AN ANALYSIS OF DETERMINANTS OF MARKET PARTICIPATION AMONG SMALLHOLDER COMMON BEAN FARMERS IN RWANDA, A GENDERED APPROACH

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This thesis is my original work and has not been presented in this or any other university for the award of any degree.

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APPROVAL

This thesis has been submitted to the Graduate school with our approval as the supervisors.

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DEDICATION

I dedicate this work to my late father Timothy Kamunye, my mother Serah Wanjiku and my brother Nehemiah Mwangi for their matchless support and encouragement, always being there for me in my journey in academia.

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ABSTRACT

The agriculture sector supports the livelihoods of the majority of the population in Rwanda. Currently, the sector is dominated by smallholder farmers most of whom are women. In order to modernize and transform agriculture to market orientation, the government has put in place agriculture sector development programs for instance the Crop Intensification Program. One of the targeted crops in the program is the common bean. Nearly all households in Rwanda produce the common bean. Though there are potential welfare gains from participating in common bean output markets, the level of market participation in common bean market is still low. There are gender disparities in the ownership and control of productive assets in Rwanda. This study therefore was a gendered assessment of determinants of market participation among smallholder common bean farmers in Rwanda. The specific objectives of the study were: to characterize the socio economic attributes of the smallholder common bean farmers by gender, to assess the determinants of market participation and extent of market participation in common bean markets among the smallholder common bean farmers by gender and to determine the factors influencing choice of common bean marketing outlets in Rwanda. Multistage sampling procedure was used to select 385 respondents. Data was analysed using Excel, STATA and SPSS computer programs. Descriptive statistics, Heckman two step model and Multinomial logistic model were used to analyse the said objectives. The results revealed disparities in market participation and extent/level with female headed households lagging behind. The age, labour used in selling and group membership significantly influenced male headed households' market participation. Education, bean type and land under beans were important in influencing female headed households' bean market participation. Age, marital status and land size significantly influenced extent of bean market participation among the male headed households. Age, land under beans, credit access, group membership and distance to the market influenced the extent of market participation among the female headed households. Household size, labour used in selling, education level, group membership, credit access and road type were important in explaining the choice of common bean market outlets. The findings showed disparities in market participation across male headed and female headed households. In order to improve common bean market participation especially among women, efforts to streamline land entitlement, price marketing and education policies should be made in a gender considerate manner. There should also be promotion of farmer cooperation, provision of agricultural credit and improvement of rural roads.

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LIST OF ABBREVIATIONS AND ACRONYMS

AERC	African Economic Research Consortium
CAADP	Comprehensive African Agriculture Development Program
CIAT	International Centre for Tropical Agriculture
CIP	Crop Intensification Program
EDPRS 2	Economic Development and Poverty Reduction Strategy Phase Two
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Statistical Databases
FHHs	Female Headed Households
GDP	Gross Domestic Product
GoK	Government of Kenya
GoR	Government of Rwanda
HHH	Household Head
IFAD	International Fund for Agricultural Development
IMR	Inverse Mills Ratio
MINAGRI	Ministry of Agriculture and Animal Resources
MINICOM	Ministry of Trade and Industry
NISR	National Institute of Statistics of Rwanda
PABRA	Pan African Bean Research Alliance
PSTA III	Strategic Plan for Agriculture Transformation phase three
RAB	Rwanda Agriculture Board
UNDP	United Nations Development Program
UN-ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USD	United States of America Dollar

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

For most economies in Sub-Saharan Africa, agriculture remains a critical sector for attaining economic growth. The sector is a source of livelihood to the majority of the rural population. In Rwanda, the sector occupies 79.5 percent of the labour force (most of whom are women), contributes one third of Gross Domestic Product (GDP) and generates more than 45 percent of the country's export revenues. Agriculture is also important for national food self-sufficiency, accounting for well over 90 percent of all food consumed in the country (Republic of Rwanda, 2012a).

Consequently, the Government of Rwanda (GoR) recognizes agriculture as an important sector in the pursuit of realizing the country's vision 2020. This vision envisages Rwanda becoming a middle income economy by the year 2020. The realization of this calls for transforming commercialization of subsistence agriculture. This constitutes one of the five pillars of the vision (Republic of Rwanda, 2000). Moreover, this is emphasized in the second Economic Development and Poverty Reduction Strategy Phase two (EDPRS 2). The strategy points to the agriculture sector as a key to inclusive growth for the country as well as poverty reduction. Furthermore, the strategy encompasses four broad programme areas: agriculture and animal resource intensification; research, technology transfer and professionalization of farmers; value-chain development and private-sector investment; and institutional development and agricultural crosscutting issues. Part of the EDPRS 2 is the Strategic Plan for Agriculture Transformation phase three (PSTA III) and it's guided by the Comprehensive Africa Agriculture Development Programme (CAADP) the Africa's roadmap to economic development via agriculture (IFAD, 2014).

As part of agricultural intensification, the government of Rwanda has placed beans as one of the target crops in the Crop Intensification Program (CIP). CIP was launched in September 2007 with the objective of increasing productivity in selected food crops while improving food security and self-sufficiency. CIP has been investing heavily to increase hectares under consolidated production and productivity of the target crops. Among the staple crops, common beans (*Phaseolus vulgaris* L.) have had the largest area under production in the country and have remained relatively stable at around 330,000 hectares (Republic of Rwanda, 2011). The other crops targeted by the program are maize, wheat, rice, potatoes and cassava.

The common dry bean is the most important food legume for direct consumption in the world. Dry beans are produced in a range of crop systems and environments in regions as diverse as Latin America, Africa, the Middle East, China, Europe, the United States, and Canada. The leading bean producer and consumer is Latin America, where beans are the traditional, significant food, especially in Brazil, Mexico, the Andean Zone, Central America, and the Caribbean. In Africa, beans are grown mainly for subsistence, where the Great Lakes region has the highest per *capita* consumption in the world (Gepts, 2001).

Common beans are also a staple food in the Rwandan diet, with the average Rwandan consuming 60 kilograms of dry beans annually making Rwanda rank the highest in per *capita* bean consumption in the world (Republic of Rwanda, 2012b). Cultivation of common beans in Rwanda is dominated by smallholders who are concentrated in rural areas. Most of them have land holdings of below 0.9 hectares (Republic of Rwanda, 2012c). In the rural areas, poverty and food insecurity continue to be a major challenge especially for the female headed households. Many of these smallholder farmers practice subsistence production of dry beans despite the high demand of dry beans in Rwanda (Ann, 2012).

In Rwanda, common beans are an important crop that is grown by almost 90% of households (FAO, 2012; Republic of Rwanda, 2012c). In the traditional planting system, women do more than 60% of the land preparation, more than 75% of the weeding; and more than 70% of the harvesting. Women are also more involved than men in transporting, drying, winnowing, storing and marketing beans (60%, 57%, 79%, 65% and 61%, respectively). When common beans are planted in lines, men do the majority of the weeding (86%) since weeding is done using the normal hoe (76.5%) (Dusengemungu *et al.*, 2006). Generally, marketing of common bean in Rwanda is still low, at 12% though this national average includes the households that do not produce common bean.

In recent years, the demand for beans has been on the rise owing to the growing population. According to FAOSTAT (2015a), the production of common bean in Rwanda was 432.857 million kilograms in the year 2012. In the preceding year, the country produced 331 million kilograms of common beans, imported 4.854 million kilograms of common beans and exported 2.485 million kilograms of common beans (FAOSTAT, 2015b). This shows that the imports were more than the exports. The prices of beans have also been increasing. For instance, in 2013, among the CIP crops, beans recorded the highest growth in price having

risen by around 20%. In the same year, dry beans exports were valued at USD 7.6 Million (Republic of Rwanda, 2011).

In most developing countries Rwanda included, there are gender disparities in agriculture and in market participation. In Rwanda, the agriculture sector is mainly dominated by poor women (about 86%) with very low levels of schooling and high illiteracy levels (23.3%). Consequently, most women remain in subsistence agriculture. In case they participate in markets, they receive low prices for their products due to inadequate market intelligence and limited capacities to participate in agribusiness. About 30% of households are female headed and most of them are very poor and are concentrated in the rural areas where agriculture is the main economic activity. In addition, most female headed households also have less labour making labour intensive agricultural technologies not appropriate for them (GoR, 2010).

There is therefore a gender gap in agricultural market participation. This gap is propagated by limited access to market information, limited knowledge, skills and technologies for processing and storage, limited access to credit to support secondary agribusiness and lack of entrepreneurship skills. In particular, female headed households do not benefit from market participation at the same level as male headed households. There are also gender disparities in the value addition and marketing of agricultural commodities where more economic commodities are controlled by men. Women are associated with marketing small quantities of produce while larger quantities are marketed by men who also control the income from the sales (*ibid*). There also exists a gender inequality in accessing land and land ownership rights where women often have lower access to land and are restricted in accessing land rights whereby they access these rights through relationship with a male relative (FAO, 2010). Rural women in developing countries, Rwanda included are more disadvantaged in access to as well as control over land and capital relative to men (Peterman *et al.,* 2009; Fletschner, 2006). Women are further disadvantaged with respect to labour because they have less access to labour saving technology and to hired labour needed for lucrative, labour intensive agricultural production (Meinzen-Dick *et al.,* 2011).

Women access to output markets may have more constraints compared to that of men (World Bank, 2012). There are several constraints that impede women access and/or increases cost of entry to output markets (OECD, 2004). These include mobility constraints that limit their ability to travel as well as sell at distant output markets, lack of certification to trade in certain markets thus limiting their entry to output market and lack of market information. Women

participation in market oriented activities is also reduced because of combination of activity regulating social norms and reduced mobility due to their domestic responsibilities (Fletschner, 2008).

In this study therefore, it was postulated that market participation among smallholder common bean farmers in Rwanda presented different opportunities and challenges for men and for women. These differences stemmed from the different roles and responsibilities of men and women as well as the different challenges they faced with women being more likely to be disadvantaged. Apparently, therefore, there exist inequalities between male headed and female headed households' involvement in agriculture particularly concerning agricultural markets. Households were defined as female headed households (FHHs) if they were headed by single, widowed, divorced, separated women, or where there was a husband who was not physically present, because for instance he was working elsewhere.

1.2 Statement of the Problem

Strengthening the abilities of smallholder farmers in developing countries, particularly women farmers, to produce for both home and the market is currently a development priority. This is due to the fact that market participation is an avenue of generating more household income as well as improving the welfare of households. In Rwanda, the government has over the years through its various programs emphasized the need for transformation of rural agriculture from subsistence to producing surplus that can be marketed.

In as much as there is an increase in market participation especially among the smallholder farmers, market participation among common bean farmers remains low and has not yet reached its full potential. Moreover, the existing gender inequalities in access to productive resources and empowerment impact on market participation and intensity of participation across gender. Further, it is not clear whether the factors that influence market participation among male headed households are the same as among female headed households. Although incorporation of gender issues in other agricultural analyses has been on the increase, women market participation has received minimal attention. This study sought to fill this knowledge gap by disaggregating by gender of the household head the underpinning factors that influence market participation and intensity of participation. The study also assessed the factors that influence the choice of marketing outlets.

1.3 Objectives

1.3.1 General Objective
To contribute to the improvement of common bean farmers' livelihoods through enhanced market participation.

1.3.2 Specific Objectives
1. To characterize the socio economic attributes of the smallholder common bean farmers by gender.
2. To assess the determinants of smallholder common bean market participation and the extent of market participation by gender.
3. To determine the factors influencing the choice of common bean marketing outlets in Rwanda.

1.4 Research Questions
1. What are the socio economic characteristics of smallholder common bean farmers by gender?
2. What are the determinants of smallholder common bean farmers' market participation and the extent of market participation by gender?
3. Which factors influence the choice of common bean marketing outlets by smallholder farmers in Rwanda?

1.5 Justification
The Government of Rwanda has a strong focus on staple crops including common beans based on their importance for food and nutrition security. Owing to the growing population in Rwanda and expanding urbanization, there is potential increase in demand for common beans which is one of the major staple foods. The government of Rwanda also aims at increasing productivity of agriculture and transforming agriculture to be market oriented. The government also aims at improving rural livelihoods through increased rural incomes. The rural population makes up 83.5% of the total population and agriculture is the main economic activity in the rural areas (Republic of Rwanda and NISR, 2012). Output market participation by farmers is one of the avenues that can achieve this. Markets have been recognized for their potential to unlock economic growth and development. This study therefore is in line with the policy direction taken by the government of Rwanda since it sought to unveil the determinants of market participation among smallholder common bean farmers. This provided an insight on the critical factors that influence smallholder market participation as

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well as the extent of participation. This is important to the government and policy makers who could use the results of the study to target interventions that are aimed to enhance market participation and also the intensity of market participation. The study also focused on the factors that influence the choice of marketing outlets for common beans. The results thereof would be useful to the government, policy makers and development partners in designing appropriate interventions to link the smallholder farmers to the markets.

One of the cross cutting areas of Rwanda's vision 2020 is gender equality. This study recognizes that there are usually some differentials in participation in markets across the male and the female gender and therefore took account of these differences in the analysis. Disparity in market participation across gender has consequences on the potential benefits of market participation across gender for instance improved livelihoods and welfare. This would further widen the inequality gap across gender. This study therefore would be useful in providing of a clearer picture of market participation from a gender point of view. This would be important in design of gender responsive and efficient market policies. The study could also enrich the stock of existing but thin literature regarding smallholder farmers' participation in common bean marketing on a gender approach.

1.6 Scope and Limitations of the Study

The study used a gender based approach on market participation among smallholder common bean farmers in Rwanda. The study was confined within Rwanda and it used survey data collected in the year 2014 thus limiting the possibility of capturing changes in the areas of focus after 2014. The gender issues explored were only concerned with the gender of the household head in terms of male headed and female headed households.

The study was also constrained by lack of longitudinal data which limited the ability of generalizing of the results. It is also important to note that the production of the common bean is susceptible to weather changes and therefore seasonal. This implies that it was difficult to determine the exact extent of market participation especially in situations where there were low yields due to adverse weather patterns.

1.7 Definition of Terms

Gender – The behavioural, cultural, or psychological traits typically associated with one sex. In this study gender is used to refer to the household head's sex where one is either male or female. Therefore, there are male headed and female headed households.

Head of Household- The person that the members of a household are answerable to, in this case on common bean production and marketing.

Household- defined as an individual or a group of people with the same arrangements for providing themselves with food and other essentials for living.

Market participation - refers to involvement in production that is market oriented as opposed to the traditional subsistence production. In other words, it involves producing with an aim of having a marketable surplus and actually going ahead and selling the surplus.

Smallholder farmers – farmers who are characterized by land holding less than two hectares.

Socio-economic factors- factors that influence both the social and economic wellbeing of an individual.

CHAPTER TWO
LITERATURE REVIEW

2.1 Importance of the Common Bean

Common bean is globally grown in about 28 million hectares with a total production of about 20 billion kilograms per year (Abd *et al.*, 2011). In Eastern, Central and Southern Africa common bean is grown on over 3.7 million of hectares every year (*ibid*). Most of the production is subsistence although about 40% of the total production is marketed fetching about USD 500 Million per year (Hillocks *et al.*, 2006).

Nearly all rural households in Rwanda cultivate common bean (Asare-Marfo *et al.,* 2011; Larochelle *et al.,* 2013). Beans are grown twice a year in many farming systems in Rwanda. They are intercropped with banana, cassava, maize, peas, and others, and grown in different agro-ecological conditions. To accommodate this environmental diversity, two bean technologies are available to farmers: bush and climbing beans. Climbing beans grow vertically, requiring staking material and are harvested over a more continuous period compared to bush beans. This vertical growth property confers climbing beans a yield advantage over bush beans and makes them less likely to be intercropped. Important research efforts have been devoted to select, breed and disseminate new bean varieties that enhance the productivity and quality of the crops, alleviating poverty and food insecurity. In Rwanda, bean is the crop that receives most research attention, followed by sweet potato and banana (Karangwa, 2007). The bean research program at Rwanda Agriculture Board (RAB) in collaboration with international partners such as International Centre for Tropical Agriculture (CIAT) and HarvestPlus, has released nearly 100 bean varieties over the last four decades (RAB, 2012).

Common beans are considered one of the best means of mitigating food and nutrition insecurity that is rampant in many developing countries. When it comes to nutrition, common dry beans are rich in protein and they provide a good source of iron and zinc both of which are key elements for mental development (Beebe, 2012). They are cheap as food and they also possess good storage properties (Siri *et al.*, 2014).

Common beans are important for income generation in many farm families and are considered a cash crop. Compared to other crops, common beans help in bridging of incomes owing to the fact that they mature earlier and can be sold at different stages including green

leaves, fresh pods and dry grains. Common beans are used both as relish and as staple food. Common beans also bear an advantage of being able to be intercropped with other crops for instance maize, groundnuts and cassava. This means they can be planted in areas with limited land. For common beans to contribute to increased incomes there is need to have well-functioning bean markets (CIAT, 2012).

2.2 Participation in Agriculture and Gender

Over the years, research has pointed out to differences in participation, productivity and overall benefits from agriculture across gender. For instance, in Malawi, Zambia and Tanzania, the participation of men and women in beans activities varies across the countries. For instance, in the presence of cash-crops, men normally focus on the income generating crops and operate on large scale. Where land scarcity is an issue, men tend to get involved in activities of all the crops grown on the farms including common beans. Where there are other cash crops and land size is not a constraint, women are left to participate in common beans cultivation. If the focus of the household is to generate farm incomes, men tend to dominate irrespective of the crop while women mostly concern themselves with production for consumption (CIAT, 2012).

Hill and Vigneri (2011) noted that assessing the nature of female involvement in cash crop production was important because cash crop production holds significant potential as a means by which rural households can improve their welfare. They also noted that women were equally as productive as men and received equal prices as men, when they farmed with the same resources and sold their crops in the same way. However, their review and analysis showed that women rarely had similar access to assets and markets as men and this had a major impact on production and marketing of cash crops. They concluded that gender inequalities in resources resulted in different levels of participation, methods of production and modes of marketing cash crops and bore consequences for women's potential outcome in the cultivation of these high value crops.

The effect of gender of the household head on market participation among smallholder maize farmers in Kenya and Ethiopia was investigated by Marenya *et al.* (2015). They used an Ordered probit model together with counter factual analysis where male headed households were taken as the advantaged group. The study results revealed that in Ethiopia, female headed households were twice as likely to be net buyers of maize compared to male headed households. When endowments were equalized, the returns effects showed that the female

headed households would still be 69% more likely to be net buyers of maize than male headed households. When the returns were equalized, the endowment effects showed that the female headed households would still be less likely to be net sellers by 17% than the male headed households. This shows that there were gender disparities that impacted on market participation though some were not directly observable.

Gender equity is an important issue for market participation, not least because of the potential equity losses that can happen if the playing field for market participation is skewed against one group (most likely women). It has been well documented that dearth of gender parity can undermine the best efforts at achieving broad based economic progress (Quisumbing, 2003; World Bank, 2012).

The aspect of gender equality has been emphasized in many agricultural development projects in the recent past. The reason gender inequality receives close attention is that gender inequalities and a lack of attention to gender in agricultural development have contributed to lower agricultural productivity, increased poverty levels and food insecurity (FAO, 2011; Quisumbing, 2003; World Bank, FAO and IFAD, 2009). The World Development Report for the year 2012 entitled *Gender Equality and Development* cautioned against the failure to recognize the differences between the roles of men and women and inequalities between them. It posited that this presents a serious threat to the effectiveness of agricultural development strategies (World Bank, 2012). In many countries, there has been a considerable increase in the percentage of female headed households (FHHs) in recent years. This has mostly affected the rural areas (Snyder *et al.*, 2006). The main causes of this increase are the deaths of male heads, family conflicts and disruption, male migration for work, women deciding not to marry, changes in women's roles, and increased empowerment of rural women. These have all heightened the importance of women as the breadwinners for their households (Kassie *et al.*, 2014).

FHHs are usually disadvantaged in terms of access to land, livestock, other assets, credit, education, health care, markets, and extension services (Odame *et al.*, 2002; Quisumbing, 1995; World Bank, 2001). Access to land does not only have to do with the land size, but also of soil quality. Women's isolation from the public arena, greater time scarcity, and lack of mobility limit their access to markets in various ways (FAO, 1988). For instance, women usually have less information about prices, rules, and rights to basic services (Kassie *et al.,* 2014).

In addition, distance to the market may limit the ability to sell in the market in the absence of adequate transport facilities. Therefore, differences between FHHs and male headed households in access to transportation also matters. In most cases less education is provided for female than for male children, such that female heads of households will have less education than their male counterparts in other households (Meinzen-Dick *et al.,* 2010; Quisumbing, 2003). Furthermore, legal and social traditions surrounding the subdivision of assets tend to favour males at the expense of females, such that, when assets are allocated after a death or a divorce, female farmers will tend to receive fewer and lower quality assets than their male relatives. For instance, less productive or smaller plots of land or fewer and less productive livestock are received by women. In addition, inequalities prevail in the form of less secure tenure, gender differences in access to extension services through which many innovations are channelled, restriction out of credit markets, greater difficulty accessing other productive inputs and other indirect forms of social and cultural inequality linked to social perceptions about the proper roles of women and about their perceived lack of suitability as farmers (Githinji *et al.*, 2011). This has implications on technology adoption, food security, and access to markets. Women's access to land, livestock, education, financial services, agricultural extension services, technology, and rural employment has the potential to boost their productivity and generate gains in agricultural output, food security, economic growth, and social welfare (FAO, 2011; Meinzen-Dick *et al.,* 2010). Given the gender disparities and the importance of considering gender as discussed above, it was in the interest of this study to do disaggregated analysis of market participation. This provided more gender specific results which are clearer than results from a pooled analysis.

2.3 Importance of Market Participation

The ability to participate in agricultural markets especially as net sellers is a strong indicator of the potential for achieving economic progress. Therefore, the role of market participation for increasing income and poverty reduction of small holder farmers cannot be exaggerated. The concept of market participation derives from the basic notion of specialization as the best means of achieving division of labour, economic efficiency and income growth (Marenya *et al.*, 2015). Consequently, market participation is cited as a vital pathway for sustainable development and poverty alleviation. This view is held by Jari (2009). Pingali *et al.* (2005) posit that in overall, increased market orientation moves rural households from subsistence production to profit and income oriented decision making.

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2.4 Factors Influencing Market Participation

Over the years, research has pointed out to different factors influencing market participation. Some past studies have found transaction costs to be a significant factor in influencing the decision on whether to participate in markets or not. For instance, Okoye *et al.* (2010) found that decisions to participate as a buyer, seller or remain autarkic were largely dependent on fixed and proportional transaction costs associated with participating in the market. Specifically, a household's decision whether or not to participate in a market is largely influenced by fixed transaction costs. The proximity of the market place, source of market information and the geographical location of the household in terms of provinces have a direct effect on fixed transaction costs and hence on this decision. On the other hand, the intensity of participation is influenced mainly by proportional transaction costs (Jagwe *et al.*, 2010). Transaction costs arise from sources such as information asymmetries, information search costs, negotiation, monitoring and enforcement of trade agreements (Nkhori, 2004).

The age of the household head has also been found to be one of the factors influencing market participation. This has been cited by several studies such that the greater the age of the household head in years the more the likelihood of participating in the market (Nkhori, 2004; Okoye *et al.,* 2010; Oparinde and Daramola, 2014). Related to this, farming experience and marketing experience are also cited as factors influencing market participation (Okoye *et al.,* 2010; Oparinde and Daramola, 2014).

The distance to the markets, the geographic location of a household and the availability of market information are also noted to influence market participation. The distance to the markets has been found to negatively impact on market participation (Bardhana, 2012; Jagwe, 2010; Nkhori, 2004; Omiti *et al.,* 2009; Onoja *et al.,* 2012; Randela *et al.,* 2008). The geographic location of a household for in terms of either urban or peri-urban also influences the decision to participate in the markets and also the extent of participation (Jagwe, 2010; Nkhori, 2004; Okoye *et al.*, 2010; Omiti *et al.,* 2009; Oparinde and Daramola, 2014). The peri-urban households are found to be more likely to participate in markets than their rural counterparts. The availability and access to market information also influences market participation positively (Jagwe, 2010; Nkhori, 2004; Ohen *et al.,* 2013; Omiti *et al.*, 2009).

Ownership of assets influences market participation. Specifically, ownership of private household assets especially land, livestock, labour and equipment have been found to be

strongly associated with market participation. The households that have access to adequate assets are faced with appropriate incentives to participate largely in markets while those that lack access to these assets largely do not participate in markets (Barrett, 2008; Green *et al.*, 2006). There is also a strong association between a household's asset endowment, market access and market participation. The more a household is endowed with assets, the more likely it is for them to cultivate in high potential agro ecological zones and the more the household will participate in the market (Barrett, 2008). On the same note land size has been found to significantly influence market participation (Ohen *et al.,* 2013; Oparinde and Daramola, 2014; Randela *et al.,* 2008). Ownership of a means of transport has also been reported to be positively influencing market participation (Jagwe, 2010; Nkhori, 2004).

Studies have also reported membership to and participation in cooperatives, farmer groups and contractual arrangements to positively influence market participation (Ohen *et al.,* 2013; Okoye *et al.*, 2010). Extension contact has also been noted to influence market participation. This is in such a way that as the frequency of extension contact increases, the likelihood of market participation and the extent of market participation increase (Bardhana, 2012; Ohen *et al.,* 2013; Okoye *et al.,* 2010). On the other hand, education of the household head has also been reported to influence market participation. The more educated farmers are said to possess a risk-taking behaviour and are usually commercially motivated to sell produce for instance beans for income generation (Ochieng *et al.*, 2014).

Studies have also reported on the impact of gender of the household head on market participation. For instance, Jagwe *et al*. (2010) found that female headed households were more negatively affected by the transaction costs of searching for buyers, contracting and enforcing a sale transaction as opposed to the male headed households. This would thereby limit female headed households' market participation. Likewise, female headed households were more likely to be resource constrained hence affecting production of marketable surpluses (Guiterrez, 2003). Also according to Ochieng *et al.* (2014) and Jagwe *et al.* (2010), the gender of the household head influences the marketing of beans such that female headed households are likely to sell less output to the market compared to the male headed households. They further posit that female headed households often lack productive assets such as land labour and capital consequently reducing their marketable surplus. In Rwanda for instance, land which is a key factor of production is transferred from father to son, and women can only access use rights through marriage (WFP, 2011). Other studies also report

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that male headed households are more likely to participate in markets than female headed households (Okoye *et al.,* 2010; Onoja *et al.,* 2012).

The volume of production and the per unit price have been reported to influence both the decisions to participate in the markets and the extent of market participation (Bardhana *et al.*, 2012; Jagwe *et al.*, 2010; Ohen *et al.,* 2013; Okoye *et al.,* 2010; Omiti *et al.,* 2009; Oparinde and Daramola, 2014). Other factors that have been reported to influence market participation are dependency ratio, house hold size and trust in case of contractual agreements (Onoja *et al.,* 2012; Randela *et al.,* 2008). Access to and household choices of technology for instance improved seeds also influence market participation (Barrett, 2008; Ohen *et al*., 2013).

2.5 Factors Influencing Choice of Marketing Outlets

Marketing outlets are basically the actual markets where the produce is sold. In agriculture, the choice of market outlets to sell the produce is an important decision. It impacts on the returns to the sale of produce since different market outlets may have different marketing costs and prices, therefore different profit margins. The choice of market outlets is influenced by various factors.

It is likely that farmers' choice of market channels is determined by the prices they receive from sale of produce, with the outlets offering higher benefits logically preferred (Chalwe, 2011). Zuniga-Arias and Ruben (2007) found out that: farm household characteristics, including farmer's experience and profitable outlets, attitudes to risk, production systems (farm size and production scale), price attributes, market context (having or not a written contract, and geographical location and distance to urban market) all influenced the choice of market outlets.

Farm gate sales tend to reduce farmer revenues due to relatively low prices. With farm size as a proxy to production scale, large land sizes imply large production scales and vice versa, positively influencing farmer decisions to sell their produce at market places due to economies of scale that lower transaction cost (Montshwe, 2006). Distance to market has also been reported to negatively affect the choice of marketing outlets (Chalwe, 2011). Consequently, for households that have to cover long distances to the market the preferred market outlet is likely to be in their neighbourhood. Minot (1999) further expounds that the choice of marketing outlet among traders is negatively related to the distance to the markets hence, farmers tend to sell outputs at farm gates due to lower transaction costs.

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Some studies have reported a general preference for channels that do not involve contracts. However, provision of inputs and credit has been found to increase the attractiveness of contracts. One of the most important factors is the level of trust the farmer places on the buyer according to how the buyer is known by the farmer (Schipmann and Qaim, 2011). The choice of marketing channel is also influenced by the intensity of market participation as measured by the ratio of the quantity sold to the quantity of produce harvested, farming mechanization used and livestock ownership. These factors positively influence the choice of a marketing outlet (Chalwe, 2011).

2.6 Theoretical Framework

The decision on whether or not to participate in dry bean market is built on utility theory and is dependent on whether market participation gives the household higher utility than not participating in dry bean market. Participation/adoption studies normally involve two stages: The decision to either participate/adopt or not and the second stage, the level of participation/adoption (Mercer and Pattanayak, 2003). The decision to either participate in dry bean markets or not is dichotomous and therefore a binary choice model has been identified as appropriate for such estimation. However, this is only possible under the following assumptions: that the households are faced with only two alternative choices and that any choice an individual household chooses depends on its characteristics (Pindyck and Rubinfeld, 1997).

The expected net utility derived from participation in dry bean markets or not given household's characteristics is determined as follows:

$$EU_i P = f(W_i) + e_i \quad \text{...(1)}$$
$$EU_i N = f(X_i) + e_i \quad \text{...(2)}$$

Where, $EU_i P$, is the expected net utility of household i from participating in dry bean market,

$EU_i N$, is the expected net utility of household i from non-participation in dry bean market,

P, denotes dry bean market participation while N denotes non participation in dry bean markets.

X_i and W_i, are independent variables denoting social economic, farm, institutional and household characteristics and e_i is an error term.

The expected net utilities from each of the decisions are then compared. To compare, Y_i is used as an indicator of whether household *i* participates in dry bean market or not, so that Y_i=1 if participates and Y_i= 0 if not, as indicated in equation (3) below:
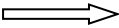
$$\left\{ \begin{array}{l} Y_i = 1 \, if \, EU_iP - EU_i > 0 \\ Y_i = 0 \, if \, EU_iP - EU_i < 0 \end{array} \right\} \quad \text{..} \quad (3)$$

Equation (3) implies that the probability that household *i* participates in dry bean market is given by the probability that the expected net utility derived from market participation is greater than the net expected utility derived from non-participation. While the probability that the household *i* does not participate is given by the probability that the net expected utility derived from market participation is less than the net utility derived from non-participation in the market.

2.7 Conceptual Framework

On the decision to participate in the market, the common bean producing households first decide whether to participate in the output market or not to sell. Conditional on deciding to participate, the next stage involves the households' decision on how much to sell (extent). Therefore, the study used a two-stage market participation model in the identification of the factors influencing a household's decision on whether or not to sell common beans and how much to sell. The common bean producing households were assumed to use part of the produce for household consumption. For the ones that decided to sell the remaining common bean to the markets, their characteristics such as institutional, socio economic and market related factors influenced the market participation decision. They also influenced the choice of market outlets. Market related factors, socio economic characteristics of the households, private assets and institutional factors influenced the level of market participation. The analysis of the aforementioned factors was done with disaggregation by the gender of the household head. This was in recognition that the various factors that influenced these outcomes varied between male headed and female headed households. Below is presented the factors influencing market participation (Figure 1).
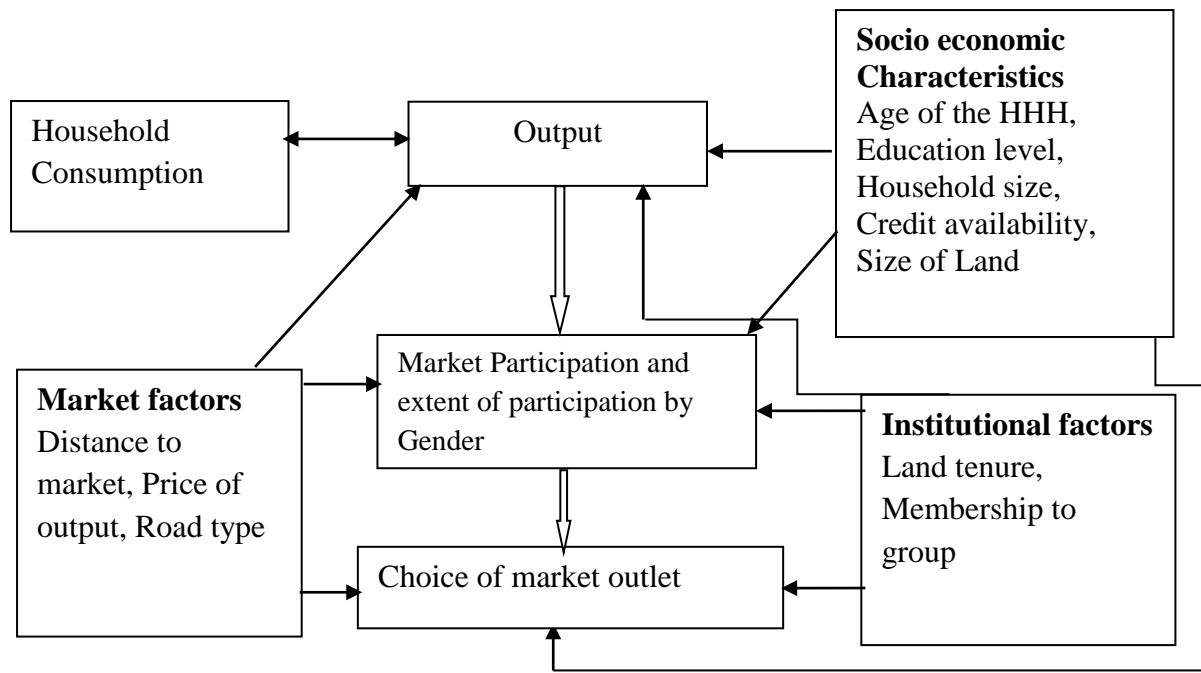
Direction of influence

HHH=Head of the Household.

Figure 1. Factors influencing Market participation.

CHAPTER THREE

METHODOLOGY

3.1 Study Area

Rwanda is an East African country with a hilly and mountainous relief with an altitude ranging between 900 meters and 4507 meters above sea level. It's located at the coordinates 2° 00' S and 30° 00' E. The country has a tropical temperate climate due to its high altitude. The average annual temperature ranges between 16°C and 20°C, without significant variation. This makes most of the areas in the country suitable for agriculture which is the mainstay of the country's economy.

This study was conducted on eight districts drawn across all the five provinces in Rwanda. The Districts were Ngororero District in Western province, Nyagatare and Kirehe Districts in Eastern Province, Nyaruguru and Nyamagabe Districts in Southern Province, Musanze and Gakenke in Northern Province and Gasabo District in Kigali city Province. Below follows the summary of the Districts (Table 1).

Table 1: Summary of the Districts of the study area.

District	Total Population (2012)	Total Area(Km^2)	Average Land Area Cultivated (hectares)	Common Bean producing Households (%)
Nyagatare	466,944	1,741.0	0.77	96.7
Musanze	368,264	530.0	0.45	91.3
Gasabo	530,907	429.2	0.80	68.6
Nyaruguru	304,000	1012.0	0.44	95.5
Nyamagabe	341,491	1090.0	0.51	91.7
Gakenke	345,000	404.0	0.62	96.0
Kirehe	329,000	1,192.0	0.73	93.8
Ngororero	333,713	678.0	0.63	93.1

Source: Republic of Rwanda (2012c).
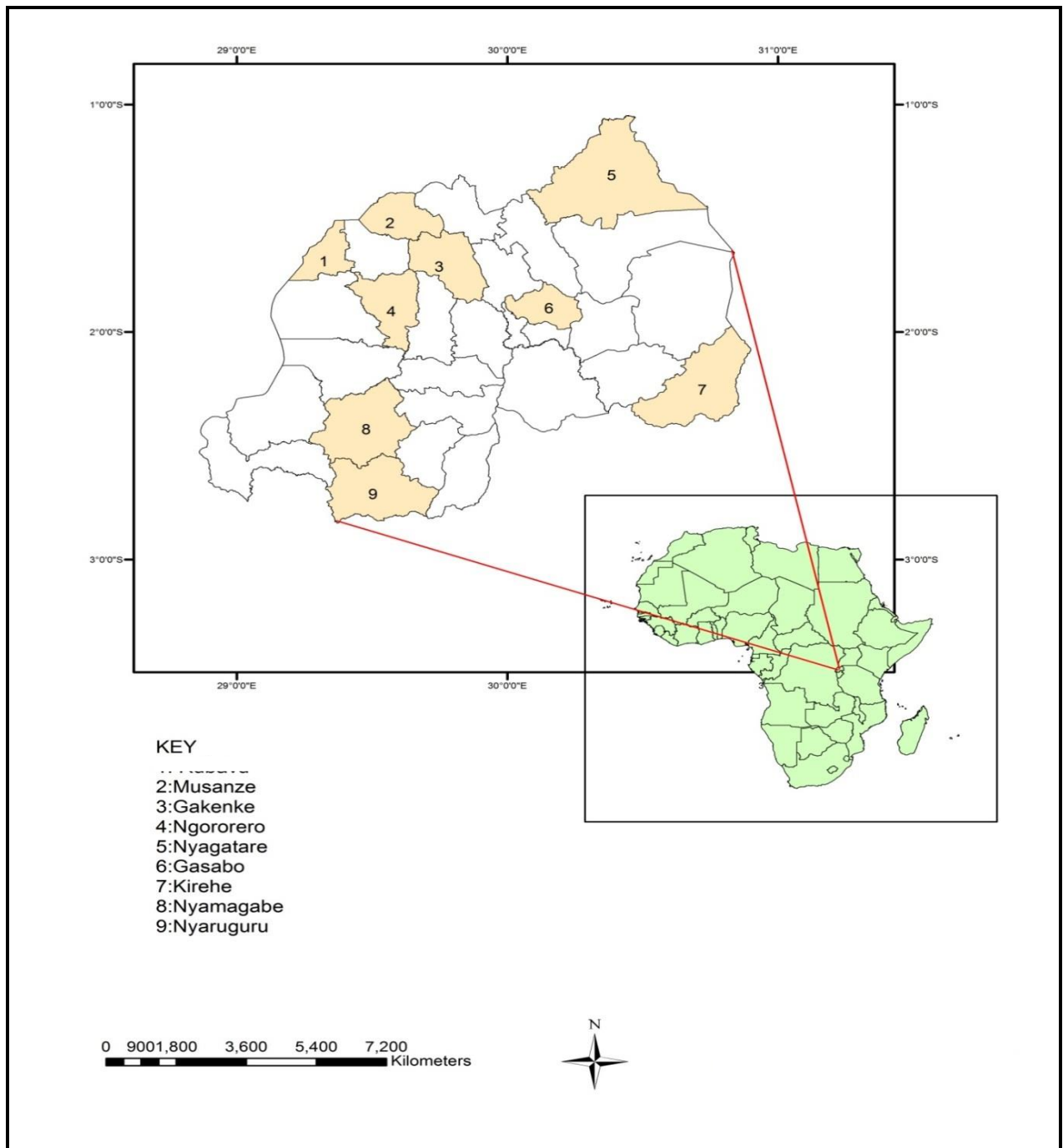
Figure 2. Map of the study area (the shaded regions).

Source: Adapted from www.statistics.gov.rw/geodata.

3.2 Sampling Procedure

The target population consisted of the smallholder common bean producing households. In Rwanda, this population is about 90% of the total households. The study used multi-stage sampling procedure to obtain a representative sample of the population. The first stage involved listing of provinces and districts in Rwanda.

Then purposively, the major bean growing districts were selected. Some were near urban areas, others quite rural, some had good food security statuses while others had malnutrition incidences. Sectors within the selected districts were randomly selected. In the second stage, there was a random selection of households producing common beans.

3.3 Sample Size Determination and Sampling Design

The required sample size was determined by proportionate to size sampling method (Anderson *et al*., 2007).

$$n = \frac{pqZ^2}{E^2}$$ ....(4)

Where n = sample size, p = proportion of the population containing the major interest, q = 1-p, z= confidence level ($\alpha = 0.05$), E = acceptable/allowable error. Since the proportion of the population containing the major interest was known to be about 90% of the total households, (p=0.9, q = 1-0.9= 0.1, Z = 1.96 and E = 0.03. This resulted to a sample size of 385 respondents.

A proportionate to district population size according to the 2012 National census was used to arrive at the number of households that were randomly selected from each district. Below is presented the number of respondents per district proportionate to population size (Table 2).

Table 2: Number of respondents per district proportionate to population size.

District	Population (2012)	(%)	Respondents per district
Nyagatare	466,944	15.46520921	60
Musanze	368,264	12.19692255	47
Gasabo	530,907	17.58366705	67
Nyaruguru	304,000	10.06849558	39
Nyamagabe	341,491	11.31019942	43
Gakenke	345,000	11.42641768	44
Kirehe	329,000	10.89649686	42
Ngororero	333,713	11.05259166	43
TOTAL	**3019319**	**100.00**	**385**

Source: Author's own computation.

3.4 Data Collection

Primary data that had been facilitated by CIAT through a survey in December 2014 was used in the study. The data was qualitative and quantitative relating to common bean production, marketing, socio-economic and institutional factors influencing common bean marketing.

3.5 Data Analysis

The data was cleaned and coded to ensure consistency and accuracy. Both qualitative and quantitative techniques were used to analyse the data. The data was analysed using Excel, STATA and SPSS computer programs.

For characterizing the smallholder common bean farmers, data was analysed using descriptive statistics such as means, percentages and frequencies. In the analysis of the factors affecting market participation and the extent of market participation, Heckman two step procedure was used. In the determination of the factors influencing the choice of market outlets, Multinomial logistic model was used.

3.6 Analytical Framework

Data was analysed as follows:

3.6.1 Socio economic attributes of smallholder common bean farmers by gender

To characterize the socio economic attributes of the smallholder common bean farmers' households by gender, descriptive statistics were used. Socio economic attributes such as the marital status, household size, age of the household head, education, land size, land allotted to beans, access to credit, membership to groups were analysed. The analysis of this objective was disaggregated by the gender of the household head.

3.6.2 Determinants of common bean market participation and extent of participation

To assess the determinants of smallholder common bean market participation and the extent of participation, the Heckman two stage model was used. The decision to either participate in the market or not and the extent of participation were the dependent variables in the two stages respectively. Heckman two step procedure was chosen since it makes it possible to analyse market participation and extent of participation as sequential decisions rather than simultaneous decisions as would be in Tobit. The Heckman two step model entailed the estimation of two equations: first for the factors that influenced a household to participate in the dry beans market and the second one for the factors that influenced the extent of participation. The extent of participation (percentage of common beans sold) was conditional

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on the decision to participate in the market. Heckman procedure is a relatively simple procedure and bears the advantage of correcting sample selectivity bias.

The first step is known as the selection equation and is estimated using a Probit model. This model predicted the probability that an individual household participated in the common beans market or not. It's presented as follows:

$$pr\left(Z_i = 1 \middle| w_{i,} \alpha\right) = \phi(h(w_{i,}\alpha)) + \varepsilon_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(5)$$

Where Z_i is the dependent variable and is equal to one for smallholder dry beans farmer either a male or a female that participates in the market and zero for those who do not participate. ϕ is the standard normal cumulative distribution function, $w_{i,}$ is a vector of factors affecting the decision to participate in market, α is a vector of coefficients to be estimated, and ε_i is the error term assumed to be distributed normally with a mean of zero and a constant variance. The variable Z_i takes the value of 1 if the marginal utility the smallholder household i either male headed or female headed gets from participating in common beans market is greater than zero, and zero otherwise as shown in equations (7) and (8) below.

$$Z_i^* = \alpha w_i + u_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

Where Z_i^* is the latent variable showing the level of utility the small holder common beans household i gets from participating in the market, $u_i \sim N\ (0,\ 1)$ and,

$$Z_i = 1\ if Z_i^* > 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$
$$Z_i = 0\ if Z_i^* \leq 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (8)$$

In the second step, an additional regressor was included in the extent of participation equation so as to correct for potential selection bias. This regressor is known as the Inverse Mills Ratio (IMR). IMR is computed as:

$$\lambda \frac{\varphi(h(w_{i,}a))}{\varphi(w_{i,}a)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(9)$$

Where φ is the normal probability density function. The second-stage equation is given by:

$$E = (Y_iZ = 1) = f(x_{i,}\beta) + \lambda \frac{\varphi(h(w_{i,}a))}{\varphi(w_{i,}a)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots. (10)$$

Where E is the expectation operator, Y was the proportion of common beans sold and was continuous and lied between zero and one, x_i was a vector of independent variables that

affected the proportion of common beans sold, and β was the vector of the corresponding coefficients to be estimated.

So Y_i can be expressed as follows:

$$Y_i^* = \beta' x_i + \gamma \lambda_i + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Where $u_i \sim N(0, \sigma_u)$

Y_i^* was only observed for those households, male headed or female headed who participate in the market.

That is when $Z_i = 1$ in which case $Y_i = Y_i^*$.

The model can thus be estimated as follows; starting with the decision on whether to participate in common bean market either by a male headed or a female headed household:

$$P_i(0,1) = \beta_0 + \beta 1 X_1 + \ldots \beta_n X_n + e \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

Where participation is denoted by 1 and non- participation is denoted by 0, β_0 is a constant, $\beta_1 \ldots \beta_n$ are the parameters to be estimated $X_1 \ldots X_n$ are a vector of explanatory variables.

Step One Model Specification

$Pr(MktPt) = \beta_0 + \beta_1 HHAge + \beta_2 HHMRTS + \beta_3 Schyrs + \beta_4 BeanType + \beta_5 Landbeans + \beta_6 Labselln + \beta_7 Landsz + \beta_8 HHsize + \beta_9 Groupmemb + \beta_{10} Creditacc + \beta_{11} LndTen + \beta_{12} DistMkt + \varepsilon$.............. (13)

In the second stage the factors affecting the level of market participation, conditional on participation decision were examined. This was realized using Ordinary Least Squares (OLS). The general model is represented in equation (14) below:

$$Q_i = \alpha_0 + \alpha_1 X_1 \ldots \alpha_n X_n + e \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (14)$$

Where Q denotes the share of dry beans sold relative to total harvested, α_0 is a constant, $\alpha_1 \ldots \alpha_n$ are parameters to be estimated $X_1 \ldots X_n$ represent a vector of explanatory variables.

Step Two Model Specification

$Q_i(ExtPt) = \alpha_0 + \alpha_1 HHAge + \alpha_2 HMRTS + \alpha_3 Schyrs + \alpha_4 BeanType + \alpha_5 Landbeans + \alpha_6 Labselln + \alpha_7 Landsz + \alpha_8 HHsize + \alpha_9 GroupMemb + \alpha_{10} Creditacc + \alpha_{11} Prc + \alpha_{12} LndTen + \alpha_{13} DistMkt + \varepsilon$.... (15)

Presented below is the description of variables used in the Heckman two step model (Table 3).

For the purpose of looking at the factors influencing market participation and extent by gender, the Heckman two step model was run with disaggregation by the gender of the household head.

3.6.3 Factors influencing smallholder farmers' choice of common bean market outlets

Upon the decision to participate in the common bean market, the households yet make another decision on where to sell the common bean. The markets they sell to are hereby referred to as the market outlets. For the purpose of this study, the market outlets were grouped into the farm gate, village market, sector market and district markets.

To determine the factors influencing the choice of common beans marketing outlet, Multinomial logit model was used.

Where P_{ij} represents the probability of choice of any given marketing outlet by the common bean farmers, the general equation representing the factors affecting the choice of marketing outlet would be:

$$P_{ij} = \beta_0 + \beta_1 X_1 + ... + \beta_n X_n + e \quad \text{.. (16)}$$

Where i takes values (0, 1, 2 and 3) each representing a marketing outlet (where farm gate =0, Village market=1, Sector market=2, District market = 3).

$X_1 ... X_n$ are factors influencing the choice of a market outlet, $\beta_1 ... \beta_n$ are the corresponding parameters to be estimated and e is the error term. With j alternative choices, probability of choosing outlet i is given by:

$$Prob\,(Y_i = j) = \frac{e_{z_j}}{\sum_{k=0}^{j} e_{z_k}} \quad \text{.. (17)}$$

The model estimates were used to determine the probability of choice of a market j outlets, while X_i is a vector of the factors that influence the choice. With a number of alternative choices log odds ratio is computed as:

$$\ln(\frac{p_{ij}}{p_{ik}}) = \alpha + \sum X_i (\beta_j - \beta_k) + e \quad \text{.............................. .... (18)}$$

Table 3: Description of Variables Used in Heckman Two Step Model.

Variables	Description	Hypothesized Relationship
Dependent Variables		
Mktpt	Market participation of farmers (1=Yes, 0=No)	
Extpt	Percentage of common bean output sold	
Independent Variables		
HHAge	Age of the household head in years	+
HHMRTS	Marital Status of the household head (Dummy;1=Single,2=Married, 3=Separated, 4=Widow/Widower)	±
HHSchyrs	Education of the household head by years of schooling	+
HHsize	Household size by number of members	±
BeanType	Bean Variety (Dummy; 0= Bush bean, 1= Climbing bean)	±
Laboursellin	Labour in selling (Dummy; 0=Family, 1=Hired, 2= Family and hired)	±
Distmkt	Distance to the nearest market in Kilometers	-
Creditacc	Access to credit when needed (Dummy; 1=Access, 0=Otherwise)	+
Landsz	Total Cultivable land owned by the household head in hectares	+
Landbeans	Total land size under beans in hectares	+
Groupmemb	Membership to a group (Dummy 1=Member, 0=Otherwise)	+
Prc	Price of beans in the market in Rwandese Franc	±
LandTen	Land Tenure (1=Owned, 2=Rented in, 3=Consolidated Land)	±

P_{ij} and P_{ik} were the probabilities that a smallholder common bean farmer would choose a given outlet or an alternative outlet respectively. $ln(\frac{P_{ij}}{P_{ik}})$ is a natural log of probability of choice j relative to probability choice k, α is a constant, β is a matrix of parameters that reflect the impact of changes in X on probability of choosing a given outlet, e is the error term that is independent and normally distributed with a mean zero. Marginal effects of the attributes on choice are determined by getting the differential of probability of a choice and it is given by:

$$(\delta) = \frac{\partial P_i}{\partial X_i} = pi(\beta_j - \sum_{k=0}^{j} P_k \beta_k) = P_i(\beta_j - \beta) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (19)$$

Model Specification

$Mktout(\boldsymbol{P_{ij}}) = \beta_0 + \beta_1 HHAge + \beta_2 HHsex + \beta_3 HHMRTS + \beta_4 HHSchyrs + \beta_5 BeanType + \beta_6 Landbeans + \beta_7 tLabourselln + \beta_8 HHSize + \beta_9 Landsz + \beta_{10} LandTen + \beta_{11} Creditacc + \beta_{12} Groupmemb + \beta_{13} Distmkt + \beta_{14} RoadTyp + \varepsilon \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (20)$

Description of the Variables Used in the Multinomial logit model (Table 4) follows below.

Table 4: Description of the Variables Used in the Multinomial Logit model.

Variables	Description	Hypothesized Relationship
Dependent Variable		
Mktout	Market outlet chosen (0=Farm gate, 1=Village Market, 2=Sector market, 3=District market)	
Independent Variables		
HHAge	Age of the household head in years	+
HHsex	Gender of the household head (Dummy; 0=Male, 1=Female)	$\pm$
HHMRTS	Marital Status of the household head (Dummy; 1=Single,2=Married, 3=Separated, 4=Widow/Widower)	$\pm$
HHSchyrs	Education of the household head by years of schooling	+
BeanType	Bean Variety (Dummy; 0= Bush bean, 1= Climbing bean)	$\pm$
HHsize	Household size by number of members	$\pm$
Landbeans	Total land size under beans in hectares	$\pm$
Laboursellin	Labour in selling (Dummy; 0=Family, 1=Hired, 2= Family and hired)	$\pm$
Landsz	Total Cultivable land owned by the household head in hectares	+
Creditacc	Access to credit when needed (Dummy; 1=Access, 0=Otherwise)	+
Distmkt	Distance to the nearest market in Kilometers	-
Groupmemb	Membership to a group (Dummy; 1=Member, 0=otherwise)	$\pm$
LandTen	Land Tenure (1=Owned, 2=Rented in, 4=Consolidated Land)	$\pm$
RoadTyp	Type of road to the market (0=Tarmac, 2=Laterite, 3=Earth	$\pm$

CHAPTER FOUR
RESULTS AND DISCUSSION

In this chapter, the results and the discussion of the study in accordance to the research objectives are summarized. Descriptive statistics results outlining the socioeconomic characteristics of common bean farmers come first followed by the Heckman two step model results and finally the multinomial logistic regression results.

4.1 Socioeconomic characteristics of common bean farmers by gender

As shown in Table 5 below, the total sample comprised of 385 respondents out of which 260 (67.5%) were male headed households while 125 (32.5%) were female headed households. This corroborates a gender report by the government of Rwanda which estimated the number of female headed households to be about 30% (GoR, 2010). These two sub-samples were significantly different at 1% significance level. The majority of the respondents were married (268) with 99.23% of the male household heads being married and 8% of female household heads being married. Among the male household heads, 0.38% were single, 0.38% were widowers. About 9% of the female household heads were single, 5.6% were separated, 12.8% were divorcees while 52% were widows.

On literacy which was measured as the ability to read and write, in the whole sample 259 respondents (67.27%) were literate while 126 respondents (32.73%) were illiterate. The literate male household heads were 192 which is 73.8% of the total male household heads in the sample while the literate female household heads were 67 which is 53.6% of the total female household heads in the sample. The female household heads had lower literacy levels by about 20% than their male counterparts. Education has been reported to enhance improved uptake of production and marketing practices (Barret and Marenya, 2006). The literacy across the male and female headed households was significantly different at 1% significance level.

Majority of the respondents (215) had adopted the climbing bean variety which was 55.8% of the total respondents. The rest were cultivating the bush bean. The male headed households that had adopted the climbing bean variety were 125 (48.07%) while 90 (72%) of the female headed households had adopted the climbing bean variety. The climbing beans are known to have a higher yielding potential as compared to the bush beans due to their vertical orientation. However, they require more labour and staking materials in order to yield

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optimally (PABRA, 2010). The adoption of the two different bean varieties across gender was significantly different at 1% significance level.

Overall, 149 households were selling beans which was 38.70% of the whole sample. Out of these there was 48.07% of the male headed households and 19.2% of the female headed households. This result indicates that there was a disparity in common bean market participation across gender with the female headed households participating less than their male counterparts. This finding was consistent with the postulation that in most cases women tend to produce food crops for own consumption (CIAT, 2012). It also corroborated a finding by Marenya *et al*. (2015) that female headed households are less likely to participate in maize markets than male headed households. The sale decision across gender was significantly different at 1% significance level.

From Table 5, family labour was the most commonly used with an overall usage in 337 households or 87.53%. About 87% of the male headed households used family labour while about 89% of the female headed households used family labour. Family labour is usually less costly and usually more common in subsistence agriculture. The fact that female headed households used slightly more family labour than their male headed counterparts is consistent with the finding that in Africa women have less access to hired labour (Meinzen-Dick *et al*., 2010).

Table 5: Socioeconomic characteristics of common bean farmers by gender (categorical variables).

Variable	Particulars	Overall	Male HHH	Female HHH	Pearson Chi^2	Pr
Gender		385	260 (67.5%)	125 (32.5%)	385.000***	0.000
Marital Status	Single	28 (7.3%)	1 (0.4%)	27 (21.6%)	332.204***	0.000
	Married	268 (69.6%)	258 (99.2%)	10 (8.0%)		
	Separated	7 (1.8%)	0 (0.0%)	7 (5.6%)		
	Widow/Widower	66 (17.1%)	1 (0.4%)	65 (52.0%)		
	Divorced	16 (4.2%)	0 (0.0%)	16 (12.8%)		
Literacy	Yes	259 (67.3%)	192 (73.8%)	67 (53.6%)	15.717***	0.000
	No	126 (32.7%)	68 (26.2%)	58 (46.4%)		
Bean Variety	Climbing	215 (55.8%)	125 (48.1%)	90 (72.0%)	19.593***	0.000
	Bush	170 (44.2%)	135 (51.9%)	35 (28.0%)		
Selling	Yes	149 (38.7%)	125 (48.1%)	24 (19.2%)	29.672***	0.000
	No	236 (61.3%)	135 (51.9%)	101 (80.8%)		
Labour Used	Family labour	337 (87.5%)	226 (86.9%)	111 (88.8%)	12.966**	0.011
	Hired labour	22 (5.7%)	19 (7.3%)	3 (2.4%)		
	Hired and family	21 (5.5%)	13 (5.0%)	8 (6.4%)		
	Labour exchange	5 (1.3%)	2 (0.8%)	3 (2.4%)		
Credit	Yes	21 (5.5%)	12 (4.6%)	9 (7.2%)	0.529	0.467
	No	317 (94.5%)	206 (95.4%)	111 (92.8%)		
Group Membership	Yes	182 (47.3%)	121 (46.5%)	61 (48.8%)	0.173	0.667
	No	203 (52.7%)	139 (53.5%)	64 (51.2%)		
Distance to nearest market	<1Km	111 (28.8%)	83 (31.9%)	28 (22.4%)	20.424***	0.000
	>1Km<5Km	199 (51.7%)	142 (54.6%)	57 (45.6%)		
	>5Km<15Km	65 (16.9%)	31 (11.9%)	34 (27.2%)		
	>15Km	9 (2.3%)	3 (1.2%)	6 (4.8%)		

Where: HHH is household head; *** significant at 1% significance level, ** Significant at 5% significance level.

Source: CIAT, 2014.

The results of the continuous socioeconomic variables are presented in Table 6 below. From Table 6, the mean age of the household head was 37 years where for the male household heads it was 35 years while it was 41 years for the female household heads. The age of the household head was significantly different across the gender of the household head at 1% level of significance. This finding indicated that most of the common bean farmers were

relatively young. This could possibly be due to the intensive nature of common bean which require the use of intensive labour. The level of education in terms of schooling years was significantly different at 1% level of significance across the gender of the household head. The mean years of schooling among the male household heads was 3.89 while for female household heads it was 2.41. The mean years of schooling for the male household heads was higher than the national average of 3.3 years while for female household heads it was lower (UNDP, 2013). This reveals a disparity in education attainment across gender in Rwanda. Household size in terms of the number of people in a household was significantly different across the gender of the household head. It was lower in the male headed households with a mean of 2.42 and higher in female headed households with a mean of 2.98. The size of the household represents the productive and the consumption unit of the household (Makhura, 2001). In this light, household members could represent labour resources and are posited to be engaged in agricultural activities (Randela *et al*., 2008). The total land size held in hectares was significantly different across the gender of the household head.

The average land size in male headed households was 0.92 hectares while for the female headed households it was 1.82 hectares. Land size has been found to influence market participation such that better access to land may translate to better capacity for households to produce agricultural commodities. Smaller land sizes may result to extensive crop diversification therefore less output for each crop and less marketable output (UN-ESCAP, 2014).

Table 6: Socioeconomic characteristics of common bean farmers by gender (continuous explanatory variables).

Variable	Overall Mean (n=385)	Male HHHs Mean (n=260)	FHHs Mean (n=125)	t-test	Pr.>t
Age	37.18(12.84)	35.07(10.48)	41.56(15.89)	-4.77***	0.0000
Years of schooling	3.41(2.93)	3.89(2.9)	2.41(2.75)	4.77***	0.0000
Household Size	2.6 (1.49)	2.42(1.45)	2.98(1.51)	-3.53***	0.0005
Land size	1.21(5.97)	0.92(3.78)	1.82(8.99)	-1.33	0.1845
Land under beans	0.67(3.5)	0.54(2.22)	0.94(5.24)	-0.68	0.4997

Where: HHHs is household heads; Standard deviations are in parentheses; *** significant at 1% significance level.

Source: CIAT, 2014.

4.2 Determinants of smallholder common bean market participation by gender

The determinants of market participation among the smallholder common bean farmers were analysed using the Heckman two step procedure. Market participation was represented by the decision to sell which was YES, coded 1 for those who sold and NO, coded 0 for the non-sellers. The analysis was disaggregated by the gender of the household head so as to allow the observation of the differences across the male headed and female headed households. The results of the first step of the procedure were the determinants of market participation. The goodness of fit measured by Prob>Chi^2 = 0 in the whole sample Prob=Chi^2=0 in the male headed household's sub-sample and Prob>Chi^2=0.0003 in the female headed household's sub-sample showed that the explanatory variables used in the first stage of the heckman two step procedure explained the variations in the decision to participate in the market. The results of the first stage are presented in Table 7 below. The discussion of the variables that were statistically significant follows.

In the aggregated sample, the labour used in selling common bean, the household size, the land size, group membership and the distance to the nearest market were statistically significant. With disaggregation, in the male headed households, the age of the household head, the labour used in selling common bean and group membership were statistically significant. In this sub-sample, a one year increase in the age of the household head decreased the probability of participating in the common bean market by 1.43%. This could be due to the possibility that older household heads had more children and dependents. Therefore, the older household heads tend to have more dependants and hence engage more in subsistence production activities (Ehui *et al*., 2009). Similarly, Arega *et al*. (2007) and Boughton *et al*. (2007) also found declining market participation with an increase in age of the farmers. The exclusive use of family labour as opposed to hired or a combination of hired and family labour increased the probability of market participation by 28.77%. This could be attributed to the fact that common bean production and marketing is labour intensive and therefore the more the access and use of family labour the more the production and therefore a marketable surplus.

Group membership decreased the chances of selling common bean by 18.36%. This finding was against the general expectation that group membership would lead to increased market participation. It was contrary to the finding by Jagwe (2011) who using Heckman two step procedure found group membership to be positively influencing participation in banana

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markets. The possible explanation in this case could be that the groups that the male household heads belonged were not the ones involved in common bean production and marketing.

Among the female headed households, a one year increase in years of schooling increased the probability of selling common bean by 3.22%. Formal education could enable its possessor to be more open to new ideas and innovative farming technologies. This could in turn lead to improved productivity and therefore more marketable surplus. This finding was consistent with the finding that the more educated farmers were more likely to take risks and be commercially oriented to produce for the market (Ochieng *et al*., 2014).

The adoption of the climbing bean variety by these households decreased their probability of selling by 21.91%. This finding was against the general expectation that adoption of climbing bean variety being a high yielding variety would increase the chances of participating in markets. A possible explanation would be the inadequacy of the required skills to manage climbing beans and therefore less yield among the female headed households. It could also be attributed to lack of proper staking materials which are a cost item and therefore low yield. A one hectare increase in land under beans decreased the probability of selling by 0.17%. This finding contravened the general belief that the bigger the size of land under a crop the more the production of the crop and possible marketable output. The finding was inconsistent with Wanyama (2013), who found a positive relationship between the size of land allocated to pea nuts production and peanut value addition activities.

The differences in the factors influencing the market participation across gender indicated a disparity between the male headed households and the female headed households in terms of the various factors especially the ones that were significant. These included age, household size, land under beans, years of schooling, bean variety adopted and group membership.

Table 7: Determinants of smallholder common bean market participation by gender.

Variable	Overall			Male			Female		
	dy/dx	Std. Err.	P>z	dy/dx	Std. Err.	P>z	dy/dx	Std. Err.	P>z
Age of the household head	0.0036	0.0051	0.4770	-0.0143**	0.0056	0.0110	0.0010	0.0024	0.6680
Marital status of household head	0.0382	0.0673	0.5700	-0.0734	0.3041	0.8090	0.0128	0.0221	0.5630
Years of schooling of household head	0.0235	0.0169	0.1630	0.0158	0.0156	0.3120	0.0322**	0.0157	0.0400
Bean type	0.0396	0.1159	0.7330	0.1192	0.0936	0.2030	-0.2191*	0.1320	0.0970
Land under beans	-0.0025	0.0018	0.1750	-0.0010	0.0014	0.4590	-0.0017*	0.0010	0.0980
Labour used in selling	0.1853***	0.0497	0.0000	0.2877***	0.0371	0.0000	0.1301	0.0883	0.1410
Household size	-0.2172***	0.0654	0.0010	0.0154	0.0332	0.6430	-0.0435	0.0303	0.1510
Land size	0.0177*	0.0096	0.0660	-0.0050	0.0227	0.8260	0.0042	0.0036	0.2410
Land tenure	-0.0300	0.0503	0.5500	0.0122	0.0415	0.7690	-0.0100	0.0278	0.7180
Access to credit	0.2840	0.2696	0.2920	0.1790	0.2340	0.4440	-0.0222	0.0903	0.8060
Group membership	-0.3419***	0.1199	0.0040	-0.1836**	0.0926	0.0470	-0.0899	0.0714	0.2080
Distance to nearest market	-0.1448*	0.0778	0.0630	0.0640	0.0675	0.3430	0.0043	0.0299	0.8850
Observations=385		Overall			Male			Female	
Wald chi^2(14)		144.1600			139.6300			39.9400	
Prob>chi^2		0.0000			0.0000			0.0003	

Note: ***: Significant at 1% significance level, **: Significant at 5% significance level, *: Significant at 10% significance level.
Source: CIAT, 2014.

4.3 Determinants of the extent of common bean market participation by gender

The determinants of the extent of common bean market participation by gender were analysed using the second step of the Heckman two step procedure. The dependent variable was the extent of market participation. It was measured by the percentage of the common bean output sold. The analysis was further disaggregated by the gender of the household head so as to observe the differences across gender. The goodness of fit measured by Prob>Chi^2 = 0 in the whole sample and the two sub-samples showed that the explanatory variables used in the second stage of the heckman procedure explained the variations in the extent of market participation. The results of this analysis are presented in Table 8 below. The discussion of the factors that were statistically significant follows.

In the aggregated sample, the age of the household head and land size were statistically significant. With disaggregation, among the male headed households, the age of the household head, the marital status and land size were statistically significant. Among the female headed households, age of the household head, years of schooling, land size under beans, price of beans, land size, credit, group membership and distance to the nearest market were statistically significant.

For the male headed households, a one year increase in the age of the household head would decrease the extent of market participation by 0.87%. The older a household head gets the more likely their strength and ability to work decreases. This finding was consistent with the finding that younger household heads are more dynamic with regard to adoption of innovations than older household heads (Enete and Igbokwe, 2009).

For marital status, being single increased the extent of market participation by 45.35% over being married, separated, widow/widower or divorced. The single household heads are deemed to have fewer responsibilities as compared to the other household heads. This could in turn translate to more time to participate in agricultural markets. This finding is consistent with that of Martey *et al*. (2013) who found that unmarried household heads were more likely to participate in rice development projects in Northern Ghana than the married household heads.

In this sub-sample, a one hectare increase in the land size decreased the extent of market participation by 18.14%. This result was a bit puzzling since it contravened a popular belief that a larger land size would lead to a higher extent in market participation. A plausible

explanation would be that larger land size translates to more demand for labour and other inputs for the whole land which may not be available. It could also be that farmers who had bigger land sizes engaged more in other land intensive enterprises as compared to common bean production.

Among the female headed households, a one year increase in the age of the household head would decrease the extent of market participation by 0.87%. An increase in age is generally associated with risk averseness. There is also a likelihood of having diversified income sources as one grows older. The finding is however contrary to one that the greater the age of the household head in years the more the likelihood of participating in the market (Nkhori, 2004; Okoye *et al.,* 2010; Oparinde and Daramola, 2014).

A one year increase in the years of schooling would increase the extent of market participation by 3.93%. With an increase in education there would be better marketing and bargaining skills for instance ability to synthesize market information. This would in turn result in greater extent of market participation. This finding is in line with the views that education level positively influences the amount of crop supplied to the markets (Astewel, 2010; Omiti *et al*., 2009).

A one hectare increase in the total land under beans would increase the extent of common bean market participation by 0.54%. An increase in the land under a crop is expected to result in an increase in the yield of the crop. This finding is consistent with Wanyama (2013) who found a positive relationship between the area under pea nuts and value addition activities.

A one unit increase in the price of beans would increase the extent of common bean market participation by 0.14%. A good price serves as an incentive to supply more output to the market so as to make more profit. This finding is consistent with that of Omiti *et al*. (2009) where they revealed that the price of the output positively influences the amount of the product sold to the market.

Those households that had obtained credit had a higher extent of market participation by 26.19% over the ones that did not obtain credit. Availability of agricultural credit serves as an incentive for farmers to increase their production and also to adopt innovative production and marketing techniques. This finding corroborates Mutai *et al*. (2013) who stated that access to credit gives a farmer more cash resources and hence influences their marketing activities. It is

also in agreement with the argument that agricultural credit plays a vital role in smallholder commercialization (Lerman, 2004).

The households that were members to groups had higher market participation by 34.48% over those who were not members to any groups. Group membership and the social capital that comes with it increases the possibility of learning from each other and reducing transaction costs through cooperation, for instance, in marketing. The finding is supported by Jagwe (2010) that group membership increases market participation.

An increase in the household size by one member increased the extent of market participation by 6.87%. This could be as a result of an increase in family labour and therefore more production. It could also be explained in terms of an increase in the other household needs and therefore the necessity to sell more in order to meet these needs. Family labour is normally advantageous since its cost is normally low. The finding is supported by that of Alene *et al.* (2008) that a large household size could produce more such that it is able to sell more to the market.

The households that were found within a distance of 1 kilometre from the nearest market had a higher extent of market participation by 15.92% over and above those who were located in more than a kilometre from the nearest market. This shows that the longer the distance to the market the less the extent of market participation. This could be attributed to the transport costs and time used to get to distant market which increases with distance. The bulky nature of many agricultural produce constrains most smallholder farmers from selling to distant markets. This finding is in agreement with the view that the greater the distance from the market the more the transport and marketing costs and therefore the less the extent of market participation (Ogunleye and Oladeji, 2007).

The differences in the factors influencing the extent of market participation across gender indicates a disparity between the male headed households and the female headed households in terms of the various factors especially the ones that were significant.

Table 8: Determinants of the extent of common bean market participation by gender.

Variables	Overall			Male			Female		
	Coef.	Std. Err.	P>z	Coef.	Std. Err.	P>z	Coef.	Std. Err.	P>z
Age of household head	-0.8236**	0.3804	0.0300	-0.8658*	0.5131	0.0920	-0.8736**	0.3589	0.0150
Marital status of household head	8.4622	11.3004	0.4540	45.3523**	21.7193	0.0370	4.3188	4.6914	0.3570
Years of schooling of household head	1.4182	0.9574	0.1390	0.9523	0.9560	0.3190	3.9309*	2.1509	0.0680
Bean variety	1.8310	5.3445	0.7320	1.1252	5.2859	0.8310	43.5884	27.0330	0.1070
Land under beans	0.0886	0.0779	0.2550	0.0516	0.0764	0.4990	0.5397***	0.1586	0.0010
Price	0.0435	0.0363	0.2310	-0.0063	0.0430	0.8840	0.1404*	0.0847	0.0970
Labour used in selling	4.4677	3.6246	0.2180	3.0322	5.2220	0.5610	0.9862	2.1139	0.6410
Household size	3.4811	2.2456	0.1210	2.8640	2.3473	0.2220	6.8673*	3.7749	0.0690
Land size	18.4649**	7.8408	0.0190	18.1396**	8.1375	0.0260	-0.1452	0.5726	0.8000
Land tenure	-2.1828	2.1225	0.3040	-3.0223	2.1079	0.1520	4.0153	4.3103	0.3520
Access to credit	5.5732	9.8706	0.5720	2.1326	9.8867	0.8290	26.1982**	12.1985	0.0320
Group membership	3.6454	5.4933	0.5070	4.9176	5.3228	0.3560	34.4778**	17.4786	0.0490
Distance to nearest market	-3.1276	3.9440	0.4280	-5.8590	4.1558	0.1590	15.9207**	7.0263	0.0230
Mills Lambda	-0.1091	10.0052	-0.0100	3.0306	15.480	0.2000	-17.2961	13.4565	0.1990
Observations=385		Overall			Male			Female	
Wald chi^2(14)		144.1600			139.6300			39.9400	
Prob>chi^2		0.0000			0.0000			0.0000	

Note: ***: Significant at 1% significance level, **: Significant at 5% significance level, *: Significant at 10% significance level.

4.4 Factors influencing the choice of common bean marketing outlets in Rwanda

A multinomial logit model was used to analyse the factors influencing the choice of common bean marketing outlets. The marketing outlets had been classified into the farm gate, the village market, the sector market and the district market. These were the dependent variable. The results of the multinomial logit regression are presented in Table 9 below. The Pseudo R^2 was 0.569 which was above the statistical threshold of 20%. This means that the explanatory variables explain about 56.9% of the dependent variable. The statistically significant results are discussed below.

With regard to the farm gate market outlet, the labour used in selling as well as the household size were statistically significant. The exclusive use of family labour in selling common bean as compared to hired or a combination of hired and family labour increased the probability of selling at the farm gate market by 0.53%. The use of family labour is a relatively cheaper option as compared to hired labour. Family members could easily sell common bean at their farm gate. An increase in the household size by one member increased the likelihood of selling at the farm gate by 0.01%. An increase in household size could translate into more household consumption of common bean and hence less common bean sales. With less quantities to sell it could be less profitable to sell in distant markets due to high per unit marketing costs.

For the village market, the years of schooling, labour used in selling and group membership were statistically significant. A one year increase in schooling years of the household head increased the probability of selling in the village market by 3.62%. The village market was deemed to offer a higher return on sale than the farm gate. More educated people could possess more off farm incomes which could enable them to sell in better markets. More educated people would be able to access and synthesize market information better than less educated people.

The use of family labour in selling common bean as opposed to hired or a combination of hired and family labour increased the probability of selling at the farm gate market by 22.15%. Family labour is usually cheaper than hired labour and therefore if available would be advantageous in marketing crops even over long distances.

Being a member of a group reduced the probability of selling in the village market by 14.95%. By being in groups, farmers are able to collectively transport their produce to

another market other than sell on the farm gate and thereby reduce transaction costs. This finding is in line with Jari and Fraser (2009), who found that farmers who participated in groups had greater potential in reaching distant markets.

As for the sector market, the household head's schooling years and the labour used in selling common bean were statistically significant. A one year increase in the schooling years of the household head increased the probability of selling in the sector market by 0.05%. Education could help in improving the bargaining skills even in distant markets. This is consistent with a finding by Chirwa (2009) who found that with more education the farmers were nor likely to participate in farm gate markets. Using family labour as opposed to hired or a combination of hired and family labour in selling common beans increased the probability of selling at the sector market by 0.5%. The use of family labour is considered a cheaper option which would mean that even for longer distances to markets the per unit marketing costs in terms of labour are reduced and hence a household can sell more to the distant markets.

Obtaining credit, group membership and road type to the market were statistically significant for the district market. The households that had obtained credit increased the probability of selling into the district markets by 0.0092%. Access to credit increases the resource and asset base of the farmers and therefore could enable farmers penetrated in more lucrative but possibly distant markets. This finding was in line with the view that credit availability is vital in smallholder commercialization (Mutai *et al.*, 2013; Lerman, 2004). The households whose member(s) belonged to group(s) had a 0.0016% increase in the chances of selling in the district markets. Group membership enhances social capital and gains from these in terms of collective action for instance in marketing could lower transaction costs. This finding was consistent with the one that group marketing lower transaction costs and also could improve bargaining power of the members (Njuki *et al.*, 2009). The households located where road type to the market was tarmac as compared to earth or laterite bettered their chances of selling at the district market by 0.00065%. The road type and quality influences the transport costs and the time taken to reach the market. The district market is deemed to be distant and more lucrative. This finding is consistent with Omiti *et al.* (2009) who found that rural upgraded roads improved the convenience of accessing the urban markets. It is also supported by the finding that in Mozambique, the distance from the village to the nearest tarred road was negatively related to crop sales (Boughton *et al.*, 2007). Most households were selling at

the farm gate and very few at the district markets and hence the very small probabilities of selling at the district markets as depicted by low marginal effects for the district market.

Table 9: Factors influencing the choice of common bean marketing outlets in Rwanda.

Variable	Farm gate dy/dx	P>z	Village Market dy/dx	P>z	Sector Market dy/dx	P>z	District Market dy/dx	P>z
Sex of the household head	0.0024	0.6910	-0.1873	0.4690	-0.0002	0.9840	-5.3E-05	0.9960
Age of household head	-0.0004	0.3540	-0.0069	0.6100	-0.0001	0.7350	-3.1E-06	0.7560
Marital status of household head	-0.0012	0.7510	0.0704	0.1400	-0.0022	0.6610	-1.2E-05	0.6530
Years of schooling	0.0002	0.7430	0.0362***	0.0030	0.0005*	0.0600	1.2E-06	0.7580
Bean type	-0.0108	0.3990	0.0233	0.8330	-0.0008	0.8730	2.2E-05	0.8950
Land under beans	-0.0001	0.5800	-0.0012	0.7390	-0.0001	0.4900	-8.6E-07	0.5430
Labour used in Selling	0.0053**	0.0250	0.2215***	0.0000	0.0058**	0.0430	3.3E-05	0.9450
Household size	0.0001*	0.0960	-0.0265	0.6090	-0.0015	0.6130	1.4E-05	0.8560
Land size	0.0000	0.9780	0.0037	0.5220	-0.0033	0.5280	-6.6E-08	0.9890
Land tenure	0.0013	0.4940	-0.0016	0.9790	-0.0015	0.6740	-1.4E-05	0.8760
Obtaining credit	0.0052	0.7660	0.0415	0.8070	0.0497	0.4810	-9.2E-05*	0.0780
Group membership	-0.0014	0.7930	-0.1495**	0.0380	0.0032	0.6120	1.6E-05*	0.0960
Distance to nearest market	-0.0019	0.6070	0.0460	0.2840	0.0005	0.8900	6.3E-06	0.9970
Road type to market	-0.0015	0.6300	-0.0036	0.9280	-0.0008	0.7520	6.5E-06*	0.0890

Ancillary Parameters

Number of observations=385

Pseudo R^2 =0.5690

Note: ***: Significant at 1% significance level, **: Significant at 5% significance level, *: Significant at 10% significance level.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study characterized the smallholder common bean farmers with regard to their socioeconomic attributes. The differences in the said attributes across the gender of the household head were also taken into account. The study also examined the factors that influenced common bean market participation as well as those that influenced the extent of common bean market participation among the male as well as female headed households. Further, the study analysed the factors that influenced the choice of market outlets.

The results showed that in the aggregated sample the household size, labour used in selling, land size, group membership as well as distance to the nearest market were important in explaining market participation. With disaggregation, the age of the household head, group membership and labour used in selling were important in influencing market participation among the male headed households. The years of schooling, the bean type and the land under beans were of importance in influencing market participation among the female headed households. The age of the household head, marital status and land size significantly influenced the extent of market participation among the male headed households. The age of the household head, years of schooling, land under beans in hectares, price, household size, credit access, group membership and distance to market were important in influencing the extent of market participation among the female headed households. In the aggregated sample, the age of the household head and the land size significantly influenced the extent of market participation. Disaggregated analysis was found to reveal more factors that influenced market participation as well as the extent of market participation.

For the factors influencing the choice of market outlets, schooling years, household size, labour used in selling, credit access, group membership and road type significantly influenced the choice of the various market outlets. Most farmers were selling common beans at the farm gate.

5.2 Recommendations and policy implications

Agricultural development strategies touching on common bean should take into account the gender of the target farmers in order to be efficient and responsive.

Market participation is a vital tool in driving growth in both rural as well as the national economies. To improve market participation, education especially to the female household heads needs to be improved. To increase the extent of market participation farmers, need to be encouraged to increase the land allocated to beans cultivation. This would increase the output of the crop increasing the likelihood of selling more beans to the market. There is also need to improve the prices of beans to serve as an incentive to the farmers to produce for the market. There should also be development and enhancement of markets that are near to farmers so as to reduce the transaction costs of selling beans. Agricultural credit should be available and accessible to common bean farmers to enable them produce for the market and meet the costs associated with the sale of common beans. There is also need to promote cooperation among farmers as a way of building social capital.

Based on the results of the factors influencing choice of market outlets, there is need to improve the rural infrastructure in terms of upgrading rural roads. This would improve the rural smallholder farmers in accessing would be more lucrative markets serving as an incentive to produce for the market. There is also need to promote education and school enrolment especially among women in the rural communities. Education would help the people in being able to synthesize technology adoption information, market and prices information as well as doing crop production as a business. There is need for strategies that promote social capital among the smallholder farmers especially men in terms of coming up with and joining farmer groups. This would be of importance in marketing of the output. There should also be promotion of agricultural services like credit especially among the women to help them acquire the requisite inputs and assets so as to produce for the markets. There also needs be programs to promote the cultivation of the common bean especially among women since it one of the women crops in Rwanda.

5.3 Further Research
This study did not get into the dynamics of household decision making and how they impact on market participation. Therefore, this study recommends a further study that would look at how household level decision making dynamics would influence market participation and the outcomes thereof.

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This is the instrument that was used by CIAT in 2014 to collect the data used in this study.

QUESTIONNAIRE

This study is conducted to find out the factors determining Market participation among smallholder common bean farmers in Rwanda. The information provided will assist the government to formulate policies and programmes that will improve market access for common beans for both male headed and female headed households. The information provided will be treated as confidential.

SECTION A: DETAILS OF THE HOUSEHOLD HEAD

A 1.0   Gender of the Household Head

   Male [ ]   Female [ ]

A 1.1 Marital status of the Household head   [   ]

        Codes

Single=1, Married=2, Separated=3, 4=Widowed

A 1.2 Age of the Household Head (Years) _____

A 1.3 Years of schooling of Household Head _____

SECTION B: LIVELIHOOD ACTIVITIES

B 1.0 How many livelihood activities does your household have?   [   ]

1 = None, 2 = One, 3 = Two, 4 = More than two

B 1.1 Rank the importance of the main livelihood activities (Rank the first three using the codes provided)

B 1.1 (a) First   [   ]

B 1.1 (b) Second   [   ]

B 1.1 (c) Third   [   ]

Codes

1=Agricultural production on own farm or on other farm for no payment, 2=Agricultural work on other farm for in kind compensation, salary/wages, 3=Livestock raising, 4=Fishing, hunting, 5=Unskilled daily labour (non-agricultural), 6=Skilled labour, 7=Purchase/ sale of product from fishing, hunting and gathering, 8=Purchase and sale of agricultural products, 9=Purchase and sale of livestock products, 10=Purchase and sale of livestock, 11=Informal

sale/petty trade, 12=Handicrafts/artisanal work, 13=Transport (including motor cycle),

14=Salaried, pension,

15=Own business/self-employed, 16=Vision 2020 Umurenge Program (VUP) public works,

17=VUP direct transfers and other social transfers, 18=Remittances from friends and

relatives, 19=Begging,

20= Other

Main (specify) _____

Second (specify) _____

Third (specify) _____

specify_____

B 1.2 Who usually participates in the livelihood activity?

B 1.1 (a) First   [   ]

B 1.1 (b) Second   [   ]

B 1.2 (c) Third   [   ]

Codes

1=Head of household only, 2=Spouse of head of household only, 3=Household head and

spouse jointly, 4=Men only, 5=Women only, 6=Adults only, 7=Children only, 8=Women and

children,

9=Men and children, 10=Everybody, 11=Other

Main (specify) _____

Second (specify) _____

Third (specify) _____

SECTION C: LAND TENURE

C 1.0 How land, in total is available to this household? _____Hectares

C 1.0 (i) How much of the total land available to this household is inherited? _____Hectares

C 1.0 (ii) How much of the total land available to this household is purchased? ____Hectares

C 1.0 (iii) How much of the total land available to this household is rented-in? ____Hectares

C 1.0 (iv) How much of the total land available to this household is rented-out? ____Hectares

C 1.1 Does your household participate in any crop intensification program?   [   ]

 1=Yes, 2=No

C 1.2 What % of your land is devoted to crop intensification? _____%

SECTION D: AGRICULTURAL PRODUCTION OF KEY FOOD COMMODITIES

D 1.0 How many crops did your household cultivate last season? _____

1=None, 2=One, 3=Two, 4=More than two

D1.1 By order of importance what are the main crops cultivated by your household?

D 1.2Please enter up to 5 crops from the list below.

1ˢᵗ ☐   2ⁿᵈ ☐   3ʳᵈ ☐   4ᵗʰ ☐   5ᵗʰ ☐

Codes

1=Wheat, 2=Maize, 3=Sorghum, 4=Rice, 5=Sweet potato, 6=Irish potato, 7=Cassava,

8=Taro, 9=Yam,11=Cooking Banana,12=Tomato, 13=Cabbage, 14=Banana (wine),

15=Banana fruit,

16=Passion fruit, 17=Pineapple, 18=Bush Beans, 19=Climbing beans, 20=Peas, 21= Soya,

22=Groundnuts, 23=Tea, 24= Coffee, 25=Tobacco, 26=Sugar cane, 27= Other

specify_____

D 1.3 What % of your total land do you generally use for this crop? _____%

D 1.4 What % of this crop do you directly consume (including animal feed and seeds for

planting)? _____%

D 1.5 What % of your production for this crop do you sell or do you give away? _____%

D 1.6 Of this major crop, approximately what Percentage was wasted or become spoilt, as to

have no value, after harvesting?

D 1.7 How do you normally acquire seeds/planting materials for this crop?

1=Purchase, 2=From other farmers, 3=Gift, 4=From previous harvest, 5=From NGO,

6=From Government, 7=Cooperatives, 8=Other, specify, 9=Not applicable

D1.8 Whom do you sell the majority of this crop to?

1=Purchaser in the field (farm gate), 2=Trader at households, 3=Trader in the village market,

4=Trader at the sector market, 5=Trader in the district, 6=Trader other country,

7=Cooperative,

8=NGO, project,9=Government, 10=Direct to processor/other buyer Individual consumer,

family, Friends, 11=Not applicable, 12=Other, specify_____

D 1.9 Do you intercrop?

1= Yes, 2= No

D 1.0 If intercropped, which is the main intercrop crop?

Indicate main _____

D 1.11 What type of labour did you use in the past one year?

1= Family labour, 2= Hired labour, 3= Both hired and family labour Exchange labour, 4=
Other (specify)

D 1.12 Who normally participates in the following activities?

Land preparation ☐

Planting ☐

Weeding ☐

Pesticide and fumigation ☐

Harvesting ☐

Selling ☐

Postharvest storage ☐

Codes

1=Head of household only, 2=Spouse of head of household only, 3=Household head and
spouse jointly, 4=Men only, 5=Women only, 6=Adults only, 7=Children only, 8=Women and
children,

9=Men and children, 10=Everybody

D 1.13 Who initiates the decisions on the area of land to plant the crop each year?

1=Head of household only, 2=Spouse of head of household only, 3=Household head and
spouse jointly, 4=Other (specify)

D 1.14 Who initiates the decisions on the variety of crop to plant?

1=Head of household only, 2=Spouse of head of household only, 3=Household head and
spouse jointly, 4=Other (specify)

D 1.15 In order to improve incomes from each crop, what main issue needs most attention?

1=Better market information, 2=Better markets / prices, 3=Credit to support production,

4=Government policies or support, 5=Better road infrastructure, 6=Food preservation

support,

7=Other (specify) _____

99=I do not know

D 1.16 Does any household member have membership in farmer cooperative/group?

1=Head of household only, 2=Spouse of head of household only, 3=Household head and

spouse jointly, 4= Other household member (specify)

D 1.17 If yes, what year did the household member join the cooperative/group?

1=Head of household only, 2=Spouse of head of household only, 3=Other household

member (specify)

D 1.17 Do you have access to extension services? ☐   1=Yes, 2=No

D 1.18 If yes, what is the frequency of extension contacts per crop year? _____

SECTION E: SALE OF HARVESTED PRODUCTS

E 1.0 Did the household harvest any of the crops it planted in the last season?

1= Yes, 2=No

E 1.1 If you sold, much did you sell? _____ Kg

E 1.2 If you sold, how did you sell?1=Individually, 2=Collectively with other farmers, 3=Other,
E 1.3How much of the crops did you harvest?_____ Kg

E 1.4Did you sell any of the harvest?

1= Yes, 2= No

E 1.5If sold, who were the major buyer(s)?

1=Other farmers/neighbours nearby, 2=Vendors and traders, 3=Government organizations/institutions,

4=Processors, 5=NGO and projects, 6=Other (specify) _____
E 1.6If sold what was the price in Rwandan francs per kg of produce? Specify_____

E 1.7In what form did you mostly sell the product?

1=Fresh, 2=Dry, 3=Processed, 4=Other, specify _____

E 1.8Who mainly decides how much to sell?

1=Head of household only, 2=Spouse of head of household only, 3=Household head and

spouse jointly, 4=Other household member (specify) _____

E 1.9Who mainly decides how to use the money earned from sale?

1=Head of household only, 2=Spouse of head of household only, 3=Household head and spouse jointly, 4=Other household member (specify) _____

E 1.10If you did not sell any product last season, what was the reason?

SECTION F: MARKETS ACCESS , INFORMATION AND OFF FARM INCOME

F 1.0 How far is the nearest market from your house/village?

1=Less than 1 km, 2=More than 1 km but less than 5 km, 3=More than 5 but less than 15 km 4=More than 15 km,

F 1.1 What is the type of road from the village to the nearest local market? _____

1=Earth road, 2=Laterite/murrum, 3=Tamac road, 4=Other (specify) _____

F 1.2 How long does it take you to get to the nearest market in order to sell product?

1=Less than 30 minutes, 2=Between 30 – 60 minutes, 3=More than 60 minutes

F 1.3 What means of transport do you use to get to nearest market when carrying product to sell?

1=On foot, 2=Bicycle, 3= cycle/tricycle, 4=Ox cart, 5=Vehicle, 6=Public transport

7=Other (specify) _____

F 1.4 Do you own a means of transport? ☐   1=Yes, 2= No

F 1.5 What is the main challenge your household faces when selling harvested food products in the market? ☐

1=Not enough demand (can't sell crops at market), 2=Low food prices, 3=Unpredictable

1=All for food, 2=Did not want to sell, 3=Wanted to sell but price not good, 4=Didn't have someone to sell to /market was far, 5=Buyers rejected product because of poor quality, 6=Will sell in future, 7=Other (specify) _____

price changes, 4=Markets are too far, 5=Bad road to market, 6=Too many taxes or fees in

F 1.6 Do you have access to market information?   1=Yes, 2=No

F 1.7 If yes above, which was the most important source of market information for you in the last 12 months? ☐

1=Newspaper, 2=Farmer cooperatives, 3=Radio, 4=TV, 5=Mobile phone, 6=Community meetings, 7=From the market place (traders, market authorities)

8=Other specify from list _____

(neighbours, friends, family members, church, government extension agents, NGO workers)

F 1.8 Were you satisfied with this source of market information? ☐

1=Very much satisfied, 2=Moderately satisfied, 3=Indifferent, neither, 4=Not satisfied at all

F 1.9 How many household/family members are working away from home and sending money back to the household considering the last 12 months?

F 1.10 In addition to incomes from agricultural crop commodities, are any of the following sources of income for your household?

Employment/paid labour [____]   1=Yes, 2= No

Other business [____]   1=Yes, 2= No

Transfers from relatives [____]   1=Yes, 2= No

Livestock and livestock product sales [____]   1=Yes, 2= No

Other (specify) _____

F 1.11 Estimate income in Rwandan francs   from the sources above in the last 12 months

1=None, 2=1-10,000, 3=10,000-20,000, 4=20,000-50,000, 5=50,000-100,000, 6=100,000-200,000

7=Over 200,000, 99=I do not know

Employment/paid labour [____]

Other business [____]

Transfers from relatives [____]

Livestock and livestock product sales [____]

Other (specify) _____