The impact of transaction costs on the participation of smallholder

farmers and intermediaries in the banana markets

of Burundi, Democratic Republic of Congo and Rwanda.

by

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Submitted in partial fulfilment of the requirements for the degree of

Doctor of Philosophy (Agricultural Economics)

in the

Department of Agricultural Economics, Extension and Rural Development

Faculty of Natural and Agricultural Sciences

University of Pretoria

Pretoria

South Africa

January 2011

DECLARATION

I declare that the dissertation, which I hereby submit for the degree of Doctor of Philosophy in Agricultural Economics at the University of Pretoria, is my own work and has not been previously submitted by me to this or any other University.

DEDICATION

To: Christine, Jethro, Eliab, Nabankema and my parents

ACKNOWLEDGEMENTS

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ABSTRACT

Agriculture is considered a critical sector in attaining economic growth for most economies in Africa. However, for the sector to play its role, it needs to be commercialised to enable smallholder farmers to participate in markets and, hence, improve their incomes and livelihoods. In most developing economies, smallholder farmers find it difficult to participate in markets because of the numerous constraints and barriers mostly reflected in the transaction costs that make access to input and output markets difficult. When analysing the effects of transaction costs on market participation, much attention has been accorded to farmers while ignoring middlemen/traders who are also part of the marketing system. Furthermore, studies on the effect of transaction costs on market participation tend to focus on grains and cereals while ignoring agro-commodities that are more perishable. The purpose of this study was to holistically examine the effects of transaction costs on participation of smallholder farmers and middlemen in banana markets of the Great Lakes region in central Africa.

The study adopted a non-separable household model which incorporated fixed and proportional transaction costs in the function of maximising utility subject to resource constraints. The Heckman procedure was used to determine the factors affecting the

discrete choice of smallholder farmers on whether to sell and quantities to sell while catering for selection biases. Probit analysis was used to determine the farmers' choice of selling point while the ordinary least squares method was used to analyse the extent of participation of traders. Variables capturing transaction costs in regards to information gathering, negotiating, contracting, monitoring and enforcing of contracts were used in the analyses. The empirical analyses were based on secondary data availed for 2666 farming households and 494 traders located in Burundi, Democratic Republic of Congo and Rwanda.

The results of the study indicate that fixed and proportional transaction costs distinctly affect the participation of smallholder farmers in markets. Belonging to farmer groups facilitates information exchange which reduces fixed transaction costs and, hence, increases the likelihood of farmers to participate in markets. The size of a household, distance to markets and ownership of transport means, which is linked to proportional transaction costs, influence the extent of farmer participation in markets. The choice of selling point was significantly influenced by household size, the gender of the household head, off farm revenue, access to price information and the extent of remoteness of household. The effects of transaction costs on market participation of smallholder farmers were more evident in the analyses for bananas than in the one for beans. The participation of traders was significantly influenced by gender, trading experience and supply distance which relate to the bargaining prowess, business networks and per unit transport cost, respectively.

Interventions geared towards supporting associations for farmers may facilitate information exchange and enhance bargaining and contracting skills which subsequently reduce transaction costs. Policies aimed at supporting investment in rural infrastructure, in terms of feeder road networks and market places, can lead to reduction in transaction costs and thereby enhance participation of farmers and traders in markets.

Key words: Transaction costs, Market participation, Bananas, Smallholder farmers, Middlemen

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

CIALCA	Consortium for Improving Agriculture-based Livelihoods in Central Africa
DFID	The UK's Department For International Development
D.R.Congo	The Democratic Republic of Congo
FTCs	Fixed Transaction Costs
GDP	Gross Domestic Product
kg	Kilogramme
km	Kilometres
ha	Hectares
HHs	Households
ICTs	Information and Communication Technologies
IITA	International Institute of Tropical Agriculture
IRAZ	Institut de Recherche Agronomiques et Zootechnique
INERA	National Agricultural Research Institute of Congo
ISABU	Institut du Sciences et Agronomique du Burundi
ISAR	Institut du Sciences et Agronomique du Rwanda
mt	Metric tons
PPP	Purchasing Power Parity
PTCs	Proportional Transaction Costs
FTCs	Fixed Transaction Costs
TCs	Transaction Costs
US$	United States Dollar

CHAPTER 1

INTRODUCTION

1.1 Background

The challenges of smallholder farmers, especially in sub-Saharan Africa, are multifaceted and tackling them requires numerous interventions. These may include institutional reforms that facilitate efficient rural service delivery, development of markets, physical infrastructure and supportive government policies while ensuring a stable and conducive political environment. As the agricultural sector in developing countries transforms towards commercialization, the smallholder farmers and intermediaries require systems that are responsive to their needs, which include access to markets, market information, market intelligence and effective farmer organization. Though marketing chains are changing, smallholder farmers in most developing countries are not yet able to meet the requirements of high-end markets (i.e. supermarkets) and, hence, the traditional markets still play a vital role in the agricultural marketing systems in sub-Saharan Africa (Reardon, 2003).

The region covered in this study comprises of Burundi, parts of the Democratic Republic of Congo (DRC), formerly known as Zaire and Rwanda (Figure 1). This region has a recent history of political instability which has disrupted much of the economic activities. However, as stability returns to the area, policies targeting poverty eradication and economic growth ought to be prioritised. Agriculture is the main economic activity, contributing more than 30% to the national income in each of the three countries. The majority of the population in the region practices small-scale agriculture, with bananas (including plantains) being a predominant crop. Uganda and Tanzania neighbour this highly mountainous region to the north and east respectively, whereas the eastern DRC

border is largely running across Lake Kivu (DRC-Rwanda) and Lake Tanganyika (DRC-Burundi).
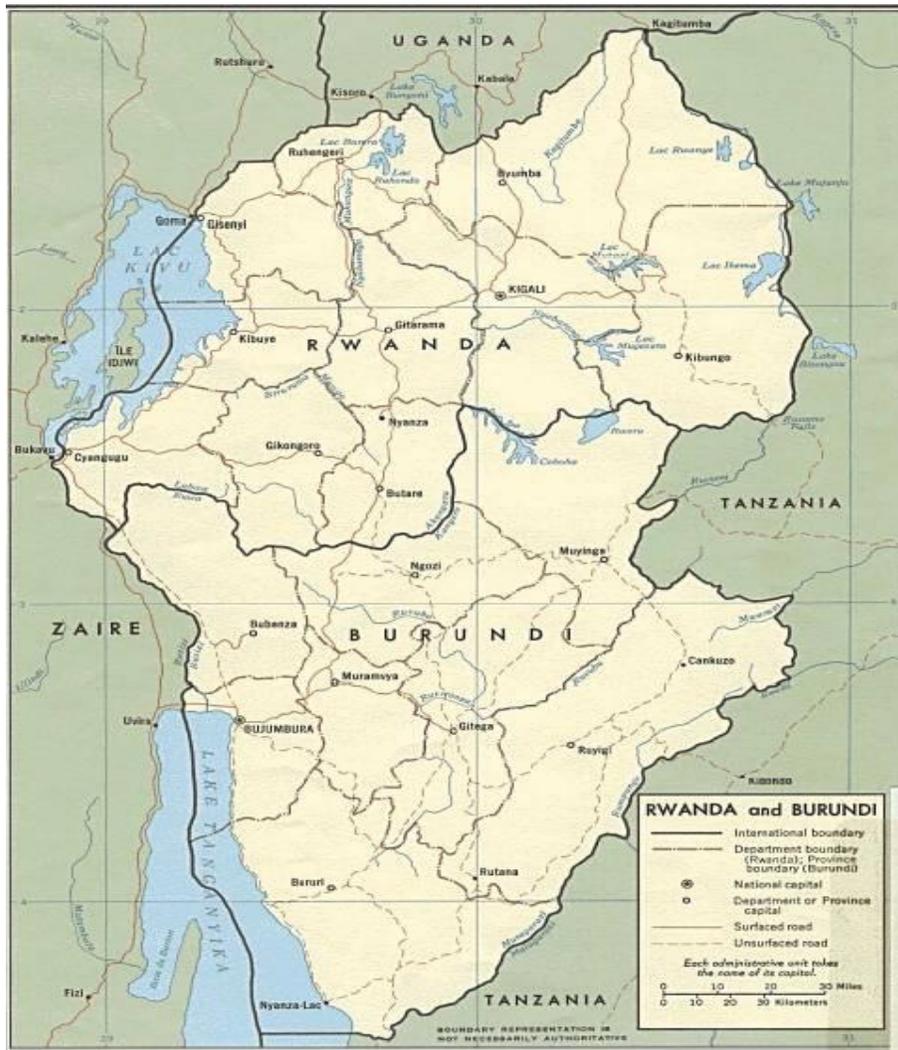
Figure 1: Geographical map of the study area

Burundi, which borders Rwanda to the south, has a population of 8.7 million with a population growth rate of 3.4% per annum (CIA, 2008b). Burundi's GDP (at PPP) was estimated at US$6.39 billion in 2007 while GDP (at the official exchange rate) was estimated at US$989 million (CIA, 2008). The real GDP growth rate is estimated at 5.5% whereas GDP per capita (at PPP) is estimated at US$800 (CIA, 2008). The agricultural

sector contributes 34% to the GDP while industry contributes 21% and the service sector 45% (CIA, 2008b).

The Democratic Republic of Congo, which is the second largest country in Africa, has a population of about 67 million and an annual population growth rate of 3.2% (CIA, 2008c). The Democratic Republic of Congo's GDP (at PPP) was estimated at US$18.8 billion in 2007 and its GDP (at official exchange rate) was estimated at US$10.1 billion with a real growth rate of about seven percent per annum. The GDP per capita (at PPP) is estimated at US$300 (2007 est.; CIA, 2008). The contribution of the various sectors to GDP is as follows: agriculture (55%), industry (11%) and services (34%) (CIA, 2008c).

Rwanda has a population of 10.2 million with a population growth rate of 2.8% per annum (CIA, 2008a). The country is considered the most densely populated in Africa. About 90% of the population in Rwanda is engaged in agriculture, which is predominantly subsistence oriented. Rwanda's GDP (at PPP) is valued at US$8.6 billion and the GDP (at the official exchange rate) is valued at US$2.8 billion with a real growth rate estimated at 6% per annum (2007 est.; CIA, 2008). The agricultural sector contributes 38.2% to the GDP while industry and services contribute 20.1% and 41.7%, respectively. GDP per capita (at PPP) is estimated at US$ 1,000 (CIA, 2008a).

Considering that agriculture remains a major sector in most economies in Africa, commercialization of the sector necessitates improving the ability of smallholder farmers to participate in markets. The importance of market participation is based on the premise that incomes and, hence, the livelihoods of smallholder farmers are likely to improve if they gain greater access to markets for the commodities they produce. Markets and

improved market access for poor rural households are a prerequisite for enhancing agriculture-based economic growth and increasing rural incomes. Intensification of agricultural production systems and increased commercialization must be built upon the establishment of efficient and well-functioning markets and trade systems that keep transaction costs low, minimize risk and extend information to all actors, particularly those living in areas of marginal productivity and weak infrastructure (IFAD, 2003; World Bank, 2008).

However, in most developing economies, smallholder farmers find it difficult to participate in markets because of the numerous constraints and barriers. The costs associated with exchanging goods or services tend to inhibit the participation of smallholders farmers and traders in markets (Pingali et al., 2005; Delgado, 1999; Holloway et al., 2000).

1.2 The Research problem

Though several previous studies (e.g. Goetz, 1992; Key et al., 2000; Makhura et al., 2001) have made fair attempts to analyze the effects of transaction costs on participation in agro-commodity markets, these studies have mainly focused on the smallholder farmers and accorded little attention to the participation of intermediaries operating in such marketing systems.

Watanabe (2006) argues that middlemen/intermediaries usually emerge endogenously to intermediate between homogenous buyers and sellers in the presence of coordination frictions. They set prices to compete in the market and they hold an inventory to provide a matching service. The inventories held by intermediaries can mitigate trade imbalances

and interact with price competition to generate a trade-off for the equilibrium price determination. However, Biglaiser (1993) ascertains that intermediaries are mainly driven by the obligation of maintaining a loyal customer base which they would not like to disappoint in terms of quality of commodity and consistency in supply in order to justify their existence and their profit margins.

Despite the moral hazard threats that portray intermediaries as exploiters only interested in creating huge profit margins for themselves, the existence of intermediaries ought to be viewed as a means of facilitating the participation of smallholder farmers in markets. The importance of the roles and functions of intermediaries are outlined in several studies (e.g. Biglaiser, 1993; Chowdhury, 2002; Fafchamps & Hill, 2005; Watanabe, 2006).

Several studies on marketing of staples such as bananas in sub-Saharan Africa (e.g. Collinson et al., 2002; Spilsbury et al., 2004; Jagwe et al., 2008) indicate that intermediaries are heavily involved in the marketing of commodities, especially in areas where farmers are remotely located and where the infrastructure is poor. Intermediaries play a crucial role of sourcing, assembling and bulking the commodity prior to transporting to urban places. Intermediaries create a margin to offset the costs they incur for the services rendered. However, their services are usually misconstrued and considered to lead to a reduction of farmers' margins. Some farmers make attempts to link directly to the markets without going through intermediaries as means of obtaining higher prices. However, they do require the necessary expertise and skills to successfully participate in markets directly (Chowdhury, 2002).

Considering this background, when analyzing the effects of transaction costs on participation in markets, the focus should not be on smallholder farmers alone, as has been the case with several previous studies (e.g. Goetz, 1992; Key et al., 2000; Makhura et al., 2001). Instead, the analysis should include the intermediaries because of the vital role they often play in the marketing of agricultural commodities. Their inclusion in studies of this nature provides a more holistic perspective of the effects of transaction costs on market participation and allows for holistic recommendations for improvement.

The novelty of this study, therefore, is to develop an approach that looks at both the smallholder farmers and the intermediaries in a holistic manner and how their participation in banana markets is affected by transaction costs. This approach takes into account the objective functions and constraints of both parties while linking them to transaction cost-related factors.

Furthermore, past efforts have mostly focused on commodities that have a relatively long shelf life such as grains and cereals and little attention has been accorded to commodities of relatively high perishability (e.g. staples such as bananas, cassava, potatoes and other roots and tubers). Regardless of their importance, in terms of food security and income generation, choosing to focus on bananas is crucial for obtaining a better understanding of the effects of transaction costs on participation of actors dealing in a highly perishable agricultural commodity.

1.3 Objectives of the study

The overall objective of the study is to investigate the effects of transaction costs on the participation of smallholder farmers and intermediaries in the banana marketing systems of Burundi, Democratic Republic of Congo and Rwanda.

The specific objectives of the study are:

a) to determine the effects of transaction costs on the discrete decision of smallholder farmers to participate in banana markets;

b) to determine the effects of transaction costs on the intensity of participation of smallholder farmers and intermediaries in banana markets;

c) to compare the effects of transaction costs on the participation of smallholder farmers in the marketing of highly perishable staples such as bananas and commodities which are less perishable (e.g. beans);

d) to examine whether there are any differences between smallholder farmers and intermediaries in regard to the effects of transaction costs on their participation in banana markets;

e) to examine the effects of transaction costs on the farmers' choice of selling point of the commodity; and

f) to determine whether the involvement of intermediaries enhances or inhibits the participation of smallholder farmers in banana markets.

1.4 Hypotheses

The hypotheses of this study basically emanate from the transaction cost theory which was developed by Coase (1937) while attempting to define the relationship between a

firm and the market. Transaction costs may be defined as the costs incurred in making an economic exchange or the cost of participating in a market. The transaction cost theory refers to the costs of obtaining information, bargaining, contracting and enforcing that parties stick to their contractual obligations in order for an exchange of goods or services to occur.

The hypotheses of the study are as follows:

Hypothesis (a): The effect of transaction costs on the participation of smallholder farmers and intermediaries is greater in the marketing of highly perishable staples (e.g. bananas) than for less perishable staples (e.g. beans). The behaviour of farming households when marketing highly perishable commodities, as compared to the less perishable, is based on transaction costs relating to searching for buyers, making contracts and enforcing them (Coase, 1937). Considering that bananas should be harvested and consumed in a short span of time to avoid quality degeneration, the need to sell such a perishable commodity urgently has an implication for the transaction costs to be incurred. Farmers and traders involved in banana marketing may be obliged to expend more resources looking for buyers so as to avoid the eventual losses in case the transactions fail to occur in the limited time period (Poulton et al., 2006).

Hypothesis (b): The participation of smallholder farmers and that of traders/middlemen in banana markets is not equally affected by transaction costs. Since transaction costs, undoubtedly, affect the process of exchanging goods and services, each of the actors in this process is exposed to these effects. However, the ability to economise on transaction costs differs amongst the actors and hence determines the intensity of participation.

Biglaiser (1993) argues that middlemen have better expertise to economise on transaction costs than the producers of the commodity.

Hypothesis (c): Transaction costs influence the decision of farmers regarding the point of sale of their produce such that the greater the costs, the less likely it is for farmers to travel to the markets to sell their commodities. Transaction cost theory has in the past been used to explain the behaviour of smallholder farmers in relation to the markets (Goetz, 1992; Key et al., 2000; Makhura et al., 2001; Fafchamps & Hill, 2005). The farmers' decision on whether to travel to market places and sell their produce at a higher price as compared to selling from home is determined by the magnitude of transaction costs to incur and the price offered at the market places.

Hypothesis (d): The involvement of intermediaries enhances the participation of smallholder farmers in banana markets. Middlemen/intermediaries are economic agents who specialize in the activities of buying and selling the same products. They play the role of mediating between the seller of a product and its potential buyers. Biglaiser (1993) argues that intermediaries emerge because they are able to economize on the cost of transactions and information asymmetries. Considering that transaction costs refer to time, effort, resources and monetary costs of searching out, negotiating and consummating an exchange, middlemen may be considered as cost-reducers since they perform the function of linking sellers to buyers. The expertise, networks and experience they accrue enables them to conclude transactions much faster thus allowing for repeated exchange of products to occur more frequently (Kirsten & Vink, 2005; Biglaiser 1993).

1.5 Definition of key terms

Smallholder farmers

For purposes of this study, "smallholder farmers" shall refer to farming households with land holdings of less than ten hectares.

Middlemen/intermediaries

The term "intermediaries", which is used interchangeably with the term "middlemen", shall refer to persons engaged in buying and selling activities within the marketing system. These persons may also be referred to as traders.

Participation

Participation shall refer to any situation which involves the exchange of goods (i.e. bananas) for money regardless of location. The discrete choice of participation refers to whether farmers or intermediaries do engage in selling activities regardless of the points of sale and quantities sold. The intensity of participation shall refer to the quantities of commodity sold by either party in a defined time period.

Transaction costs

Transaction costs refer to costs incurred when looking for a trading partner, negotiating with them, making a contract and enforcing it. Transaction costs could be in terms of money spent or the opportunity cost of time spent.

Bananas

The term "bananas" shall refer to all types of bananas and plantain produced and marketed in the study area. These include the cooking types, the dessert types, the beer types the roasting type or plantain.

1.6 Organisation of the dissertation

The rest of the dissertation is organised as follows: Chapter two gives an overview of the banana industry in the Great Lakes region of central Africa, highlighting levels of production, importance to livelihoods, consumption behaviour and marketing channels. Chapter three describes the conceptual framework on which the study is based while defining transaction costs and the role of middlemen in marketing. The sources of data for the study and sample composition are described in chapter four. This chapter also describes and defines the variables used in the analyses. Chapter five reviews previous approaches used in analysing transaction costs and market participation and outlines the approach adopted in this study. The measurement and estimation procedures are discussed in chapter six and the results of the analyses presented in chapter seven. The dissertation concludes with a summary of the study, major findings and policy implication in chapter eight.

CHAPTER 2

THE BANANA INDUSTRY IN THE GREAT LAKES REGION

This study focuses on banana marketing in Burundi, parts of the Democratic Republic of Congo and Rwanda, where the International Institute of Tropical Agriculture (IITA), under the Consortium for the Improvement of Agriculture-based livelihoods in Central Africa (CIALCA) is implementing a comprehensive project. The project is aimed at improving the livelihoods of households engaged in banana production through soil, agronomic and marketing interventions. Bananas are given the spotlight in this study due to their relatively high importance in the area. The Great Lakes region of central Africa, specifically Burundi, the eastern parts of the Democratic Republic of Congo and Rwanda has experienced political instability in the recent past. Some of the areas are still experiencing sporadic occurrences of conflict and this has had negative impacts on the economic growth of the area.

2.1 Banana production in the Great Lakes region

Globally, Burundi and Rwanda rank among the top 20 largest producers of bananas and plantains (FAOSTAT, 2008) and are among the largest banana producers in sub-Saharan Africa (Figure 2). In Burundi, bananas are ranked highest among the major agricultural commodities produced, with production for the year 2007 estimated at 1.60 million mt per annum and valued at about US$230 million (FAOSTAT, 2008).
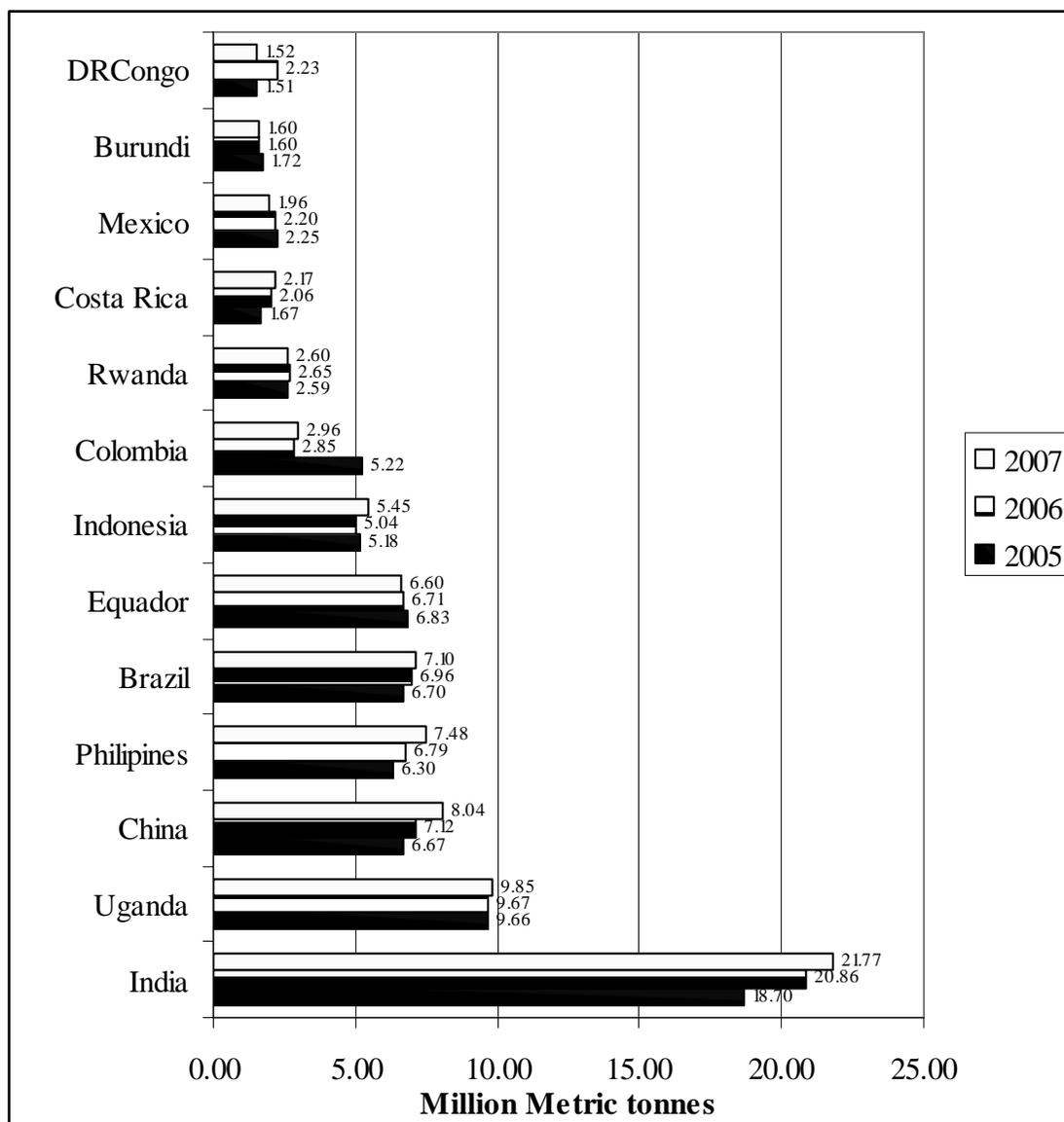
Figure 2: World's leading banana producers (2004-2006)
Source: FAOSTAT (2008)

The Democratic Republic of Congo is also a major producer of bananas with an estimated production of about 1.52 million mt in 2007. Bananas rank second after cassava as an important agricultural commodity produced in terms of quantity and value (Jagwe et al., 2008). The South Kivu province is quite prominent in banana production and has significant trade activities with the neighbouring countries such as Tanzania, Rwanda and Burundi where the Kiswahili language is the commonest medium of communication facilitating information exchange and trade. Bukavu, the largest city and

capital of the province, is instrumental in the cross border trade of bananas and other agricultural commodities in the region due to its strategic geographical location near the Rwanda border and on the shores of Lake Kivu.

In Rwanda, bananas are grown on 213000 ha of land, occupying 23% of total arable land (Mpyisi et al., 2003) and contributing more than 50% of the annual crop production in terms of fresh weight (RADA, 2007). Annual banana production in 2007 in Rwanda was about 2.60 million mt as shown in Figure 2.

2.2 Importance of bananas to livelihoods

About 80% of Rwandan households practice banana production mainly for household food security and income generation. A typical household's agricultural enterprise regime comprises 50% tubers, 30% bananas and 20% legumes, cereals and vegetables (RADA, 2007). The commonly produced banana types include the beer and cooking varieties. Generally, the beer banana types comprise 64% of the total banana production in Rwanda while the cooking types comprise 30% and the dessert types about 6% (Gaidashova et al., 2005).

In Burundi, the beer banana types are largely produced in Cibitoke and Kirundo provinces while the cooking and dessert types are mainly produced in Gitega province (CIALCA, 2007). In the South Kivu province of the Democratic Republic of Congo, the cooking and dessert types are mainly produced in Luhihi and Irhambi/Katana groupements of Kabare territory. The beer banana types are largely produced in Burhale and Luhihi groupements of Walungu and Kabare territories, respectively. Surplus

production is exported to Rwanda using water transport along Lake Kivu. Some of the exports from this region go through Bukavu and then cross to Cyangugu in Rwanda.

2.3 Banana consumption in the study area

Bananas are consumed in various forms; mostly as cooked, roasted, dessert, brew, and juice. The demand for the cooking types is increasing rapidly in the urban areas due to rural-urban migration and changing consumer preferences. In Rwanda's capital city of Kigali, the demand for cooking banana types has recorded a 50% increase over the past ten years (Spilsbury et al., 2004). Likewise, demand in the other urban centres in the study region is increasing rapidly. The beer banana types are mostly processed into a brew consumed within the household or in restaurants. This processing is mainly done informally by individual households or traders. The dessert types are mostly consumed fresh whereas the plantains are mostly roasted and consumed in households or sold in urban centres and roadside markets. Since production levels of the dessert and plantain types are not as high as the beer and cooking types, their consumption zones are quite indefinite with a fair spread across most communities (Jagwe et al., 2008).

There is little or no consumption of plantains in Rwanda and Burundi. The main source of cooking bananas for the households is from own production in all the three countries. In South Kivu, the main source of plantain is own production. For beer bananas, a number of households rely either on purchases alone or both own production and purchases.

2.4 Banana marketing channels and chain actors
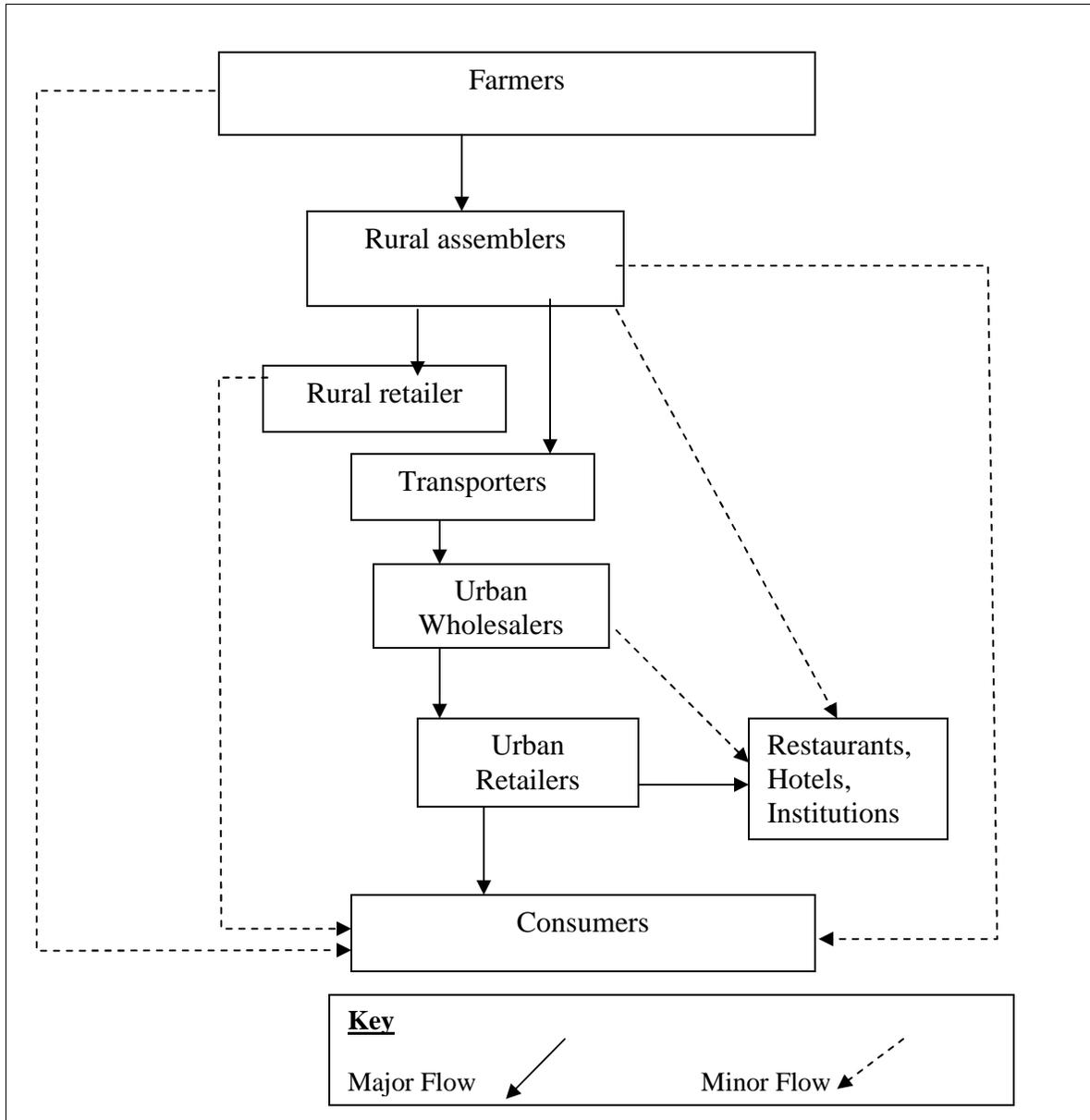
Figure 3: The marketing channels of bananas (all types except beer) in D.R.Congo, Rwanda and Burundi
Source: Jagwe et al. (2008)

The marketing channel for all types of bananas traded in the region is depicted in Figure 3. There is limited coordination of activities between the supply chain participants and activities and many of the contractual arrangements are informal. The channel is

relatively long. The smallholder farmers mostly sell their produce to rural assemblers at the farmgate and these occasionally travel to local markets to sell directly to consumers.

The rural assemblers subsequently sell the produce to either transporters or to rural retailers. The transporters are often hired by urban wholesalers and their task is simply to deliver the produce to the wholesalers in urban markets where it is dispersed to urban retailers, institutions, restaurants and hotels. The urban retailers mostly sell their produce to consumers. Bananas are commonly sold in bunches or as heaps of fingers. It should be noted here that the wholesalers seem to wield the greatest influence in the supply chain. They have the largest operating capital, hire the transport and also handle the largest volumes of the produce. They sometimes offer storage for the produce and may also extend some credit facilities to the other traders in the chain.

Although the cooking banana types mainly follow the channel represented in Figure 3, the beer banana channel differs quite a bit and is relatively short. Figure 4 shows the marketing channel for beer bananas. From the farmer, the bananas are either sold directly to processors or to travelling traders who subsequently sell them to processors. Once the beverage has been made, it is either sold to retailers who sell to consumers or it is sold directly to the consumers.

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                    ┌─────────────────────────────┐
                    │           Farmers           │
                    └─────────────────────────────┘
                         │          │          │
                         │          ▼          │
                         │   ┌──────────────┐  │
                         │   │ Travelling   │  │
                         │   │ Traders      │  │
                         │   └──────────────┘  │
                         ▼          │          ▼
                ┌──────────────────┐│    ┌──────────────┐
                │    Processors     ││    │   Retailers  │
                └──────────────────┘     └──────────────┘
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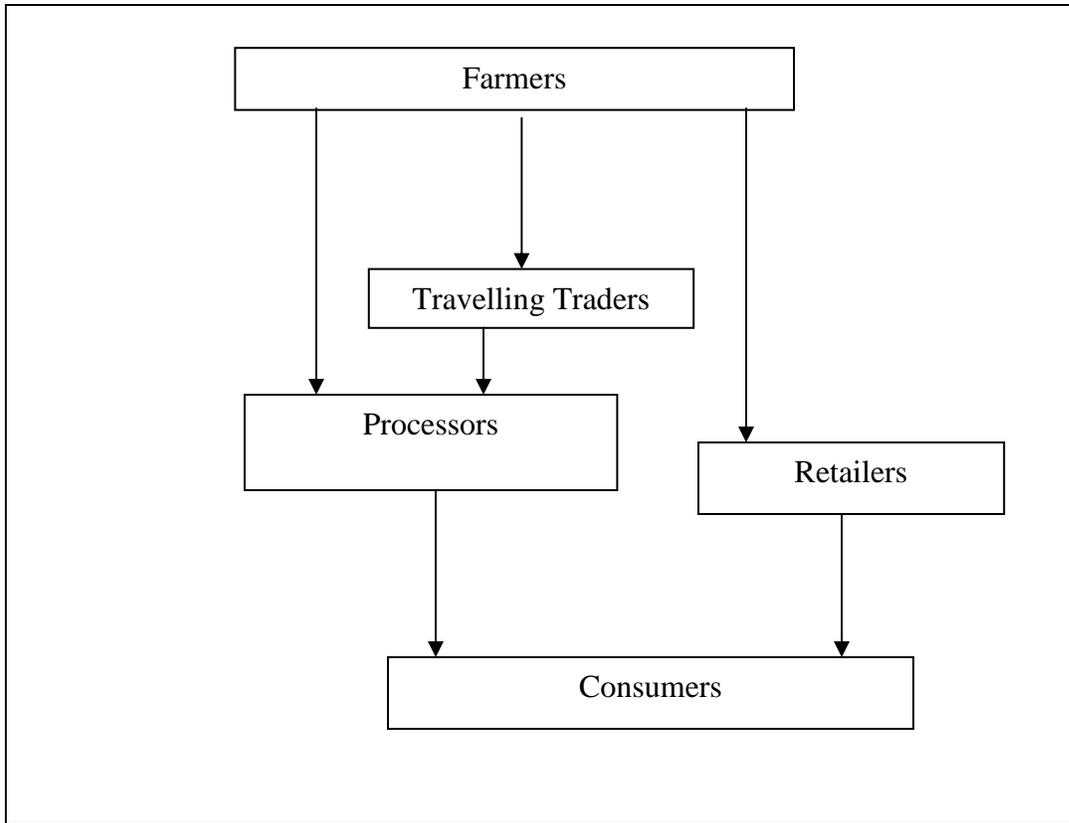
Figure 4: The beer banana marketing channel
Source: Jagwe et al. (2008)

2.5 Summary

The prominence of banana production and the importance of bananas to the livelihoods of the population in the study area have been highlighted. The different forms in which bananas are consumed have been mentioned and the marketing channels that are used in the study area for the beer and cooking types have been illustrated. The roles of the chain actors have been explained.

CHAPTER 3

DETERMINANTS OF MARKET PARTICIPATION OF SMALLHOLDER FARMERS AND INTERMEDIARIES IN DEVELOPING COUNTRIES

3.1 The conceptual framework

Market participation of smallholder farmers and intermediaries is affected by numerous factors, including government policies relating to infrastructure development, price controls and taxes (Figure 5). Socio-economic factors, cultural factors and external factors such as political stability of the nation, natural disasters and calamities also affect market participation. These factors could have positive or negative effects, which could either improve or cause a decline in the welfare of the actors as illustrated in Figure 5. The point of departure is that greater market participation of farmers and intermediaries results in more commodities being traded and this may lead to more revenue being obtained by the actors. In the case of farmers, this becomes an incentive to increase production and hence a positive supply response is achieved (Escobal and Torero, 2006; Omiti et al., 2009).

This conceptual framework builds upon the World Bank's framework for agricultural development (World Bank, 2008) and the DFID framework for promoting agricultural growth in Africa (DFID, 2006). The premise behind the DFID framework is that markets that work well are essential for stimulating productivity and profits which, in turn, stimulate agricultural growth and reduce poverty. Building effective markets requires a supportive policy environment which ensures improvement in infrastructure, communications and removal of barriers. This helps agri-businesses to grow and thereby benefits producers and the public in the long term. Reducing transaction costs and risks

in agro-commodity markets can promote faster growth and benefit the poor (World Bank, 2008).
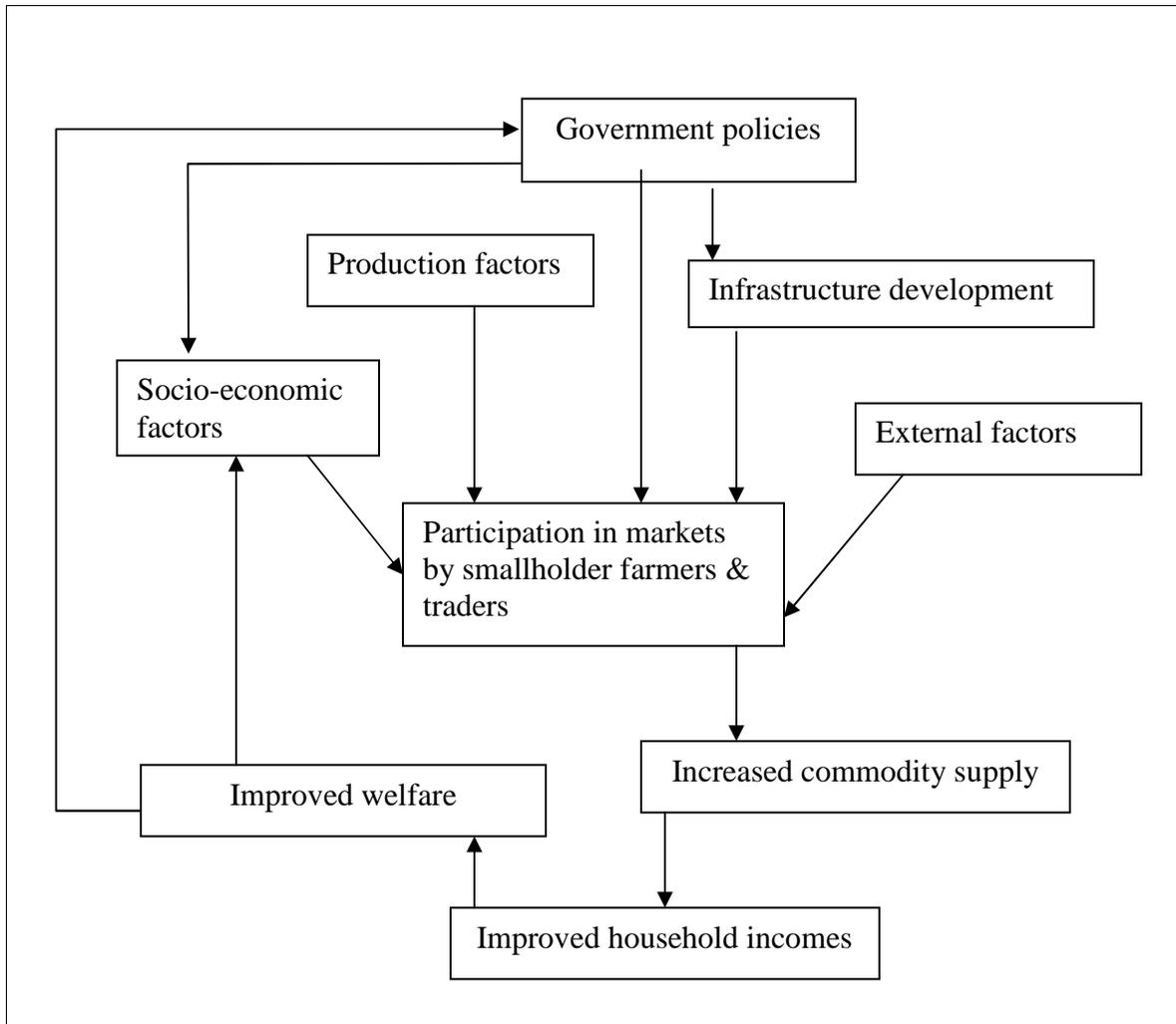
Figure 5: Factors affecting market participation of smallholder farmers and traders

Matungul et al. (2002) earlier argued that investment in public goods such as roads, telecommunications and an efficient legal system (to uphold commercial contracts), and farmer support services (extension, marketing information and research) would raise farm and non-farm income by reducing transaction costs. This would increase the effective demand for locally produced goods and services, thus contributing to rural employment and livelihoods within rural communal areas.

Previous studies (e.g. Goetz, 1992; Omamo, 1998; Key et al., 2000; Makhura et al., 2001) have sought to understand the factors that influence the discrete decision agricultural households have to make on whether to participate in markets or not. Participation can take on a trichotomy of some households being net buyers, while others are net sellers and some remain non-participants. This decision is not only affected by unobservable variables such as risk and preferences but also additional factors which affect household production and costs associated with market transactions.

3.2 Transaction costs

The decision to participate in markets is not only influenced by prices, but also several other factors which are characteristic of both the farming household and environment in which the smallholder farmers and intermediaries operate. The majority of smallholder farmers in developing countries are located in remote areas with poor infrastructure and they often fail to participate in markets due to the high transaction costs involved (Goetz, 1992; Key et al., 2000; Makhura et al., 2001). Sometimes the transaction costs are so high that markets can be said to be "missing" while in other instances, farmers may choose to remain self-sufficient in order to minimize the transaction costs (Omamo, 1998; Key et al., 2000).

New Institutional Economics defines transaction costs as costs relating to searching and gathering information on agents and goods or services. They involve costs of bargaining and negotiating contracts while including costs of monitoring and enforcement (Bromely, 1991). However, Eggertson (1990) defines transaction costs as costs which arise when activities such as information searches, bargaining, contracting, monitoring, enforcement and protection of property rights are done. Transaction costs are mostly considered as

hidden costs due to lack of a clear cut definition and the difficulty in measuring them. Indeed, many forms of transactions may not take place when costs of transacting are very high (Key et al., 2000). More often, transaction costs are captured as opportunity costs faced by individuals in the process of exchanging property rights (Kirsten & Vink, 2005).

Transaction costs, whether observable and unobservable, are associated with the exchange of goods or services and are often the embodiment of access barriers to market participation of smallholder farmers (Coase, 1960; Delgado, 1999; Holloway et al., 2000; Makhura et al., 2001). Likewise, Kirsten & Vink (2005) define transaction costs to include costs associated with searching for a trading partner with whom to exchange, costs of screening and bargaining with the partner and then costs of enforcing the contract made with the trading partner. Transaction costs also include costs associated with reorganizing household labour and other resources in order to produce a marketable surplus (Makhura et al., 2001).

3.3 Selling directly versus selling through intermediaries

Though farmers typically have to choose between selling their output at the farmgate or transporting it to the nearest market, selling at the farmgate is often less remunerative. In some situations, it may be the only alternative open to farmers who cannot afford carrying their crop to the market, usually located many miles away (Fafchamps & Hill, 2005). The choice of farmers to sell directly or through intermediaries is also influenced by transaction costs and several other factors. Cheung (1969) earlier argued that risk aversion was strongly related to the choice of market institution.

Farmers are constantly faced with the challenge of optimizing their production to maximize revenue while minimizing costs. However, farmers can only obtain revenue once the commodity has been purchased by a trading partner. This may occur at the farmers' premises or at a market place. Farmers are, therefore, faced with a constant challenge of deciding at which point they should sell their commodities. This decision is based on the benefits and costs involved which relate to transport to the market place, the certainty of getting buyers, the quantity of commodity, price expected, payment terms, capacity to store unsold commodities and the nature of the commodity itself. Most of the determinants of points of sale are associated with transaction costs which by definition can be summarised as costs of looking for a trading partner, making and enforcing contracts (Delgado, 1999; Holloway et al., 2000).

Transaction costs are broadly categorised into the following: i) information and search costs, ii) negotiation and contracting, and iii) monitoring and enforcement costs. The first category involves gathering information about potential buyers of the product, price offers, delivery mode, terms of payment and possibly frequency of repeat transactions. The second category involves building consensus on the price, quantity, quality, terms of payment and mode of delivery. The third category involves making sure that what has been agreed upon in the contract is adhered to.

Nonetheless, transactions do occur when producers deal directly with consumers or indirectly through intermediaries (middlemen). Intermediaries are economic agents who specialize in the activities of buying and selling the same products and, in Africa, they are commonly referred to as middlemen. The existence of friction in trade gives rise to the function of intermediation. Middlemen play the role of mediating between the seller of a

product and its potential buyers. In instances where transactions are direct (i.e. without involving the middlemen), the seller and buyers share the trade surplus. However, in instances where middlemen negotiate the trade, the middlemen share the surplus with the sellers and the buyers. The economic literature rationalizes the intermediation by arguing that intermediaries emerge because they are able to economize on the cost of transactions and information asymmetries (Chowdhury, 2002; Chowdhury et al., 2005).

Though neo-classical economists essentially assume that information is perfect and costless, this assumption does not comply with reality, especially in developing countries (Stiglitz, 1988). Each step in a transaction is associated with a cost which generates a wedge between the buying price and the selling price. One of the fundamental sources of transaction costs affecting both the smallholder farmers and the intermediaries is the cost of obtaining information (Sheperd, 1997). Since information is not perfect and costless, this has important implications for contracts and transactions. This was earlier pointed out in work pioneered by Coase (1937) and later expanded in Coase (1960) emphasizing that market exchange is not costless. In developing countries, economic agents overcome information problems and other setbacks of adverse selection and moral hazard through informal arrangements and institutions. The existence of intermediaries can, therefore, be viewed as one of the arrangements to overcome the problems of transaction costs and imperfect or costly information.

However, farmers often view middlemen as exploiters who offer them low prices and sell to buyers at higher prices. Farmers, sometimes, endeavour to bypass middlemen and sell directly to the buyers at the end of the supply chain but this involves costs which are not anticipated by farmers. Middlemen have over time gained expertise in minimizing

transaction costs and, hence, there is a continuous debate about the gains and losses of selling through middlemen or directly (Fafchamps & Hill, 2005; Chowdhury et al. 2005).

3.4 Traders' participation in banana markets

Intensification of agricultural production systems and increased commercialization must be built upon the establishment of efficient and well-functioning markets and trade systems that keep transaction costs low, minimize risks and extend information to all actors (von Braun, 2008). Actors include farmers, traders/middlemen and consumers.

Numerous studies have accorded much attention to the effects of transaction costs on smallholder farmers mainly focusing on their decision to participate in markets and extent of participation (e.g. Goetz, 1992; Key et al., 2000; Alene et al., 2008; Omiti et al., 2009). However, when farmers choose to participate beyond the farmgate, this implies that they become prone to experiencing the challenges traders commonly face. Questions are often asked about how capable farmers are in handling these challenges and whether the returns to participating beyond the farmgate supersede the opportunity cost of their time and other resources expended in the process (Fafchamps & Hill, 2005; Chowdhury, 2002).

Smallholder farmers in the Great Lakes region are mostly located in remote areas which are distant from market places and where the physical infrastructure is weak. Due to their nature and scale of operation, selling their produce at farmgate is often the easier option. However, this option usually places the farmers in a vulnerable position in regards to obtaining favourable prices for their produce, especially when the commodity handled is highly perishable and when the farmers lack information about market prices of the

commodity elsewhere. Farmers are thus caught up in a *prisoner's dilemma* kind of situation whereby if they decide not to sell to the traders, the produce may deteriorate in quality and if they choose to sell, they may obtain unfavourable prices (Dasgupta & Heal, 1980).

However, it is not conclusive enough to only focus on the farmers' dilemma. There is a need to also realise that traders/middlemen play a crucial role of moving the commodity off the farms to the markets where it can be purchased by the consumers. They too face the challenges associated with weak infrastructure and high transaction costs which characterise trade in most developing countries. Biglaiser (1993) emphasises that middlemen have an incentive to invest in skills that enable them detect the true quality of a commodity. Also, middlemen have an obligation of maintaining a loyal customer base which they would not like to disappoint in terms of quality of commodity and consistency in supply. These two attributes cause middlemen to behave in a manner that may increase efficiency in a marketing system. Over time, middlemen emerge as specialists in differentiating the quality of goods and as assurance givers to buyers about the quality of goods and consistency in supply. Hence, it is important to understand the common interest of both parties (i.e. farmers and intermediaries) and to identify policy interventions that would create benefits for them.

3.5 The analytical framework for market participation

The model used to analyse market participation of smallholder farmers in banana markets incorporates transaction costs into an agricultural household model framework. This involves postulating that the objective of households is to maximise their utility subject to a set of constraints which include cash and resource constraints. The model must include

variables that capture fixed and proportional transaction costs that affect farmers' participation in banana markets.

Similarly, a model for middlemen is developed to incorporate transaction costs. The model postulates that the objective function of middlemen is to maximise profits subject to a set of constraints, which include transaction costs. Likewise, the model must include variables that capture the effects of both fixed and proportional transaction costs on the participation of middlemen in banana markets.

Considering an approach used by Key et al. (2000), a static model is constructed. The model concentrates on the role of transaction costs, ignoring other aspects such as risk or credit constraints which also give rise to production and trading behaviour similar to those of markets characterized by high transaction costs (Finkelshtain and Chalfant, 1991). Key et al. (2000) argue that constructing a complete model may improve the relevance of its prediction but blur the particular interest of transaction costs which is of particular interest in this study.

3.5.1 Producers

Incorporating transaction costs into an agricultural household model framework, market participation is conveniently specified as a choice variable. In addition to deciding how much of each good i to consume (c_i), produce (q_i), and use of input x_i, the household also decides how much of each good to sell (m_i). When the household sells the goods it produces, m_i assumes a positive. However, when the household purchases such goods, m_i

assumes a negative sign. Supposing there were no transactions costs, the household's problem would be to maximize the utility function (1) subject to (2)-(5):

(1)   Maximize; $u(c; z_u)$ the utility function

Subject to

(2) $\sum_{i=1}^{N} p_i^m m_i + T = 0$ the cash constraint

(3) $q_i - x_i + A_i - m_i - c_i = 0$ the resource balance (where $i = 1,....N$)

(4) $G(q, x; z_q) = 0$ the production technology

(5) $c_i, q_i, x_i \geq 0$ the non-negativity condition

where p_i^m is the market price of good i, A_i is endowment in good i, T is exogenous transfers and other incomes, z_u and z_q are exogenous shifters in utility and production, respectively, and G represents the production technology. The cash constraint (2) states that expenditures on all purchases must not exceed revenues from all sales and transfers. The resource balance (3) states that, for each of the N goods, the amount consumed, used as input, and sold is equal to what is produced and bought plus the endowment of the good. The production technology (4) relates inputs (e.g. land, labour) to outputs.

Proportional transaction costs (PTCs) raise the price paid by a buyer and lower the price received by a seller and these costs may include transportation and marketing costs (Key et al., 2000). However, fixed transaction costs (FTCs) are invariant to the quantity transacted; hence they are generally unobservable though factors z_t^s and z_t^b with coefficients δ_i^s and δ_i^b, respectively, can explain these costs. Incorporating both the FTCs and PTCs into the cash constraint of a household, it can then be expressed as shown in equation (6);

(6) $$\sum_{i=1}^{N}[(p_i^m - t_{pi}^s(z_t^s))\delta_i^s - (p_i^m + t_{pi}^b(z_t^b))\delta_i^b]m_i - t_{fi}^s(z_t^s)\delta_i^s - t_{fi}^b(z_t^b)\delta_i^b + T = 0$$

where the household pays the fixed cost t_{fi}^s if it sells good i and pays t_{fi}^b if it buys good i.

To solve for the household problem, a Lagrange expression can be derived and first order conditions for the consumption goods obtained from equations $(1) - (6)$.

The decision price p_i is thus defined as

$$p_i^m - t_{pi}^s \qquad \text{if } m_i > 0, \text{ for the selling household}$$

$$p_i^m + t_{pi}^b \qquad \text{if } m_i < 0, \text{ for buying household}$$

$$\tilde{p}_i = \frac{\mu_i}{\lambda} \qquad \text{if } m_i = 0 \text{ for self sufficient households}$$

The supply curve in the absence of transaction costs would be $q(p^m, z_q)$. However, when transaction costs are incorporated, the supply curves for the selling, buying and non- participating households are

$$q^s = q(p^m - t_p^s - t_f^s, Z_q) \quad \text{for sellers}$$

$$q^b = q(p^m + t_p^b + t_f^b, Z_q) \quad \text{for buyers and}$$

$$q^a = q(\tilde{p}, Z_q) \qquad \text{for autarkic households (non-participating)}$$
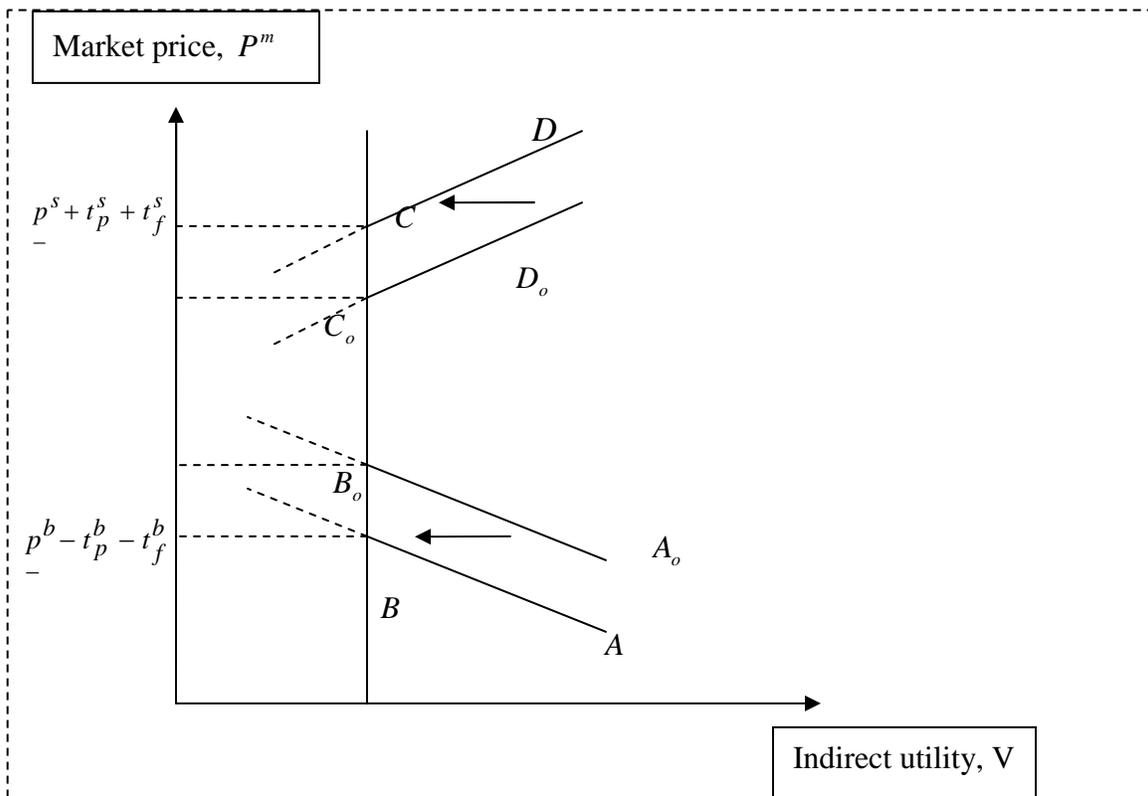
Figure 6: Indirect utility of a household under proportional and fixed costs
 Source: Key et al. (2000)

The optimal participation of household follows the path ABCD (Figure 6). A household

will buy when market prices are below $\underset{-}{p}^b - t_p^b - t_f^b$ or be self-sufficient when

$[\underset{-}{p}^b - t_p^b - t_f^b] < p^m < [\underset{-}{p}^s + t_p^s + t_f^s]$ and will sell when market prices are

above $\underset{-}{p}^s + t_p^s + t_f^s$; where $\underset{-}{p}^s$ and $\underset{-}{p}^b$ are the threshold or decision selling and buying

prices, respectively.

For empirical analysis, mostly focusing on the selling households, a linear expression is

assumed for the supply functions and the PTCs as follows:

$q(p, Z_q) = p\beta + Z_q \beta_q$ and $t_p^s = -Z_t^s \beta_p^s$ whereas $t_p^b = -Z_t^b \beta_p^b$.

This leads to linear expressions for supply by sellers as follows:

(7a) $\quad q^{s*} = p^m \beta_m + Z_t^s \beta_t^s + Z_q \beta_q$

The linear expressions for the production threshold levels are thus

(7b) $\quad \underset{-}{q^s} = Z_t^s \alpha_t^s + Z_q \alpha_q^s + Z_c \alpha_c^s$,

where Z_t are exogenous characteristics that affect transaction costs when selling, Z_q are production shifters, Z_c are consumption shifters and α_q^s, α_c^s are their coefficients, respectively, and β_t^s, β_q are coefficients of Z_t^s and Z_q respectively.

The econometric specification can thus be obtained by adding an error term as follows:

(7c) $\quad q^{s*} = p^m \beta_m + Z_t^S \beta_t^S + Z_q \beta_q + u$

where q^{s*} is the latent supply if a household is a seller and it is observed when it is higher than the threshold for market participation $\underset{-}{q^s}$.

Thus, if $q^{s*} > \underset{-}{q^s}$ then the household is participating in the market as a seller. The expression (7d), therefore, allows for the identification of parameters β_i using probit analysis. The factors affecting the discrete decision of smallholder farmers to participate in banana markets can be determined on the basis that

(7d) $\quad q^s > \underset{-}{q^s} \equiv \Pr ob(Y = 1) = X_i \beta_i + u$

The estimation of coefficients $\beta_m, \beta_t^s, \beta_q$, caters for the aspect of the intensity of participation of the smallholder farmers.

3.5.2 The socio-economic characteristics of households

Building on the approaches used by Goetz (1992), Key et al. (2000) and Chowdhury (2002), the model for the participation of middlemen is constructed as follows:

The objective of middlemen is to maximize profits subject to a set of constraints. Given that p represents a vector of prices, m represents the amount of products produced by the household for sale, t are transaction costs, and L represents other factors that affect middlemen's profits, π;

(8) Maximize $\pi(p, m, t, L)$

Subject to

(9) $\quad p^{\alpha} m_i - p^{\sigma} m_i - t_{fi}^{b} - t_{pi}^{b} - t_{fi}^{s} - t_{pi}^{s} - K \geq 0$

(10) $\quad m_i, p^{\alpha}, p^{\sigma}, t_{fi}^{b}, t_{pi}^{b}, t_{fi}^{s}, t_{pi}^{s}, \geq 0$

where p^{α} represents the selling prices of middlemen, p^{σ} represents the price at which middlemen purchase the tradable commodity, m_i is the amount of commodity traded, t_{fi}^{b}, t_{pi}^{b} are the fixed and proportional transaction costs incurred in purchasing the commodity, t_{fi}^{s}, t_{pi}^{s} are the fixed and proportional transaction costs incurred in selling the commodity and K represents other costs.

Incorporating the transaction costs and other factors that affect buying and selling of commodities, equation (9) can be re-written as

$$(p^{\alpha} - p^{\sigma})m_i \geq (t_{fi}^{b} + t_{pi}^{b})Z_t^{b} + (t_{fi}^{s} + t_{pi}^{s})Z_t^{s} + K$$

32

(11)

where Z_t^b, Z_t^s are the factors capturing the proportional and fixed transaction costs affecting buying and selling, respectively, and K represents all other costs (i.e. risk).

For intermediaries to engage in trade, there has to be a positive price differential. Hence, the condition shown in (12) has to be fulfilled.

(12) $\quad (p^\alpha - p^\sigma) > 0$

However, this condition is necessary but not sufficient to entice intermediaries to engage in trade. The quantities tradable have to be large enough to offset all costs involved and generate a margin for the intermediaries. Hence, the conditions in equations (13) and (14) have to be fulfilled,

(13) $\quad (p^\alpha - p^\sigma)m^* = (t_{fi}^b + t_{pi}^b)Z_t^b + (t_{fi}^s + t_{pi}^s)Z_t^s + K$

(14) $\quad m_i > m^*$

where m_i is the quantity of commodities tradable and m^* is the threshold quantity of commodity traded beyond which the traders' margins would be positive.

However, assuming a situation where there are many intermediaries, the competition amongst them causes the price differential to even out and therefore the margins are mostly determined by the quantities of the commodity traded and the costs incurred.

The discrete choice for middlemen is arrived at when

$\quad m_i > m^*$ in terms of amount of goods tradable,

$$(p^{\alpha} - p^{\sigma})m_i \geq (t_{fi}^b + t_{pi}^b)Z_t^b + (t_{fi}^s + t_{pi}^s)Z_t^s + K \quad \text{in terms of transaction and other costs,}$$

and $p^{\alpha} > p^{\sigma}$ in terms of pricing.

Probit analysis can be used to arrive at the factors that affect the discrete decision on whether to participate in the market. The decision to participate in the market is observed by assuming an econometric expression in equation (15)

(15) $\quad m_i > m^* \equiv \Pr(Y_i = 1) = X_i\beta_i + u$

where Y_i is the latent variable reflecting the decision to participate in banana marketing and X_i is the vector of explanatory variables representing factors affecting the decision to participate in banana marketing. The discrete decision to participate is observed by

$Y_i = 1$ if $Y_i > 0$ and otherwise if $Y_i = 0$.

The probit method can be used to analyse whether the intermediary chooses to participate in the banana markets.

$$\text{Prob}(Y_i = 1) \quad = \text{prob } (\beta_1 X_i + \varepsilon_{i1} > \beta_0 X_i + \varepsilon_{i0})$$

$$\text{Prob}(Y_i = 1) \quad = \text{prob } (\varepsilon_{i0} - \varepsilon_{i1} < \beta_1 X_i - \beta_0 X_i)$$

$$= \text{prob } (\varepsilon_i < \beta X_i)$$

$$\text{Prob}(Y_i = 1) \quad = \phi(\beta X_i),$$

where ϕ is the cumulative distribution function for ε. The functional form will therefore depend on the assumptions made about ε.

For a household to be a seller, an econometric form is adopted as shown in equation (16).

(16) $\qquad \phi(\beta X_i) = \dfrac{1}{\sqrt{2\pi}} \displaystyle\int_{-\infty}^{\beta X_i} e^{\frac{-t^2}{2}} dt$

The continuous decision made by the smallholder farmers and intermediaries about the intensity of participation is captured by the factors that affect the amount of commodity traded m_i. We assume an expression (equation 17) to link back to equation (11)

(17) $m_i = f(p^\alpha, p^\sigma, t_{fi}^b Z_t^b, t_{pi}^b Z_t^b, t_{fi}^s Z_t^s, t_{pi}^s Z_t^s, K, L)$

where m_i represents quantities of bananas sold, the Z's represent the factors capturing the transaction costs incurred in buying and selling of the commodity, K represents other costs and L represents other factors such as household characteristics.

An econometric form is adopted as shown in equation (18) and the estimates βi for the vector of variables capturing the factors determining m_i , which include transaction related factors (i.e. access to information, transport, distance and status of infrastructure), are obtained. The Heckman method may be used to cater for the selectivity biases that may occur as a result of the non-participating subjects to be catered for in this analysis.

(18) $m_i = \beta_i X_i + u$ $\{i=1,2,..n\}$

3.6 Summary

The conceptual framework on which this study is based has been outlined, showing the relationship between market participation, agricultural development and social welfare. The different definitions of transaction costs have been presented and discussed in view of the perceptions held by several authors. The role of intermediaries in the marketing of agro-commodities has been discussed highlighting the perceived merits and demerits. The analytical framework used in the analysis is presented and discussed in relation to the participation of farmers and intermediaries/traders in banana markets of the Great Lakes region of central Africa.

CHAPTER 4

DATA SOURCES AND SAMPLE CHARACTERISTICS

4.1 The data sources

Data used in this study were provided by the International Institute of Tropical Agriculture (IITA) in collaboration with the Consortium for the Improvement of Agriculture-based Livelihoods in Central Africa (CIALCA). CIALCA collaborates with the national agricultural research institutions in the study area and these include Institut de l'Environnement et de Recherches Agricoles (INERA) of the Democratic Republic of Congo, Institut des Sciences Agronomiques du Rwanda (ISAR) of Rwanda and Institut des Sciences Agronomiques du Burundi/Institut Recherches Agronomique et Zootechnique (ISABU/IRAZ) of Burundi.

The data were collected during a farm level baseline cross-sectional survey that was conducted in Rwanda, Burundi and the Democratic Republic of Congo covering approximately 2666 households between June 2006 and February 2007 (Table 1). The data capture the farmer typologies based on the presence of specific production units or access to resources and it also captures the biophysical and economic parameters characteristic of the banana cropping systems in the study area.

4.2 The sample composition

The sample comprised of 494 households drawn from Burundi and were randomly selected from three provinces, namely, Cibitoke, Gitega and Kirundo. Approximately 912 respondents were randomly selected and interviewed from three provinces of Rwanda, namely, the east, west and south. In the Democratic Republic of Congo, 1260 households

were captured from the three provinces, namely, North Kivu, South Kivu and Bas Congo where banana production is quite prominent. Table 1 provides information on the number of households sampled.

The sample for Burundi covered three provinces, namely, Cibitoke, Gitega and Kirundo (Figure 7 and Appendix ii), where banana production is quite prominent. The communes within each of the provinces were randomly selected and 100 respondents were targeted in randomly selected zones within the communes.

In the Democratic Republic of Congo (Figure 8), two territories, namely, North Kivu and South Kivu and one district, namely, Bas-Congo, were purposively selected due to their significance of banana production. These were equivalent to provinces in Rwanda and Burundi in terms of administrative structure. Chefferies, which follow in administrative hierarchy, were randomly selected within these territories. Groupments/sectors were randomly selected from these chefferies/territories and over 95 households were drawn from each.

In the case of Rwanda (Figure 9 and Appendix iii), three provinces, namely, East, West and South, were purposively selected. Districts and, subsequently, sectors were randomly selected in each of the provinces. Households were thus identified randomly in these sectors and interviewed.

Table 1: Number of households included in the sample by administrative boundary

Country: Burundi			
Province	**Commune**	**Zone**	**No. of households**
Cibitoke	Mugina	Rugajo	103
Gitega	Giteta	Giteta	98
	Mutaho	Mutaho	96
Kirundo	Busoni	Murore	100
	Kirundo	Kirundo rural	97
		Sub total	494

Country: D.R.Congo			
Territory / District[#]	**Chefferie/Territory^**	**Groupment/Sector˜**	**No. of households**
North Kivu		Beni-Mbau	97
	Beni	Ruwenzori	97
		Bashu	100
	Lubero	Baswagha	99
South Kivu	Kabare	Kabare	203
	Walungu	Ngweshe	262
Bas Congo[#]	Lukaya^	Madimba˜	102
	Cataractes^	Mbanza-Ngungu˜	300
		Sub total	1260

Country: Rwanda			
Province	**Districts**	**Sectors**	**No. of households**
Eastern	Bugesera	Mayange	98
		Musenyi	97
	Gatsibo	Kabarore	54
		Murambi	58
		Rugarama	51
	Kayonza	Kabare	102
	Kirehe	Gatore	103
	Nyagatare	Katabagemu	49
Western	Rubavu	Rugerero	50
	Rusizi	Nzahaha	50
	Karongi	Bwishyura	99
Southern	Ruhango	Kinazi	101
		Sub total	912
		Total	2,666

Source: CIALCA (2007)
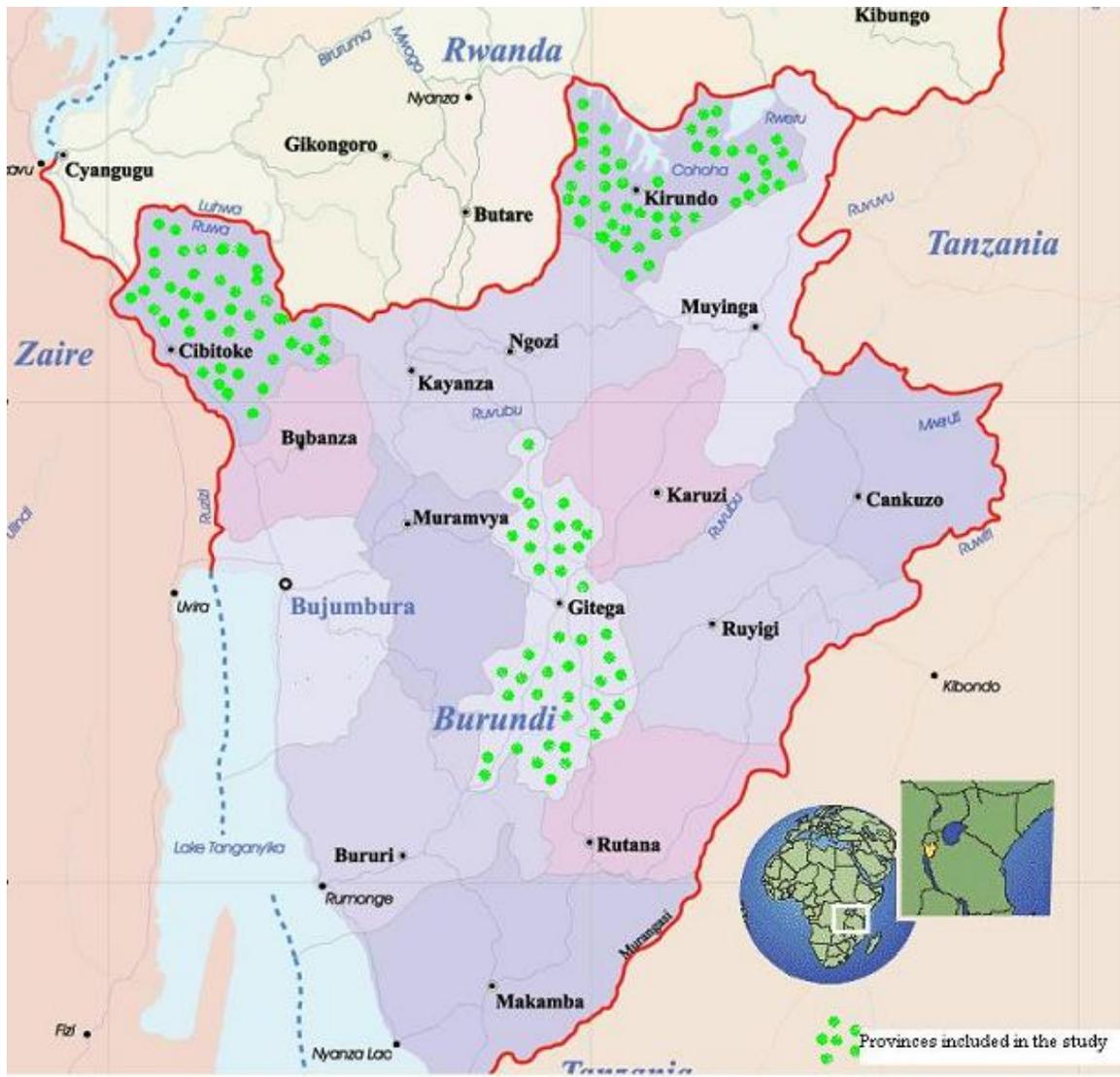
Figure 7: Map of Burundi showing provinces
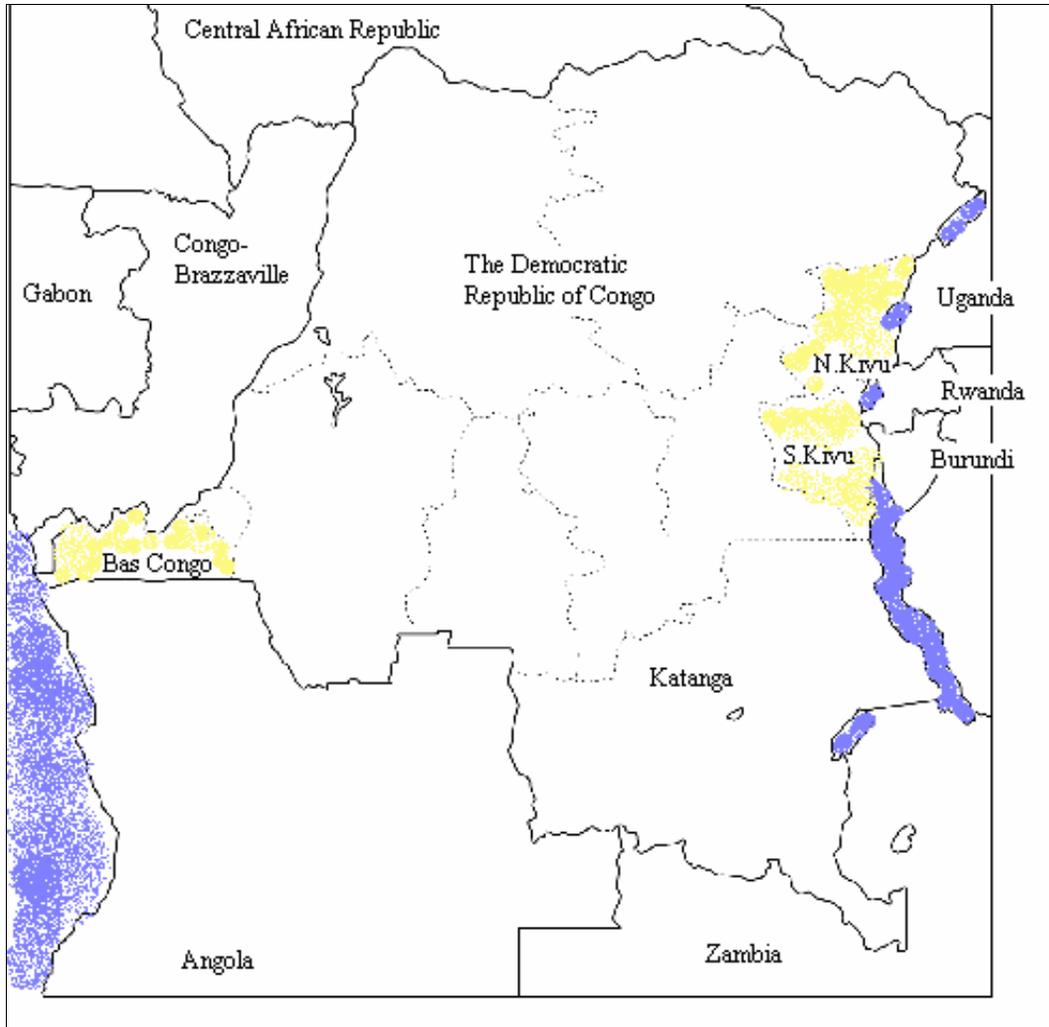
Figure 8: Map of the Democratic Republic of Congo showing provinces
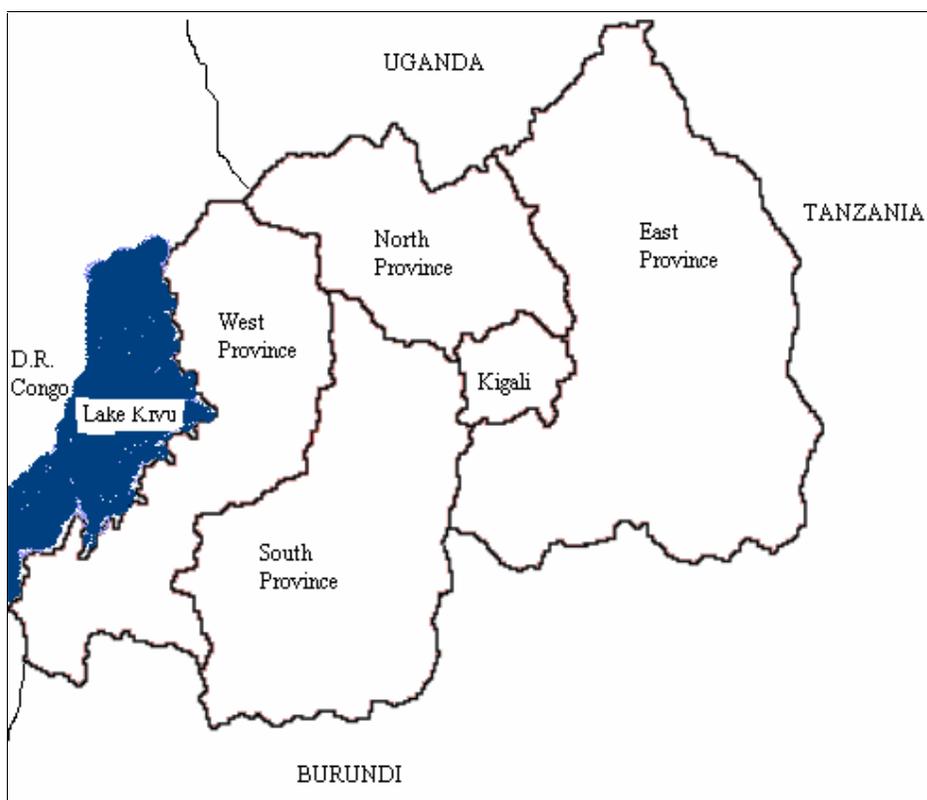
Figure 9: Map of Rwanda showing provinces

Table 2: Summary of the composition of the traders' sample

Country	Province	Rural assemblers	Rural retailers	Wholesalers	Urban retailers	No. of traders
Burundi	Gitega	13		2	5	20
	Kirundo	8	10		4	22
	Cibitoke	6	17			23
	Bujumbura			24	21	45
	Sub totals	27	27	26	30	110
DRCongo	S.Kivu (Kabare)	16	20			36
	S.Kivu (Walungu)	8	10			18
	S.Kivu (Ibanda)				16	16
	S.Kivu (Kadutu)			9	6	15
	Sub totals	24	30	9	22	85
Rwanda	Western	83	18	20	16	137
	Eastern	34	7	3	8	52
	Southern			6	8	14
	Kigali		1	7	8	16
	Sub totals	117	26	36	40	219
					Total	414

Table 2 presents information on the sample of traders from the three countries included in this study. The traders (or intermediaries) were regarded as those who perform buying and selling functions within the supply chain until the commodity reaches the final consumers. These include (a) the rural assemblers who mainly buy from the farmers and sell to wholesalers and other buyers; (b) the rural retailers who buy from rural assemblers or directly from farmers and sell to consumers; and (c) wholesalers and urban retailers.

The data were collected during a market survey that was conducted in December 2006 to March 2007. The survey covered 414 traders/intermediaries who were randomly selected from the banana producing provinces of the three countries. One hundred and ten of the respondents were drawn from four provinces of Burundi, namely, Bujumbura, Cibitoke, Kirundo and Gitega, while 85 respondents were drawn from Sud Kivu province of the Democratic Republic of Congo. The remaining 219 respondents were drawn from the Eastern, Southern, Kigali and Western provinces of Rwanda (Table 2).

The sampling was purposive to capture areas with some banana trading activity. For Burundi, the intermediaries were drawn from several areas of operation covering four provinces of Gitega, Cibitoke, Kirundo and Bujumbura. For the Democratic Republic of Congo, the sample was drawn from South Kivu from Kabare and Walungu chefferies and also from commune de Kadutu and Commune d'Ibanda. For Rwanda, the sample comprised of intermediaries operating in West, South East and Kigali provinces (Table 2).

4.3 Descriptions and definitions of variables used in the study

Tables 3, 4 and 5 describe the variables of the entire sample drawn from the three countries and have been used in the analysis. The means and standard deviations of the continuous variables are shown while the percentages of the discrete variables are indicated.

4.3.1 The socio-economic characteristics of households

The characteristics of the households constituting the study sample are depicted in Tables 3 and 4. The farmers have an average land holding of about four hectares and have an average family size of about six persons. Approximately 80 percent of the households are headed by males and the households have farming experience of about 20 years on the average.

The average distance to the nearest market is approximately three kilometres while the average distance to the nearest hospital is approximately 12 km. About 32 percent of these respondents own bicycles while 62 percent own radios. Approximately 30 percent of these farmers belong to a farmer group. About 29 percent of these sample households have access to credit (formal or informal) and their average non-agricultural revenue does not exceed US$75 per annum.

Each of these households produces about 1572 kg of bananas per annum on the average of which about 13 percent is sold. About 30 percent of the sales occur at the farmgate. Their main source of market information are traders and fellow village mates.

Table 3: Description of variables and their summary statistics (I)

Variable name	Description of Variables	Mean	Standard deviation	Percentage for yes=1
LANDSIZE	Average land holdings (in hectares)	3.93	11.4	-
HHSIZE	Average family size	6.16	2.85	-
CHILD_5YRS	Household residents aged 5years or less	1.28	1.23	-
CHILD6_17YRS	Household residents aged 6 - 17years	2.21	1.89	-
ADULT18_59	Household residents aged 18 - 59years	2.52	1.61	-
HEAD_MALE	Household headed by male (yes=1, no=0)	-	-	80.96%
CREDIT	Used credit in ref. period (yes=1, no=0)	-	-	29.41%
BICYCLE	Household owning a bicycle (yes=1, no=0)	-	-	32.48%
RADIO	Household owning a radio (yes=1, no=0)	-	-	62.00%
FARMER_GROUP	Household member belonging to a farmer group (yes=1, no=0)	-	-	29.64%
MARKET_GROUP	Household member belonging to a marketing group (yes=1, no=0)	-	-	4.16%
FARMEXP	Period of existence of farm (years)	20.1	13.5	-
MARKET_DIST	Mean distance to nearest market (km)	3.08	4.17	-
HOSPITAL_DIST	Mean distance to nearest hospital (km)	11.59	10.08	-
PRICEINFO_NONE	Households without access to price information (yes=1, no=0)	-	-	6.18%
PRICEINFO_NEIGHBOUR	Neighbours are the main source of price info (yes=1, no=0)	-	-	19.61%
PRICEINFO_TRADERS	Traders are the main source of price info (yes=1, no=0)	-	-	31.43%
NONFARMREV	Off -farm revenue (US$ p.a.)	74.37	500.80	-
BANANAPRODN	Banana production in ref. period (kg)	1572	3060	-
EDUCATION	Level of education of head (1- 6)	2.57	1.33	-
COOKBANANA_PRICE	Av. selling price of cooking bananas in the ref. period. (US$ per bunch) [a]	1.36	0.78	-
BEERBANANA_PRICE	Av. selling price of beer bananas in the ref. period. (US$ per bunch) [a]	0.55	0.26	-
BEAN_PRICE	Average selling price of beans in the ref. period. (in US$ per kg) [a]	0.295	0.178	-
BANANASALES	Banana sales in ref. period (kg)	637.9	1889.2	-
BEANSALES	Bean sales in the ref. period (kg) [b]	42.54	320.09	-

[a] A bunch cooking banana weighs appx 20 kg, & a bunch of beer banana weighs approx 10kg.
Average dollar rates used: 1 US$ = 1008 Burundi Francs; 550 Rwandese Francs, 480 DR. Congo francs
[b] Calculated for only those who participated in the banana markets.

Table 4: Description of variables and their summary statistics (II)

Variable name	Description of Variables	Percentage for yes=1
BANANASELLING	Households which sold bananas in the ref. period. (yes=1, no=0)	52.58%
BEANSELLING	Households which sold beans in the ref. period. (yes=1, no=0)	22.8%
SELLING_MARKET	Households mainly selling at the markets (yes=1, no=0)	69.40%
FARMGATE_SALES	Main market outlet of the household is at farmgate	30.6%
BANANASOLD%	Proportion of bananas sold in reference period	13.02%
CIBITOKE	Household is located in Cibitoke province of Burundi (yes=1, no=0)	3.79%
GITEGA	Household is located in Gitega province of Burundi (yes=1, no=0)	7.39%
KIRUNDO	Household is located in Kirundo province of Burundi (yes=1, no=0)	7.35%
NORDKIVU	Household is located in the North Kivu territory of DRCongo (yes=1, no=0)	14.74%
SUDKIVU	Household is located in the South Kivu territory of DRCongo (yes=1, no=0)	17.44%
BASCONGO	Household is located in Bas Congo district of DR Congo. (yes=1, no=0)	15.08%
EAST	Household is located in the Eastern province of Rwanda (yes=1, no=0)	22.96%
WEST	Household is located in the Western province of Rwanda (yes=1, no=0)	7.46%
SOUTH	Household is located in the Southern province of Rwanda (yes=1, no=0)	3.79%

4.3.2 Socio-economic characteristics of traders

A detailed description of the traders is presented in Table 5. About 37 of the traders interviewed were male and the average age was about 35 years. The average quantity of bananas sold per week by each trader is approximately 101 bunches and the average experience in banana marketing of each trader is about nine years. Approximately 61 percent of the traders interviewed operated in rural markets and the bananas traded were sourced from distances averaging 16.4 km.

Table 5: Variable definitions and descriptive statistics for traders

Variable	Description	Continuous variables		Discrete variables	
		Mean	S.D.	1 (%)	0 (%)
WEEKLY_SALES	No. of banana bunches sold weekly	101	307	-	-
TRADER_AGE	Age of the respondent (trader)	34.9	10.7	-	-
TRADER_MALE	Respondent / trader is male	-	-	37.7	62.3
TRADING_EXP	No. of years spent trading in bananas	9.2	8.3	-	-
SUPPLY_DIST	Av. supply distances of commodity (km)	16.4	44.9	-	-
RURALMARKET	Respondent operates from a rural market	-	-	61.1	38.9
MARKET_INFO	Respondent accesses market information	-	-	21.0	79.0
ASSOCIATION	Respondent belongs to an association	-	-	19.8	80.2
COMPETITORS	No. of traders operating in the same vicinity	16	13	-	-
CREDIT	Respondent who used credit in the reference period.	-	-	14	86
COMMUNICATION_COST	Daily expenditure on communication (in US$)	0.86	3.12	-	-
GITEGA	Traders located in Gitega province	-	-	5	95
KIRUNDO	Traders located in Kirundo province	-	-	5	95
CIBITOKE	Traders located in Cibitoke province	-	-	6	94
BUJUMBURA	Traders located in Bujumbura province	-	-	11	89
SUDKIVU	Traders located in South Kivu province	-	-	21	79
KIGALITOWN	Traders located in Kigali town province	-	-	4	96
SOUTHERN	Traders located in Southern province	-	-	3	97
EASTERN	Traders located in Eastern province	-	-	13	87
WESTERN	Traders located in Western province	-	-	33	67

About 14 percent of the traders had access to some form of credit while each trader spent approximately US$0.86 daily on communication. About 21 percent of the traders accessed market information while 19.8 percent of the traders belonged to an association.

4.4 Summary

The source of data used in this study is indicated and the sample composition outlined in detail. Maps showing the location of the households in the sampled areas are presented and some details of the locations are mentioned. The acronyms for variables used in the analyses have been described and summary statistics presented. In general, about 52% of the households participated in banana markets and approximately 69% of the households sold their produce mainly at the market.

CHAPTER 5

REVIEW OF PREVIOUS APPROACHES TO ANALYSING THE RELATIONSHIP BETWEEN TRANSACTION COSTS AND MARKET PARTICIPATION AND APPROACH USED IN THE STUDY

This chapter reviews previous work on transaction costs and market participation, specifically focusing on the commodities handled, the approaches and methods used. Gaps and areas requiring further scrutiny are identified as an entry point for this study.

5.1 Previous studies on market participation

Costs associated with market transactions attempt to explain why households have different relationships to the market. Goetz (1992) considered the household trichotomy (net buyers, net sellers and autarkic or non-participants) and raised questions on how to econometrically model the factors that determine whether or not a household participates in food markets and the extent of participation. While analyzing the coarse grain market in Senegal, Goetz (1992) criticized the use of Ordinary Least Squares (OLS) estimates because the unobserved variables (e.g. risk preference) do affect both the discrete decision on whether to participate in the markets and the continuous decision on how much to buy and sell. Therefore, the use of OLS method would generate biased coefficient estimates. Goetz (1992) opted for an analysis that separated the decision on whether to buy or sell from the decision on how much to buy or sell. Goetz (1992) used the bivariate probit model to obtain estimates of the selectivity terms and then used the least squares, while accounting for the selectivity bias, to obtain estimates for the continuous market behaviour. Notable among Goetz's findings was the change in the probability of market participation with respect to price changes.

Goetz 's results also suggested that options other than relative output price changes were available for stimulating marketed surpluses in sub-Saharan Africa. Such options include better information which significantly raises the probability of market participation of the selling households while access to coarse grain processing technologies raises quantities sold by sellers. Goetz (1992), however, cautions that availability of options other than floor prices is very important. This is because, in the short run, higher prices are likely to benefit sellers only, thereby imposing costs on buying households that are unable to respond to the price incentive and also this option may bypass the households that are unable to participate in markets due to the high transaction costs.

Key et al. (2000) tackled market participation, supply response and transaction costs using data from corn producers in Mexico and constructed a supply response model that catered for different relationships producers have to the market. They claimed that costs associated with market transactions were responsible for explaining why households have different relationships to the market. They distinguished these costs as proportional transaction costs (PTCs) and fixed transaction costs (FTCs). The PTCs include per unit costs of accessing markets, i.e. costs associated with transportation. PTCs offered an explanation for the labour and food market participation decisions in developing countries (Eswaran and Kotwal, 1986; Sadoulet et al., 1998). However, FTCs are invariant to the quantity of goods traded and they affect a household's decision to participate in markets (Goetz, 1992; Skoufias, 1994). FTCs may include costs of searching for a customer with the best price or simply a market and these costs are often lumped up since one incurs the same search costs to sell 100 kg or one metric ton. FTCs also include negotiation and bargaining costs especially when there is imperfect

information regarding prices. Other FTCs may include costs related to screening, enforcement and supervision to ensure reliability and no default.

Using a non-separable household model, Key et al. (2000) specified market participation as choice variable and derived the supply and demand equations of a household facing fixed and proportional transaction costs. They defined a Lagrangian function for a household intending to maximize utility subject to constraints such as cash income, resource balance and production technology. The solution was decomposed into two stages where the first stage solves for the optimal solution conditional on market participation and the second for choosing the market participation that leads to highest level of utility. For households in the non-separable model, when goods are not traded, the decision price becomes the unobservable internal shadow price. When goods are traded, the household's decision price would include the proportional transaction costs.

Whereas it might be quite cumbersome to establish the conditions that determine market participation for a household that faces both FTCs and PTCs when considering several commodities, it can be simpler to focus only on one commodity which is produced and consumed by the household. Market participation is determined by comparing the utility obtained from selling, buying or remaining self-sufficient in this particular commodity. All the three regimes can be expressed as similar optimization problems by using the relevant decision price for each case. Key et al. (2000) established that the selling decision price of a household is an increasing function of FTCs and not PTCs and that a household will switch from autarky (non-participation) to selling when the price offered is sufficient enough to compensate for the FTCs but not the PTCs. Similarly, the buying price decreases as FTCs decrease, hence, the buying production threshold decreases as

FTCs decrease but do not depend on PTCs. The model used by Key et al. (2000) allows for testing whether PTCs or FTCs play a significant role in explaining household behaviour in selling or buying decisions. Indeed, policies that reduce transaction costs are consequently important complements to price policies which affect supply response. Lowering transaction costs through improved transportation and promotion of marketing organization would increase market participation and increase production of the market participants.

Transaction costs not only reflect the character of the market but are mainly embedded in the households' characteristics and their economic environment. As a consequence, farmers may respond to market barriers by opting for alternative market institutions as analysed by Gabre-Madhin (2001) and Holloway et al. (2000).

The decision about the selling point of a household is also influenced by transaction costs. Chowdhury (2002) tested hypotheses whether access to information brought about any change in the producer's discrete choice between selling to middlemen *vis-à-vis* selling to direct buyers and whether it also brought about any change in the continuous choice of selling intensity. Using data from poor households of Bangladesh selling eggs, chicken and milk, Chowdhury (2002) used the probit method to analyze the discrete choice of producers between mediated selling and direct selling. To account for the selling intensity, a two-limit Tobit model was used to specify the behaviour of rural producers.

5.2 Previous focus on intermediaries/middlemen

Though much of the literature dwells on the behaviour of households towards markets in terms of decision to participate and intensity of participation, the environment in many developing countries, especially of sub-Saharan Africa, makes it difficult for the smallholder farmers to gainfully and sustainably participate in markets. For that reason, the existence of intermediaries/middlemen in most commodity chains is believed to play a crucial role of enabling markets to function (Watanabe, 2006).

Some schools of thought have attempted to undermine the role of middlemen and have advocated for producers to device means of bypassing them to link directly to the final buyers. Many of such attempts have shown that smallholder farmers lack the capacity to effectively engage and sustain such functions (Chowdhury, 2002; Watanabe, 2006). A few success stories have been told, but they do not seem to last long without significant support from development organizations.

Though middlemen in developing countries mostly operate in loosely regulated environments and have minimal barriers to entry or exit, their role in the marketing system cannot be underestimated. It should be noted that they are faced with numerous options in terms of which commodity to deal in and it is mostly assumed that they are more attracted to commodities that offer higher margins. They are, however, constrained by operating capital and other facilities such as storage and transport which directly impact on their operations. The need to look at transaction costs and their effects on the participation of smallholder farmers and middlemen in markets is of great importance if the objective of transforming subsistence agriculture into commercialised agriculture is to be met.

Approaches and methods used by Goetz (1992), Key et al. (2000) and Makhura et al. (2001), as mentioned before, have made fair attempts to look at transaction costs and their effects on the participation of smallholder farmers. However, approaches and methods should be modified to integrate middlemen as part of the research subjects since they are important actors in the marketing systems of agro-commodities, especially where information exchange is poor and physical infrastructure is weak.

Several studies have dwelt on empirically explaining the existence of middlemen in the context of developing countries by estimating their margins on each transaction. However, little attention has been accorded to explaining the role of transaction costs in explaining the farmers' choice between selling directly or selling through middlemen. Chowdhury (2002) made attempts towards this direction by assessing the impact of information cost and other transaction costs on rural producers of non-staples such as eggs, milk and chicken in Bangladesh. Nonetheless the story could be different when handling a staple such as banana which, despite being highly perishable, is widely produced, sold and consumed in the Great Lakes region of central Africa where transaction costs are high due to the weak physical and telecommunication infrastructure.

In summary, previous studies have outlined criticisms levelled against middlemen and justification for their existence, highlighting their roles and functions. However, the studies have not provided holistic analyses of market participation which include both middlemen and farming households.

5.3 The proposed crop in focus

Most studies on the impact of transaction costs on market participation have handled crops which have a relatively long post-harvest life. Studies by Goetz (1992), Key et al. (2000) and Makhura et al. (2001) focused on grains while Fafchamps & Hill (2005) worked on coffee. However, for a commodity like banana which has a relatively shorter post-harvest life, several aspects are linked to the marketing of such a commodity. The functioning of the actors in the supply chain adapts to the uniqueness of the commodity and, therefore, the issue of participation amidst transaction costs may imply new challenges.

The desired practice, especially for cooking banana, is to ensure that the commodity is harvested, transported, and sold to final consumers within a period of 10-12 days before it ripens (Spilsbury et al., 2004). Such temporal limitations create some urgency in conducting transactions of such a commodity and may, thereby, impact on the transaction costs as well.

5.4 The proposed approach

This study adopts a holistic approach which considers banana producing households as well as the intermediaries/middlemen engaged in the marketing process. The study compares the effects of transaction costs amongst the highly perishable and less perishable crops. A two-stage approach is adopted whereby analysis of the discrete decision to participate is conducted and subsequently an analysis of the continuous decision pertaining to the intensity of participation is made.

The first part of the study comprises an analysis where the dependent variable is whether households engage in banana marketing or not for a given reference period and the independent variables capture all factors affecting a household's market participation. Specific variables to capture transaction cost factors (i.e. access to information, availability and status of infrastructure) are included in the analysis. A binary response model is used for this stage of the analysis. This process contributes directly towards examining the effects of transaction costs on the discrete decision of smallholder farmers to participate in banana markets.

In order to compare the effects of transaction costs on the participation of smallholder farmers in the marketing of highly perishable and less perishable staples, a bivariate probit analysis is used to include another staple (e.g. beans) commonly produced and traded in the study area. A comparison of the marginal effects leads to deductions about the differences in the effects of transaction costs on staples that differ in perishability.

To examine the effects of transaction costs on the intensity of participation of smallholder farmers and intermediaries in banana markets, the banana sales made by a household in the reference period becomes the dependent variable and the independent variables comprise those capturing all factors affecting intensity of banana sales. Specific variables capturing transaction costs are included among the independent variables and a regression analysis catering for selectivity bias is performed to obtain coefficient estimates. A similar process is followed with intermediaries to examine whether there are any differences between smallholder farmers and intermediaries in regard to the effects of transaction costs on their participation in banana sales. The hypothesis that the

participation of smallholder farmers and that of traders/middlemen in banana markets is equally affected by transaction costs is thus tested.

The subsequent analysis involves obtaining the determinants of the selling point of farmers with respect to transaction costs. A binary response model is used whereby the dependent variable is the most commonly used market outlet and the independent variables are those capturing all factors affecting the choice of a market outlet, including transaction cost related factors.

5.5 Suitability of the approach

The holistic approach used in this study is based on several approaches that have been used to analyse agricultural households' participation in markets. The approach of the study is built on the premise that middlemen are crucial actors in the banana supply chains of the study area. Since this study extends its scope to include an analysis of the functioning of the middlemen, the approach captures the factors that determine the participation of middlemen in banana markets.

The study approach utilises the objective function of an agricultural household whose intention is to maximise utility subject to a set of cash and resource constraints. Subsequently, the objective of the middlemen is to maximise profits subject to cash constraints as well. This approach is able to link backwards to the positive supply response that results when transaction costs are lowered and marketing systems become more efficient.

The approach recognises that though farmers and the middlemen may appear to have clashing interests, the lowering of transaction costs would be in the interest of both parties to make the marketing system more efficient. Results from this study are expected to lead to the development of interventions that will make banana marketing systems more efficient for all actors.

The other unique feature of this approach is the choice of commodity. Bananas, though bulky and relatively highly perishable, contribute significantly to food security and income generation of most of the population in the study area. An improvement in the marketing of the commodity is likely to bring about an improvement in the livelihoods of a large section of the population in this three-country study area.

5.6 Summary

A review of literature outlining the different relationships households have with markets (i.e. net buyers, net sellers and autarky) has been presented. Transaction costs have been distinguished into two categories (i.e. proportional and fixed transaction costs), depending on their nature. Each category of costs plays a distinct role in explaining household behaviour in selling or buying decisions. The chapter explains why the use of OLS regression may not be the most appropriate method of determining the intensity of market participation since the discrete decision on whether to participate cannot be ignored.

Previous approaches that have been used to analyse market participation of farmers and intermediaries have been reviewed. The holistic approach used in this study and justification for selecting banana as the crop in focus have been outlined.

CHAPTER 6

MEASUREMENT AND ESTIMATION PROCEDURES

This chapter outlines the methods and estimation procedures used to examine the effects of transaction costs on the discrete and continuous decisions of smallholder farmers and intermediaries on whether to participate in banana markets and to what extent. The chapter further explains the methods used to compare the effects of transaction costs on the participation of smallholder farmers in the marketing of highly perishable staples such as bananas and less perishable staples (i.e. beans). The chapter outlines the methods and estimation procedures used to examine the effects of transaction costs on the farmers' choice of selling point of the commodity and whether the involvement of intermediaries enhances or inhibits their participation in banana markets.

6.1 Market participation

The estimation of intensity of participation is dependent on whether the farmers do engage in banana marketing or not. Given that 52.6% (Table 3) of the households included in the sample did participate in banana markets in the reference period, this implies that when only such households are considered in estimating the intensity of participation, the parameter estimates are bound to be biased due to the sample selection bias. Using the ordinary least squares (OLS) method would thus be inappropriate since it may not cater for the selection biases. The Heckman two-step method is, therefore, selected to correct for this selection bias.

6.1.1 The Heckman procedure

This method was developed by Heckman (1979) and has been used extensively to correct for biases arising from sample selection. The Heckman procedure provides consistent and asymptotically efficient estimates for all the parameters (Heckman, 1979; Amemiya,

1985; Maddala, 1983). This method assumes that the missing values of the dependent variable imply that the dependent variable is unobserved (not selected).

In this analysis, the determinants of banana sales are estimated while censoring those households which did not engage in banana sales in the reference period. The selection variable therefore is whether the household sold any bananas during the reference period. The zero values for the selection variable (i.e. BANANASELLING) are considered as unobserved. Thus, it is a good way of predicting the value of the dependent variable that would be observed without biases that would arise due to the selection of those participating or not.

The Heckman selection model assumes that there exists an underlying regression relationship between the dependent variable, banana sales (BANANASALES), and a set of independent variables which include those capturing transaction costs. However, banana sales are only evident for those households which engaged in the selling of bananas during the reference period. The variable BANANASELLING takes on the values 0 or 1, whereby BANANASELLING =1 represents the households that sold bananas in the reference period.

The regression equation is therefore specified as

(19) $$y_j = \sum_{j=1}^{j=n} (x_j \beta + u_{1j})$$

where

y_j = banana sales of a household in the reference period denoted by BANANASALES ;

x_j = independent variables which affect banana sales and include those capturing

       transaction costs for the j observations;

β = coefficient estimates of the independent variables; and

u_{1j} = the error term for the regression equation.

The dependent variable for observation j is observed if the selection equation is

(20)
$$z_j \gamma + u_{2j} > 0 \ ,$$

where

z_j = the independent variables which determine whether a household engaged in selling

of bananas in the reference period or not (including those capturing transaction costs);

γ = the coefficient estimates of the independent variables of z_j ; and

u_{2j} = the error term for the selection equation.

For both equations 19 and 20,

$$u_1 \approx N(0,\sigma) \ ;$$

$$u_2 \approx N(0,1) \ ; \text{ and}$$

$$corr(u_1 u_2) = \rho \ .$$

When $\rho \neq 0$, standard regression techniques applied to the first equation yield biased estimates. The Heckman procedure thus provides consistent, asymptotically efficient estimates for all the parameters in such models.

6.1.2 Estimating the determinants of banana sales

In this analysis, the underlying regression is to determine the relationship between banana sales (BANANASALES) and a set of independent variables which affect these sales. The independent variables capture aspects related to transaction costs such as distance to markets (MARKET_DIST), distance to urban centres (HOSPITAL_DIST), possession of means of transport (BICYCLE), sources of market information (RADIO, PRICEINFO_NONE, PRICEINFO_NEIGHBOUR and PRICEINFO_TRADERS) and collective action which affects bargaining position and contract enforcement (FARMER_GROUP, MARKET_GROUP and HEAD_MALE) and variables which capture the level of dependency on the crop (NONFARMREV).

Other variables which determine the ability of a household to produce a marketable surplus (LANDSIZE, HHSIZE and FARMEXP) are also included. The selling prices of cooking bananas and beer bananas (i.e. COOKBANANA_PRICE and BEERBANANA_PRICE) are also included in the analysis. The other independent variables that are included are the dummies for the various locations (CIBITOKE, GITEGA, KIRUNDO, NORDKIVU, SUDKIVU, BASCONGO, EAST, WEST and SOUTH).

The variable BANANASELLING refers to whether a household sold bananas in the reference period and it is considered as the dependent variable in the selection regression

of the Heckman analysis. The variable BANANASALES refers to banana sales in the reference period. It is the dependent variable in the underlying regression of the Heckman analysis.

The variables BEERBANANA_PRICE and COOKBANANA_PRICE which refer to the selling prices (in US dollars) of beer bananas and cooking bananas, respectively, enter the analysis as key independent variables. A positive relationship is expected between each of them and market participation as hypothesized by (Key et al., 2000; Alene et al., 2008).

The dummy variable BICYCLE was included to assess households' ease of transportation to the market and captures the proportional variable costs associated with the per-unit costs of accessing markets. Access to transportation equipment reduces the costs associated with transportation and is, therefore, expected to positively influence market participation (Key et al., 2000; Eswaran and Kotwal, 1986).

The variables HOSPITAL_DIST and MARKET_DIST, which refer to the distances to the nearest hospital and market, respectively, are included in the analysis to capture the extent of isolation of farming households and level of access to marketing infrastructure. The variables are associated with the per-unit costs of accessing markets as pointed out by Key et al. (2000) and, hence, a negative relationship with market participation is expected.

Considering the fixed transaction costs associated with searching for a trading partner, negotiating, bargaining, contracting and enforcing the contract, the variables

FARMER_GROUP and MARKET_GROUP were included in the analysis. Poulton et al. (2006) argued that belonging to a group empowers farmers to bargain and negotiate for better trading terms. Granovetter (1985) and Polanyi (1944) highlighted the importance of social relations and networks of actors in shaping their economic actions. Groups, therefore, are important platforms for information exchange among farmers, especially in places with weak physical infrastructure. A positive relationship between these two variables and market participation is, therefore, expected.

The variable HEAD_MALE is included in the analysis to capture the gender aspect with respect to market orientation. Cunningham et al. (2008) argue that men are likely to sell more due to their natural ability to bargain, negotiate and enforce contracts. A positive relationship with market participation is, therefore, expected for this variable.

The variable FARMEXP is included in the analysis to capture aspects relating to social networks and linkages with market players which accrue over time. The existence of such linkages reduces the fixed transaction costs involved in searching for trading partners, contracting, negotiating and enforcing contracts. A positive relationship between the farming experience of the household and market participation is expected.

Other variables which are expected to affect market participation include LANDSIZE, and CHILD6_17YRS. Considering the land holdings of the households, this is mainly linked to the ability to produce a marketable surplus as pointed out by Key et al. (2000) and Goetz (1992). A positive relationship is expected between farm size and market participation. However, the intensification of land use and productivity may portray a different relationship. The labour resource endowment of households is critical in

determining their ability to produce a marketable surplus. Alene et al. (2008) and Omiti et al. (2009) postulate that household size affects labour supply for production and assume that more food is produced than what is consumed. However, only the age bracket 6 -17 years is considered in order to avoid the endogeneity biases which may occur as a result of the relationship between market participation and ability to hire labour, presumably of adults above 18 years of age. Since household members in this age bracket are capable of engaging in production and marketing activities without pay, a positive relationship is expected between this variable and market participation.

The variables PRICEINFO_NONE and PRICEINFO_NEIGHBOUR, which refer to households having no access to market information and households having access to market information mainly through neighbours, respectively, capture the fixed transaction costs associated with information access. A negative relationship is expected between both of these variables and market participation as argued by Omiti et al. (2009). The two variables are used for the identification of the Heckman model such that they enter the selection regression but not the underlying regression (Heckman, 1979; Maddala, 1983).

The rest of the variables in the analysis, i.e. CIBITOKE, GITEGA, KIRUNDO, NORDKIVU, SUDKIVU, BASCONGO, EAST, WEST and SOUTHERN, refer to the geographical locations of the households and are intended to capture advantages and disadvantages of the different locations in regards to market participation. The relationships portrayed by the results are to be explained by the specific attributes of each of the locations.

6.2 Transaction cost effects on the marketing of highly and less perishable

commodities

A comparative analysis of the effects of transaction costs on the marketing of a highly perishable commodity (i.e. bananas) and a less perishable commodity (i.e. beans) is performed in this section. Both of these commodities are more or less produced by the same households or households under similar climatic conditions.

As revealed in section 6.1, transaction costs indeed have an effect on the decision-making processes of households on whether to sell their bananas and the amount to sell. Nonetheless, the nature of the commodity may also create a certain level of urgency to sell, especially when not selling immediately may imply severe losses.

For commodities that can be processed at household level and stored, the urgency to sell may be different. Nonetheless, for households operating in conditions characterized by high transaction costs which involve locating trading partners, negotiating, contracting, monitoring and enforcing contracts, the ability to process and store commodities may create differences in household behaviour in terms of market participation.

Bananas are usually intercropped with beans and both of these crops can thrive well in similar agro-ecological conditions. As per the data used in this study, approximately 79 percent of the households that produced bananas in the reference period also engaged in the production of beans.

Beans are supposedly important for their nitrogen fixing attributes which enhance soil fertility and hence boost crop yields. Beans are also promoted amongst rural households

as an important source of protein in terms of nutrition. The usual feeding habits in the study area are that beans are complementary to bananas as both commodities are usually consumed together.

The Heckman method is yet again employed while maintaining the same set of independent variables. The Heckman method suits this analysis because the discrete decision to sell and the extent of selling are assumed to be linked. The selection regression in this case estimates the coefficients of the variables which determine whether the household engaged in selling beans during the reference period. The underlying regression estimates the coefficients of variables which determine the intensity of bean sales of a household in the reference period.

The same set of independent variables from the same dataset is maintained as a basis for making a comparison of the effects of transaction costs on the participation of the households in marketing this commodity (i.e. beans) with the marketing of bananas as previously analysed. The results are then compared with those obtained for bananas in the previous chapter in terms of which variables are significant.

The dependent variable for the underlying equation is denoted by BEANSALES and refers to the bean sales of a household in the reference period measured in kilogrammes. The dependent variable for the selection equation is denoted by BEANSELLING and refers to whether the household sold any beans in the reference period, whereby 1=yes and 0=no.

The independent variables capture aspects related to transaction costs such as distance to markets (MARKET_DIST), distance to urban centres (HOSPITAL_DIST), possession of means of transport (BICYCLE), sources of market information (PRICEINFO_NONE, PRICEINFO_NEIGHBOUR and RADIO) and collective action which affects bargaining position and contract enforcement (FARMER_GROUP and MARKET_GROUP). The variable (HEAD_MALE) is included in the analysis to capture the effects of gender on market participation.

Other variables which determine the ability of a household to produce a marketable surplus (LANDSIZE, HHSIZE and FARMEXP) are also included, as is the selling price of the commodity (BEAN_PRICE). The other independent variables that are included are the dummies for the various locations (CIBITOKE, GITEGA, KIRUNDO, NORDKIVU, SUDKIVU, BASCONGO, EAST, WEST and SOUTH). The Heckman Maximum Likelihood selection model is then run to determine the coefficient estimates of the underlying regression equation and the selection equation using STATA 9.1 software.

6.3 Transaction costs and the farmers' choice of selling point

The effects of transaction costs on the farmers' choice of selling point of the commodity are examined in this section. Farmers are faced with a challenge of making a decision on whether to travel to market places to sell their produce or sell at the farmgate. This section outlines the estimation procedures used in examining the effects of transaction costs on the farmers' choice of a selling point of the commodity.

A situation is postulated whereby banana producers have to make a discrete choice between selling at the farmgate and travelling to the market place. This decision is based

on the margins obtainable while taking into consideration the costs involved. It is assumed that P_{prd} is the producer price which includes the cost of production plus the producer's margin, P_{mkt} is the average price at which the bananas are sold if the farmer travelled to the market and P_{fg} is the price at which bananas would be sold if the farmer sold to intermediaries at the farmgate. The transaction costs incurred if the farmer sells at the farmgate are denoted by TC_{fg} while those incurred if the farmer sells at the market place are denoted by TC_{mkt}.

Three scenarios (shown in equations 21 to 23) are likely to guide the choice of selling point, assuming that the farmers minimize costs and maximize gains.

(21)
$$[P_{mkt} - (P_{prd} + TC_{mkt})] > [P_{fg} - (P_{prd} + TC_{fg})]$$

(22)
$$[P_{mkt} - (P_{prd} + TC_{mkt})] < [P_{fg} - (P_{prd} + TC_{fg})]$$

(23)
$$[P_{mkt} - (P_{prd} + TC_{mkt})] = [P_{fg} - (P_{prd} + TC_{fg})]$$

Equation (21) indicates that the price offered at the market less the producer price and the transaction costs incurred in selling the commodity at the market exceeds the price offered at the farmgate less the producer price and the transaction costs incurred in selling the commodity at the farmgate. Equation (21), therefore, suggests that farmers would opt to travel to the market place to sell their commodities.

Equation (22) shows that the price offered at the market less the producer price and the transaction costs incurred in selling the commodity at the market is less than the price offered at the farmgate less the producer price and the transaction costs incurred in selling

the commodity at the farmgate. Equation (22), therefore, suggests that farmers would opt to sell their commodities at the farmgate.

Equation (23) indicates that the price offered at the market less the producer price and the transaction costs incurred in selling the commodity at the market is equal to the price offered at the farmgate less the producer price and the transaction costs incurred in selling the commodity at the farmgate. Equation (23), therefore, suggests that farmers would be indifferent between travelling to the market place and selling their commodities at the farmgate.

The choice of selling point, Y, is therefore a function of the price offered at the market, price offered at the farmgate, the respective transaction costs incurred and other factors such as the institutional environment represented by Z. This relationship is depicted in equation (24).

(24)
$$Y = f(P_{mkt}, P_{fg}, TC_{mkt}, TC_{fg}, Z)$$

The third scenario depicted by equation (23) may collapse into the two scenarios depicted by equations (21) and (22) to create a situation where a discrete choice of the selling point has to be made. The situation $Y=1$ represents scenario 1 shown by equation (21) whereby travelling to the market to sell is opted for. The situation $Y=0$ represents scenario 2, shown by equation (22) whereby selling at the farmgate is opted for.

Econometrically, the specification problem follows a latent regression model

(25)
$$Y^* = \beta_1 TC + \beta_2 Z + e$$

69

where Y* is a latent variable that is unobserved. The dummy variable Y is what is observed and is defined by

(26)   Y=1 if Y*>0 and

(27)   Y=0 otherwise.

Furthermore, β_1 represents parameter estimates for the variables capturing transaction costs and β_2 represents parameter estimates for variables capturing the other factors affecting the choice of selling point (e.g. variables capturing the institutional environment).

The likelihood functions of this model are therefore as follows:

(28)
$$L(\beta_1, \sigma/_{Y_i}, TC_i,) = \prod \phi(-\beta_1 TC) \prod [1 - \phi(-\beta_1 TC)]$$

(29)
$$L(\beta_2, \sigma/_{Y_i}, Z_i,) = \prod \phi(-\beta_2 Z) \prod [1 - \phi(-\beta_2 Z)]$$
.

The system of equations (28) and (29) depict the relationship between transaction costs and the choice of selling point. Since transaction costs are often difficult to observe, the decision made by the farmer about the selling point is linked to the factors capturing the costs incurred in the choice made and other institutional factors which affect this choice.

The marginal effects of this model are expressed as

(30)
$$\frac{\partial}{\partial TC_{ik}} \phi(TC_i \beta_1) = \phi(TC_i \beta_1) \beta_k$$

(31)
$$\frac{\partial}{\partial Z_{ik}} \phi(Z_i \beta_2) = \phi(Z_i \beta_2) \beta_k$$

Equations (30) and (31) represent the transaction cost variables and other factors, respectively. These depict the relationship between the variables used in the analysis and the choice of selling point. The increments in certain continuous variables may favour the choice of a certain selling point rather than the other. Likewise, certain dummy variables may be associated with preference for a certain selling point against the other. The marginal effects obtained in this analysis are thus interpreted accordingly.

The dependent variable, Y, as shown in equation (25), is a binary, taking on the values 1 or 0, if the common practice of the household is to (a) travel to the market to sell the commodity or (b) sell the commodity at the farmgate, respectively. The independent variables range from those capturing transaction costs to those which capture the institutional environment within which the farmers operate. The variables capturing transaction costs include distance to the nearest markets and health centres, access to market information, membership to a market oriented group and possession of means of transport. The variables which capture other factors affecting the choice of selling point include product price differences, degree of dependency on the product, scale of operation, family size, age of household head, gender of household head, access to credit and asset holdings of the household. The description of the variable names and their summary statistics are presented in Tables 3 and 4.

The variable SELLING_MARKET is the dependent variable. It takes the values 1, if households' common practice is to take produce for sale to the market place, and 0, if the households mostly sell their produce at the farmgate.

The independent variables capturing transaction costs include those relating to searching for trading partners and gathering of information about buyers and prices. Among these are the variables FARMER_GROUP and MARKET_GROUP, which capture involvement of household members in groups where information relating to selling their produce might be accessed. Negative signs are expected for the estimates of both of these variables because involvement in collective action is expected to assume a joint responsibility in marketing which then relieves farmers from travelling to markets to sell their produce on an individual basis. These variables also capture the aspects of negotiating and contracting since a common voice tends to be more powerful than individual voices. Other variables related to information availability include PRICEINFO_NONE, PRICEINFO_NEIGHBOUR and PRICEINFO_TRADERS. Negative signs are expected for the estimates of these variables on the basis that the greater the lack of information the less likely it will be for farmers to travel to markets to sell their produce in fear of making losses. Ownership of means of transport and access to media are crucial in gathering information, hence, the variables BICYCLE and RADIO are included in the model. Positive signs are expected for the estimates of these variables (Chowdhury, 2002).

Considering the aspect of negotiation and contracting, variables capturing the ability of the farmers to profitably engage with their trading partners are used. These include BANANASOLD% which captures the dependence of the household on the commodity. A positive sign would imply that households less dependent on the commodity for domestic consumption would be more willing to sell much of it. The variable HEAD_MALE which captures the issues of gender and the variable EDUCATION which refers to the level of education of the respondent are included in the analysis based on the

assumption that male headed households and households headed by more educated people are better empowered to travel to the markets and negotiate for better prices; hence positive signs are expected. Variables such as HOSPITAL_DIST and MARKET_DIST do capture the degree of remoteness of the households and the distance to market places, respectively. These affect monitoring and enforcement of contracts and thus the choice of selling point. Negative signs are expected for the coefficients of both of these variables.

Other variables capture factors that may have a direct or indirect influence on the choice of selling point of a household. These include LANDSIZE, HHSIZE, CREDIT, NONFARMREV and BANANAPRODN. These capture the characteristics of the household such as household size, land holdings, the asset base and the scale of operation which may have an influence on the choice of market outlet. The expected signs for the estimates of these variables are ambiguous since they are not directly linked to transaction costs.

6.4 Transaction costs and the participation of traders in banana markets

The effects of transaction costs on the participation of traders/middlemen in banana markets are examined in comparison to the smallholder farmers operating in the same study area. The aim is to examine whether there are any differences between smallholder farmers and intermediaries in regard to the effects of transaction costs on their participation in banana markets and to test whether the participation of smallholder farmers and traders/middlemen in banana markets is affected equally by transaction costs.

The data used are obtained from traders operating in the same study area (i.e. Great Lakes region) and handling the same commodity (i.e. banana). A set of variables capturing transaction costs is used in the analysis of the determinants of intensity of participation of traders. The terms "traders", "intermediaries" and "middlemen" are used interchangeably to refer to anyone who buys goods from a producer and then sells them to retailers or consumers.

It is postulated that the objective of traders is to maximize profits subject to a set of constraints. The objective function of the trader is therefore given as

(32) $\quad\quad$ Maximize $\pi(P_s, P_b, Q_m, MC, TC)$

subject to the following constraints:

(33) $\quad\quad [\ (P_s - P_b)Q_m - MC - TC\ ] \geq 0$

(implying that profits are non-negative);

(34) $\quad\quad (P_s - P_b) \geq 0$

(implying that the price differential is non-negative);

(35) $\quad\quad \{P_s, P_b, Q_m, MC, TC\} > 0$

(implying that prices, quantities traded and costs are non-negative).

$\pi \quad$ = profit margin;

$P_s \quad$ = most commonly reported selling price of the commodity for the reference period;

$P_b \quad$ = most commonly reported buying price of the commodity for the reference period;

$Q_m \quad$ = quantity of commodity traded in the reference period;

MC = marketing costs incurred by traders (e.g. transport, storage, handling, levies, taxes…); and

TC = transaction costs incurred in the reference period.

Based on the rational classical assumption that traders seek to maximise profit, equation (32) depicts that profit (π) is a function of the buying and selling prices of a commodity (P_b and P_s, respectively), the quantity of the commodity traded (Q_m), the marketing costs, MC, (i.e. storage, transport, processing) and the transaction costs, TC, (i.e. costs of gathering information about potential buyers, bargaining, contracting and enforcement of contracts). However, in order for traders/middlemen to engage in trading, the income should exceed the costs and this is depicted in equation (33). All this can only happen if the following conditions are met: (i) a non-negative price differential (equation 34) and (ii) non-negative prices, quantities traded and costs (see equation 35).

Given the above objective function and constraints, a Lagrangian function is introduced in order to obtain the solutions for maximizing profits with respect to the various factors. The Lagrangian function is thus formed as

(36) $$L = \pi(P_s, P_b, Q_m, MC, TC) + \lambda\left[(P_s - P_b)Q_m - MC - TC\right] + \psi(P_s - P_b)$$

where π and ψ are Lagrangian multipliers associated with the non-negative profit constraint and non-negative price differential constraint respectively.

Maximizing the Lagrangian function with respect to P_s, P_b, Q_m, MC and TC yields the following first order conditions:

(37) $$\partial\pi/\partial P_s + \lambda Q_m + \psi = 0$$

75

(38) $$\partial \pi \big/ \partial P_b - \lambda Q_m - \psi = 0$$

(39) $$\partial \pi \big/ \partial Q_m + \lambda (P_s - P_b) = 0$$

(40) $$\partial \pi \big/ \partial MC - \lambda = 0$$

(41) $$\partial \pi \big/ \partial TC - \lambda = 0$$

Since capturing profit margins of traders can be a difficult process due to several issues such as wrong reporting for suspicion of ulterior motives, quantities traded, Q_m, is introduced as a proxy for profits since they have a positive relation. Furthermore, the ease of entry/exit into banana trading, coupled with the relatively high number of participants in the trade which inhibits collusion and individual traders from influencing prices to own advantage, limit traders' influence on buying and selling prices. As regards buying prices in particular, these are largely determined by the costs of production and value addition. Hence, buying prices hence may not be easily influenced by the trader. This further ascertains the suitability of using the quantities traded, Q_m, as a proxy for profits. Since traders seek to maximize profit, they most probably look towards trading bigger quantities as a means of maximizing their profits. This is also enhanced by the benefits of the economies of scale which they could obtain from operating at a bigger scale which may include some unit cost reductions.

From equations (39), (40) and (41), we can comfortably conclude that the quantity traded is a function of the several factors that affect marketing costs, transaction costs and several other factors characteristic to the traders. We thus postulate the expression as follows:

(42) $$Q_m = f(MC, TC, \Delta)$$

(43) $$TC = f(\tau)$$

From equations (42) and (43), we can obtain the expression

(44) $$Q_m = f(MC, \tau, \Delta) \ ,$$

where

Q_m = quantity of commodity traded in the reference period;

MC = marketing costs incurred by traders (i.e. transport, storage, handling, levies, taxes…);

TC = transaction costs incurred in the reference period;

τ = factors which influence transaction costs; and

Δ = factors characteristic of the traders (i.e. location, farming experience, finances, etc…)

Since, by definition, transaction costs are sometimes considered to be "hidden", it is often difficult to quantify them. Many scholars, therefore, opt to use variables which are closely associated with searching for trading partners, contracting and enforcement of contracts. These variables may include, participation in collective action, distances to sources of the products, social networks associated with information exchange, trust, norms, values and physical location with regard to level of commercial activity and status of infrastructure. The variables used in this analysis are described in Table 5.

The variable WEEKLY_SALES refers to the average banana sales (number of bunches sold per week) and serves as the dependent variable for market participation of the traders. The independent variables included those capturing the socio-economic characteristics of traders (e.g. age, gender, experience in trade and access to credit). The

independent variables also include those which may capture transaction costs involved in banana trading in terms of information flow, communication cost and distance (e.g. access to market information, expenditure on communication, belonging to an association, average distance travelled to source the commodity and the geographic location of operation of the traders in terms of provinces).

The coefficients of variables TRADER_AGE and TRADING_EXP are expected to have positive signs since experience and repeated exchange are linked to age and experience in trading (Kirsten & Vink, 2005). The arguments by Cunningham et al. (2008) imply that males are more market oriented than females, hence, a positive sign is expected for the coefficient of the variable TRADER_MALE. A negative sign is expected for the coefficient of the variable SUPPLY_DIST which implies that shorter distances to commodity sources enhance sales. This is consistent with economic theory as shown by Chowdhury (2002).

A positive coefficient is expected for the variable COMMUNICATION_COST implying that traders who spend more on communication to obtain information are likely to have greater sales. This is based on the observation by Aker and Mbiti (2010) that as mobile phone network coverage grows, especially in sub-Saharan Africa, traders increasingly use their phones to conduct their trading activities and this reduces their search costs while improving their efficiency in trading.

The variable ASSOCIATION is expected to have a positive coefficient since associations are assumed to be avenues for exchanging information; hence lowering transaction costs involved in trading (Omiti et al., 2009). Likewise, a positive coefficient is expected for

the variable CREDIT since capital is a crucial determinant of the magnitude of trade as implied by economic theory.

The rest of the dummy variables associated with the geographical locations of provinces of the study area are supposed to indicate the advantages and disadvantages of different locations in regards to agro-commodity trading.

6.5 Summary

This measurement and estimation procedures used in this study have been outlined. They include capturing the effect of transaction costs on market participation of smallholder farmers, with a clear distinction between choosing to participate and extent of participation. The Heckman procedure is explained with emphasis on how selection biases are to be avoided. Furthermore, the estimation procedures for comparing the effect of transaction costs on the marketing of perishable and less perishable commodities have been outlined. The estimation procedures for capturing the determinants of choice of selling point and participation of traders in banana markets are also outlined. The estimation procedures for capturing the effect of transaction costs on the market participation of intermediaries are outlined, indicating their postulated objective subject to several constraints.

CHAPTER 7

RESULTS OF THE STUDY AND DISCUSSION

This chapter presents the results of the study. The determinants of market participation of households (which include the discrete decision on whether to participate and to what extent) are presented in this chapter. The results capturing the effects of transaction costs on the marketing of perishables versus less perishable food commodities are also presented. The determinants of the choice of selling point of farmers are outlined and the chapter concludes by presenting the determinants of market participation of traders as affected by transaction costs.

7.1 Households' market participation

Results of the Heckman two-step analysis on whether households participate in banana markets and the extent of participation are presented in this section. Table 6 presents the results of the selection regression which involved the probit analysis on the discrete decision of whether to participate in banana markets. The results of the underlying regression which establishes the determinants of the extent of participation are also shown in Table 6. The coefficient for inverse Mills ratio, λ, in the banana market supply equations, is statistically significant at the 1% level indicating that sample selection bias would have resulted if the banana supply equations were estimated without considering the discrete decision to participate in banana markets.

Table 6: Heckman selection model coefficient estimates for participation in banana markets

The selection regression;		The underlying regression;	
Dependent variable: BANANASELLING		Dependent variable: BANANASALES	
Variable name	**Coefficients**	**Variable name**	**Coefficients**
COOKBANANA_PRICE	0.0095 (0.062)	COOKBANANA_PRICE	355.5(158.6)**
BEERBANANA_PRICE	0.207 (0.16)	BEERBANANA_PRICE	60.26 (414.05)
LANDSIZE	0.03 (0.01)***	LANDSIZE	0.158 (18.44)
CHILD6_17YRS	0.0005 (0.023)	CHILD6_17YRS	108.44 (67.31)*
FARMER_GROUP	0.24 (0.1)***	FARMER_GROUP	-219.07 (283.3)
MARKET_GROUP	0.269 (0.25)	MARKET_GROUP	486.183 (608.7)
BICYCLE	-0.246 (0.1)***	BICYCLE	816.2 (284.8)***
HEAD_MALE	0.012 (0.121)	HEAD_MALE	-47.17 (291.095)
MARKET_DIST	0.0086 (0.01)	MARKET_DIST	-25.09 (22.79)
HOSPITAL_DIST	-0.000074 (0.005)	HOSPITAL_DIST	13.16 (11.817)
FARMEXP	-0.00044 (0.0035)	FARMEXP	5.635 (8.803)
PRICEINFO_NONE	-0.620 (0.211)***	CIBITOKE	-648.16 (518.69)
PXINFO_NEIGHBOUR	-0.275 (0.113)***	GITEGA	-612.57 (592.504)
CIBITOKE	-0.139 (0.183)	KIRUNDO	55.26 (769.75)
GITEGA	-0.607 (0.152)***	NORDKIVU	-97.18 (578.57)
KIRUNDO	-0.75 (0.199)***	SUDKIVU	-336.74 (406.7)
NORDKIVU	-0.642 (0.134)***	BASCONGO	-468.66 (938.07)
SUDKIVU	0.670 (0.171)***	EAST	234.84 (341.98)
BASCONGO	6.07 (0.205)***	WEST	1289.2(340.4)***
EAST	0.625 (0.132)***	SOUTH	1199/6 (818.51)
WEST	0.733 (0.164) ***		
SOUTH	-0.137 (0.333)		

N=868   (censored obs=395, uncensored obs= 473),   Mill lamba = -206.46 (51.46)***

Wald Test of indep eqns. (rho=0.08643)   Wald chi^2 (33) = 136.03   Prob> chi^2 = 0.0000

Note: * , ** and *** denote significance at the 10%, 5% and 1% levels, respectively.
Robust standard errors in parentheses.

The dependent variable for the selection equation is denoted as BANANASELLING, whereby Y=1 implies that the household sold any bananas in the reference period and Y=0 implies that the household did not sell bananas in the reference period. The

dependent variable for the underlying equation is denoted as BANANASALES which refers to the banana sales by a household in the reference period. The statistically significant results of this analysis are discussed in the following two sub-sections.

7.1.1 The discrete decision of participation in banana markets

The coefficients for prices of both the cooking and beer bananas were positive but not statistically significant. The coefficient for the land size variable was positive and statistically significant at the 1% level. This result suggests that there is a positive relationship between the land holdings of a household and the likelihood to participate in the banana market as a seller. This is as expected since land is a critical production asset having a direct bearing on the production of a marketable surplus, *ceteris paribus*.

The coefficient for the farmer group membership variable was positive and statistically significant at the 1% level. This result implies that a positive relationship exists between a member of a household belonging to a farmer group and the likelihood of that household to participate in banana markets as sellers. As expected, farmer groups can be good platforms for enhancing exchange of information which enables farmers to link to buyers at a lower cost, thereby lowering the fixed transaction costs of market participation.

The coefficient for the bicycle ownership variable is negative and statistically significant at the 1% level. This result is contrary to the expectation that owing a bicycle is positively linked to market participation. However, in a situation where transaction costs are extremely high, ownership of any means of transport may not influence the discrete decision to participate in banana markets.

The coefficients for the variables referring to having no access to market information or only accessing information from neighbours were negative and statistically significant at 1% level. This result is an important indication that access to market information is extremely critical to the market participation decision as was also observed by Omiti et al. (2009). Households without any access to market information or even those whose main source of market information is their neighbours are not likely to participate in banana markets.

In regards to the geographical locations of the households, negative and statistically significant coefficients at the 1% level were obtained for Gitega, Kirundo and North Kivu provinces. These provinces are characterised by relatively weaker physical infrastructure and lower levels economic activity. The North Kivu province has experienced a prolonged period of instability mainly due to political conflicts. These characteristics of the respective locations immensely reduce the likelihood of households to participate in banana markets.

7.1.2 The determinants of banana sales by households

The coefficients for the variables which determine the level of banana sales of households in the study area are discussed in this sub-section. They are obtained from the underlying regression (Table 6). The observations of households which produce bananas but do not sell are censored in this analysis.

A positive and statistically significant coefficient at the 5% level is obtained for the cooking banana selling price variable. Consistent with economic theory (Key et al., 2000;

Alene et al., 2008), the positive relationship confirms that price is an incentive to sell. The coefficient for the beer banana selling price is positive but not statistically significant.

The coefficient for the variable referring to the number of household members aged 6-17 years was statistically significant at the 10% level. This result concurs with the findings of Alene et al. (2008) that members of a household within this age bracket can contribute to on-farm family labour supply, particularly during the non school-going periods, thereby contributing to the production of a marketable surplus. Household members in this category may also engage in some of the marketing activities at a much less cost; hence lowering the proportional transaction costs. This argument explains the positive relationship between this variable and intensity of market participation.

The coefficient for the bicycle ownership variable was positive and statistically significant at the 1% level. This result is consistent with the argument by Key et al. (2000) that ownership of means of transport lowers the proportional transaction costs, thereby enhancing the intensity of market participation.

Considering the variations in geographical location, a positive coefficient and statistically significant at the 1% level was obtained for the dummy variable of the Western province of Rwanda. This result implies that there is a positive relationship between being located in this province and the intensity of participation. Although the Great Lakes region is generally characterised by high transaction costs, some parts of the region such as the Western province in Rwanda have some relative advantage compared to the others. This province has Lake Kivu as its boundary on the western side and it is located along the

Rwanda and the Democratic Republic of Congo frontier. As argued by Jagwe et al. (2008), this strategic location offers this province some unique opportunities in terms of cheap water transport, the relatively high economic activity, and greater access to neighbouring markets. The cheaper transport option lowers the proportional transaction costs while the exposure to wider markets lowers the fixed transaction costs associated with banana marketing.

7.1.3 Discussion on households' market participation

The results presented in 7.1.1 and 7.1.2 offer substantial evidence that the discrete decision of households on whether to participate in banana markets and the extent of participation are truly influenced by transaction costs. The transaction costs, though hidden, can be captured by variables relating to information exchange, negotiating, contracting, monitoring and enforcement of contracts. Any initiatives aimed at lowering these transaction costs are likely to improve the participation of smallholder farmers in banana markets.

In general, many of the coefficients for the variables which capture transaction costs were statistically significant in this analysis. They included coefficients for the variables relating to farmer group membership, possession of means of transport (i.e. owning a bicycle) and also variables capturing distance to markets. The coefficients of variables capturing the different sources of information on prices were also statistically significant thus highlighting their importance in relation to lowering transaction costs. The location dummy variables offer insights into the advantages and disadvantages that are closely linked to the transaction costs faced in the respective locations of the study area.

Much as physical infrastructure is crucial in determining whether households are likely to participate in markets and to what extent, information exchange is also important for transactions to take place. Information exchange can occur when farmers interact in groups or at market places to sell their commodities. Findings from this analysis suggest that farmer groups are important avenues for information exchange and households with any member belonging to such groups may access more information which increases their likelihood to participate in markets as sellers as opposed to households with none of the members belonging to a farmer group. Farmer groups can be used as platforms for enhancing information exchange about potential trading partners and commodity prices, quality and quantity requirements, bulking and common storage. Strengthening of farmer groups with much focus on strengthening skills in negotiating, contracting, monitoring and enforcement of contracts should be considered. Farmer groups assist members in attaining greater abilities in negotiating, bargaining, monitoring and enforcing contracts through collective action.

Ease of transportation in terms of households owning bicycles enhances the intensity of participation in markets by households which are located in areas with weak physical infrastructure. Shorter distances to markets enhance the intensity of participation in markets.

Market places are crucial for any transaction to occur. Market places provide a platform for trading partners to meet, negotiate trading terms and make contracts. Increased investment in physical market structures, especially in remote areas, is strongly recommended in order to enhance market participation.

Adequate physical infrastructure, especially in terms of good roads and road networks, is extremely crucial in making most production areas accessible. Increased investments in such infrastructure, especially in the rural areas where much of the farming population dwells, ought to be encouraged.

7.2 Transaction cost effects on the marketing of perishables versus less perishables

This analysis provides a basis for comparing the effect of transaction costs on the participation of households in markets with regards to the perishability of the commodity. The analysis is based on using the same method with the same sample but for differing crops commonly grown in the study area. The analysis is intended to test the hypothesis that transaction costs may have a greater effect on the highly perishable commodities such as bananas as compared to the less perishable commodities such as beans.

The results from the Heckman two-step analysis on bean marketing are shown in Table 7. The robust standard errors obtained and the Wald test of the independency of the equations is shown. The statistically significant coefficient of the Mills lambda implies that using the Heckman two-step procedure was appropriate to cater for the selection bias that would have occurred in estimating the determinants of bean sales without considering the discrete choice of participation.

7.2.1 The discrete decision of participation in bean markets

A positive coefficient and statistically significant at the 5% level is obtained for the bean selling price variable which implies that price is an incentive for participation in the bean markets. Likewise, a positive coefficient and statistically significant at the 5% level is obtained for the variable referring to the household head being male, implying that males are more market oriented as also observed by Omiti et al. (2009).

87

Table 7: The Heckman selection procedure coefficient estimates for bean market participation

The selection regression;		The underlying regression;	
Dependent variable: BEANSELLING		Dependent variable: BEANSALES	
Variable name	**Coefficients**	**Variable name**	**Coefficients**
BEAN_PRICE	0.643 (0.300)**	BEAN_PRICE	-225.061 (386.8)
LANDSIZE	0.0001 (0.0083)	LANDSIZE	-1.817 (11.68)
CHILD6_17YRS	-0.017 (0.021)	CHILD6_17YRS	9.445 (18.997)
FARMER_GROUP	0.135 (0.099)	FARMER_GROUP	-95.092 (102.392)
MARKET_GROUP	-0.331 (0.314)	MARKET_GROUP	19.032 (319.701)
BICYCLE	-0.062 (0.101)	BICYCLE	71.11 (94.32)
HEAD_MALE	0.269 (0.118)**	HEAD_MALE	-127.852 (143.57)
MARKET_DIST	0.0056 (0.0087)	MARKET_DIST	-2.064 (6.94)
HOSPITAL_DIST	-0.00153 (0.004)	HOSPITAL_DIST	0.0317 (4.032)
FARMEXP	0.0021 (0.0035)	FARMEXP	-1.814 (3.312)
PRICEINFO_NONE	-0.509 (0.21)***	CIBITOKE	76.106 (201.78)
PXINFO_NEIGHBOUR	-0.152 (0.113)	GITEGA	184.54 (359.59)
CIBITOKE	0.059 (0.203)	KIRUNDO	119.36 (182.61)
GITEGA	-0.746 (0.153)	NORDKIVU	486.76 (904.06)
KIRUNDO	-0.475 (0.169)	SUDKIVU	-160.07 (151.67)
NORDKIVU	-1.651 (0.472)	BASCONGO	-583.618 (871.48)
SUDKIVU	-0.223 (0.18)	EAST	-106.077 (250.68)
BASCONGO	7.622 (5.39)	WEST	192.5 (156.64)
EAST	0.592 (0.115)	SOUTH	-94.33 (171.59)
WEST	-0.151 (0.145)		
SOUTH	0.196 (0.178)		

N=913   (censored obs=579, uncensored obs=334),   Mills Lambda = -512.91 (112.18)***

Wald chi^2 (31) =63.99   Prob> chi^2 =0.0004

Note: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.
Robust standard errors in parentheses.

A negative coefficient which is statistically significant at the 1% level is obtained for the
PRICEINFO_NONE variable ascertaining that lack of access to market information
discourages market participation. None of the coefficients for the dummy variables
capturing geographical locations were found to be significant.

7.2.2 The determinants of bean sales by households

Considering the intensity of participation of households in bean markets, none of the independent variables had a significant coefficient. Since the same set of independent variables was used in the banana analysis, this observation is supportive of the argument that the urgency to sell beans differs from the urgency to sell bananas and hence they are affected differently by transaction costs. This observation is critical in testing the hypothesis regarding the effects of transaction costs on the marketing of perishables compared to less perishable agro-commodities. The implication of this observation is that transaction costs appear to have a lower effect on the intensity of sales of beans as compared to the effect they have on the intensity of banana sales.

The observations drawn from the results also imply that the ability to process and store a commodity affects the households' urgency to sell. Beans are a commodity that can be dried and stored for long periods even at household level. This attribute makes it less vulnerable to the urgency to sell immediately in fear of making losses. This is not the case for bananas. Bananas are ideally harvested and consumed in such a short time span which then makes them vulnerable to losses in case buyers are not found immediately. The effects of transaction costs are therefore more evident in the marketing of bananas due to their perishability.

7.3 Household's choice of selling point

The comparative statistics of the two categories of households, i.e. those mainly selling at the market place and those mainly selling at the farmgate, are presented in Table 8.

Table 8: Comparative statistics for households categorised by selling point

Variables description	Market Obs	Farmgate Obs	Market Mean (Std.Err)	Farmgate Mean (Std.Err)	t-value
Land holdings (hectares) [+]	1635	720	2.87 (0.19)	7.47 (0.66)	8.72**
Family size	1635	720	6.23 (0.07)	6.13 (0.11)	-0.76
Age of household head (years)	1614	712	43.02 (0.33)	43.80 (0.51)	1.29
Distance to nearest market (km)	1635	720	3.24 (0.11)	2.99 (0.13)	-1.29
Distance to nearest hospital (km)	1635	720	11.68 (0.24)	11.17 (0.39)	-1.13
Selling price of cooking banana (US$ per kg) [+]	1635	720	1.38 (0.019)	1.22 (0.026)	-4.73**
Selling price of beer bananas (US$ per kg) [+]	1635	720	0.567 (0.006)	0.538 (0.009)	-2.36**
Off-farm revenue (US$ per year)	1635	720	68.31 (14.85)	93.57 (11.10)	1.07
Banana production in ref. period (kg)	602	259	1527 (119.6)	1859 (205.2)	1.46
Banana sales in ref. period (kg)	602	259	663.7 (70.3)	770.1 (152.7)	0.72
Proportion of bananas sold by HH in ref. period (%)	1635	720	14.01 (0.007)	14.66 (0.011)	0.50

Note: Standard errors are in parentheses,   H0: The means values are not significantly different.
** Significant at P <0.05 level implying reject H0.
[+] Wilcoxon-Mann-Whitney test performed.

The average land holding of households which mainly sell their produce at the markets is significantly much lower than the average landholdings of those households which mainly sell their produce at farmgate (i.e. 2.87ha and 7.47ha, respectively). This observation may imply that resource poor farmers are more obliged to travel to the market to sell their produce as opposed to staying home and waiting for buyers. This kind of behaviour is mostly evident amongst households with cash requirements but with limited sources of revenue. The land holdings are a reflection of the economic status of

the household which is subsequently linked to household revenue. Fafchamps & Hill (2005) made similar observations when looking at coffee marketing in Uganda whereby wealthier farmers were less likely to travel to market places to sell their produce.

Significant differences are observed between the mean values of the selling price of cooking bananas for the two household categories. This observation is critical and may imply that households which commonly travel to market places sell their commodities at much higher prices as compared to those which commonly sell at the farmgate.

Significant differences in the mean values are also observed for the selling prices of beer bananas for the two household categories. This observation further affirms the previous deduction that households which commonly travel to market places do sell their commodities at much higher prices as compared to those which commonly sell at the farmgate.

The comparison of banana sales of the two categories of farmers aimed at establishing whether the involvement of middlemen enhanced market participation of farmers. The rest of the variables whose mean values were compared for the two household categories did not show any significant difference at the $p<0.05$ level.

The results from the Probit analysis on the discrete choice between selling at the market versus selling at farmgate are presented in Table 9. The results are discussed focusing on the variables which directly capture the effects of transaction costs on the discrete decision whether to sell at the market versus selling at farmgate.

Table 9: The probit estimation results of the discrete choice between travelling to the market to sell versus selling at farmgate.

Dependent variable : SELLING_MARKET Y=1 if yes Y=0 if no

Independent Variables	Coefficients	Marginal Effects
LANDSIZE	-0.0056 (0.005)	-0.002 (0.002)
HHSIZE	0.018 (0.0096)*	0.0064 (0.0034)*
AGE	0.0093 (0.003)***	0.0032 (0.0009)***
EDUCATION	0.0261 (0.037)	0.00091 (0.013)
HEAD_MALE	0.217 (0.12)*	0.078 (0.04)*
CREDIT	0.105 (0.098)	0.036 (0.034)
BICYCLE	-0.108 (0.105)	-0.038 (0.037)
RADIO	0.047 (0.106)	0.016 (0.037)
FARMER_GROUP	-0.042 (0.101)	-0.014 (0.035)
MARKET_GROUP	-0.192 (0.25)	-0.07 (0.094)
NONFARMREV	-0.00037 (0.00018)***	-0.00013 (0.00006)***
MARKET_DIST	-0.011 (0.01)	-0.0038 (0.003)
HOSPITAL_DIST	0.0093 (0.0046)***	0.0032 (0.0016)***
PRICEINFO_NONE	-1.023 (0.26)***	-0.39 (0.09)***
PXINFO_NEIGHBOUR	-0.271 (0.123)***	-0.098 (0.046)***
PRICEINFO_TRADERS	-0.563 (0.108)***	0.204 (0.04)***
BANANASOLD%	0.0043 (0.129)	0.0015 (0.045)

 (Dependent variable: Y=1 if selling at market and Y=0 if selling at farmgate)
Standard errors are in parentheses ( ), *significant at 10%, **significant at 5%, ***significant at 1%

In regards to gathering information about prices offered coupled with searching for potential trading partners, belonging to a farmer group or a collective marketing group decreases the probability of a household selling their produce directly at the market. This result, though not significant, is intuitive in the sense that farmers who belong to farming groups or marketing groups do sell their produce under such arrangements and hence they travel less to the markets.

Furthermore, negative and statistically significant marginal effects are observed for the variables which capture sources of price information. Lack of access to price information reduces the probability of a household selling their produce at market places. Households remotely located and with no access to price information are less likely to travel to the markets to sell their produce. They can only sell to those who manage to get to them. In such instances, farmers are likely to be more of price takers than price makers especially when the commodity handled is highly perishable.

The negative and statistically significant marginal effects observed for access to price information from neighbours implies that a situation where households only mainly access price information from village mates and neighbours reduces their chances of travelling to the market to sell their produce. A similar observation is made for those households mainly accessing price information from traders. The explanation for these observations is that households which do not have easy access to markets are prone to only obtaining information from neighbours, village mates and traders. In such a case, information may be distorted to the advantage of the other party thereby discouraging farmers from endeavouring to travel to the markets to sell their produce.

In terms of negotiations and contracting, the significant and positive marginal effects of HEAD_MALE and AGE imply that for a household head to be male and more advanced in age increases the probability of the household selling its produce at the market. This can be attributed to their ability to engage in negotiations and their experience in trade both of which are positively linked to age and gender.

The dependence on the commodity which is captured by NONFARMREV and BANANASOLD% also affects the negotiations. The significant and negative marginal effects observed for the NONFARMREV variable implies that the less the off-farm revenue, the higher the probability of selling produce at the market. Intuitively, households with fewer non-farming revenue options are more likely to endeavour travelling to the markets in search for better prices. Similar observations were made about farmers in Bangladesh (Chowdhury, 2002).

In regards to monitoring of the contracts and enforcement, variables such as MARKET_DIST and HOSPITAL_DIST were included in the analysis. The positive and significant marginal effect shown for HOSPITAL_DIST implies that the more remotely located a household is, the greater the probability that this household's members will travel to the market to sell their commodities. The urgent need for cash revenue outweighs the opportunity cost of time especially for the remotely placed households such that the members are willing to travel long distances to gain this revenue. This implication may be counter intuitive to the earlier observations by Fafchamps & Hill (2005) that shorter distances would favour monitoring and enforcement of contracts hence encouraging farmers to travel to the markets.

The other factors included in the analysis were not significant except for the size of the household. The positive and significant marginal effect of this variable may imply that the bigger the family size the greater the chances of travelling to the market to sell their produce. This could be attributed to the availability of household members to embark on the task which is relatively time consuming. Households with fewer members may incur a higher opportunity cost of their labour time.

Indeed, transaction costs do have an influence on the choice of selling point of a household. This influence is mostly related to searching for potential trading partners and gathering information about price offers, terms of payment, quality and quantity requirements of the buyers. This analysis captures these aspects through a set of variables which relate to the transaction costs.

7.4 Traders' participation in banana markets

The determinants of quantities of bananas sold by the traders were estimated using OLS regression. The Durbin-Wu-Hausman test was performed to test for endogeneity between the dependent variable and the variable MARKET_INFO referring to access to market information. Furthermore, the augmented regression test was performed using ASSOCIATION, COMMUNICATION_COST and TRADING_EXP as instrumental variables for MARKET_INFO. The coefficient of the added residual was found to be $F_{(1, 163)} = 1.83$ and Prob > F = 0.1785. It was thus found not to be significant hence ascertaining that use of OLS would yield consistent estimators. The results of the analysis are shown in Table 10.

The age of the trader reflected a significant positive relation to banana sales implying that the older traders were probably better at trading due to their linkages and their social networks. A similar explanation is given for the significantly positive relation reflected between banana sales of the traders and number of years spent trading in bananas. The duration in this trade is probably associated with the linkages traders build with the suppliers of commodities and the repeated exchange activities build some level of trust among the trading partners. This has an effect on the consistency of supply and quality of

the product traded in order to meet the expectations of the other party and thereby
reducing transaction costs.

Table 10: The determinants of banana sales by the traders

Variable	Coefficient estimates
TRADER_AGE	5.979 (2.391) ***
TRADER_MALE	152.585 (41.316)***
TRADING_EXP	9.367 (4.297)***
RURALMARKET	101.582 (46.964)***
SUPPLY_DIST	-1.729 (0.399)***
MARKET_INFO	7.569 (56.891)
ASSOCIATION	36.843 (45.948)
COMPETITORS	-1.906 (2.523)
CREDIT	113.439 (85.793)
COMMUNICATION_COST	10.849 (5.984)***
KIRUNDO	-131.409 (68.771)***
SUDKIVU	-109.239 (43.984)***
SOUTHERN	44.466 (96.791)
EASTERN	-26.589 (88.771)
WESTERN	97.143 (41.431)***

n = 414
R-squared   = 0.2401
Adj R-squared = 0.1787
Prob > F   = 0.0000

Note: *significant at 10%, **significant at 5%, ***significant at 1%
Standard errors are in parentheses

A positive and statistically significant relationship is observed between traders being
male and their banana sales. This observation indicates that banana trade is gender
sensitive and male traders tend to have an advantage. Dorward et al. (2004) argue that
the discriminatory tendencies against women tend to weaken their negotiation prowess
and thereby making them less influential in agro-commodity trade. This result is
consistent with earlier findings by Jiggins (1989) which highlighted the importance of

negotiation skills in closing the gender gap while Dorward et al. (2004) analysed discrimination against women, especially in labour markets, as a manifestation of weak negotiation skills. Sagrario Floro (1995) attributes the gender-based differences in market participation to the allocation of time between non-market and market activities by females as compared to males.

The positive and statistically significant relation between banana sales and traders operating in rural markets is probably attributed to the fact that much of the production and hence the supply of banana is in the rural areas. Therefore, despite the weak infrastructure, the traders who endeavour to operate in such areas are likely to have greater sales. The ready availability of the commodity reduces the costs of searching and hence the transaction costs.

The negative and statistically significant relationship between average supply distances and banana sales implies that the shorter these distances, the easier it becomes to source, transport and then sell the commodity. The shorter distances imply less transaction costs incurred in searching for trading partners and less costs involved in enforcing and monitoring the purchase and sales contracts. These distances could also be a proxy for the accessibility to the places of production where the commodity tradable is sourced. This result concurs with the observations made by Omiti et al. (2009) and Fafchamps & Hill (2005) when looking at farmers' participation in agro-commodity markets in Kenya and Uganda, respectively.

The coefficient estimates of variables relating to access to market information and being a member of an association, though not statistically significant, do show a positive

relation to banana sales by the traders. It is expected that access to market information would reduce transaction costs and also belonging to an association would probably enable traders to take some collective action in a manner so as to reduce on costs. Similar observations were made by Alene et al. (2008), who concluded that associations are institutional innovations meant to mitigate transaction costs.

Though not statistically significant, the negative relation between number of competitors operating in the vicinity and the banana sales implies that traders are likely to transact more when operating in areas less infiltrated by fellow traders. The reasoning behind this could be that the fewer the traders operating in an area, the more likely it is for these traders to build relationships with the suppliers of the commodity thus reducing transaction costs associated with mistrust. In situations where the traders operating in an area are numerous, the chances of defaulting on contracts are quite high and, therefore, building trust becomes much difficult. Such situations push up the costs of transacting as observed by Kirsten et al. (2009).

The significant and positive relation between daily communication costs of traders and their sales is a key result indicating that communication has a great effect on sales. Traders incur costs of searching for trading partners, contracting and enforcing contracts and much of these costs could be harnessed using telecommunication technologies. Traders spending more on communication are likely to transact more than those spending less assuming that most of this communication is associated with business. With this assumption not holding, this may reflect an endogeneity problem amongst these variables. Similar observations were made about farmers in Bangladesh (Chowdhury, 2002).

The significant and negative relation between banana sales and being located in Kirundo province is attributed to the fact that this province is the most distant from Bujumbura which is the main market for most bananas and hence traders opting to source the commodity from this province incur greater transaction costs. Furthermore, the infrastructure in this province is much weaker compared to other provinces of Burundi and thereby leading to the greater costs of transacting in this province.

The significant and negative relation observed between banana sales and being located in South Kivu of the Democratic Republic of Congo is mainly attributed to the weak infrastructure in this province and also to the sporadic insurgency which makes the costs of transacting in this province to be high.

The significant and positive relation observed between banana sales and being located in the Western province of Rwanda is mainly attributed to infrastructure status of this province which includes four big markets and a good road network. Its access to Lake Kivu makes it a gateway to neighbouring Eastern Democratic Republic of Congo through the cheap water transport and also to Burundi. It is therefore of little surprise that traders operating in this province record higher sales due to the lower transaction costs incurred.

The analysis is indeed a fair attempt to empirically investigate the effects of transaction costs on the participation of traders in the banana markets of the Great Lakes region. Though the quantification of transaction costs can be an elusive task, this analysis invokes variables which affect the magnitude of transaction costs in either direction. These variables include the distance travelled to obtain the commodity, communication

costs, experience in the trade, access to market information, belonging to an association and location dummies by province to capture the differing status of infrastructure.

The results from this analysis generally indicate that information exchange, mostly through informal linkages, as opposed to formal associations, established by traders and their trading partners is crucial in reducing transaction costs. This is reflected by the positive relation between banana sales and the traders' experience in trade.

The findings generally indicate that the status of infrastructure (i.e. availability and conditions of road networks, telecommunications) is crucial in determining the intensity of trade in an area. The findings further indicate that utilization of telecommunications has a positive effect on the level of trade. This is illustrated by a comparison of levels of trade across several provinces. Traders operating in provinces with weaker infrastructure trade less as compared to those operating in areas with stronger infrastructure. Information exchange appears to be more critical for traders and, hence, variables capturing expenditure on communication shows significant relations with sales of the commodity.

Results from the analysis imply that trader associations may not be critical avenues for exchanging information amongst traders as is the case with farmer associations. Traders tend to thrive on the information imperfections and hence may not be very willing to share information in order to maintain their competitiveness. In considering such aspects, groups and associations may not be the best avenues for information exchange and, hence, alternative arrangements of availing market information should be more explored.

CHAPTER 8

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

This chapter presents a summary of the study. Major findings of the study and the relevant conclusions are outlined. The limitations of the study are identified and recommendations for future research are made. Areas for policy intervention are also indicated.

8.1 Summary of the study

8.1.1 Background

Agriculture is considered a critical sector in the attainment of economic growth for most developing economies due to its influence on the livelihoods of the majority of the population. Nonetheless, for this to occur, the sector needs to be commercialised to enable smallholder farmers to participate in markets in order to improve their incomes and subsequently their livelihoods.

However, in most developing economies, smallholder farmers find it difficult to participate in markets because of the numerous constraints and barriers mostly reflected in the hidden costs that make access to input and output markets difficult. Transaction costs are the embodiment of access barriers to market participation for most resource poor smallholder actors.

The cost of obtaining information is one of the fundamental sources of transaction costs affecting both the smallholder farmers and the middlemen. Though neo-classical economists essentially assume that information is perfect and costless, this assumption does not comply with reality especially in developing countries. Since information is not

perfect and costless, this has important implications for contracts and transactions. In developing countries, economic agents overcome the information problems and other setbacks of adverse selection and moral hazard through informal arrangements and institutions.

The existence of middlemen can, therefore, be viewed as one of the arrangements to overcome the problems of transaction costs and imperfect or costly information. Middlemen play the role of mediating between the seller of a product and its potential buyers. They emerge because they are able to economize on the cost of transactions and information asymmetries. Middlemen are heavily involved in the marketing of commodities, especially in areas where farmers are remotely located and where the infrastructure is poor. However, their services are usually misconstrued and considered as a reduction of farmers' margins. When analyzing the effects of transaction costs on participation in markets, it is vital to not only focus on smallholder farmers, as has been the case with several previous studies, but to include middlemen considering the vital role they often play in the marketing of agricultural commodities. Their inclusion in studies of this nature provides a more holistic perspective of the effects of transaction costs on the marketing system and allows for holistic recommendations to be suggested for improvement.

This study focuses on the marketing of bananas which is considered a major staple in the Great Lakes region in Central Africa. Bananas contribute significantly to the incomes of the rural population in the study area.

Furthermore, several studies of this nature have mostly focused on commodities that have a relatively high shelf life such as grains and cereals and little attention has been accorded to commodities of relatively high perishability (e.g. staples such as bananas, cassava, potatoes and other roots and tubers). Focusing on bananas is crucial for obtaining a better understanding of the effects of transaction costs on participation of actors dealing in a highly perishable agricultural commodity. The temporal specificities associated with perishability may have implications on the willingness of the supply chain actors to incur costs in order for a transaction to occur in the limited time period.

8.1.2 Purpose of the Study

The overall purpose of this study was to investigate, in a holistic manner, the effects of transaction costs on agro-commodity marketing, especially in areas characterised by weak infrastructure and high transaction costs. The study was intended to use a holistic approach in looking at several issues regarding the effects of transaction costs on market participation. The scope of this study was, therefore, not restricted to smallholder farmers but extended to traders/middlemen who play a crucial role in banana marketing systems of Rwanda, Burundi and the Democratic Republic of Congo.

More specifically, the objectives of this study were to a) examine the effects of transaction costs on the discrete decision of smallholder farmers to participate in banana markets; b) examine the effects of transaction costs on the intensity of participation of smallholder farmers and middlemen in banana markets; c) compare the effects of transaction costs on the participation of smallholder farmers in the marketing of highly perishable staples such as bananas and commodities which are less perishable (e.g. beans); d) examine whether there are any differences between smallholder farmers and

middlemen in regard to the effects of transaction costs on their participation in banana markets; e) examine the effects of transaction costs on the farmers' choice of selling point of the commodity; and   f) examine whether the involvement of middlemen enhances or inhibits the participation of smallholder farmers in banana markets.

8.1.3 ethods and approaches used in the study

The empirical analyses in this study were based on data availed by the CIALCA project administered by IITA in the Great Lakes region. The data were collected during June 2006 to February 2007 from 2666 households. These constituted 1260 households from the Eastern parts of the Democratic Republic of Congo, 912 households from Rwanda and 494 households from Burundi. The study also used data collected from a total of 414 traders/middlemen who trade in bananas within the study area.

The Heckman procedure was used to examine the effects of transaction costs on the discrete decision of smallholder farmers and middlemen on whether to participate in banana markets and to what extent. The first stage of the Heckman procedure dealt with the binary choice on whether to participate and the subsequent stage of the analysis dealt with the continuous decision on the intensity of participation while accounting for selection biases. Variables capturing costs relating to searching for trading partners, negotiating, contracting and enforcement of contracts were included in the analysis as independent variables.

A similar analysis was conducted on beans to represent staples of less perishability but produced and marketed in similar conditions as bananas. Comparisons were made

between the highly perishables and less perishables regarding the effects of transaction costs on market participation.

The intensity of participation of banana traders/middlemen was established using ordinary least squares regression analysis since endogeneity was not detected. Likewise, variables capturing costs relating to searching for trading partners, negotiating, contracting and enforcement of contracts were included in the analysis as independent variables against banana sales as the dependent variable.

The Probit analytical method was used to analyse the effects of transaction costs on the choice of selling point. The variables capturing costs relating to searching for trading partners, negotiating, contracting and enforcement of contracts were included in the analysis as independent variables against the commonest selling point of a farming household as the binary choice dependent variable.

8.2 Major findings of the study

8.2.1 Transaction cost effects on market participation of farmers

The study distinguished between the discrete decision to participate and the intensity of participation of smallholder farmers in banana markets. The following is the summary of the major findings of the study:

Regarding the discrete decision on whether to participate in markets, land is a critical production asset having a direct bearing on the production of a marketable surplus, *ceteris paribus*. Furthermore, access to market information is extremely critical to the market participation decision. Farmer groups are good platforms for enhancing exchange

of information which enables farmers to link to buyers at a lower cost, thereby lowering the fixed transaction costs of market participation. The geographical location has an influence on market participation whereby some provinces have some relative advantage compared to the others in terms of mode of transport, economic activity and access to neighbouring country markets.

As regards the intensity of participation, the study established that price is an incentive to sell. The study also established that members of a household within the age category of 6-17 years can significantly contribute to on-farm family labour supply, particularly during the school holidays, thereby contributing to the production of a marketable surplus. Ownership of means of transport lowers the proportional transaction costs, thereby enhancing the intensity of market participation.

8.2.2 Transaction cost effects on market participation of traders

The study results showed that older traders participated more in the marketing of bananas. This is probably due to the linkages and social networks built over time with trading partners as a result of repeated exchange activities that create some level of trust. The study established that banana trade is gender biased and male traders tend to have an advantage. The discriminatory tendencies against women tend to weaken their negotiation prowess and thereby making them less influential in the trade. The study established that shorter distances to market places imply less transaction costs incurred in searching for trading partners and less costs involved in enforcing and monitoring the purchase and sales contracts. Furthermore, communication has a great effect on sales and hence traders spending more on communication are likely to transact more than those

spending less, assuming that communication is closely associated with business. The intensity of participation of traders in market is also influenced by geographical location.

8.2.3 Transaction cost effects on the marketing of perishable and less perishable agro-commodities

The comparison of the effects of transaction costs between highly perishable and less perishable agro-commodities revealed that the marketing of the latter is less sensitive to the effects of transaction costs. None of the variables capturing information gathering, contracting, negotiating, enforcing and monitoring had significant coefficient estimates. It can be concluded that the ability to add value and prolong the shelf life of what is produced shields the farming household from the urgency to sell. Once the urgency to sell reduces, the seller becomes less responsive to market shocks. The effects of transaction costs will be less visible when handling a less perishable commodity. However, for bananas, these effects are more evident because failure to conclude a transaction in a limited time frame implies severe loss. The sensitivity to market participation of households producing such perishable commodities is therefore quite high.

8.2.4 Transaction cost effects on choice of selling point

Though the results regarding the relationship between selling through middlemen and intensity of sales were not significant, the positive sign implies that middlemen have a positive effect on the intensity of sales. In markets which are characterised by high transaction costs, farmers are better off selling at the farmgate. However, in order for farmers to benefit from such an arrangement, they ought to be equipped with market information and value adding capacity in order to enhance their bargaining position.

8.3 Conclusions and implications for policy

8.3.1 Enhancing the participation of farmers and middlemen in markets

The participation of smallholder farmers in markets is greatly associated with the activities of the middlemen. Little progress will be made in enhancing the market participation of smallholder farmers unless attention is also given to supporting middlemen whose role was seen in a negative light in the past. The support to smallholder farmers and intermediaries/traders may include:

i) Strengthening farmer groups/associations: This may be attained by designing appropriate policies to support the establishment and existence of farmer groups or association which can act as platforms for market information exchange especially in areas where infrastructure is weak and such information is unavailable.

ii) Enhancing family labour: This can be attained through exploring ways of appropriately utilising family labour (especially in the age bracket of 6 to 17 years) to boost the labour requirements of households in order to enhance the household's potential of producing a marketable surplus.

iii) Establishing more market places: This may achieved through making policies aimed at encouraging the construction of more market places, especially in the rural areas. Such places increase market participation through enhancing the meeting of trading partners at a common place hence lowering transaction costs.

iv) Telecommunication technology utilisation: In this era of great advancement in telecommunication technologies (Appendix i), policies geared towards encouraging farmers and traders to access and utilise these technologies for trade purposes should be supported. The utilisation of these technologies would lower the transaction costs immensely and, thus, enhance market participation.

8.3.2 Supporting the marketing of perishables

The results of the study indicate that the marketing of perishables is more sensitive to the effects of transaction costs than that of non-perishables. This suggests that smallholder farmers engaged in the production of perishables like bananas require more support to promote their market participation than those engaged in the production of non-perishables. Likewise, traders handling perishable commodities are more susceptible to risks since their transactions are highly time bound. Support to enhance the participation of smallholder farmers and traders in marketing highly perishable products may include:

i)   Increased investment in rural infrastructure, especially in the rural road network, to ease movement of goods while reducing costs of effecting transactions. Other investments may include setting up market places, collection centres and storage facilities to ease the exchange of goods. Market places are crucial in lowering transaction costs because information exchange, negotiations, bargaining, contract making, enforcement and monitoring can all occur at this one-stop place. Policies supporting the establishment of market places are likely to enhance the marketing of agro-commodities, especially the perishables, whose transactions are highly time-bound.

ii)   Improving access to market information through appropriate media (e.g. radio) to lower the transaction costs associated with searching for trading partners, contracting and enforcing the contracts for the farmers and traders handling perishables.

iii)   Strengthening institutional arrangements to facilitate amicable transactions between farmers and their trading partners. The institutional arrangements

could be formal or informal and may include farmer groups or organisations through which farmers may collectively access markets. Such groups can facilitate the exchange of marketing information while strengthening the negotiation and bargaining position of the members. Contracting and enforcement of contracts can be much easier when done collectively.

8.4 Limitations of the study and recommendations for future research

8.4.1 Quantification of transaction costs

Considering that transaction costs are "hidden costs", quantifying them can be a challenge. This study only captures variables relating to transaction costs but falls short of quantifying them. Future research should attempt to quantify transaction costs for better observations and inferences should be considered. This may involve quantifying actual costs incurred in searching for trading partners, negotiating, bargaining, contracting and enforcing a contract. Furthermore, quantitative analysis of the benefits of selling through middlemen as compared to selling directly at the market place remains one of the areas that ought to be considered for future research.

8.4.2 Capturing ICT use in marketing

The use of ICTs in marketing was scantily captured in this study. Since ICTs are becoming more applicable to the marketing activities in most developing countries, future research ought to capture and examine the role of ICTs in promoting market participation. A panel data set can be established for more succinct observations in this regard.

8.4.3 Accounting for other issues

This study does not adequately account for gender issues in the farming households and in the trading communities yet these have an impact on market participation. Furthermore, with the increasing vulnerability to climate change and its effects, it is important to incorporate it into such an analysis. Future research, therefore, ought to consider capturing gender and climate change when analysing transaction costs and market participation.

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Appendices

Appendix (i): New mobile phone subscriptions for period 2000 - 2008
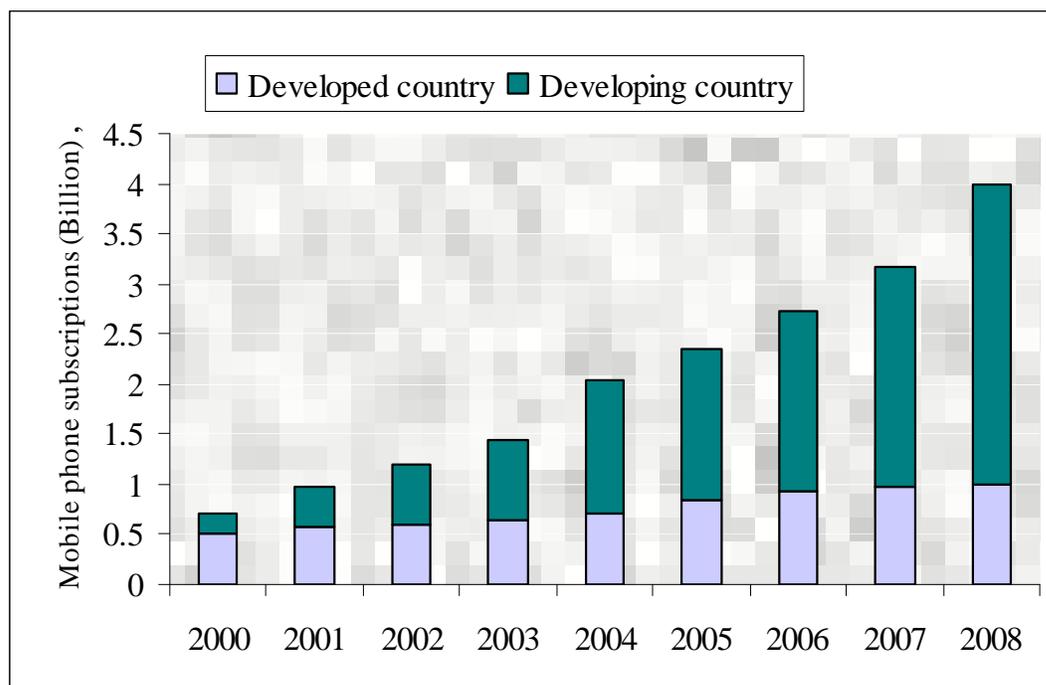
Source: ITU (2009)

Appendix (ii): Map of Burundi showing physical infrastructure

Source: Geographic guide (2011)

Appendix (iii): Map of Rwanda showing physical infrastructure

Source: Geographic guide (2011)