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FACTORS INFLUENCING HULLING OF COFFEE AMONG FARMERS IN MASAKA DISTRICT, UGANDA

BY

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MAY, 2009

DECLARATION

I, Wakulira Mathias declare that this is my original work and has never been presented for a masters degree in this or any other institution of higher learning. Otherwise stated, the work contained in herein is my own.

Signed ……. Date…….

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Student

This thesis has been submitted for examination with our approval as University supervisors

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Supervisor

DEDICATION

This thesis is dedicated to all people of good will.

ACKNOWLEDGEMENTS

I would like to thank my supervisors Dr. Kiiza A.Barnabas and Dr. Sserunkuuma Dick for their in depth review of this thesis and tireless guidance throughout this study. In case of any mistake herein, it is due to me. I am also grateful to Belgian Technical Cooperation and African Economic Research Consortium for sponsoring me for the Masters programme.

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ABSTRACT

For many years, coffee has been a major source of income to many Ugandans. Traditionally, Uganda coffee farmers have sold their coffee in unhulled form as dried cherries (Kiboko) through governmental parastatals. Structural changes in the agricultural sector arising from policy reforms that Uganda embraced since 1990 (notably liberalisation, privatisation and decentralization) removed the monopoly of governmental parastatals in agricultural marketing and pricing which was a disincentive to improvement of quality and quantity of output. Because of liberalisation, coffee quality and exports declined as the traders were more concerned about quantity rather than quality, which led to low prices and consequently low farm incomes. In response to this, value addition through hulling prior to marketing by farmers was suggested as one of the remedies. However, the rate of adoption of this strategy remains disappointingly low.

The purpose of this study is to determine the factors underlying the adoption of coffee hulling by farmers, and to estimate the price elasticities for hulled and unhulled coffee sold. 300 farmers were randomly selected and interviewed using a structured questionnaire. Descriptive statistics were used to characterize and highlight differences between farmers who sell hulled and unhulled coffee. The censored Tobit model was used to analyse the factors that influence the sale of hulled coffee. Two OLS models for the marketed supply of unhulled and hulled coffee were estimated and their corresponding elasticities determined.

The results indicate that higher market prices of hulled coffee positively and significantly ($p<0.01$) enhance the proportion of hulled coffee sold, while distance from the farmer's

home to the coffee processing factory and drought conditions during the season significantly ($p<0.05$) reduce the proportion of hulled coffee sold. Membership in farmer associations has a positive and significant influence on the amount of hulled coffee sold because it enables farmers to transport and sell together thereby reducing the transaction costs borne by each farmer. The sale of hulled coffee was found to be more price responsive than the sale of unhulled coffee both in the short and long run.

Based on these findings the study recommends supporting the development of farmer institutions as a way of promoting the uptake of coffee hulling and value addition to improve farmers' incomes. In addition, the bulking of coffee among farmers should be encouraged and accompanied by provision of market information to farmers for both hulled and unhulled coffee to help them to make informed decisions on where and what form of coffee to sell. There is also a need to invest in improving farmers' access to processing facilities, since long distance to such facilities is shown to have a negative effect on the sale of hulled coffee.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Agriculture dominates both the economic and social activity in Uganda and employs over 80% of the population (Ministry of Finance, Planning and Economic Development, MFPED, 2003). Even where agriculture may not be a major activity, it still provides the main source of employment and income indirectly through activities such as agricultural processing, domestic trade and transportation of produce. It contributes about 40% of the total gross domestic product and provides inputs to other sectors especially the manufacturing sector (MFPED, 2003).

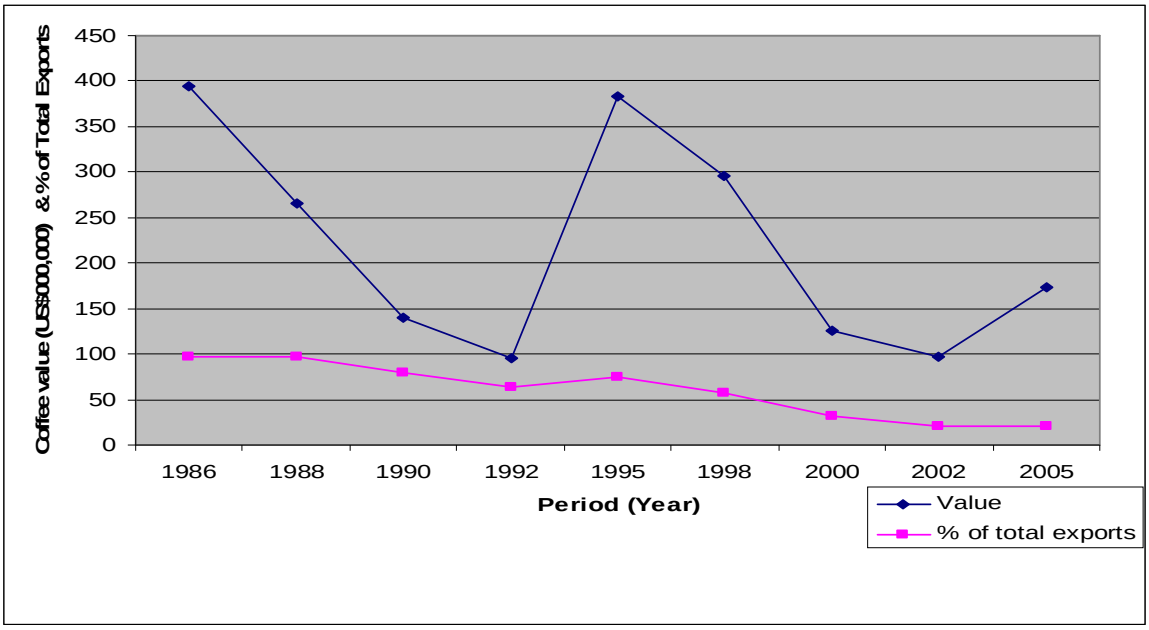
For the last 25 years, coffee has contributed an average of US$245 million per year to Uganda's national foreign exchange earnings (Kasozi, 2006). Approximately 500,000 smallholder families are engaged directly in its production, with over seven million people depending on the crop for their livelihoods. This represents more than one quarter of Uganda's population, and the crop contributes about 70% of total household income among coffee producing households (MFPED, 2005). However, coffee's contribution to Uganda's export earnings has declined over time, from a high of over 95 per cent in the 1980s to just 20 per cent by 2006 primarily because of falling world market prices and diversification of exports. Deninger and Okidi (2003) argue that had coffee prices been 10 per cent higher during the 1990s there would have been an additional six per cent decline in poverty by 1999/2000 (Okidi *et al.*, 2005).

1.2 Trend of coffee Marketing in Uganda

Before the late 1980s, farmers in Uganda produced, harvested, and dried coffee, and sold to primary cooperative societies or private stores (UCDA, 2004). Primary societies sold their coffee to cooperative unions, while the private stores sold the beans to either huller operators or the cooperative unions who, after hulling, sold the coffee to the Coffee Marketing Board (CMB). The CMB in turn sorted and graded the coffee before export (NUCAFE, 2005). The prices paid at each level were pre-determined by the government and remained fixed irrespective of movements in the international coffee market.

After liberalization in the early 1990's, nearly all exporters became vertically integrated, with the supply chain for coffee export being dominated by coffee processing and trading companies (Ssemogerere, 1990). The activities of the cooperatives included procurement of coffee from farmers and primary cooperatives, hulling and processing the coffee into the exportable grades and blends, and in many cases exporting the coffee as well. Alongside the main supply chain were private traders and the old cooperative trading system. The increased liberalisation of the coffee sub-sector encouraged foreign direct investment (FDI) and brought in multinational coffee companies (UCDA, 2005). The price of coffee surged from 20 per cent of the world prices before liberalization to as high as 85 per cent at the peak of the competition, before falling back to about 70 per cent. Traders and exporters competed for a larger market share, which compromised the quality of coffee, as traders became more concerned about quantity rather than quality. This led to an inconsistent trend in the value of coffee exported (see Figure 1).

Figure 1: Coffee export value and percent of total exports, 1986–2005



Source: Adopted and modified from Warnock and Cornway (1999); BOU (2001, 2005)

The Government of Uganda has been implementing economic reforms since 1987 geared at restoring economic growth and development. The reforms centered on economic liberalization and privatization of public enterprises with the aim of promoting private sector participation in the development process (Ssemogerere, 1990). These reforms were amended and consolidated into an all-inclusive government development framework, the Poverty Eradication Action Plan (PEAP), in 1997 that was revised in 2000 with the major goal being to reduce the poverty level from 35 percent in 2000 to less than 10 percent of the population by the year 2017.

Coffee marketing, like many sectors was previously government controlled under the coffee marketing board and the cooperative movement (Fafchamps, 2005). Under this arrangement, farmers produced with predictable prices although their average earnings were only 29% of the international prices. With the onset of liberalisation, all the

activities previously done by the government were left to private individual players, including traders and farmers. This meant that the farmer was free to decide to which trader to sell, when and at which price. Due to competition among traders for coffee, there was little attention to quality which led to coffee quality deterioration and consequently, the price fell at both farm gate and international level (Uganda Coffee Development Authority (UCDA), 2005). Despite these challenges, the liberalisation policy brought about favourable changes, such as prompt payment to farmers and an increase in the farm-gate share of the international prices to 70%. It also encouraged private sector organisations to fill the gap in delivery of services to support production, processing and marketing, a role that was previously played by the cooperatives and government parastatals (Fafchamps, 2005).

Currently it is reported that coffee farmers receive only about 25% share of the prices of their coffee when they sell at the farm gate without processing and over 60% share after processing. Apart from providing income, another advantage of sale after processing is that the farmer can collect the coffee husks and use them for mulching.

1.3 Problem Statement

With liberalisation of markets, the number of private traders in Uganda increased and so did the competition for coffee among the coffee traders. This meant that coffee farmers were free to produce and sell their output to private traders. Due to this competition for the available coffee, many traders resorted to buying half dried coffee and often mixed it with other materials without due concern for quality. The quality of Ugandan coffee

gradually declined as did the prices offered at the international market level (NUCAFE, 2005). Coffee prices at the farm gate became less rewarding to producers, and the sector registered a decline in production and overall contribution to GDP.

To help farmers to get better prices for their coffee, organisations such as UCDA, NUCAFE and Uganda Cooperative Alliance (UCA) embarked on a training campaign to encourage farmers to add value to their coffee by picking ripe cherries, drying to the recommended moisture content (13-14%) and selling hulled coffee beans. It was envisaged that by farmers adding value to their coffee through hulling, quality would improve and the supply chain would be shortened, leading to higher prices for farmers. The campaign to encourage farmers to hull and add value to their coffee before selling is continuing. Some farmers have adopted this practice while others have not (NUCAFE, 2005). This study was undertaken to determine the factors influencing the adoption of coffee hulling at farm level and to determine if the supply of hulled coffee is more responsive to prices.

1.4 General Objective

To determine factors that influence the sale of hulled coffee by farmers.

1.4.1 Specific Objectives

1. To characterise the coffee farmers in the study area by form of coffee sold.
2. To determine factors affecting the proportion of hulled coffee sold by farmers.
3. To determine the price elasticity of marketed production of hulled and unhulled coffee.

4. To determine and compare the gross margins from the sale of hulled and unhulled coffee.

1.5 Hypotheses

1. The Price of hulled coffee influences the proportion of hulled coffee sold by the farmers.
2. The location of the farmer relative to the factory influences the proportion of hulled coffee sold by the farmers.
3. The price elasticity of supply of hulled coffee is greater than that of unhulled coffee.
4. The gross margins from sale of hulled coffee is higher than that of unhulled coffee

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 History of coffee Production in Uganda

Uganda produces two types of coffee: Arabica coffee (*Coffea arabica*), which comprises about 70 per cent of the world's coffee production and 10 percent of Uganda's coffee production; and Robusta coffee (*Coffea canephora*), which comprises about 30 per cent of the world's production and 90 per cent of Uganda's production (UCDA 2005). Robusta coffee is indigenous to the central parts of the Uganda, while the British colonial authorities introduced Arabica coffee at the turn of the twentieth century. Robusta is grown in the central part of Uganda in the Lake Victoria crescent, and across the west, south-west, and east of the country. Arabica is grown at a higher altitude, in the areas of Mountain Elgon along Uganda's eastern border with Kenya and in south-western Uganda along the Rwenzori mountain range (UCDA, opcit).

This widespread cultivation of coffee places Uganda among the top 10 coffee-producing countries in the world and second only to Ethiopia among the Africa, Caribbean and Pacific (ACP) countries (CTA, 2006). Ugandan Robusta beans are uncharacteristically hard, giving them good roasting qualities. They have a mild, soft, sweet and neutral taste, and have high frothing properties suitable for popular drinks such as espressos. Uganda's Arabica also has strong market qualities; it is wet processed (washed) to produce a mild coffee that is popular with most consumers.

2.2 Coffee Processing

The processing of coffee occurs in two stages. First is the primary processing (hulling) which involves the removal of husks from the dried coffee beans. Second is the roasting and grinding of coffee into a finer form that is ready for consumption (secondary processing). In Uganda it is the primary processing that is mostly commonly done (UCDA, 2006). Out of the coffee that is produced, 95% is exported after primary processing. Only 5% is locally roasted and grounded into finer coffee ready for consumption. In most cases, this processing is done by traders. Of recent, some farmers have adopted coffee processing before sale and the number is on the increase. There are about 250 active hullers in Uganda and these are widely distributed in coffee growing areas. However the proximity of these facilities to farmers is still inadequate. Unless these facilities become equitably located to favour access by remote poor farmers, improvement in coffee quality through farmers' processing may still remain a myth (Baffes, 2006).

2.3 Adoption

In most of the economic literature, adoption is defined as a qualitative variable, analysed in terms of whether or not the innovation is used by the household. This has in some cases expanded to include the extent of use, based on various indicators such as land area under technology or other components of the technology used (Nkonya *et al.*, 1998). Adoption and diffusion of innovations theory has been widely used to identify factors that influence an individual decision to adopt or reject the innovation (Rogers, 1995). An innovation is an idea, practice or object that is perceived as new by individuals or other

unit of the adoption. The perceived newness of the idea for the individual determines his reaction to it (Rogers, *1995*).

Rogers (1995) identifies five characteristics of an innovation that affect the decision to adopt or not. These are (1) Relative advantage, which is the degree to which an innovation is perceived as being better than the idea it supersedes. (2) Compatibility or the degree to which an innovation is perceived as being consistent with the existing values, beliefs, past experience and the needs of the potential adopters. (3) Complexity, which is the degree to which an innovation is perceived as relatively difficult to understand and use. (4) Triability or the degree to which an innovation may be used experimentally on a limited basis and (5) Observability which is the degree to which results of the innovation are visible to others. The relative advantage and observability of the innovation describe the immediate and long term economic benefits (profits) from using it, while compatibility, complexity and triability indicate the ease with which the potential adopter can learn about and use an innovation (King and Rollins, 1995). For purposes of this study, the innovation of interest is the hulling of coffee beans before sale.

Many characteristics generalised by Rogers (1995) (educational level, farm size and income) have been found to be significant variables that affect adoption (Ismet and Cuma, 2004). Adoption decisions are also greatly affected by the availability of information because it increases the likelihood of adoption. Saha *et al.* (1994) go on to argue that the adopters' information depends on individual specific attributes for example education. He found that education was one of the most important factors in technology

adoption. Extension is a major source of agricultural information from the researcher to the farmers. Adesina and Baidu (1995) found that visits from extension staff are positively related to adoption by exposing farmers to new information. Likewise, Kitinila *et al.* (1998) found that fewer contacts of farmers with extension worker constrained adoption.

According to Kirsur *et al.* (1999), for effective diffusion of a technology, there must be compatibility between the technology and the target. The technology should be farmer friendly and must be acceptable to the farmers as it is, or with minor adjustments. This is why it is important to study the adoption of a technology in relation to the farmers' socioeconomic characteristics. The economic assessment of adoption is based on the assumption that households are motivated to adopt new practices due to their desire to maximise utility explained in terms of perceived net returns (Semgalawe, 1998). Further more, Ntege *et al.* (1997) contend that the awareness of profitability or potential benefits of the new technologies is necessary though not sufficient to trigger the diffusion of an agricultural innovation.

The effect of age of household head on technology is an empirical question; it may be that older farmers have more experience in farming practices and are therefore able to assess characteristics of the technology. However, it could be that older farmers are more risk averse and therefore have a less likelihood of adopting a new technology than young farmers (Adesina and Baidu, 1995). Brush (1997) found that farms that adopt tend to be larger in size, while non adopters have smaller plots. Credit availability has been found to

affect adoption positively (Erbaugh, 1997). Drought and unfavorable temperatures are also major climatic limitations for coffee production and thus, adoption of new coffee technologies. These limitations are expected to become increasingly important in several coffee growing regions due to the recognized changes in global climate, where water shortage and unfavorable temperatures negatively affect coffee yield (Wang, 2003).

2.4 The Rate of Technology Adoption

When a new technology is introduced, farmers experiment with it before adopting. According to Saha *et al.* (1994), adoption can be classified into three phases namely, information collection, decision whether or not to adopt and how much to adopt. Adoption occurs if the perceived benefit of adoption outweighs its cost. The farmer also decides on what proportion of resources to allocate to the new technology. Previous studies have shown that the rate of adoption varies from one location to another (Ismet and Cuma, 2004).

2.5 Theoretical and Analytical Framework of the Tobit Model

Qualitative response models represent one of the most important developments in econometrics (Amemiya, 1981) and are the most commonly used models in static household adoption studies. The most frequently used models are the linear probability models, the logit and the probit models. For either model to be used, the dependent variable should take on two discrete values e.g whether or not some one does a certain practice or not. The logit and probit are also sufficient if just the probability to adopt a technology is the question of interest as they are adequate tools for addressing probability

questions. However in this study the dependent variable, Y (proportion of hulled coffee) is mixed in a sense that those who don't hull coffee would have a value of 0 for Y, while the adopters will have a continuous outcome defined by the proportion of hulled coffee marketed. The study also was interested in the intensity of adoption and neither the logit or probit could handle this. What is needed is a model hybrid between Ordinary Least Squares (OLS) regression and logit or probit. The Tobit model is such a hybrid (Nkonya, 1999) and was therefore chosen for this study.

2.6 Supply Response

2.6.1 Supply response in Agriculture

Production and supply of perennial crops have been studied by several authors, including Ssemogerere (1990), Trivedi (1992), Aashish and Chavas (2008)**.** Many of these studies use models that take into account both short-run and long-run responses. Supply response also depends on the availability (quantity, quality, and cost) of supporting services and on the legal and institutional framework (Schiff and Montenegro, 1997). Taking into consideration supply responses with respect to perennial crops, the long-run responses become more complicated because time lags allow all factors to change resulting into higher elasticities. The importance of lags in the supply of tree crops is greater than for field crops. For this reason, the supply model of Nerlove which has proved so successful for field crops cannot be expected to perform as well for tree crop (Wickens, 1973). Long-run responses also have to deal with formulating models for tree removal, for replanting and for new planting, as well as for increased acreage (Kidane, 1999).

There is a great deal of disagreement in the literature on what the correct measure of output is in determining supply response. The three choices for measuring output are the acreage under cultivation, production or yield per unit area, and total production in terms of weight or tonnage produced (Mshomba, 1989). The best measure of output appears to be the use of the actual produce weight because it acknowledges that farmers may respond to price incentives by using either more intensive or more extensive farming techniques. An additional factor in favour of the use of this particular measure is that of data on tonnage produced if it is readily available (Mshomba, 1989). Research shows that there is no difference in determining the supply elasticity when one of the three choice variables is used (Askari and Cummings, 1977).

The yield of a perennial crop varies with the age of the bearing plants, with technology (cultural techniques, varieties, etc.) weather and biological factors. In some cases, current yields also may be related to past yields by alternate bearing tendencies and conceivably may be varied in response to current profit expectations (French *et al*., 1985). Yield has positive and significant impacts on market participation for cash crops, food crops and all output as well as on total sales value (French *et al*., *op cit*) and therefore yield levels rather than expected prices affect the supply response of small farms whereas large farms react more strongly to price.

Most studies of supply response agree that farmers respond positively to increments in producer prices but inelastically. The success or failure of agricultural programmes depends decisively on the reaction of the farmers to such programmes, since it is the

farmer who ultimately makes the decision concerning the allocation of resources for particular crop enterprises (Chembezi and Womack, 1986).

2.6.2 Aggregate Agricultural Supply Response

Commodity and aggregate supply response have different policy implications. The former involves shifting resources between commodities within a sector while the latter involves the transfer of resources from other sectors into agriculture and vice versa (Bond, 1983). For this reason commodity response has been found to be greater than aggregate supply response. Aggregate agricultural production responds to a change in relative prices of export versus domestically consumed crops and to change in aggregate price index. The latter response is more commonly studied. This depends on a number of factors such as the movement of labour and materials from urban to the rural sector and other such transfers (Bond, 1983; Rao, 1989). For developing countries there are often under utilised resources, so such transfers need not occur.

2.6.3 Key Factors in Supply Response

Price plays an important role in generation of marketed surplus. Generally, higher prices are expected to result in a larger output. Price is therefore, among the most important determinants of the area under different crops (Ramulu, 1996). In economic analysis of the farm supply response, price is considered to be the critical economic factor that determines farmers' production decisions (Ramulu, *op cit*). In Turkey the supply of major field crops was found also to respond significantly to both own-price and substitute price changes (Koc, 1998). Koc (1998) differs from some economists. He argues that farmers

in underdeveloped countries need only a little amount of cash and therefore price has no impact on agricultural output, but according to other economists it was found that farmers in developing countries do respond to changes in prices (Ramulu *op cit*).

Also studies by Bevan *et al.* (1989) show that African farmers do indeed respond to price and other incentives in a rational and predictable manner. They argued that the response of acreage to changes in relative price is a good indicator of the price responsiveness for both annual and perennial crops. Price was also found to be an important factor in determining the size area of cocoa cultivation in Malaysia. With respect to smallholder farmers in Ethiopia, Abrar (2004) found that farmers do respond positively and significantly to price and price incentives.

Measures such as distance, type of transport available and information variables are examples of exogenous transaction cost determinants. Measures of distance and transport are expected to determine variable transaction costs, and information variables are expected to determine fixed transaction costs. Transaction cost considerations would make one expect market participation to decrease and not increase, with distance (Sadoulet *et.a.l,* 2000). Policies that reduce transactions costs are consequently important complements to price policies in affecting supply response (Sadoulet *et al.,* 2000; Fafchamps, 2005). Schiff *et al*. (1997) argue that the prices obtained from time series data are mainly drawn from a given price regime, reflecting mainly short-run variation in price, while prices obtained from cross sectional data better reflect differences in price regimes. Generally the structural breaks in the economy due to transition do not allow the

use of time series data and modern dynamic econometric analysis of supply response. Therefore, given such limitations, cross-section data were used in this study.

2.6.4 The Concept and Nature of Supply Price Elasticities

Supply price elasticity refers to the percentage change in output arising from a percentage change in prices and is obtained from supply functions. Information on supply price elasticities has been acknowledged as being very important for decision makers at the macro and micro levels and that supply price elasticities are derived from a rule that defines the relationship between a set of prices and output (Abdallah, 1998). In supply relationships, it is normally accepted that producers who try to maximize profits will increase (decrease) the supply of a commodity in response to an increase (decrease) in the price of that commodity subject to a given technology. The technology available to the producers determines the physical response of output to the use of a set of inputs - this is what economists refer to as a production function (Collery, 1955). Producers use changes in both output and input prices to determine the expected profitability of a particular production activity.

A basic problem which farmers face when they decide about output response to price changes is that they have to base their decision on future prices (Abrar, 2004). This partly results from the lagged response of agricultural production to changes in prices. This is particularly important in perennial crops production, in most cases, due to the relatively long period that it takes for actual output to be realized. This is further complicated by the fact that physical production responses in the future depend on past decisions affecting such things as the production dynamics. The majority of the regression analyses based on

the Nerlovian method obtain low or even zero, long-run price elasticities of agricultural supply. Binswanger (1993) found that short-run supply response is low because the use of the primary factors, which usually account for 70-85 percent of the cost of agricultural production in developing countries, cannot be changed instantaneously.

2.6.5 Analytical Framework of the Supply Response Model

The decision problem confronting each farmer is to choose a particular technology in order to maximise expected profits (Reca, 1980). A theoretical supply curve is based on the assumption that farmers seek to maximise profits. A rational expectations equilibrium model of agricultural supply is one in which producer supply decisions are derived entirely from an explicit optimization problem, future values of variables that influence these decisions are forecasted optimally, and all markets are clear (Eckstein, 1985). Tomek and Robinson (1990) show that the supply of a commodity is influenced by cost of production, returns from commodities that compete for the same resources, technology that influence both yields and costs of production or efficiency, prices of output, yield risks faced by the producer and institutional constraints such as government control programs. These factors have informed the design and analysis of the study to identify whether they are key to adoption of selling hulled coffee and also whether they are important determinants of supply response for hulled and unhulled coffee.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Field Methods

3.1.1 Study Area

This study was carried out in Masaka district, which is located in the south of the central region of Uganda. The district is one of the leading producers of Robusta coffee in the central region and the whole country. Masaka district is also one of the beneficiaries of the national coffee replanting programme by UCDA that has targeted reviving the coffee sub-sector. The district has many coffee factories that have been used by coffee traders to hull their coffee, sort and grade and finally sell to exporters. It is also one of the districts where most of the programmes encouraging the sale of hulled coffee were started and are continuing.

3.1.2 Sampling Procedure and Sample Size

Both random and purposive sampling techniques were used in selecting the study sample. Out of the 23 sub counties found in Masaka district, 20 sub-counties were purposively selected because it is in these sub-counties that coffee production takes place. From the 20 sub-counties, 3 were randomly selected to include Kibinge, Kisekka and Kabonera. Five parishes were then randomly selected from each sub-county. With the help of area extension workers, a list of all coffee farmers was generated in each parish from which 20 farmers per parish were randomly selected to make a total of 100 farmers per sub-county and study sample of 300 coffee farmers.

3.1.3 Data Collection

Both primary and secondary data were collected. Primary data, which formed the core of this study, were collected from coffee farmers using a structured, pre-tested questionnaire (Appendix 2). The questionnaires were administered through face-to-face interviews. The data collected included:

a) Socio demographic characteristics like sex, age, education level, occupation and incomes of household heads and their spouses, household size, farm size, access to markets, access to credit and access to extension services, and decision making.

b) Production characteristics like; type, quantities and costs of inputs used such as seed planted, land under cultivation of the coffee, labour (family and hired) in terms of hours spent per person per day, pesticides, fertilizers, etc. Also the amount of output harvested, and quantity sold plus the prices of both hulled and unhulled coffee, household inputs hired out and technology used were collected.

c) Marketing characteristics like type and form of coffee sold, prices, markets, transport mode used to the market. Also information on whether the farmers market their produce as a group or individually were collected.

3.2 Analytical Methods

Data collected were coded, entered and cleaned using the Statistical Package for Social Scientists (SPSS) computer program. A summary of descriptive statistics (percentages, means, standard deviations and t-statistics) were generated. The data were then transferred to STATA version 9.0 in which econometric analyses were carried out.

Objective number One

Objective one is to characterise the households by the form of coffee they sell. Descriptive statistics of household demographic and socio-economic characteristics were generated to include; means, frequencies, standard deviations. T-test statistics were used to determine the differences between farmers who sell hulled and unhulled Coffee. Explanatory data analysis was carried out to check for symmetry, skewness and data distribution (Murkherjee *et al*., 1998). Variables that were skewed and had high kurtosis were transformed by logarithms.

Objective number two

Objective two was to determine the factors affecting the proportion of coffee sold. This was achieved using the Tobit model. The assumption is that not all farmers sell 100% hulled coffee. Thus, the dependent variable (proportion of coffee sold as hulled) is treated as censored with lower limit as zero and upper limit as 1. This study employed a generalized two-tailed Tobit model and specified as,

$$\boldsymbol{y_i^*} = \mathbf{X}\,\boldsymbol{\alpha} + \boldsymbol{\varepsilon} \quad \text{.....(1)}$$

$$y_i = 0 \text{ if } y_i^* \leq 0 \quad \text{.....(2)}$$

$$y_i = \boldsymbol{y_i^*} \text{ if } 0 < y^* < 1 \quad \text{.....(3)}$$

$$y_i = 1 \text{ if } y_i^* \geq 1 \quad \text{.....(4)}$$

where y_i is the proportion of hulled coffee, $\boldsymbol{y_i^*}$ is the unobservable latent variable, $\boldsymbol{\alpha}$ is the vector of parameters to be estimated and $\boldsymbol{\varepsilon}$ is a vector of independently normally distributed error terms with zero mean and constant variance σ^2.

X is a vector of explanatory variables that include; Age of farmer, Price of hulled coffee per kilogram, Access to extension service and training, Membership in a group, Total Coffee harvest, Distance from home to factory (location) and Drought effect.

Objective three

Objective three is to determine the price elasticity of hulled and unhulled coffee. The Supply Function is one of the many models used to account for the fact that farmers don't react immediately to changes in the factors that influence supply. The foundation of this model therefore is the dynamic supply response. Nerlove (1958) stated that producers adjust to the change in the following manner;

$$Q_t - Q_{t-1} = \lambda (Q_{t*} - Q_{t-1}) \quad \text{.....(5)}$$

This equation is the partial adjustment model, meaning that the difference between what the farmer produces in a given period (Q_t), and what s/he produced in the previous period (Q_{t-1})**,** is only a proportion (λ) of the difference between what s/he plans to produce(Q_{t*}) and what s/he produced in the previous period. An alternative way of expressing it is by re-writing the equation as follows;

$$Q_t = (1-\lambda) Q_{t-1} + \lambda Q_{t*} \quad \text{.....(6)}$$

This means that what s/he produces in a given period is a weighted average of what s/he produced in the previously plus what s/he plans to produce. But,

$Q_{t*} = \alpha_o + \alpha_1 P_{t*} + \alpha_t Z_t$…….… (7)

Where P_{t*} = Expected price, Z = All other factors which influence supply

Substituting equation (7) into equation (6)

The overall equation becomes;

$Q_t = \lambda (\alpha_o + \alpha_1 P_{t*} + \alpha_t Z_t) + (1- \lambda) Q_{t-1}$ ……..…… (8)

This equation however cannot be estimated because of the unknown expected price. According to naive expectation model used by Nerlove (1958), the farmer bases his decision to produce on the previous season's price (P_{t-1}). Therefore,

$P_{t*} = P_{t-1}$ ……...……. (9)

Thus the supply function is obtained as

$Q_t = \lambda \alpha_o + \lambda \alpha_1 P_{t-1} + (1- \lambda) Q_{t-1} + \lambda \alpha_2 Z_t$ ……..(10)

Where Z is a set of variables in the extended model and can include:

Prices of unhulled coffee (P_2) in Shillings, Total area (Acreage) under coffee planted (A) in Acres, Transaction costs for sale of hulled coffee (Tc) in Shillings, Total production costs (C), Dummy for technology adoption (DT), Lagged Quantity of coffee produced (Q_{t-1}) in kilograms.

In this objective, the aim is to obtain the own price and cross price elasticities for both hulled and unhulled coffee in Masaka to use for informing policy.

The general functional form of the supply function can be written as;

$$Q_t = \beta_0 + \beta_1 P_1 + \beta_2 P_2 + \beta_3 C + \beta_4 Q_{t-1} + \beta_6 A + \beta_7 DT + u_i \text{ .....(11)}$$

Specifically for the hulled coffee;

$$Q^h_t = \beta_0 + \beta_1 P_{t-1}^h + \beta_2 P_{t-1}^{uh} + \beta_3 C + \beta_4 Tc + \beta_5 Q^h_{t-1} + \beta_6 A + \beta_7 D + u_i \text{ .....(12)}$$

For the unhulled coffee

$$Q^{uh}_t = \beta_0 + \beta_1 P_{t-1}^{uh} + \beta_2 P_{t-1}^h + \beta_3 C + \beta_4 A + \beta_5 Q^{uh}_{t-1} + \beta_6 D + u_i \text{ .....(13)}$$

P_{t-1}^h, Qt^h and Q^h_{t-1} are lagged Price of hulled coffee per kilogram, present Quantity and lagged quantity of hulled coffee in kilograms respectively. P_{t-1}^{uh} , Q^{uh} and Q^{uh}_{t-1} are lagged price of unhulled coffee per kilogram, present quantity and lagged quantity of unhulled coffee in kilograms, respectively.

Estimation of Elasticity

Elasticity is the percentage change in output resulting from a one percentage change in the product or input prices. In the short-run, due to fixed resources, adjustment in production is limited. In the long run, alteration of productive resources is more possible. The Short-Run Elasticity (SRE) can be calculated only after allowing for one production period (Behrman, 1968). SRE relationship calculated at the mean value of $\overline{P}_1$ and $\overline{Q}_t$ is presented below;

$$SRE = \beta_1 . \left(\overline{P}_{t-1} / \overline{Q}_t\right) \text{ .....(14)}$$

In this form, the equation can be estimated using ordinary least square (OLS) technique. A similar relationship holds when Q_t is replaced by the area planted by the crop.

From equation (11) the elasticity or coefficient of adjustment (λ) can be found. λ determines the relation among the short-run elasticities and long-run elasticity and can be obtained by subtracting the statistically determined coefficient of lagged quantity (Q_{t-1}) from equation (12) and (13) respectively.

Therefore $\lambda = 1-\beta$ (of lagged quantity marketed) ……..... (15)

Where β_5 is the coefficient of lagged quantity (past quantity of hulled or unhulled coffee sold). By dividing the SRE by λ then the Long-run Elasticity (LRE) is obtained as shown below;

LRE=SRE/λ ..... (16)

However, the above calculation of elasticity is applicable only when individual output prices and not price ratios are used.

Objective four

Estimation of Gross Margins (objective 4)

In this study the profit margins of the sellers of hulled coffee and those who sell unhulled coffee was determined separately and compared. An enterprise budget listing all incomes and variable costs associated with all the activities involved in the production up to the sale of both types of coffee to estimate its profitability. All the input and operational costs will be used in the estimation of enterprise gross margins. Gross margins were compared for the sale of both types of coffee. Emery *et.al* (1987) defined gross margins as the difference between the revenue and the operating expenses (variable costs) of a firm.

Gross margins (GM) = Total revenue- Total variable costs

In equation form, it can be represented as follows:

$$GM_i = P_q Q_i - \sum_{x=1}^{n} P_x X_i$$

GM_i = Gross margin per acre for the crop

Q_i = Quantity of output per acre of the crop

P_q =Unit price of the crop product

P_x = unit cost of variable in puts per acre used in the crop enterprise

X_i = Quantity of variable inputs per acre

In this study, the gross profits of farmers using selling hulled coffee and those selling unhulled coffee was calculated.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

In this chapter, results are presented of data collected in a survey of 300 coffee farmers in Masaka district. The section compares the socio-economic characteristics of the households that grow and sell coffee in hulled and unhulled forms, and discusses the factors influencing the proportion of hulled coffee sold by the household. Finally, supply response to changes in prices the last two seasons and the elasticities for hulled and unhulled are estimated and compared for statistical differences.

4.1 Socio-economic Characteristics of Respondents

The biggest proportion of farmers (49.5%) sold their coffee exclusively in the unhulled form (*Kiboko)* while 29.85% sold only in the hulled form and 20.7% sold both hulled and unhulled coffee in different proportions. Analysis of household characteristics shows that decision making about the sale of either hulled or unhulled coffee in the household is predominantly made by husbands (45.5%) compared to their spouses (13.0%). This is in agreement with UNICEF (2006) that in a household, decision-making often belongs to the family member who controls the largest share of household income and assets. Coffee being a cash crop has traditionally been a male domain, favoring males, who have access and control over production resources. It must, however, be noted that throughout the development of agriculture, women have played a significant role to the continuity of farming systems. It is well established for example that coffee production in Uganda still relies heavily on female labour input in the production process with male hands

controlling marketing and proceeds from the crop and this is in agreement with the findings of Evers and Walters, (2001; 2000); Kasente, (1997); Elson and Evers, (1996)

Table 4.1: Socio-economic Characteristics of Respondents

Household characteristic	Hulled	Unhulled	Overall	
Variable	Coffee	Coffee	Sample of	t-value
	Farmers N=	*Farmers N=*	*Farmers N=*	
Age of household head	45.0 (12.31)	51.9 (12.5)	49.7 (13.17)	-4.113***
Years of formal schooling	8.0(2.76)	7.7 (3.02)	7.8 (2.8)	1.009
Coffee farm size(Acres)	4.23(7.47)	1.8 (2.15)	2.86(4.57)	2.935***
Coffee farming experience (Years)	18.0(11.11)	25.4 (13.1)	22.9(13.0)	-4.42***
Total land owned (Acres)	7.7(7.6)	5.1 (5.13)	6.52(6.61)	2.850***
Distance to factory (Km)	7.55(4.87)	9.3 (4.63)	8.27(4.68)	-2.74***
Price of coffee per Kg (Shs)	1,902.5(161.3)	732.4 (149.1)	1,172(588)	56.7***
Duration of storage before selling Coffee (Months)	1.60(0.49)	1.16 (0.36)	1.38(0.48)	7.410***
Number of extension Visits per year	3.3(1.9)	1.2 (0.8)	2.69(1.75)	6.826***
Credit from banks/MFI (Shs)	322,222 (156,347)	250,000 (132,287)	336,842 (208,061)	0.713
Number of dependants	6.4(3.7)	5.3(2.6)	1.75(3.0)	2.479**
Off-farm income per year (Shs)	2,073,645 (1,992,993)	1,216,562 (1,324,336)	1,863,963 (1,801,672)	2.00**
Gross margin per acre per year	999,848 (882,874)	332,966 (336,266)		8.202***

Source: Survey data, 2007; Figure in parentheses are standard deviations
****, ** , * Refers to significance levels at 1%, 5% and 10% respectively*

The mean age of farmers who sold hulled coffee (45 years) is significantly lower than that of those who sold unhulled coffee (52years). In addition, the mean experience in coffee farming was significantly lower for farmers who sold hulled coffee (18years) as compared to those who sold unhulled coffee (25 years). The argument by Fafchamps and Hill (2005) that older people tend to be less amenable to change and hence reluctant to change their old ways of doing things is consistent with the findings of this study.

The mean of total land endowment among farmers who sold hulled coffee (7.7acres) is significantly larger than for those who sold unhulled coffee (5.1 acres). In addition, the average land area allocated to coffee among the farmers who sold hulled coffee (4.23acres) is significantly higher than that of their counterparts who sold unhulled (1.8acres). Feder (1980) argues that farmers with larger farms are more likely to adopt improved technologies that require economies of scale for profitable production. A possible reason for this is that the appropriateness of the innovation is very often dependent on farm size. In addition, size of land is an indicator of household wealth, with larger farmers also likely to be wealthier and with a higher ability to afford new technologies which usually need higher capital requirements than the local technologies.

Literature on innovation emphasizes the role of distance and geographical location in technology adoption (Rogers 1995). On average hulled coffee sellers traveled 7.6 kilometers to the processing factory which is significantly lower than the 9.3 kilometers that those who sold unhulled coffee would have to travel before sale. Distance to processing factory is a proxy for the cost involved in accessing the technology and is also a proxy for market access

since buyers tend to capture sellers at these factories. Assessment of processing facilities shows significant travel and transport costs, and these costs increase with distance implying that higher transport costs could be a deterrent to the selling of hulled coffee. Investment in rural based processing infrastructure to reduce transportation costs may therefore accelerate the adoption of hulling coffee.

In addition, the average storage time for coffee among hulled coffee sellers was 2 months compared to less than 1 month for unhulled coffee sellers, and the difference in storage period was statistically significant ($p \leq 0.01$). The reason could be that farmers intending to hull their coffee continuously bulk their coffee as they harvest to reap from the economies of scale of transporting a large volume to the factory. Such farmers capture a better price since they sell towards the end of the harvesting period and realize higher profits.

Exposure to information reduces subjective uncertainty and therefore increases the likelihood of adoption of new technologies. The number of training sessions on sale of hulled coffee received by farmers ranged between 0-10. Findings from this study show that the mean frequency of training on sell of hulled coffee was significantly higher (3 times) among farmers who sold hulled coffee than to those who sold unhulled coffee (1 time). This suggests that frequency of training on sale of hulled coffee significantly influenced farmers' decision to sell hulled coffee. This is in agreement with Lindner (1987) who argue that the final decision to adopt or reject is consistent with the producer's acquisition of the knowledge, self interest; and that economic considerations are the most important determinants of actual adoption decisions.

4.1.1 Source of Information and group Membership

The study shows that information about the selling of hulled coffee was obtained from different sources that include fellow farmers (49.4%), extension personnel (23.1%), radio (18.4%), and other sources (8.9%). The fact that the majority of the farmers accessed information from their fellow farmers indicates that the information flow gap that exists in the promotion of coffee hulling is bridged by group membership. Many farmers may not adopt because of lack of adequate information on the innovation, as farmers may not have sufficient information to pass on to fellow farmers.

51.8% of the sampled farmers belonged to farmers groups while the rest did not. This suggests a need to encourage farmers to join groups established through farmer institutional development programs. When farmers were asked why they joined groups, specifically coffee based groups, the majority of the farmers identified group training as the main reason for joining (62%), while 24% joined to improve market access through group marketing, and 13.7% were concerned with maintenance of coffee quality.

Table 4.2: Reasons for Joining Farmer Groups

Advantage	Frequency	% of responses
Group training	113	62.1
Group marketing	44	24.2
Quality maintenance	25	13.7
Total counts/responses	182	100

Source: Survey data, 2007

4.1.2 Coffee Post Harvest Handling Practices

Most of the farmers (78.3%) sold their coffee in the dried form while 7.4% sold it as fresh cherries and 14.4% in both forms. Much as the majority of farmers disposed off their coffee in dried form, the majority did not use modern drying technologies with over two thirds (68.6%) drying it on bare ground. Only 23.3% of the farmers in the study sample dried coffee on mats placed on the ground or on raised stands. In addition, the majority of the farmers stored their coffee in bags in their houses (68.8%). Coffee quality can be enhanced through proper management and handling which begins right from agronomic practices, harvesting, post harvest handling including drying and storage, to marketing. Recommended drying and storage methods are those that minimise the incidence of storage pests, diseases and contamination with inert matter. Drying coffee on bare ground and packing fresh cherries in bags increases risks of contamination with stones and animal droppings in addition to exposure of the coffee beans to moulding, leading to production of a dangerous food poison Ochratoxin A (OTA). Although efforts have been made to sensitize farmers on this issue, compliance with the recommended practices is still inadequate.

4.1.3 Marketing of Coffee

Most of the farmers sell their coffee individually (83.9%) compared to 16.1% who sell in groups. Given the small-scale nature of most of the rural farmers, selling individually prevents farmers from reaping the benefits of economies of scale. Working through groups, farmers can reduce the cost of accessing inputs, production technologies, information and markets by sharing these costs amongst members of the group. Most

farmers used pickups (77.7%) as the means of transport to the hullers, others used bicycles (10.8%) while 11.5% used Lorries and these were mostly large producers and/or those who sold in groups.

Table 4.3: Reasons for not selling hulled Coffee

Reason	Frequency	% of response
Urgent need for cash	139	46.5
Low quantity	68	22.7
Expensive venture	62	20.7
Drought	11	3.7
Cheating in weights	10	3.3
Not sensitized about sale of hulled coffee	9	3.0
Total	299	100

Source: Survey data, 2007

Farmers who sold unhulled coffee identified urgent need for cash (46.5%) as the main barrier to hulling their coffee. Other reasons include low quantity of their coffee (22.7%), high costs involved in processing (20.7%), and fear of being cheated at the factory (10%). Improved access to rural finance by coffee farmers could enable them to address their immediate financial needs, and accumulate a reasonable volume and pay for the cost of processing. However, small-scale farmers in rural Uganda have always found it hard to access rural financial systems that are efficient, sustainable and widely accessible. Another approach would be establishing Warehousing Receipt (WHR) systems to operate alongside the hullers as also suggested by Lacroix and Varangis (1996) who ague that the WHR is an efficient arrangement to improve farm income and smooth domestic prices by providing an instrument to farmers to spread sales throughout the crop year.

Table 4.4: Results of the Tobit Model on Determinants of Proportion of Hulled Coffee Marketed

Variable	Estimate	Standard Error	t-value	Marginal Effects (δy/ δx)
Intercept	-0.5262	0.20413	-2.58	
Age of farmer	-0.0040	0.00247	-1.63	-0.0040
Price of hulled coffee	0.0010***	0.00009	10.42	0.0010
Log distance	-0.0924**	0.04596	-2.01	-0.0924
Total coffee harvested	0.00002	0.00002	0.990	0.00002
Access to extension	-0.0885	0.09675	-0.92	-0.0885
Drought effect	-0.1822***	0.07049	-2.59	-0.1822
Membership to farmer association	0.15064*	0.08728	1.73	0.15064

****, ** , * denote significance levels at 1%, 5% and 10% respectively*

N=298
Chi-square = 468.2(P=0.00)
Log likelihood = -75.298575
Pseudo R^2 = 0.7566
Left-censored observations =149
Uncensored observations = 61
Right-censored observations =88

4.2 Factors that Affect the Proportion of Hulled Coffee Marketed

The results in Table 4.4 above show a positive and significant ($p \leq 0.01$) relationship between the price and proportion of hulled coffee that was sold by the farmers. When the price of hulled coffee received by farmers increases by ten shillings, the proportion of hulled coffee sold increases by 1%. This is consistent with Lilyan *et.al*, (1993) who argues that prices are one of the key determinants of the decision to adopt new techniques.

The regression results further show that the distance from the farmer's home to the coffee factory negatively affects the proportion of hulled coffee sold, and the relationship is significant ($p \leq 0.05$). An increase of one kilometer from the farmer's home to the coffee factory reduces the proportion of hulled coffee by 9.24%. This is because, when distance increases, the transport costs also increase, which reduces the profit margins. As a result farmers will sell more unhulled coffee at their home to avoid the transport and processing costs.

The results also indicated that drought significantly affects the proportion of hulled coffee sold ($p \leq 0.01$). Having drought conditions decreases the proportion of hulled coffee sold by 18.2%. This is due to the fact that drought affects the physiology of the coffee beans. When the drought intensity is high, the coffee beans will be poorly developed and on harvesting and drying, they will be small, light (less weight) and deformed. In such a situation farmers decide to sell their coffee at home as unhulled, to avoid exposing the poor quality of their coffee beans.

Membership in a coffee group positively affects the proportion of hulled coffee sold and the relationship is significant ($p \leq 0.1$). Joining a farmer's group increases the proportion of hulled coffee sold by 15%. In a group, the farmers are more likely to access information about the sale of hulled coffee and how to maintain coffee quality. They are also able to market their coffee as a group, which reduces the transaction costs per kilogram of coffee sold per farmer thereby increasing the amount of hulled coffee marketed. This is consistent with Minot (1999).

4.3 Supply response for Hulled and Unhulled Coffee

Two models were run to measure supply response; one for hulled coffee and the other for unhulled coffee supplied to the market.

Table 4.5: OLS Estimates with Robust Standard Errors: Supply Response for Hulled Coffee

Variable	Estimated. Coefficient	Standard. Error	t-value
Intercept	99.367	89.400	1.110
Lagged quantity of hulled Coffee	0.3830	0.2417	1.580
Lagged price of hulled Coffee	0.3486**	0.1644	2.120
Lagged price of unhulled Coffee	-0.359**	0.1783	-2.02
Herbicide/fertilizer use	35.955	57.210	0.630
Total production cost per unit (Shs/kg)	-0.054	0.0666	-0.82
Transaction cost per unit (Shs/kg)	-8.231*	4.8006	-1.71
Coffee farm size	78.080	49.135	1.590

N = 295
F = 39.67
R^2 = 0.6364

****, ** , * denote significance levels at 1%, 5% and 10% respectively*

The results show that 63.6% of the variation in the marketed quantity of hulled coffee (measured by R^2) is explained by the explanatory variables in the model. An increase in the lagged price of hulled coffee significantly increases the quantity of hulled coffee supplied at 5% level of significance (Table 4.5). On the contrary, an increase in the lagged price of unhulled coffee (competing price) significantly reduces the quantity of hulled coffee supplied. This conforms to economic theory that an increase in the producer price of a crop or form of crop sold motivates farmers to produce more. In the face of the liberalized coffee trade characterized by unstable rock-bottom prices, policy measures that seek to address price stability and a greater share received by the rural poor farmers should be emphasized. Policies that support establishment of shorter, efficient, value

chains should be viewed as potential remedies to address low prices and subsequently increase farm supply of hulled coffee. Ware housing receipt systems have been reported to offer an efficient market arrangement that smoothens domestic prices (Lacroix and Varangis, 1996) alongside other benefits like improved quality and better prices.

Further analysis indicates a significant ($p<0.1$) inverse relationship between transaction costs (transport to processing factory, labour, electricity charges) and the amount of hulled coffee sold. This is in congruence with Fafchamps (2005) showing that transaction costs prevent farmers from taking advantage of better market conditions and instead encourage sale on farm without value addition. Minot (1999) also identified transportation costs as the most concrete form of transaction costs associated with carrying out a sale alongside other transaction costs including; costs associated with finding a buyer, negotiating a contract, financing the payment, and enforcing the transaction agreement. The poor transport infrastructure, a characteristic of most of the rural areas in Uganda is one of the critical areas that need to be addressed by policy makers if farmers are to reap benefits from value addition innovations. The high cost of electricity is yet another constraint identified by many players in the coffee value chain resulting into high transaction costs which hinders the selling of hulled coffee.

Table 4.6: OLS Estimates with Robust Standard Errors: Supply Response for Unhulled Coffee

Variable	Estimated. Coefficient	Standard. Error	t-value
Intercept	39.213	67.969	0.580
Lagged quantity of unhulled Coffee(kg)	0.4559	0.3218	1.420
Lagged price of hulled Coffee(Shs)	-0.030	0.0555	-0.56
Lagged price of unhulled Coffee(shs) |	0.2237*	0.1346	1.660
Technology dummy	22.170	30.713	0.720
Total production cost per unit(Shs/kg)	-0.092*	0.0498	-1.85
Coffee farm size (acres)	15.707	23.400	0.670

N = 295; R^2 = 0.4480

****, ** , * denote significance levels at 1%, 5% and 10% respectively*

The study findings (Table 4.6) show that production cost is inversely related to the amount of unhulled coffee supplied to the market and is significant ($p \leq 0.1$). Therefore the higher the production costs, the less likely the farmer will sell unhulled coffee. The same is true for hulled coffee though the relationship is not statistically significant.

4.3.1 Price Elasticity of Supply

Table 4.7: Estimated Price Elasticities of Supply

Form of Coffee	Short-run	Long-run
Hulled coffee	0.83	1.36
Unhulled coffee	0.35	0.65

The price elasticity of supply measures the relationship between change in the quantity supplied and a change in output price; and is important in determining agricultural price policy effects on the livelihood of the rural poor. The elasticity will affect the way in which price and output will change in a market. From the results (Table 4.7), the short-run elasticity of hulled coffee sold (0.83) is higher than that of unhulled coffee (0.35). Thus, the sale of hulled coffee is more price responsive. However, in both cases the marketed supply was price inelastic in the short-run. This implies that under such cases, it would be difficult for farmers to react swiftly to price changes in the market. One plausible explanation for this is that for a perennial crop like coffee, there are time lags in the production process which means that farmers' output may not responsively change immediately. But the decision to hull or not doesn't require a lot of time, this makes it more responsive to price changes

Further analysis indicates that in the long-run, the marketed supply is price elastic for hulled coffee (1.36) but not unhulled coffee (0.65). Under such a scenario, it's reasonable to argue that farmers are more responsive to changes in prices for hulled coffee than for unhulled coffee. Since coffee farmers are more responsive to price of hulled coffee, then the development of the coffee sector can be enhanced through focusing critically on provision of incentives for the sale of hulled coffee through subsidization of electricity costs, programs that promote investment in rural areas and farmer mobilization for strong farmer institution development.

4.4 Constraints to Coffee Marketing

Farmers were asked to list the problems they face in selling their coffee. Different reasons were given most of which are of policy importance and if these problems are addressed the farmers' incomes can be improved. The constraints faced by those selling unhulled coffee include low prices (36%), price fluctuations (34.6%), theft in measurement (28.7%) and failure by the traders to consider coffee quality as an important attribute (0.7%).

Table 4.8: Constraints faced in selling of Unhulled Coffee

Constraint	Frequency	% of responses
Low prices	97	36.1
Price fluctuations	93	34.6
Thefts in measurements	77	28.7
Buyers don't mind about quality	2	.7
Total	**269**	**100**

Source: Survey data, 2007

For those selling hulled coffee, the constraints include coffee bean moisture content over declaration (manipulation) (31.6%), high power costs (14.5%), and high transport costs (5.3%), poor knowledge in measurement of coffee on weighing scales (2.6%), under weighing of coffee beans (9.6%) and price fluctuations (36.4%). It is therefore important to address the problem of moisture content manipulation by the processors by training farmers to use moisture meter and weighing scales since they are cheated because they don't know how to use these machines. Farmers must also continue to maintain quality of their coffee as well as marketing collectively to obtain higher revenue from their coffee.

Table 4.9: Constraints Faced in selling of Hulled Coffee

Constraints	Frequency	% of responses
Moisture content manipulation	72	31.6
Power cost	33	14.5
High transport costs	12	5.3
Poor knowledge in measurement	6	2.6
Under weighing	22	9.6
Price fluctuations	83	36.4
Total	**228**	**100**

Source: Survey data, 2007

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings

The study findings show that the proportion of hulled coffee marketed is significantly influenced by the price of hulled coffee. As the price increases, farmers are motivated to sell more hulled coffee than unhulled coffee. Distance from the farmer's home to the coffee processing factory negatively affects the proportion of hulled coffee sold, while membership in a farmers' association also helps farmers to share information on coffee hulling, and transport and sell together thereby reducing the transaction costs and positively influencing the sale of hulled coffee. Drought is a major deterrent to the sale of hulled coffee.

In the short-run, the supply elasticity for hulled coffee (0.83) was found to be higher than that of unhulled coffee (0.35). In the long–run, the supply elasticity for hulled coffee is 1.36, whereas that for unhulled coffee is 0.65. Therefore, the sale of hulled coffee is more price responsive than the sale of unhulled coffee both in the short and long-run. Constraints to the sale of hulled coffee include moisture content manipulation, high power costs, high transport costs, poor knowledge in measurement of coffee on weighing scales, under weighing of coffee beans, and price fluctuations. Constraints faced by farmers selling unhulled coffee include low prices, overall price fluctuations, theft in measurement and failure by the traders to consider coffee quality as an important attribute.

5.2 Conclusions

Farmers selling hulled coffee have been found to be more price responsive than those selling unhulled coffee. Group membership has been found to influence adoption of selling hulled coffee through promotion of group cohesion by fostering information sharing on coffee hulling, promotion of quality and other technologies through synergy that would not have been possible with individuals. Proximity of coffee processing factories to farmers encourages them to sell hulled coffee. This reduces the transportation charges and the time saved could be put to other alternative uses.

Farmers have also been found to respond to drought by selling unhulled instead of hulled coffee. This is a risk control measure taken by farmers to reduce loss associated with drought which affects the quality of coffee beans. The farmers respond by selling the harvested coffee on farm using tins or bags instead of kilograms as units of measurements. Therefore the location of the farmer relative to the factory and price of hulled coffee influence the proportion of hulled coffee sold by the farmers.

5.3 Recommendations

Based on the results of this study, farmers need to be encouraged to market their coffee in groups, because this reduces the transaction costs of marketing the coffee and enables information sharing about quality management and benefits of selling hulled coffee. Proximity to coffee factories encourages the sale of hulled coffee, therefore provision of incentives to private coffee processors to locate factories in remote but major coffee

producing areas closer to the farmers is recommended. This would reduce the distance and therefore the costs incurred by the farmer to hull their coffee before selling.

One of the problems identified by the farmers who sell hulled coffee is the higher electricity charges in addition to other charges by the factory owner. Government intervention in reducing/subsidizing on the power costs would reduce the electricity costs incurred there by lowering the costs of hulling coffee. Drought has been found to negatively affect the sale of hulled coffee. Given the uncertain rainfall pattern in Uganda, the adoption of irrigation technologies should be encouraged as well as development plans that address the drought effect on coffee to encourage the sale of hulled coffee in the long term. Policies that support establishment of shorter, efficient, value chains should be viewed as vivid remedies to address low prices and subsequently farm supply of coffee. Ware house receipt systems that have been reported to offer an efficient market arrangement that smoothen domestic prices alongside other benefits such as improved quality and better prices should be encouraged to take root in the coffee sub sector.

This study found that the sale of hulled coffee is more price responsive than the sale of unhulled coffee both in the short and long-run. Therefore, the sale of hulled coffee should be encouraged to help farmers to quickly adjust to price changes that comparatively take place between hulled and unhulled coffee at times when the transaction costs are higher.

5.3 Further Research

This study examined the factors that influence sale of hulled coffee and the supply price elasticities of marketed hulled and unhulled coffee. As farmers are encouraged to sell hulled coffee, profitability analysis of other small scale farm-based processing technologies like wet processing need to be carried out and compared. The results of this will help to determine the most profitable value adding technology to be disseminated to the farmers.

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APPENDIX 1: Results

```
tobit   prop_h2 age pch2 logdist  drought farm_ass  totcofe2 extn,
ll(0) ul(1)

Tobit regression                          Number of obs   =    298
                                          LR chi2(7)      =   468.20
                                          Prob > chi2     =  0.0000
Log likelihood = -75.298575               Pseudo R2       =  0.7566

------------------------------------------------------------------
     prop_h2 | Coef.   Std. Err.  t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------
age |      -.0040215  .0024716  -1.63   0.105   -.0088859  .000843
pch2 |      .0010408  .0000998  10.42   0.000    .0008443  .0012373
logdist |  -.0924931  .0459678  -2.01   0.045   -.1829647 -.0020215
drought |  -.1822959  .0704942  -2.59   0.010   -.3210391 -.0435527
farm_ass |  .1506497  .0872824   1.73   0.085   -.021135   .3224345
totcofe2 |  .0000161  .0000162   0.99   0.321   -.0000157  .0000479
extn |     -.0885421  .0967576  -0.92   0.361   -.2789755  .1018913
cons |     -.5262457  .2041337  -2.58   0.010   -.9280113 -.1244802
-------------+----------------------------------------------------
      /sigma |   .3485042   .0361169          .2774208    .4195876
-------------------------------------------------------------------
  Obs. summary:        149  left-censored observations at prop_h2<=0
                        61     uncensored observations
                        88 right-censored observations at prop_h2>=1
```

```
regress qtyh2 qtyh1 pch1 pcuh1DDtech unit2totalcoffe traunit2 cofe_siz
,robust

Linear regression                          Number of obs =     295
                                           F(  7,   287) =   39.67
                                           Prob > F      =  0.0000
                                           R-squared     =  0.6364
                                           Root MSE      =  738.39
-----------------------------------------------------------------
                                           Robust
                                     Coef.  Std. Err.   t    P>|t|
-------------+---------------------------------------------------
laggedquantiy of hulled coffee      0.383    0.2417   1.58    0.114
lagged price of hulled coffee       0.3486** 0.1644   2.12    0.035
lagged price of unhulled coffee    -0.359**  0.1783  -2.02    0.045
herbicide/fertilizer use           35.955    57.210   0.63    0.530
unit total cost/kg                  -0.054   0.0666  -0.82    0.415
transaction cost per unit/kg        -8.231*  4.8006  -1.71    0.087
coffee farm size                    78.080   49.135   1.59    0.113
intercept                           99.36    89.400   1.11    0.267
-------------------------------------------------------------------
------------------------------
```

```
regress   qtyuh2   qtyuh1  pch1  pcuh1     DDtech       unit2totalcoffe
cofe_siz , robust

Linear regression                      Number of obs =     295
                                       F(  6,   288) =   29.17
                                       Prob > F      =  0.0000
                                       R-squared     =  0.4480
                                       Root MSE      =   682.9
------------------------------------------------------------------------
                                                  Robust
qtyuh2 |                                   Coef.    Std. Err.    t
-------------+----------------------------------------------------------
lagged quantity of unhulled coffee(kg) 0.4559    0.3218      1.42
lagged price of hulled coffee(Shs)     -0.030    0.0555      -0.56
lagged price of unhulled coffee(shs)   0.2237*   0.1346      1.66
herbicide/fertilizer use               22.170    30.713      0.72
total production cost per unit(Shs)    -0.092*   0.0498      -1.85
coffee farmsize(acres)                 15.707    23.400      0.67
intercept                              39.213    67.969      0.58
------------------------------------------------------------------------
```

APPENDIX 2: Questionnaire

A SURVEY ON FACTORS INFLUENCING VALUE ADDITION AMONG COFFEE FARMERS IN MASAKA DISTRICT, UGANDA

A. **Identification**

(1) Date of Interview: ……..... (2) Interviewer's name: ……

(3)Name of Respondent …… (4)Village/Zone……

(5) Parish……(6) Sub-County……. (7) County……

B**. Socio-economic characteristics**

8. Household characteristics

	Sex 1. M 2. F	Age (yrs)	Marital status (use codes 1, 2, 3, 4 below)	Level of education (years in school)	Farming experience (in years)	Coffee farming experience (in years)
Respondent						
Spouse						

Dependants								
	Total number in household		Not active in farm work		Part-time work		Permanently active on the farm	
	F	M	F	M	F	M	F	M
Children not yet in school								
Children in Nursery school								
Primary school								
Secondary sch.								
Tertiary institu.								
Not in school but are at home								
Total								

Marital Status Codes: 1. Single 2. Married 3. Widowed 4. Divorced

9. Who is the major decision-maker in the family on the type/variety of crop to be grown?

1. Husband 2. Wife 3. Both husband and wife 4. Brother/Son

5. Sister/Daughter 6. Other (specify)….....

C. **HOUSEHOLD INCOME**

10. Spouse and other household members' income

	Major occupation in 2006	Income 2006
Spouse		
Others	- -	

Occupation Codes: a. Farming b. Trading/Business c. Civil Service
d. Other (specify) …….

11. Income from livestock sales

Type of animal	Value (shs) 2006
Cattle -Goats -Pigs - Birds	
Livestock products sold -Milk, -Hides, etc.	

12. Disposable income from salary earners

Nature of employment	2005 (shs)	2006 (shs)
Salary + allowances		
Graduated tax P.A.Y.E., NSSF		
Net annual income		

13. Income from crop sales

Crops sold	Amount harvested (kg/Bunch/ tin/sacks) in 2006	Amount sold (kg/bunch/ tin/sacks) in 2006	Selling price (per kg/ bunch/tin/sack) in 2006	Total revenue
1. Banana 2. 3. 4. 5.				

14. What was the price of a bunch of banana in the last 2 seasons?

…….. ……

15. Wages from non-agricultural activities, e.g. masons, brewers, plumbers, mechanics

Nature of employment	2005 Value (shs)	2006 Value (shs)
Total wages earned per year		
Graduated tax other taxes		
Total net wages earned		

16. Income from rent received by the respondent

Income from rent, 2005		Income from rent, 2006	
Source of income	(Shs)	Source of income	(Shs)
1.	……..	1.	……...
2.	……...	2.	…….
3.	……	3.	……
4.	……...	4.	…….

17. Income for the consumer's trading activities

Nature of employment	2006
Gross sales per day or week or month	
Rent for premises paid per month	
Labour per month	
Graduated tax	
Income tax	
Trade licence tax	
VAT	

D. **FARM COMPOSITION AND LAND USE**

18. Do you have land of your own? (1) Yes (0) No

19. If yes, how did you come to own this land? (Tick those applicable)

(1) Inherited (2) Bought (3) Hired (4) Communal

(5) Given (6) Borrowed (7) Others……..

20. Farm composition

Item	Acreage (Hactares)
Coffee farm size 1. Clonal coffee 2.non-clonal coffee	
Bananas	
Other crops: 1. 2. 3.	
Uncultivated land	
Total land size owned	

21. What is the cost of land per hectare in this area? ……..……UShs/ha

22. Coffee Farming practices and associated costs for the last 3 seasons

ACTIVITY/ INPUTS	Cost for Season 2, 2006			Cost for Season 1, 2006			Cost for Season 2, 2005		
	Quantity (ml or kg)	Price per unit	Total cost	Quantity (ml or kg)	Price per unit	Total cost	Quantity (ml or kg)	Price per unit	Total cost
Mulching									
Manure									
Weeding/herbicides									
Fertilizer application									
Prunning									
Harvesting									
Drying									

23. Source of labour and its cost

Source of labour	Total cost per season
Family	
Hired	

D. COFFEE MARKETING

24.Which type of coffee do you sell 1. Ripe 2. Dried 3.Both		40. How is coffee dried after harvest? 1. Bare ground …… 2. Mats on ground …. 3. Others (specify)…….		41. How do you store the dried coffee on your farm? 1. In the bags 2. Heaped in corner 3. Other (specify)
42. Where do you store the harvested coffee on your farm? 1. Special coffee house 2. House 3. Kitchen 4. Other (specify)	25. How long do you store coffee before you sell it? 1. Immediately (< 1 month) 2. After 1month	29.If you sell Unhulled coffee, where do you sell you coffee? 1.Home 2. Factory 3.Village market 32. If you sell your coffee at home, why? …….. ……..		27. Form of coffee sold 1. Hulled 2. Unhulled 3. Both
28.What type of coffee do you hull? 1. Clonal…… 2. Non-clonal… 3. Both		30. If you **sell hulled coffee**, where do you sell? 1.Middlemen 2. Exporters 3. Factory	33. What is the distance from your home to the coffee factory?.....km	26. How long have you been selling hulled coffee…….years
34. Do you market individually or sell as a group? ……...		36. If yes, a) How many associations or organisation are you a member? …… 2) What roles do you play as a member? 1) …… 2) ……	37. What are the advantages of being a member? 1)…… 2) …… 3) ……	. 35. Do you belong to any farmers' association or organisation? (1) Yes (2) N0

31. Source information on sell of hulled Coffee 1. Radio …… 2. TV…… 3.Field-day demonstrations 4. Extension personnel 5. Other farmers 6. Others (specify) ……..	38. Have you ever accessed any extension service on sell of hulled coffee? 1. Yes…… 2. No….		39. If yes, how many visits do access extension service on selling hulled coffee?.....
43. How do you move your coffee to the factory? 1. Bicycle 2. Pick-up 3. Lorry	44. What has been your response as a result of selling hulled coffee? 1. Increased production 2. No change	45. If production increased, how? 1) Increased acreage 2. Increased productivity of existing coffee plantation.	46. Do you access any credit facility to facilitate in coffee production and marketing? 1. Yes 2. No
47. If yes, how much per season/year?	48. Does drought affect your decision to sell hulled coffee?	49. If yes how? ……	50. Which season do you hull coffee 1) Main crop season (May-July) 2) Fly crop season (Oct-Dec) 3) Both seasons

51. Quantity of coffee produced and marketed in the last 3 seasons

Form of coffee	Season 2, 2006 (current season)		Season 1, 2006		Season 2, 2005	
	Qty(kg)	Price/kg	Qty(kg)	Price/kg	Qty(kg)	Price/kg
Unhulled at farm gate						
Hulled						
Average FAQ						

52. What are the reasons why you do not sale 100% hulled coffee?

(1)……..

(2)…….

(3)……

53. What was the cost of transport to the factory in the last 3 seasons and processing costs?

Activity	Cost for season 2, 2006	Cost for season 1, 2006	Cost for season 2, 2005
Transport to factory			
Processing			

54. How do you rate the road infrastructure from your home to the coffee factory?

1) Good 2) Fair 3) Poor

55. What other costs do you incur during coffee marketing IF ANY?

1)……. 2) ……. 3)……..

56. How do you use the husks?

1. Take home for mulch 2. Sell at factory 3. Leave it at factory free

57. What was the price for the coffee husks for the last season per sack? ..... (UShs)

58. How many sacks of coffee husks did you get in the last two seasons?.....

E. Constraints to coffee marketing

59. Rank the most serious problems that you face marketing unhulled coffee.

(i)……

(ii)……

(iii)……

(iv)……

60. Rank the most serious problems that you face marketing hulled coffee

(i)……. (ii)……

(iii)…… (iv)……..

THANK YOU FOR YOUR KIND RESPONSE