who like coffee") located along Rwanda's southern border, and the "*Coopérative pour la Promotion des Activités-Café*" (COOPAC) in the northwest. RWASHOSCCO and RFCA are referred to as "second level cooperatives" which handle exporting, branding and marketing of coffee.

1.1.2 Rwandese women in agriculture

Women play a major role in coffee production and processing in Rwanda but they play a much smaller role at the level of decision making. Rwandese women have decision-making power in agriculture and particularly coffee production. Studies of Rwanda socio-cultural practices have found that men and women can carry out all activities in agriculture but there are a number of activities which are effectively performed by a particular gender. For instance, land clearance is primarily a male activity but it is also done by women, while ploughing is primarily a women's activity but it is also done by men. Sowing is almost exclusively female dominated, as are weeding and hoeing, storing and processing the output. Harvesting is done by both men and women , as well as fertilizing, and marketing (IFAD, 2010). Work on subsistence food crops is primarily done by women. Due to various constraints, women participation in agricultural production, mostly in cash crops, is often minimal (EICV2 Survey, 2005/2006).

With respect to coffee, some women are moving slowly up the value chain for coffee, but most have little or no control over the proceeds of the harvest. Planting, shaping and pruning are done mainly by men, but men and women dig the holes in which the seedlings are planted. Mulching and sprayings are activities which are generally shared by men and women, though women

spend more time in the fields (OCIR Café, 2009). At every stage, there is great potential for women in the Rwandan coffee value chain. Even though they are active, women are commonly hired as temporary or casual workers (e.g. processing and packaging) that require relatively unskilled labour and abilities (OCIR Café, 2009).

The International Coffee Market (ICM) report (2010) states that women face several limitations, including lack of security of tenure and lack of access to credit, infrastructure, skills and markets, low incomes and lack of control over incomes. Gender discrimination in access to credit and training reinforce a cycle whereby women farmers are unable to invest in cash crops. Women are generally overworked and spend a lot of time on domestic chores and hence find little time to spend on income generating activities such as coffee production. Given all these constraints, what factors contribute to women's participation in coffee production in Rwanda?

1.2 Problem Statement

Women's participation in political environment has received significant attention in the World. In Africa, many countries have adopted voluntary or mandatory quotas, with a basis of 30 per cent in politics, as a tool to enhance women's participation in decision making that is conducive for a sustainable development (Ballington, 2004). However, in rural areas women have low power of decision making in the distribution of income. Their responsibilities are distinct from those of their male counterpart. (Knab and Nkoyok, 2006).

In agricultural sector, while cash crops give opportunity to earn income to farmers, women have very low purchasing power (World Bank, 2009). As a result, this may have potential negative impact on their livelihood.

The government has therefore given attention to gender issues in order to increase women's participation in the development of the country, especially in view of the fact that women are the sole providers for their families. In politics, however, women are well represented and Rwanda boasts the highest percentage of women in parliamentary office (Lisa Baldez, 2006). But, despite the increasing number of women in politics, their decision in coffee value chain is extremely insignificant since most women are involved in less paying activities.

Women face challenges to shift from unpaid or less paying activities to economic empowerment. This has consequence on their productivity (Damisa et al. 2007, Enete and Amusa, 2010; USAID, 2011) and thereafter on their poverty (UN, 2000). Thus, their participation analysis is vital to assess barriers as well as opportunities to women's participation level in coffee in order to address development issues in Huye District of Rwanda.

The information generated will provide an insight for development planning and policy formulation that is relevant to the need of women participation in coffee value chain and for achieving poverty reduction, economic growth and household food security goals in Rwanda.

1.3 Objectives of the study

The overall objective of this study was to identify and analyze factors affecting women's participation in the coffee value chain in Huye District, Rwanda. The specific objectives were to:

- Characterize the coffee value chain in Huye District
- Examine the extent of women participation in coffee value chain in Huye District
- Examine the influence of selected socio-economic characteristics of women participation and their level of participation in coffee production in Huye District of Rwanda.

1.4 Justification of the study

A study on coffee is crucial in that the crop has been one of Rwanda's most valuable traded commodities. It has played a key role in the Rwanda national economy and provides income to many rural households. With the problem of land fragmentation, as a result of continuous growing population through inheritance, the Government of Rwanda has targeted coffee production to meet the Millennium Development Goal because coffee can easily be grown on small plots and it has the potential to earn income. In this regard, Rwanda's vision 2020 aims to replace subsistence farming by promoting adoption of high value crops; and, by encouraging gender equality as a means of fighting against poverty among households headed by women. The results of the study will provide the necessary information on potential areas of intervention for policy makers and interested stakeholders (both public and private).

CHAPTER TWO: LITERATURE REVIEW

2.1 General information

The history of coffee in Rwanda dates back to 1905 when German missionaries introduced coffee plantations in the highlands (Murekezi, 2003). Since early 1920s, the country became an exporter of semi-washed bourbon Arabica coffee. The colonial authorities enhanced its production through intensive extension services and by 1927 it became mandatory to farm coffee in Rwanda (Goff, 2006).

After independence in 1962, coffee production was controlled by the government. Since 1978, the "*Office Nationale des Cultures Industrielles au Rwanda –*" (OCIR *Café* or Rwandan Coffee Development Authority) under the Ministry of Agriculture and Livestock was the government agency in charge of coordinating and monitoring farming activities; supplying farm inputs, pulping machines, and extension services; as well as setting the seasonal farm gate prices.

In the aftermath of 1994 genocide, many coffee farmers were forced to uproot their coffee to plant bananas, beans, maize, and other food crops as a result of hunger coupled with low and decreasing prices on the international coffee market (Bourdeaux, 2007).

In 1995, the government liberalized the coffee sector and this created incentives for the private sector to venture into production, processing and marketing of coffee. At that time, coffee marketing was too risky due to competition in international coffee market. The OCIR Café was assigned new duties of monitoring the marketing mechanism and providing information on local and international coffee prices, certification documents to coffee exporters and financial and technical support to coffee growers.

To raise farmers' income, the government used strategies geared at strengthening farmers' organizations. Within that context, a group of coffee farmers in the Southern Province (where the coffee is mainly grown) realized that reducing middlemen was a good option to increase their revenues. Then they created the Maraba Coffee Growers' Association (MCGA) and started to pool their harvest together. This initiative to work in groups was seen by many research institutions such as the National University of Rwanda (NUR) and the National Agricultural Research Institute (ISAR) as bearing great potentials for poverty alleviation among coffee farmers. It is within that context that the government and many donor agencies welcomed this initiative and supported the association technically and financially. Many donors funded the project and the MCGA gained access to new markets and introduced quality standards that are geared for sales to these markets. Since then, Rwandese coffee farmers have shifted from the production of ordinary to specialty coffee. Coffee is graded as specialty according to its different phases of production such as growing, grading, and trade. As a result, smallholder growers have improved their livelihood.

2.2 Women and Participation decision approach

2.2.1 Participation decision approach

Participation in social science refers to different method for the public to express opinions and use influence concerning political, economic or other social decisions. According to Stasser and Titus (1987), participation stimulates the exchange and integration of information. Mumford and Gustafson (1988) argued that participation produces the social support needed for new ideas to be pursued and implemented. Edmondson (1999) asserts that participation encourages learning

through the acquisition, sharing and combining of knowledge. Literature explains that individual participation is critical for converting knowledge into innovation procedures, services and products; this means learning-by-doing.

2.2.2 Women and participation decision making in the value chain

The participation decision in value chain gives opportunity to empower people when they make choice. This leads to reduction of inequalities in their participation which seems to be influenced by gender related factors (Coles and Mitchell, 2010). The authors stated that value chain analysis and development are tools address gender inequalities in markets. They found that factors such as access to assets, gendered education differentials and the nature and value of economic activities affect the way in which men and women participate and benefit from value chains. They suggest that horizontal coordination can reduce gender-related disparities by giving opportunity to bargain and show power. According to them improvement in processes, products and functional distributions can empower women and household outcome. However, these outcomes are determined, in their view, by control of resources by women and the level of decision in their households; in other words, when both men and women play a role in decision making.

Enete and Amusa (2010) in Nigeria worked on determinants of women's contribution to farming decision making in cocoa-based agro-forestry households of Ekiti State. Their study identified socio-economic factors affecting women's contribution in farm decision making. Based on data collected in Ekiti State, southwest Nigeria, the authors found that the key factors that positively influence women's contribution in decision making were their number of years of formal

education, farming experience, financial contributions, number of hours spent in the farm, and their farm size. The women's contribution is constrained by lack of extension and access to non-government organization programs for women, insufficient knowledge of farm credit sources, misconception of women of no having ideas in farming, low self confidence, lack of access to credit support groups such as cooperatives, and unwillingness to invest in a male dominated cocoa farming. The author suggested the need to empower and recognize women through education, finance and information.

Hilli and Vigneri (2011) conducted their study in Ghana and Uganda. Their study considered the impact of gender specific constraints on the production and marketing of cash crops. They found that production from cash crops defers from general agricultural production because it is a market oriented which necessitate the access to these markets and scale and quality of the production. Cash crops production presents potential of improving welfare of rural households. Therefore, involving women in cash crops is crucial. However, the authors stated that, though women are equally productive as men and receive equal prices; their analysis showed that the level of access assets and markets are not similar to men. This has consequence on production and marketing of cash crops and also on gender inequalities. According to the Hilli and Vigneri these gender inequalities in resources are due to deferent levels of participation, methods of production and modes of marketing cash crops and have consequences on women's potential outcome from high value crops.

The Ministry of Foreign Affairs of Denmark in 2010 conducted an evaluation study on gender and value chain development. The authors (Riisgaard et al. 2010) used a value chain approach.

The study aimed to examine which gender issues are important, when and where in value chains and how value chain impacts women. The evaluation highlighted that women are more disadvantaged than men in the context of value chain operations. In gender equality and value chain participation, evaluation stated that an increase in number of women participating in value chain-related activities does not necessarily explain that their participation met the terms of participation and therefore their gains in male-dominated societies. Specific strategies may be put in place to ensure a positive relationship between participation in value chain-related training and changes in household decision-making. The evaluation suggested that the strategies such as negotiations over contract with buyers and intra-household distribution of income must be done at the collective level rather than individual one.

2.2.3 Women and labour force participation in the value chain

Oladejo et al. (2011) investigated the impact of women access to economic resources on their participation in agricultural production. The study showed that household size and marital status influence the participation of women in agricultural production. The study showed also that factors such as social capital, landed-property and cash, as well as savings, are central in determining the level of participation of women in agricultural production. Whereas Damisa et al (2007) found that disposable income, perception, and tenure determine of women participation in agricultural production in Nigeria.

Narayana and Shongwe (2010) studied the determinants of female participation in agricultural sector in Swaziland. Their findings indicated that age, marital status, level of education, land

ownership, employment status and credit accessibility determine the likelihood of female participation in the agricultural sector.

Ackah et al. (2009) conducted a study on determinants of female labour force participation in Ghana using data from the periods 1991/1992 and 2005/2006 Ghana Living Standards Survey. The authors expected that labour market participation of women should improve their economic positions and the overall economic efficiency of the country. They found that education level and fertility influence women's labor force participation in Ghana. They explained that women with primary level or above are better off economically than those with no education. The factor fertility constrains the participation in wage employment in the sense that presence of children in house reduces participation in wage work. The authors suggested that access to child care facilities should facilitate the access to wage employment.

In Chile, Dante (2008) studied the importance of cultural factors on women participation in agricultural sector. The author found that the more conservative a woman is in regard to values, the lower her participation. However, Huerta (2006) studied the factors affecting the level of women's participation in agriculture in Central Serbia. Using phenomenological and heuristic inquiry approach, the study indicated that various cultural factors affect the level of women's participation in agriculture in Central Serbia.

Atieno (2006) analyzed the factors determining the participation of women in the labor market in public, private, informal, unpaid family work and agriculture sectors in Kenya. The study found that education is one of the important determinants of women's participation in the different

labour markets. The author also found that age, years of schooling and land owned did not have any effect on female participation in agriculture sector.

Naved (2000) evaluated the impact of the implementation of modern agricultural technology across three programs (aquaculture, vegetable and fish farming) in Bangladesh. The author targeted individual versus groups of women in their participation. The study was qualitative and gender based. The study investigated, whether income has increased as a result of the implementation of new technology, and wanted to know who controls the income and what will be the effect of group membership in the participation decision of women. From the aquaculture and vegetable programs with individual women participation, the author found that the income was retained by men who controlled land and its output. Compared to fish program managed by women groups, the study found that though women involved men as workers and collectors of money, the men had no direct access to the income. Thus the evaluation of the project showed that the project succeeded due to the group approach in the project implementation. The study showed that group membership is important in empowering women and developing confidence in controlling their labour and earnings and to be able to voice their needs and opinions.

2.3 Past studies that used the double-hurdle model

Ahmed (2011) curried out a study on the trade-off between child labour and schooling in Bangladesh. The Probit regression model was used to predict the probability that a child will choose to attend classes and the Tobit regression model to evaluate the grade-for-age. The Tobit model and the truncated model are all censored models but differ in that the Tobit evaluates both decisions at the same time. The school attendance was considered as dependent variable in the

Probit model and grade for age in the Tobit model. Both models used the same independent variables comprising: age, gender, labour hours, residual labour hours, and education all for the child; number of children, number of adult males, adult female, education of the father and mother, access to piped water, television and bicycle, formal school, NGO school, own marginal land, living in urban, mother education and father education. The present study used the Probit and the truncated regression models.

Babatunde et al. (2010) analysed the factors that influence the participation and the level of engagement in sport. They used pooled cross-section data from four waves of the United Kingdom. The authors used two modelling approaches that are the Heckman sample selection and the double-hurdle models. After regression statistics showed that double hurdle model offered reliable estimates than Heckman sample selection model. The present study used also double hurdle and the reason was that land was considered as a constraint in the area of study due to fragmentation and land scarce.

Ndinomupya (2010) examined the determinants of sustainable coffee marketing channel choice and supply response among organic and UTZ certified smallholder farmers: Evidence from Uganda. The author used the double-hurdle model to identify factors influencing coffee growers' choice of market channel and sales volume decision. The probability of participation in the sustainable coffee marketing channel was used as dependent variable while the exogenous variable included 21 variables in number some are altitude, hire labour, household size, total farm, education of the household head and its squared, price of coffee, sex of the household head, dependence ratio, revenue from non-crops, training extension, revenue from coffee. The

present used the same models but looked at participation decision of women in coffee production in the Probit regression and the proportion of land under coffee in the truncated regression model.

Sanchez (2005) studied the determinants of rural no-farm employment and incomes in Bolivia. The double hurdle model was used. The Probit regression model was used to identify the factors that influence the individual participation in low-skilled and high-skilled activities (dependent variable) in agricultural and non-agricultural wage employment. The truncated regression model was used to evaluate their level of participation (dependent variable). The independent variables that were included in the models were same in both models and were grouped in individual characteristics (female, household head, household spouse, age, education, education squared); household characteristics (household gender, household age, adults in household, total land, livestock, distance) and location characteristics (valles, altiplano and dispersed area). Some of them were used in the present study and the models used are same. The present study differed from this above in that it considered the gender issues and the agricultural sector and especially in coffee plant.

2.4 Analytical models

Participation behavior is a discrete choice phenomenon. In the literature different models have been used to analyze factors that influence the participation decision and its level separately or simultaneously. The main models used include the Heckman model, the Tobit model, and the double-hurdle models. Alene et al (2008) and Olwande and Mathenge (2010) used the Heckman

model to assess the participation and the level of participation sequentially in their respective studies.

Participation and the level of participation decisions can also be modeled using the Tobit model (Tobin, 1958). The participation and the intensity decisions are also estimated sequentially. The model is considered as censored regression model with a zero value on the dependent variable (intensity of participation). However, the major limitation is that participation and intensity of participation may be determined by the same variables and be affected in the same way (Balsevich et al, 2006). Tobin (1958) and Greene (1993) explained that both decisions are used simultaneously and factors that affect participation decision also affect the intensity of participation by the same level. This weakness prevented the use of the Tobit model because of discrete choice of the dependent variable due to non-economic reasons.

The double hurdle model referred to above also used the two step approach adopted by Cragg (1971) but relaxes these assumptions by allowing alternative ways to determine discrete probability of women participation and the level of participation. The model separately estimates both participation decisions because it allowed possibility of the choice not to participate. This is based on the assumption that women make two separate decisions; one involves the decision to participate in coffee value chain or not and then the decision on the level of participation. The double hurdle model is basically a two step procedure in which at step one, the Probit model is used to analyze the participation decision (takes value 1 if women participate or 0 otherwise) and at the second stage, the truncated regression model is used to model intensity of participation (takes values greater than 0). Thus, the double-hurdle model facilitates the separation between

the decision to participate ($y>0$ V^s $y= 0$) and the decision of how much to participate ($y>0$). At the second stage, the truncated model allows for censoring at both decision stages (Brouhle and Khann, 2005). Therefore, the double-hurdle allows farmer to choose whether or not to participate while the second stage allows a corner solution. However, Neumann et al. (2001) suggested that complications in selection of parameters may occur when using same explanatory variables in both decisions.

The present study selected the double-hurdle model because it allows evaluation of discrete choice of whether or not to participate and the level of participation contingent upon the participation decision having been made.

CHAPTER THREE: METHODOLOGY

3.1 Conceptual framework

The study focuses on smallholder women and participation in coffee growing and marketing was conceptualized as a technology adoption. Agricultural production and commercialization are defined in terms of the degree of participation in production and markets. This can be measured either in terms of the total land allocated to a specific crop or the volume or proportion of output produced and sold in markets, or the total volume or proportion of purchased inputs in total inputs utilized on the farm, or all.

The vast majority of studies on smallholder commercialization measure the level of commercialization in terms of the proportion of output sold in markets. A value of zero would imply a totally subsistence-oriented household; the closer the index is to 100, the higher the degree of participation (Leavy and Poulton, 2007). Therefore, the choice depends on the maximum utility that a technology gives to the players and the incentive created by participating in production and commercialization activities. Adoption proceeds only when the incentives dominate the disincentives meaning that the returns are higher than the total costs. However, technology adoption is influenced by numerous factors. Therefore, identifying those factors that impede adoption is important. This is done through different theoretical frameworks. For instance Leagans (1979) highlighted that choosing to adopt an innovation will depend on how a decision maker behaves vis a vis set of alternatives and constraints. These alternatives and constraints are assumed, in this study, to be different factors that may be influenced by the women's decision.

3.2 Theoretical framework

3.2.1 Modeling the participation decision

The participation decision results from farmer's desire for utility maximization. Following Holloway (2001), a farmer *i* will participate in cash crops (in this case coffee), if the utility derived from participation in coffee is greater than can be derived from food crops for example, here like beans. Therefore, factors that influence the participation decision are important when a farmer has to choose between the two kinds of crops (e.g. coffee and beans). Let x be the crop choice. The choice is that x=1 if the farmer prefers coffee production and x=0 if she/he chooses to grow beans. Thus, if the utility function is expressed in terms of farm characteristics (w_{ij}) and farmer characteristics (z_{ij}), the farmer will choose to grow coffee if the utility to participate is greater than that of not participating. Defining y* is a latent variable which is a function of utility (U_{1i}) expressing the utility that a farmer *i* prefers to participate in coffee production than participating in the production of beans (U_{0i}). Therefore, we have:

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

Then, the probability of choosing the coffee production is:

$$P_i = P(Y=1) = P(U_{1i} > U_{0i}) \qquad (3.2)$$

$$= P((\delta_1) F(Z_{1i}, W1_i) + \varepsilon_{1i} > (\delta_0) F(Z_{0i}, W_{0i}) + \varepsilon_{0i})$$

$$= P(\varepsilon_{1i} - \varepsilon_{0i}) > F(Z_i, W_i)(\delta_0 - \delta_1)$$

$$= P(\mu_i) > -F(Z_i, W_i, \beta) \qquad (3.3)$$

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

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

$$\mu_i = \varepsilon_{1i} - \varepsilon_{0i} \text{ is a random disturbance term} \qquad (3.4)$$

$$\beta = \delta_0 - \delta_1 \text{ is coefficient vector} \qquad (3.5)$$

$F_i(\beta X_i)$ = 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. Therefore the Probit model is as follows:

$$P(y=1) = a Z_{ji}, + bW_{ji} + \varepsilon_{ji} \quad (3.6)$$

Where a and b are the unknown parameters to be estimated, P the probability of participation, and ε_{ji} a random error distributed as with regard to the level of participation.

Holloway (2001) shows that the utility of the farmer comes from the proportion of the area cropped under coffee. Thus, the farmer maximizes his/her utility by participating in the coffee value chain.

The function is, therefore, as follows:

$$\text{Max. } U(Y \mid Z_{ji}, W_{ji}, I_{ji})$$

s.t.

$$y_i \geq 0 \quad (3.7)$$

Taking the first order condition in equation (3.7) gives

$$= \sigma(Y \mid Z_{ji}, W_{ji}, I_{ji}) \leq 0 \quad (3.8)$$

With $y_i \geq 0$

Where: y_i is the level of land under coffee; I_{ji} is the sets of socio-economic characteristics influencing the participation decision.

The level of participation is given by:

$$Y_i = c Z_{ji}, + d W_{ji} + e I_{ji} + \mu_{ij} \quad (3.9)$$

where c, d, e are parameters to be estimated and μ_{ij} is the error term.

3.2.2 The double-hurdle model

The double hurdle model has been widely adopted in the agricultural technology (Coady, 1995; Ghadim *et al*. 1999; Nguthi, 2007; Tuvhag, 2008) and in consumer demand literature (Atkinson et al., 1984; Jones, 1989, Burton *et al*., 2000). In this study, the participation decision of women in coffee production can be conceived to be based in two main hurdles (i) the decision of whether or not to participate in coffee production (participation decision) and (ii) the decision of how much land to allocate to coffee production.

Following Cragg (1958) the first stage of the double-hurdle model, a Probit regression which is used to examine the participation of the i^{th} farmer in coffee value chain (production, processing and in marketing) in the area of study. However, because processing and marketing activities were not carried out in the study area, only the decision to participate in coffee production and the level of participation were analyzed in this study. The following Probit model was used:

$$P_i^* = \beta_i X_i + \mu_i \qquad (3.10)$$

Where, P_i^* is the latent participation variable, X_i represents $n*k$ vector of factors that influence the participation decision, β_i is $1 \times k$ vector of unknown parameters to be estimated, μ_i is the random error term assumed to be independently and identically distributed (iid) as N(0,1) and P_i is the probability of participation of a woman in coffee production expressed as follows.

$$P_i = 1 \text{ if } P_i^* > 0 \text{ and} \qquad (3.11)$$

$$= 0 \text{ if } P_i^* \leq 0 \qquad (3.12)$$

The second stage of the model determines the level of participation conditional on participation and is implemented using a truncated regression model. The later examines the determinants of

the proportion of land /area a household allocates to coffee production. The truncated regression was specified as:

$$Y_i = y_i^* \text{ if } y_i^* > 0 \text{ and } P_i = 1 \quad (3.13)$$

$$= 0 \text{ otherwise} \quad (3.14)$$

$$\text{and } y_i^* = \beta_0 + \beta_i Z_i + \varepsilon_i \quad (3.15)$$

Where y_i^* is the observed level of participation , Z_i represents a nxK vector of factors influencing the level of participation decision, β_i is a 1xK vector of parameters to be estimated and ε_i a vector of random error assumed to be iid, i.e. as $N(0, \sigma^2)$.

In the two stages represented by the Probit and truncated regression models, P_i and Y_i are the probabilities of participation decision and intensity of participation respectively. In the participation decision (model 3. 2) dependent variable Pi is 1 if the farmer decides to participate in coffee production and zero otherwise. The intensity of participation (model 3.3) was estimated using the truncated regression model. The dependent variable Y_i had positive values of the land under coffee.

According to Cragg (1958) and Aristei *et al.* (2007), the log-likelihood for the double-hurdle is equal to the sum of the log-likelihood of the Probit and the truncated regression models under the assumption of the independent error terms (equation 3.16) . The model is as following:

$$\ln L_C = \sum_0 \ln\left[1 - \Phi\left(\varpi_{hp}\gamma\right)\right] + \sum_+ \left\{ \ln \Phi\left(\varpi_{hp}\gamma\right) + \ln \phi\left[\frac{1}{\sigma}\left(\frac{x_{hp}^f - z_{hp}\beta}{\sigma}\right)\right] - \ln \Phi\left(z_{hp}\beta/\sigma\right)\right\} \quad (3.16)$$

In equation (3.16), the first term explains the probability of participation and the second term gives the density of positive values.

In this study, the choice of the double-hurdle model was motivated by the fact that Rwandan farms are generally small and fragmented (Bizimana et al., 2004; Musahara, 2006). In such a case, the Tobit model presents weaknesses of inseparability of decision of participation and decision of the proportion of land allocated to coffee production. The main issue is how a variable like additional level of education, large household size, can affect the participation decision in the same way it affects the proportion of land under coffee when smallholder farmers are affected by land fragmentation. Therefore, the study adopted the double-hurdle model.

3.2.3 Specification of empirical model

The following models were fitted into the data:
Model 1: The participation decision using the Probit model

$$GROWCOF = \beta_0 + \beta_1 EXPE + \beta 2\ HHSZ + \beta_3 LDSZ + \beta_4 GRPM + \beta_5 ACCR + \beta_6 TRAIN + \beta_7 FLAB + \beta_8 DIST + \varepsilon$$

Model 2: The level of participation using the truncated regression model

$$LANDCOF = \alpha_0 + \alpha_1 EXPE + \alpha_2 EDUC + \alpha_3 LDSZ + \alpha_4 EXTE + \alpha_5 GRPM + \alpha_6 ACCR + \alpha_7 PROD + \alpha_8 TRAIN + \alpha_9 FLAB + \alpha_{10} HHSZ + \alpha_{11} DIST + \mu$$

3.2.3.1 The dependent variables

The dependents variables were:

i) 1 = Participation GROWCOF; the farmer who decides to participate in coffee production

ii) LANDCOF = Proportion of land under coffee; the farmer allocates a plot of his land for growing coffee.

3.2.3.2 Explanatory variables

Probit model:

EXPE: The number of years the farmer woman has been in coffee farming (+)

LDSZ: The size of the cropland in hectares (+)

FLAB: The number of adults who provide family labour (+/-)

HHSZ: The number of people living in the family (+/-)

DIST: Distance to the nearest market in km (-)

GRPM: Membership of a women farmers group; Dummy 1 for members, 0 otherwise (+)

TRAIN: Access to training services, 1 if received training at least once, 0 otherwise (+)

ACCR: Access to credit in financial services in microfinance or commercial banks, Dummy 1 if received credit and 0 otherwise (+)

Truncated model

EXPE: The number of years the farmer woman has been in coffee farming (+)

EDUC: the level of formal education in years (+)

FLAB: The number of adults who provide family labour (+/-)

HHSZ: The number of people living in the family (+/-)

LDSZ: The size of the cropland in hectares (+)

DIST: Distance to the nearest market in km (-)

EXTE: The number of times (frequency) farmer woman has been visited by extension services

GRPM: Membership of a women farmers group; Dummy 1 for members, 0 otherwise (+)

ACCR: Access to credit in financial services in microfinance or commercial banks, Dummy 1 if received credit and 0 otherwise (+)

PROD: Quantity of output in kgs (+/-)

TRAIN: Access to training services, 1 if received training at least once, 0 otherwise (+)

Table 3.1 shows the independent variable hypothesized variables to influence the participation decision in coffee production in Huye District

Table 3.1: Table 3.1: Explanatory variables and their expected signs (Probit Model)

Variable	Variable definition	Variable measurement unit	Expected sign	Obs. signs
EXPE	Women's experience in coffee growing	Years	+	+
HHSZ	Household size	Number of people	+	+
LDSZ	Size of the land holding	Hectares	+	+
DIST	Distance to the nearest market	Measured in kilometer	-	+
FLAB	Adults in the household	Number of members	+	+
GRPM	Membership to farmer organization/group	1 if member and 0 otherwise	+	+
ACCR	Access to credit	1 for those who accessed credit, 0 otherwise	+	+
TRAIN	Coffee training programs	1 if benefited from extension services, o otherwise	+	+

Source: Author, 2011

Table 3.2 shows the independent variables hypothesized variables to influence the level of participation decision in coffee production in Huye District.

Table 3.2: Explanatory variables and their expected signs (Truncated Model)

Variable	Variable definition	Variable measurement unit	Expected sign	Obs. signs
EXPE	Women's experience in coffee growing	Years	+	+
EDUC	Education level of the woman	Years spent in school	+	+
HHSZ	Total people living in the household	Number of members	+	+
LDSZ	Size of the land holding	Hectares	+	+

EXTE	Extension services	1 if benefited from extension services, 0 otherwise	+	+
DIST	Distance to the nearest market	Measured in kilometer	-	+
FLAB	Adults in the household	Number of members	+	+
GRPM	Membership to farmer organization/group	1 if member and 0 otherwise	+	+
ACCR	Access to credit	1 for those who accessed credit, 0 otherwise	+	+
TRAIN	Coffee training programs	1 if benefited from extension services, 0 otherwise	+	+
PROD	Quantity of Coffee output	Kilograms	+	+

Source: Author, 2011

3.2.3.3 Justification for inclusion of various explanatory variables

Experience (**EXPE**) was defined as the number of years of farming experience of the household head. Frank (1995) argued that a woman assesses the utility of new technology when she relates her perception of the technology to the experience. Consequently, farming experience is likely to facilitate the participation decision. Hence, Experience was hypothesized to be positively associated with the participation decision as well as with the level of participation.

LANDSIZE: This was the size of the land (**LDSZ**) in hectare. Household with a big land size is more likely to try new agricultural technologies than those with small land size.

TRAINING: This (**TRAIN**) was the number of times a farmer has had received training services. Agricultural training (**TRAIN**) is hypothesized to have a positive influence on the adoption and in turn a positive relationship with the area under coffee (Bizimana *et al*, 2004). Agricultural training creates incentives and increases the area under coffee production. The higher a farmer is trained, the large the area operated in coffee production.

EDUCATION: Education (EDUC) was the number of formal schooling of farmer operators. It was conceptualized to positively influence the participation decision and the level of participation. The more educated the woman is, the more likely she would participate in coffee. It could also be that the more educated the woman is, the more likely to adopt new technologies (Norris and Batie, 1987; Kebede *et al*., 1990) that would enhance her status as a farmer.

HOUSEHOLD SIZE: The household size (**HHSZ**) is used as a proxy for available household labor represented by the total number of adult persons in a household. Coffee production is generally labor intensive. It has been found that household size influences positively adoption (Kassie *et al*., 2008). This fact underlines the importance of labor in the ability of farm households to increase the labor intensive production, harvesting and processing (picking, pulping, subsequent fermentation, sun drying) and storage. For this reason, HOUSEHOLD SIZE was hypothesized to positively influence both decisions.

ACCESS TO CREDIT: Farmers, that have access to credit (**ACCR**), have to prove their ability to produce a marketable surplus, which is in turn associated to the type and size of the land they hold (Bell, 1990). Credit may also be tied to the lender's perception of the farmers' ability to repay the loan. These variables are associated with the high income that gives possibility to purchase necessary inputs and pay the hired labor during the peak period of harvest, in coffee industry (Marenya *et al*., 2006). Hence, access to credit was hypothesized to be positively associated with the participation decision and the level of participation.

EXTENSION: To adopt new agricultural technologies, extension services (EXTE) are important for the provision of information on new technology and crops (Anderson and Feder, 2003; Evenson, 2001). Farmers who are in contact with extension agents are expected to be more exposed to information that may not be accessible to other farmers (Kassie *et. al*., 2008). Most studies hypothesize that extension is a dummy variable with1 if a woman participates and 0 otherwise. However, Doss and Morris (2001) argue that extension agents tend to approach farmers who are relatively better-off in terms of access to endowments of land, labor, and capital to the extent that women are under-represented among these better-off farmers, and thus more likely to be overlooked in extension programs. For this reason, EXTENSION was hypothesized to have a positive sign on women participation decision and the level of participation.

GROUP MEMBERSHIP: This was the Group membership (**GRPM**) variable. It has a dummy variable and has had value 1 if it has adhered to a group and 0 otherwise. A farmer who is a member to a farmers' organization was more privileged. He/she has access to information in agricultural innovation (Bayard *et. al*., 2006). The GRPM has a positive influence on the participation and the level of participation decision.

PRODUCTION: this is the variable (PROD) was measured the quantity of coffee a farmer has produced in kilograms. It was assumed to influence positively the participation decision and the level of participation. A farmer with big volume of yield is more likely to participate in coffee production and to increase the level of participation.

3.3 Issues of model estimation

3.3.1 Testing for multicollinearity

Gujarati (2003) stated that for a model that has more than one qualitative variable, as in this study, problems of multicollinearity can arise. Also, since data are non-experimental, many explanatory variables tend to move together meaning that they may be collinear. When two variables are highly or near perfectly correlated, their variances tend to infinity and as a result, hypothesis testing becomes weak so that diverse hypothesis parameter values cannot be rejected (Greene, 2004).

Standard errors and overall coefficient of determination (R^2) may be used for testing for multicollinearity. According to Gujarati (2003), if the coefficient of determination (R^2) is greater than 0.8, that is, there is a high correlation among variables, then multicollinearity is suspected.. Through the computation of the coefficient of determination, multicollinearity was identified in this study between EXPERIENCE and AGE. This is not surprising given the fact that age and experience can be used to measure the same thing. To correct this problem, one of the solutions suggested by Gujarati (2003) is to exclude one of the variables. In our case, the variable AGE was excluded from the models. Following which there were no signs of multicollinearity (see the correlation matrix in Appendix I)

3.3.2 Testing for the goodness of fit.

The goodness of fit refers to the summary of statistics that indicate the precision with which a model approximates the observed data. For MLE models, Greene (2002; 2004) suggests the use

of the likelihood ratio (LR). The LR is similar to the χ^2 in the conventional regression. In this study, the LR was computed using the following formula:

$LR = 1 - \ln L / \ln_0$

where ln L is the natural log of the log-likelihood for the model having all independent variables and $\ln_0$ is the log-likelihood function for the model having only the constant term. A zero value indicates lack of fit while a value of 1 indicates perfect fit.

3.4 Study area

Huye district has a total population of 290,677 inhabitants with an average of 500 inhabitants per square kilometer (GoR, 2009). The Huye District has common food crops produced such as sweet potato, maize, rice, sorghum, beans, soya, cassava and bananas. The major cash crops are tea and coffee. The District is particularly a suitable agro-ecological zone for coffee crop since it is very hilly with an altitude between 1,700 and 2,100 meters above sea level and an average of 115 centimeters of rainfall annually (Boudreau, 2007). As coffee is considered to be the best way to reduce poverty among the population, a number of washing stations have been created to give additional value in order to provide enough income and services to the population. Those washing stations are Nyarusiza, KOAKAKA Karambi, MIG Kibumbwe, MIG Buremera and Karama, and Maraba. Despite this, however, a bigger part of the population depends mainly on agricultural production of food crops characterized by subsistence farming using traditional practices. The Figures (3.1 & 3.2) below show the location of the Huye District in Rwanda map and the Huye District with the sectors (Maraba, Kigoma and Rusatira) in which the study was conducted.

Figure 3.1: Map of Rwanda

Figure 3.2: Sketch map of Huye district

3.5 Data collection and sampling procedure

The study used both primary and secondary data. The latter were collected from cooperative records, institutional libraries especially of the Ministry of Agriculture (MINAGRI), Rwanda Coffee Authority (OCIR Café) currently National Agricultural Exportation Board and Rwanda Agricultural Science Institute (ISAR) and books from NUR library.

Primary data were collected by use of semi-structured questionnaires from Maraba, Rusatira and Kigoma sectors of Huye District in May 2011. These data included socio-economic and household characteristics. Five enumerators were recruited and trained on how administer the questionnaire. The questionnaire was first pre-tested before administration. The OCIR Café provided invaluable information related to the coffee processing and marketing.

A total of 246 women households from two cells for each of the three sectors Maraba, Kigoma and Rusatira were included in the study.. They were randomly selected proportional to the size by computing a 10 percent of the total number of women coffee growers in each sector using the OCIR Café census (2009). The study interviewed 134 women who participated in the coffee production. The women who did not adopt were identified by their neighbors. Thus, 112 non-adopters who have never been interested in coffee production were interviewed.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Coffee Value Chain in Huye District

The findings on coffee value chain in Huye District responded to the first objective which is characterizing the coffee value chain in Huye District in Rwanda. From figure 4.1, we can identify four parts of the coffee value chain in the area of study; these are supply services, production, processing and marketing. The information came from observations on field and the bureau of research and development of OCIR Café (Rwanda Coffee Development Authority). Before liberalization (1994) of the coffee sector, government was fully involved in all activities of the sector: insured training and extension services, distribution of inputs (seeds, fertilizer, and pesticides); setting prices and was the potential buyer of the coffee product. The extension, training and distribution of inputs were done by agronomists of the OCIR Café.

There were a total of 52 agronomists of whom only 4 (8%) are women; 423 'animateur/trices' (model farmers) paid to provide extension services to others producers among them only 107 (25%) are women (IFAD, 2010). After liberalization, Rwanda government has removed barriers to trade and created incentives of groups in cooperatives and individual farmers. In Rwanda, there is an estimated number of around 400,000 coffee farmers. Coffee cooperatives are 190 and have 80,600 members (29% are women). There are almost smallholders (Census, 2009).

In post-liberalization period, farmers received extension, training and inputs services from the OCIR Café or MINAGRI on behalf of OCIR Café. The extension and training were directly given to the farmers. Inputs were supplied directly under contract or credit involvement payment

after harvesting. However, because farmers misconstrued the inputs received to be public goods, they failed or refused to pay. Thereafter, at the time of survey, a strategy has been put in place by OCIR to supply inputs to farmers via private businessmen. The latter buy inputs from OCIR at low price to allow farmers to access inputs easily. The OCIR has ordered businessmen price to enable farmers to access the inputs. This strategy has helped to reduce transaction costs encountered by OCIR when supplying inputs like transport, salary of drivers, gasoil and others related costs.

There is a time gap of at least three years between planting and the first harvesting. It is a constraint as no income during that period. At the time of harvesting, in order to meet the quality required a respect of timing is important: not go beyond 6 hours after harvested and 12 hours beans have not yet processed (harvest is done manually so it is easy for a farmer to fail to respect time). To avoid losses, the processors cooperatives pick the beans at farmer gate. Beans are brought at the washing stations for process. Therefore, the fully washed coffees or green coffees are sorted and graded into product specification for high quality attributes based on customer's preferences (ACIAR, 2007). The moisture must be ranged within 11% and12% (Calver, 1998 & 1999). After grading, the fully washed coffee is brought in OCIR's warehouse for identification and then exportation to international market.

The low quality of beans is given back to the owners and the owner farmers process them manually to become ordinary coffee which is sold to the private washing stations through middlemen; this kind of coffee does not meet the quality requirement. The distribution of labour is explained in Table 4.1.

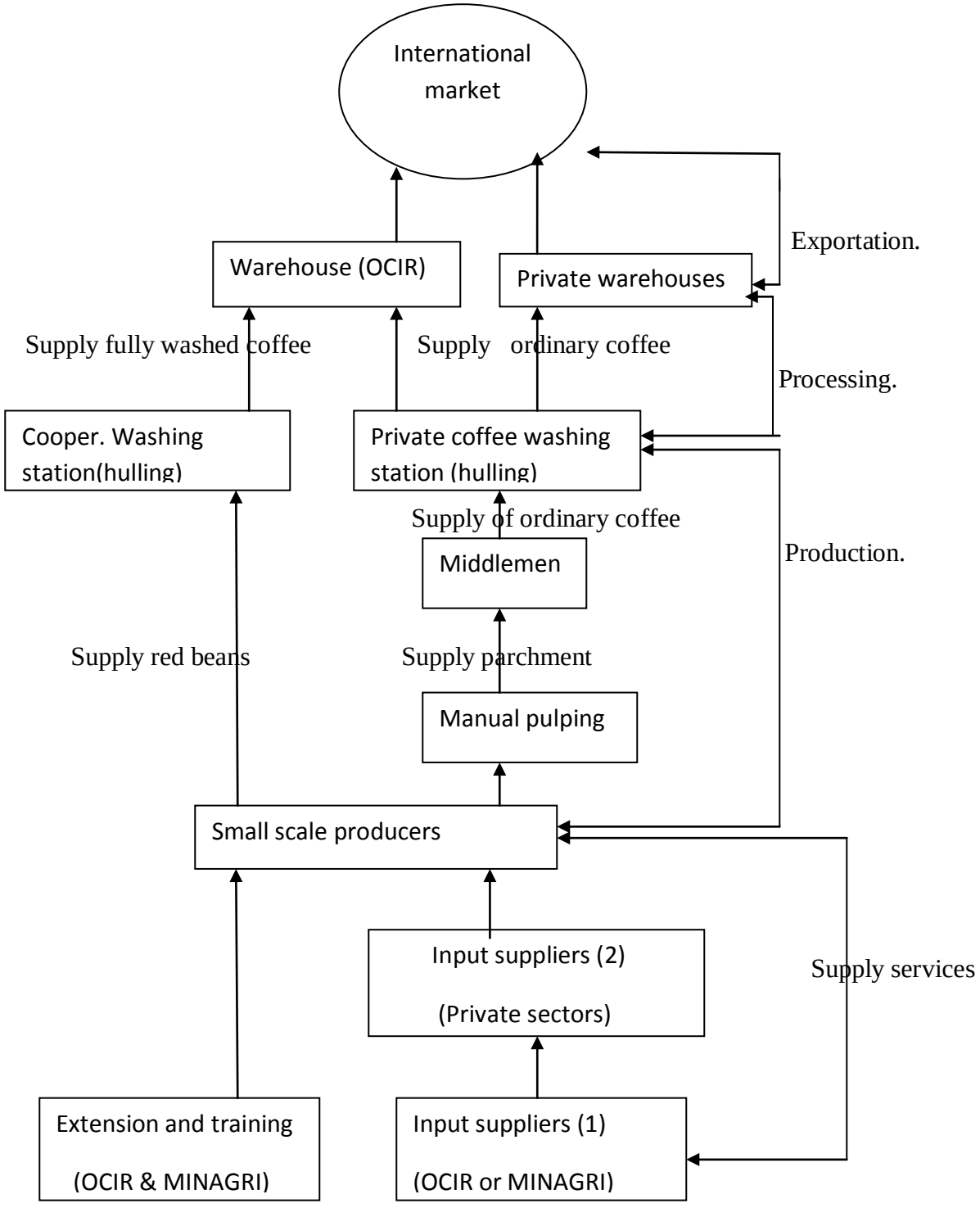

Figure 4.1: The coffee value chain in Huye district.
Source: Survey data, 2011

4.2 Women Participation in Coffee value chain

Generally, women do not own coffee washing stations and did not participate much in coffee export but they are members of farmer cooperatives and participate in less income generating activities. After harvest and processing, good quality coffee beans are sold to coffee washing stations while the remainder was processed manually by farmers themselves without compliance to international standards. Women generally participated in manual processing of coffee. The manually processed coffee beans were sold to middlemen who then sold to private exporters. In Huye District, the results from the survey showed that no woman has invested in coffee marketing. The 3.8 percent of women in the process (see Table 4.0) are found in the Nyamagabe and Nyamasheke Districts only. The share of women participation in processing and marketing of coffee is shown in table 4.1.

Table 4.1: Gender labor force in washing stations in the area of study

Activity	Number of men (%)	Number of women (%)	Observations
PROCESSING			
machine	100.0	0 .0	
fermentation	10.0	0.0	
Drying	3.4	96.6	
Remains	49.0	51.0	
collection	78.0	22.0	
carrying	100.0	0.0	
watchmen	100.0	0.0	
stock	100.0	0.0	
MARKETING			
exporting	96.2	3.8	From outside the study area

Source: Survey data, 2011

According to Table 4.1 and Figure 4.1, women participate in less paying activities such as drying, sorting and remains. Only 2 women were found to be engaged in coffee export relative to

50 men engaged in the same activity outside the area of study, Huye District. The Figure 4.1 shows women in different activities of coffee processing in Kigoma and Maraba Sectors.

Figure 4.2: Women cooperative sorting owned red coffee in Kigoma Sector and other women hiring labor in Abahuzamugambi cooperative of Maraba.
Source: Survey, May 2011.

4.3 Socio-economics and demographic profiles of survey respondents.

Participation in coffee growing

Out of 246 households surveyed, almost 55% participated in coffee growing while about 45 percent did not participate.

Age of the household head

Table 4.2 shows that out of the sampled households, those aged 50 years and below, were 57.2 percent while those that were above 60 years were only 19.51 percent. Having a large proportion

of young population has implications for coffee production as it would provide a large pool of the labor force that is likely to participate in coffee production.

Table 3.2: Age distribution of household head surveyed in Huye District, Rwanda

Age group	n	Percent
below 30	43	17.48
31-40	40	16.26
41-50	59	23.98
51-60	56	22.76
above 60	48	19.51
Total	246	100.0

Source: Survey data, May, 2011

Education level

In terms of education, households were classified in 3 categories with majority of farmers (53 %) reached primary school, followed by the uneducated (44 %) percent and then those attained secondary school(3%). In general, many farmers are less educated. Thus, if lower levels of education can impede adoption, this probably explains why the percentage of non-participants is quite high (45.5 %)

Access to extension services

The statistics showed that about 63% of farmers received extension services while 37 percent did not. With relatively higher access (63%) to extension services, it is expected that women gain useful information that may encourage them to participate in coffee production.

Number of extension visits

The majority of sampled households (69 percent) received at least one extension visit while 31 percent received two extension visits in pat three years. This may have had implications on coffee production since dissemination of information aimed at convincing famers to adopt a particular technology needs to be a continuous process.

Household size

From sampled households, statistics showed that majority of farmers (67%) had more than four household members. This can be a source of family labor and therefore a key input in coffee production.

Family labour

About 41 percent of sampled households had 3 to 5 members adult to use as family labour while 50 percent had less than 2. In other word the majority of farmers (91%) use less than 5 adults for family labour. Thus, if about 67 percent of sampled households had 4 or more members this implies that most of the household members are not part of the agricultural labor force. Either some participate in off-farm activities or are still dependents.

Experience in farming

Table 4.3 shows that out of the sampled famers about 55 percent of them had experience in coffee growing of about 15 years or more. If the farmers follow learning approach, increase in experience is expected to lead to increased participation and intensity of participation.

Table 4.3: Distribution of women according to coffee growing experience in Huye District, Rwanda

Experience (yrs)	N	Percent
1-5	48	19.5
6-10	25	10.1
11-15	39	15.8
15+	134	54.5
Total	246	100.0

Source**:** Survey data, May, 2011

Land size

The majority of the farmers (57%) had land sizes in the range of 0.5 – 1.0 ha, and only about 15 % had land measuring over 1 ha. Land is a basic resource on which agricultural production takes place. It is commonly argued that a productive land holding needs to be at least one hectare which is perhaps why the

Rwandan government prohibits fragmentation of land below one hectare (Bizimana et al., 2004; Musahara, 2006).

Distance to the nearest market

Most of Farmers (87%) were located within one kilometer from the market while 13 percent were far from the market (more than one km). Access to the market may influence production since proximity to nearer markets facilitates the selling of output and buying inputs and may involve lower transport costs compared to distant markets. If at least a number of farmers were far from the market, this suggests that access to the market, measured in terms of distance, is not a constraint to the sampled households.

Off-farm income

Most of the sampled households (73%) in Huye District did not have off-farm income while only 27 farmers gained income from off-farm activities. This suggests that Rwandan farmers generally depend on farm income and again points out the problem of lack of off-farm employment. In such situations, cultivation of a highly paying cash crop, like coffee, would be a better option to ensure farmers can get some income to help them finance their daily transactions.

Group memberships

The majority of farmers (67%) were member of farmer organizations or associations/cooperatives. Farmer organizations/associations/groups are useful for they help farmers to embrace the idea of collective action in terms of solving their problems. These groups also facilitate information exchange and give farmers a strong voice while negotiating for prices. Membership into such organizations is therefore expected to enhance both participation and intensity of participation. Out of the sampled households, about 68 percent did not participate in farmer cooperatives.

Access to credit

Statistics showed that about 56 percent of sampled households did not have access to credit while only 44 percent received credit from banks and microfinances. This suggests that access to credit is a constraint to a majority of farmers and may impede participation and intensity of participation of coffee production.

Training services

The majority of farmers (66%) received training services. Through training service, farmers gain a lot of useful additional information on the techniques of how to grow coffee. This may increase their incentive by encouraging them to participate in coffee production.

Summary statistics of all variables

Table 4.4 below gives the summary statistics of all the variables used in this study; the table gives the means and gives the standard deviations which gives a clue on the spread of the data. It also gives maximum and minimum values for each variable and can be used to compute the range.

Table 4: Summary statistics of factors hypothesized to influence respondents in Huye District, Rwanda

Variable	Mean	Strd deviation	Minimum	Maximum
Participation	0.5	0.6	0	1
Household size	4.6	1.9	1	10
Experience	18.0	12.1	1	60
Land size	0.7	0.4	0.03	2
Distance	0.6	0.7	0.03	9
Education	1.6	0.6	1	3
Production	71.0	77.0	0	375
Family labour	2.9	1.6	0	9

Source: Survey data, May, 2011; n= 246

4.4 Regression results

4.4.1 Summary statistic of variables hypothesized to influence respondents

As mentioned earlier, this study adopted the double hurdle model for women engaged in coffee production (who have coffee plots) and it follows two steps. Step one involves estimation of the Probit model to assess the determinants of participation in coffee production and step two estimates the truncated regression model to analyze the factors that determine intensity of participation in coffee production (proxied here as share of land under coffee). This section presents and discusses the results of the two regression models. We latter carry out a descriptive analysis of the role of women in coffee processing and marketing. In the Probit model, age was excluded because it virtually serves the same purpose as experience. Other insignificant variables were dropped too and ended up with a more parsimonious model presented in Table 4.3.

4.4.2 Factors influencing the participation decision of women in coffee production

4.4.2.1 Determinants of participation decision

Table 4.5 gives the coefficients of the Probit model. The results of the Probit model suggest that women's participation in coffee production is mainly influenced by experience, land size, household size, and membership to farmer cooperatives, training and access to credit.

Table 4.5: Determinants of the participation decision using the Probit model

Variable	Coefficient	Standard error	Z	P
EXPE	0.046***	0.014	3.22	0.001
LDSZ	4.180***	0.537	7.78	0.000
FLAB	0.078	0.128	0.61	0.543
HHSZ	0.161*	0.089	1.79	0.074
DIST	0.444	0.305	1.46	0.145
GRPM	0.508*	0.285	1.78	0.076
TRAIN	1.344***	0.305	4.41	0.000
ACCR	1.469***	0.280	5.25	0.000

LR chi2(8) = 229.19 n= 246
Prob > chi2 = 0.0000

Source **:** Survey data, May, 2011; ***, ** and * denote significance at 1%, 5% and 10% respectively.

Experience (**EXPE**) is significant at 1% and positively influences women participation in coffee growing. The more the years a woman participates in coffee production, the more likely she is to continue participating. This finding is consistent with Frank (1995) who argued that a farmer assesses the utility of new technology when she relates her perception of the technology to his/her experience. This relationship implied that experienced farmers were better informed on the technological practices and could adopt agricultural technologies. Moreover, experienced women farmers may be more flexible with regards to the production systems and may therefore be better able to assess the risks involved in farming than inexperienced ones (Enete *et al.*, 2002). Consequently, farming experience is likely to facilitate adoption of agricultural technology in the present study women participating in coffee production.

The size of the household farm (**LDSZ**) was positive and significant at 1% in explaining the level of women's participation in coffee production. This is perhaps due to the fact that as farms expand in size, due to resource requirements for household farms; they tend to adopt agricultural technologies because the household farms will certainly increase with the size of the farm than

smaller ones. This finding conforms to the argument by Welch (1978) that relatively smaller farm businesses have less incentive to adopt agricultural technologies.

Household size (**HHSZ**) was positively significant at 10percent in influencing women participation in coffee production. This implies that larger households tend to participate more than smaller ones and this may be due to the fact that larger households can have a cheaper source of labor force in the form of family labor for use in coffee production. This argument is supported by the fact that coffee production is generally labour intensive and it has been found that household size influences positively participation in coffee production (Kassie *et al*., 2008).

Group membership of an association or cooperative (**GRPM**) facilitates information exchange and enables members to negotiate for better terms on the input and output markets. It is therefore expected to positively influence participation in coffee production. The group membership variable was significant at 10% and positively related to the participation decision. This result reinforces the finding that membership to a farmers' organization facilitates exchange of information and is therefore expected to encourage members to participate in coffee production. Members of self help groups could get easily credit and loans for their farm development and increase their coffee production because they could get discount when purchase inputs in bulk. Therefore, these facilities could create incentive to increase their level of land under coffee production (Bayard *et. al*., 2006).

Training (**TRAIN**) here refers to programs focusing on the coffee industry. Once these trainings are increased, participation is likely to increase. Indeed, training was slightly significant at 1%

and was positively associated with the participation decision. This finding is consistent with the view that formal education and training in agriculture improves farmers' abilities to acquire accurate information, evaluate new production processes, and use new agricultural inputs and practices efficiently (Mbowa, 1996).

Access to credit (**ACCR**) was also significant at 1% and positively influenced women participation in coffee production in Huye District. This is consistent with the assertion by Ndinomupya (2010) that lack of access to credit is a constraint for the amount of coffee production that might be offered for sale to the sustain the coffee marketing channel. Access to credit enables farmers to make necessary investments, to purchase inputs in order to increase quantity and meet the quality requirements in the coffee channel.

Though variables like family labour (**FLAB**) and distance (**DIST**) to the nearest market were hypothesized to influence the participation and the level of participation in the coffee production positively and negatively respectively, they didn't. This led to reject the null hypothesis that the decision to participate and the level of participation in coffee production were significantly influenced by those variables. The lack of significance of the family labour did not imply that farmers did not need the additional labour but some are constraint by their statute (single women or widow). The fact that distance is not significant imply that market being far or near farmer home is not a matter to participate in coffee production as long as farmer possess capital, information and land.

4.4.2.2 Marginal Effect of the Probit regression model

Table 4.6 gives the marginal effects of the Probit model which show the change in the probability for an infinitesimal change in each independent variable. The key factors in influencing the participation as shown by Table 4.5 are the land size (**LDSZ**), the access to credit (**ACCR**) and training (**TRAIN**). The finds showed that a one percentage increased in land size will lead to a 145.5 increase in the participation. Similarly, a unit change in access to credit leads to 0.51 units increase in the probability of participation. Also a 1% increased in training will lead to a 46.8% increase in participation decision. A unit change in group membership, household size and experience lead to an increase of about 0.18; 0.06 and 0.02 units respectively in the participation decision of women in coffee production.

Table 4.6: Marginal effects of the Probit model

Variable	dy/dx
EXPE	0.016
LDSZ	1.455
HHSZ	0.056
GRPM	0.176
TRAIN	0.468
ACCR	0.511

Source**:** Survey data, May, 2011

4.4.3 Factors influencing the level of participation decision

4.4.3.1 Determinants of the level of participation decision

Table 4.7 gives the coefficients of the truncated regression model which measure the change in intensity of participation in coffee production (measured by changes in area planted with coffee) as the independent variable(s) change. The results show that land size (**LDSZ**), extension (**EXTE**), training (**TRAIN**) and group membership (**GRPM**) were the most important determinants of the level of land under coffee production. Thus, a one percent increase in LAND

SIZE, EXTENSION, TRAINING AND FARMER MEMBERSHIP or cooperative would lead to 8.7%, 7.8%, 7.3%, and 6.0% changes, respectively. As in the case of participation, LAND SIZE and TRAINING were also key determinants of the intensity of participation in coffee production in Huye Dustric, Rwanda.

Table 4.7: Determinants of intensity of participation using the truncated regression model

Variable	Coefficient	Standard error	Z	p
EXPE	0.002*	0.001	1.78	0.076
EDUC	0.048**	0.023	2.10	0.036
FLAB	0.003	0.009	0.33	0.743
HHSZ	0.005	0.007	0.75	0.455
LDSZ	0.087***	0.031	2.88	0.004
DIST	0.002	0.013	0.19	0.847
EXTE	0.078**	0.037	2.11	0.035
GRPM	0.060**	0.025	2.37	0.018
ACCR	0.038*	0.025	1.53	0.127
PROD	0.001***	0.000	3.27	0.001
TRAIN	0.073***	0.028	2.57	0.010

Wald chi2(11) =2036.91
Prob > chi2 = 0.0000
N = 134

Source**:** Primary data, May, 2011; ***, ** and * imply significance at 1%, 5% and 10% respectively

Farm or Land size (**LDSZ**) and Production (**PROD**) were positive and important in explaining to which extent women decide on the level of land under coffee both at 1 % level. An increase in production contributes, all factors remaining constant, to the resource requirements to a better management decision for household farm and in return it would certainly create women's incentives to increase the size of the land under coffee. Therefore, the bigger a farm size is, the more it influences the increase in land under coffee. In other words, a large farm size creates incentives of the farmer to increase the area of land under coffee production.

The variables education (**EDUC**), group membership or membership in farmer cooperatives (**GRPM**) and extension (**EXTE**) were significant at 5 % level while the variable training (**TRAIN**) was positive and significant at 1 % level. Educated women would be more informed and this might contribute to the decision to increase the level of area operated under coffee production. In other words, highly educated women were likely to easily decide on the level of land than less educated ones. Enete et al (2002) reported that educated women are more likely to defend their rights and responsibilities in the household than uneducated ones.

The variable access to credit (**ACCR**) was also positive and statistically significant at 10 % level. Access to credit and loans contribute financially from women to farming activities and help to purchase inputs necessary to increase production. Therefore, lack of access to credit might shortage the demand for input and other needs in farming thereby limiting the women decision on the level of land operated coffee.

Like in the Probit model, in truncated regression the variable that did not conform to the expectation was distance (**DIST**). I have observed a positive relationship between the distance and both decisions; participation decision and the level of participation; which is surprising because women would not have incentives when the market is far from home.

4.4.3.2 Marginal Effect of the truncated regression model

Table 4.8 summarizes the marginal effects of the truncated model which show the marginal change in area planted with coffee for a change in each independent variable. The factors that influence the area of land are the experience (**EXPE**), the education (**EDUC**), the land size

(**LDSZ**), the extension (**EXTE**), the farmer membership of a cooperative or association (**GRPM**), the access to credit (**ACCR**), the production (**PROD**) and training (**TRAIN**) from which the key factors as shown in the Table 4.7 are land size (**LDSZ**), extension (**EXTE**), training (**TRAN**) and farmer membership (**GRPM**).

Increase the experience by 1 year increases the area of land under coffee by 0.2 percent. Similarly, an increase of one year of education of the female farmer increases the area of land planted coffee by 4.9 percent. An additional hectare to the size of the farm holding increases the area of land planted with coffee by 8.7 percent. Access to credit leads to 3.8 percent increase in the land under coffee production while enabling farmer women access to training and extension will lead to an increase of land of 7.3 and 7.8 percent, respectively. Enabling a non-member household to be member in farm group or farm cooperative increases the area of land under coffee by 6 percent. Increasing the production of coffee by 1 kilogram female farmer will increases the level of area under coffee by 0.1 percent.

Table 4.8: Marginal effects after truncated regression model

Variable	dy/dx
EXPE	.002
EDUC	.049
LDSZ	.087
EXTE	.078
GRPM	.060
ACCR	.038
PROD	.001
TRAIN	.073

Source**:** Survey data, May, 2011

4.4.4 Test for goodness of fit

In terms of the goodness of fit, the hypothesis that all coefficients on the explanatory variables included in the Probit model are jointly equal to zero is rejected given that the probability of having a chi-square value of 229.2 if the null hypothesis is true is zero. In addition, the hypothesis that all coefficients on the explanatory variables included in the truncated regression model are jointly equal to zero is rejected given that the probability of having a Wald chi-square value of 2036.91 if the null hypothesis is true is zero.

The variables in the model can help explain the choice of the double-hurdle model. The overall goodness of fit as reflected by Prob > Chi2 (0.0000) was also good. In terms of consistency with *a priori* expectations on the relationship between the dependent variable and the explanatory variables, the model seems to have behaved well. This result favored the use of the double-hurdle model.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Summary of the major findings

The main objective of this study was to analyze the factors influencing the participation of women in coffee production in Huye District of Rwanda's southern province. This area was chosen because there is high incidence of poverty but at the same time has favorable agro-climatic conditions that can enable specialty coffee to flourish and lead to higher output.

The study specifically aimed at evaluating the key factors affecting women's participation in coffee production and also to assess the determinants of the extent/intensity of their participation in coffee production in the study area. A double hurdle model was employed on 246 households. The first hurdle employed the Probit model to assess the factors affecting women participation in coffee production. The second hurdle used the truncated regression model to evaluate the determinants of the intensity of women participation in coffee production among women. This study was built on theoretical foundations of adoption studies by hypothesizing that the decision to grow coffee can be likened to adoption of an agricultural technology. In a similar fashion, the decision of how much land area to plant with coffee (share of coffee land), is similar to analyzing the intensity of adoption of a particular agricultural technology.

Along the value chain, women were mainly involved in less paying activities and generally participated in manual processing of poor quality coffee beans rejected by coffee washing stations. The findings revealed that experience in coffee farming, the size of land owned by a household, family labor, house hold size, distance, membership to a farmer's cooperative,

specialized training on coffee farming practices and access to credit were the key determinants of women's choice to participate in coffee production.

The truncated regression results revealed that experience in coffee farming, education of the respondent, land size, access to extension services, membership to farmers' groups, access to credit, coffee output and specialized training on coffee farming practices were the key determinants of how much land women choose to plant with coffee.

5.2 Major conclusions

This study found importance of land size, access to credit and coffee training in determining the choice of women participation in coffee production. The importance of land size is not striking given how acutely scarce land is in Rwanda. Therefore, an increase in the size of the land held would influence a woman's choice to grow coffee. However, outside the scope of this study, such a finding emphasizes the importance of combating the problem of land fragmentation.

The current government effort to encourage farmers to consolidate their land is a clear support of this finding. The significance of access to credit is justifiable given that financial accessibility is still low in Rwanda and most women lack collateral thereby leaving them as risky borrowers. This justifies the weight they attach on access to credit as a major driver of their choice to participate in coffee production. The access to specialized training on coffee farming practices is a key factor given the fact that coffee is widely cultivated in Rwanda and it still requires specific practices to ensure that good quality is produced. The key drivers of the intensity to participate were found to be land size, extension, training and membership to farmer groups.

5.3 Policy implications

The findings of this study show that the size of the land was an important constraint to both decisions (participation and proportion of land attributed to coffee once participant). This implies that land is critical as it is considered as a fixed asset for farmers. Therefore, government policy efforts should be sustained to ensure redaction in fertility to reduce the problem of fragmentation (due to inheritance) in order to increase women's incentives in participating in coffee and in return increase their well-being in particular and their families in general. In addition, the government should move with speed to implement the land consolidation policy. This will enable farmers to consolidate their small pieces of land leading at increasing women's incentives by extending their lands and enabling them to work as groups.

It was found that group membership was another factor influencing the level of participation. This means that collective action is important tool to facilitate access to information and empowers women when undertaking deals in financial services, loans and credit. Since smallholder farmers are constrained by scarcity of land, credit and loans are critical in allowing them to purchase additional land once they get money and also necessary inputs to increase productivity. Therefore, social capital, for smallholder women, can be supportive in the sense that it facilitates mutual insurance to easily get credit and loans when bargaining in bulk.

Women who have easy access to credit are more likely to participate in coffee production. As explained above, it allows access to financial capital and helps smallholder women to overcome costs related to coffee processing. Therefore, financial availability should be improved in ways that would increase women's participation through encouraging group lending. In addition to

this, financial literacy campaign should be conducted to raise women's awareness on the opportunities offered by financial institutions and/or lending organizations.

Access to extension programs and coffee training were significant at influencing women's incentives in their decision to participate in coffee value chain. This indicates that access to these programs is important to smallholder women in deciding to grow coffee and on which proportional of land to allocate to it. They are considered as added values by allowing female farmers to gain appropriate knowledge in coffee production and processing practices. This will have a positive implication to overcome human capital constraints ensuring high degrees of participation. Therefore, improving training and extension for women should be considered as a basis for enhancing their decision to participate in coffee value chain in order to generate adequate incomes in order to improve family welfare.

Training has a significant influence on both decisions to participant and land allocation to coffee thus indicating the importance of training programs specifically tailored to coffee productions and processing. The special coffee training as well as other sensitization programs should be designed in such a way that uplifts the status of women along the coffee value chain and that also take into account women's time constraints at the household level.

Given the current legal and policy framework in Rwanda, women only need to build their confidence that would enable them to have control over the proceeds of harvests and to engage in highly paying activities along the coffee value chain. All stakeholders in coffee production and marketing need to acknowledge the role of women and to grant them equal rights and

opportunities. The process of gender mainstreaming in the legal and policy framework should continue but a lot more emphasis should also be put on monitoring its implementation to enhance women's ownership.

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APPENDIX

Appendix I. Correlation Matrix

	propor~e	experi~e	educ	landown	farmla~r	hhsize	landsize	distance	extens~n	farmer~p	access~t	produc~n	traini~1
proportion~e	1.0000												
experience	0.1423	1.0000											
educ	-0.0702	-0.3412	1.0000										
landown	0.0739	-0.0067	0.0841	1.0000									
farmlabour	0.1516	0.3921	-0.1196	0.0194	1.0000								
hhsize	0.1495	0.1462	0.0423	-0.0742	0.5603	1.0000							
landsize	0.2665	0.1673	0.0493	0.3919	0.2027	0.0743	1.0000						
distance	0.0283	0.1624	-0.0084	0.1428	0.0657	0.0871	0.1364	1.0000					
extension	0.3285	0.2005	-0.0547	0.1670	0.2032	0.1357	0.4440	0.0978	1.0000				
farmercop	0.3082	0.1572	-0.0859	0.1791	-0.0077	0.0621	0.3781	0.1518	0.4552	1.0000			
accesscredit	0.1894	0.1579	0.0194	-0.0667	0.0373	0.1159	0.1703	0.0854	0.2188	0.1494	1.0000		
production	0.4380	0.2453	0.0178	0.1546	0.1676	0.1760	0.5478	0.1446	0.5285	0.2757	0.3865	1.0000	
training	0.1941	0.1192	0.0132	0.0453	0.0788	-0.0153	0.1202	0.0602	0.1472	0.1339	0.1418	0.1957	1.0000

Appendix II: Research Questionnaire

A. General information

A1.Serial: ----------

A2. District: ----------

A3. Sector: ----------

A4. Cell: ----------

A5. Village: ----------

A6. Name of enumerator: ----------

A7. Name of respondent: ----------

A8. Date of interview ----------

B. Individual identification

B1. Gender of the household head: 1. Man 2. woman

B2. Category of the age of woman household head

Years of age of HH	Right Age Category
0 - 15	
16 - 35	
36 - 45	
46 - 65	
66 - Above	

B3. What is your level of schooling in year? Fill the table below.

Level of schooling	**Year**	**Education**
Primary	1 - 4	
	5 - 8	
Secondary school	1 - 3	
	4 - 6	
university	Degree 1	
	Degree 2	
	Degree 3	

B4.What is your family size?

B5. Number of children under age and adult in your household

Category	Number of children	Category	Number of Adult
0 - 2		16 – 25	
3 – 5		26 – 35	
		36 – 45	
		46 – 55	
		56 - 65above	
		66 - above	

C. Farm characteristics

C2. 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	

C2.1. How do you own it?

(1) Bought (2) inheritance (3) for rent (4). Other (specify)

C2.2. List the most important crops that you grow and their respective land (in hectares)

Code/No	Crops grown	Land attributed (hectares)
1		
2		
3		

C3. If you are a coffee farmer, what is the system in which your coffee is grown?

1. Monocrop 2. Mix crop

C4. How many years of experience have you in coffee farming?

category of year	Years of experience in coffee farming
Less than 1	
1 - 5	
6 - 10	
11 - 15	
16 - 20	
21 - 30	
31 - 40	
41 - above	

C5. What is the distance between home and your field (in km)

C6. Yield harvested in kg/bag since 2005-2009 and selling prices

Categorization	Yield in (kg/bag)	Selling prices
0 -1		
1 - 5		
5 – 10		
10 - 15		
15 – above		

C7. Do you hire in labour in your coffee farming (0) No (1) yes

C7.1. How many people do use in your coffee production?------

C7.2. How many women are they engaged? ------

C7.3. What is the cost of hiring labour (in man day)? ------

C8. Are there any other women in the household who are coffee farmers? 1. yes 2. no

C8.1. How many are there? -----

C8.2. Are there any women in the household who are off-farmers? 0. no 1.yes

C9. If you are not a coffee farmer, why don't you grow coffee? Give reasons:

(1) Land constraint (2) lack of information (3) budget constraint

(4) Not interested (5) other (specify).

D. Institution characteristics

D1. Have you ever been in contact with any extension services? (0) Non (1) Yes

D11. If yes, how many times and in how many years? ------- no of times/ -------years

D2. Have you ever receive training on coffee farming? (0) none (1) yes

D21. If yes, how many times have been trained and in how many years? ------times --------years

D3. Are you member of any group (cooperative or association)? (0) no (1) yes

D3.1. How is it called? -------

D3.2. what kind of group is that? (1) Farmers' coop (2) Government programs

(3) Private programs (4) workers' association (5) other (specify)

D4. Is credit available to you? (1) yes (0) no

D4.1. what kind of credit services? 1. formal credit 2. Informal credit

D4.2. From which financial institutions do you receive the credit?

Institution	Informal credit	Formal credit
1.		
2.		
3.		

D5. Where do you process your coffee?

1. Own wash station
2. Cooperative wash station
3. Public wash station
4. Private wash station
5. Other (specify)

D5.1. If the response in D5 is own wash station, is water available for you? 1. yes 0. No

D5.2. if no, where do you get water? 1. river 2.public pump 3. other

D5.3. how do you carry the water ? 1. head 2. vehicle 3. bicycle 4. Other (specify)

F. Market information

F 1. how many women members in the family are involved in coffee market?.

F.1.1. who take coffee to be sold? -----

F1.2. how far is the market? -----

F1.3. what channel do you use?

1. Direct selling
2. Cooperative
3. Other

F1.4. Do you need information on market before selling your coffee? 1. yes 2. no

F1.5. what kind of information do you want to receive about market?

1. Date of sale
2. Prices
3. Buyers
4. Others

F2. List the challenges that you meet in your enterprise in the table below.

Kind of problem	How do you think it can be solved?	Who is supposed to solve it?	Who do you want he/she solve it?	Suggest a solution
1.				
2.				
3.				