ANALYSIS OF THE CONSTRAINTS AND EFFECTS OF VALUE ADDITION IN HONEY AMONG PRODUCERS IN BARINGO DISTRICT, KENYA

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A Thesis submitted to the Graduate School in partial fulfilment of the requirements for the Master of Science Degree in Agricultural and Applied Economics of Egerton University

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DECLARATION AND RECOMMENDATION

Declaration

I declare that this thesis is my original work and has never been submitted in this or any other university for the award of a degree

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Recommendation

This thesis has been submitted with our approval as University Supervisors.

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DEDICATION

To my grandmother, parents, Raphael and Miriam Berem, sister Sella, brothers Mark and Eliud, and my nephews Limo and Kemboi who are aspiring scientists.

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ABSTRACT

Baringo District is one of the districts in Kenya that is categorized as an ASAL area, characterized by high poverty and food insecurity. Subsistence farming and pastoralism have been and still are the main source of livelihood for majority of the people. However, since crop and livestock agriculture are susceptible to drought, beekeeping has become the sole most important alternative form of sustenance. Despite documented potential benefits of value addition, honey is majorly produced and marketed with little processing. There is insufficient knowledge on why this is the case. Using survey data from 110 randomly selected honey producers from two divisions in Baringo District, descriptive methods were used to summarize household characteristics and to characterize the farming systems in the study area, while the Heckman two stage and the logistic regression models were used to determine the extent of value addition contingent on the decision of a honey producer to participate in value addition activity, and to assess the link between honey value addition and household poverty status, respectively. From the results, it emerged that farmers in the study area can be categorized into three farming systems, namely, small scale subsistence, small scale semi-commercial, and medium-scale commercial with varying levels of honey production and value addition. The Heckman two stage results indicated that the decision to add value was positively and significantly influenced by the amount of honey harvested, group membership and amount of hours spent on off-farm activities. On the other hand, value addition was negatively influenced by the age of the farmers as well education level. From the study, it also emerged that value addition plays an important role in poverty reduction among those who practice it. The results implied the need come up with specific measures targeting rural farmers, majority of whom are illiterate. This is important as far as training of farmers is concerned and especially when it concerns adoption of new technologies. It is also vital to put in place measures that would encourage and facilitate the practice of value addition if the welfare of the rural population is to be uplifted. The study highlighted imperative policy implications that can help in the debate of poverty alleviation through engaging in high value markets and boosting value addition at farm level.

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LIST OF ABBREVIATIONS AND ACRONYMS

AOAC	:	Association of the Official Analytical Chemists
ASAL	:	Arid and Semi-Arid Lands
BKAK	:	Bee Keeping Association of Kenya
CBS	:	Central Bureau of Statistics
CIAT	:	Centro Internacional de Agricultura Tropical
CIGs	:	Common Interest Groups
DPI	:	Daily Percapita Income
EHC	:	European Honey Commission
EU	:	European Union
FAO	:	Food and Agriculture Organization
GoK	:	Government of Kenya.
HCA	:	Honey Care Africa
IHC	:	International Honey Commission
IMR	:	Inverse Mills Ratio
KEPIM	:	Kenya Participatory Impact Monitoring
KNBS	:	Kenya National Bureau of Statistics
Kshs	:	Kenya Shillings
MRM	:	Multiple Regression Method
NaOH	:	Sodium Hydroxide
NGCs	:	New Generation Cooperatives
NRI	:	Natural Resource Institute
OLS	:	Ordinary least Squares
SMEs	:	Small and Micro Enterprises.
SPSS	:	Statistical Packages for Social Sciences
USA	:	Unites States of America
USAID	:	United States Agency for International Development

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CHAPTER ONE
INTRODUCTION

1.1 Background Information

Beekeeping is an important component of agriculture, rural employment, human nutrition and economic development. Honey is the most important primary product of beekeeping both from a quantitative and economic point of view, and has been used by mankind for many years as a source of food, medicine and for religious and cultural ceremonies (Cartland 1970; Mcinerney 1990; Molan 1999). Apiculture is currently one of the most widespread agricultural activities carried out throughout the world. There are approximately 56 million bee hives in the world, which produce an estimated 1.2 billion tons of honey. About a quarter of the honey produced is traded and90% of the exportation is made from around 20countries that produce honey. China has the highest number of beehives with 65 million units and with honey production of 306,000 tons. Average honey production per hive is 20 kg throughout the world, and this figure is 33 in China, 40 in Argentina, 27 in Mexico, 64 in Canada, 55 in Australia, 40 in Hungary, and 16 kg in Turkey. These countries are also the highest honey exporting countries in the world. The countries that are the best honey importers are Germany, the United States of America (USA), Japan, England, Italy, Switzerland, France, Austria and other European countries. In addition to honey, bee products such as propolis, royal jelly, pollens and wax are also significant in the world trade. On the other hand, in countries with developed agriculture, in addition to production of bee products and even rather mainly, vegetative production is exercised in order to increase quantity and quality (Kizilaslan and Kizilaslan, 2007).

According to Roubik,(1995:2002), apiculture in general and improved apiculture in particular contributes to environmental protection and sustainable agriculture through a reduction of environmental effects from tree felling for traditional bee hive construction and from fire hazards from smoking of hives. Encouragement of apiculture and increases in output of hive products would be in accordance with agricultural sector policies of many African Governments. These often seek the improvement of household food security concurrently with raising incomes and stabilizing cash flows through improving productivity of various agricultural and diversified agricultural activities

Bee-keeping has been contributing to household incomes hence livelihoods in terms of food security and poverty alleviation. It has been advocated for by development agents, because its nature: low input requirement, cheap technology based, and gender friendly and independent from environmental changes. It does not depend on soil, and it can be a single means of living for families with very little or no soil (Kizilaslan and Kizilaslan, 2007).

According to a study by FAO, 2001, it was found that depending on the assets people have the structures and processes that impact on them, tradition, and the vulnerability context under which they operate, they choose livelihood strategies that will best provide them with livelihood outcomes. Livelihood strategies are composed of activities that generate the means of household survival (Ellis, 2000:40). Livelihood strategies change as the external environment over which people have little control changes. Sometimes unsustainable and unproductive Livelihood strategies continue because of tradition and habit (Izadi and Cahn, 2000) at other times livelihood activities are introduced as coping strategies in difficult times. In this study, livelihood outcomes will entail poverty reduction, food security, welfare, and asset ownership.

The benefits from bee keeping come through provision of honey, wax, propolis and pollination (Krell, 2000). The product, honey, has a long shelf life well suited for rural communities without much infrastructure. It has also a high nutritional and medicinal value and hence contributes immensely to the community health and wellbeing in the short-term. Bee production globally has been growing steadily, with demand growing at a faster rate. Global honey production has been adversely affected by the global collapse of bee colonies. This has affected also the big honey producers: US, China and Argentina. As a result, major importers of honey are now turning to Africa. Britain for instance, only produces one-tenth of the honey it consumes while 22tonnes are imported from other honey producing countries. Although the ban on Chinese honey in the European market was lifted three years ago, consumers in the European Union (EU) countries still want organic honey which Kenya has (Ann,2008).

1.1.2 Bee-Keeping in Kenya

Bee-keeping in Kenya is practiced in the arid and semi arid areas both by individual small scale farmers and Common Interest Groups (CIGs).According to a report by the Ministry of Livestock (GOK, 2001) bee keeping can be carried out successfully in 80 percent of the country. It is especially suitable in semi-arid areas where other modes of agriculture are not very possible. Bee keeping contributes to incomes as well as food security through provision of honey, beeswax, proppolis, bees' venom and royal jelly in medicine. It also contributes to seed and food crop production through pollination and conserves natural environment.

The country's potential for apiculture development is estimated at over 100,000 metric tones of honey and 10,000 metric tones of beeswax. However, at the moment only a fifth of this potential is being exploited (GoK, 2005). Despite this however, and the downward trend in global production of honey, the Kenyan case has however been different. Findings by the Ministry of trade in 2001 indicated that production in Kenya has been steadily growing for instance from 17,259 metric tones in1994, 19,071 in 1996 and 22,803 in 2000 (GoK, 2001). In Kenya, over 90% of beekeepers use traditional methods that presumably lead to honey of low quality (Mbae 1999).

1.1.3 Role of Bee Keeping in Baringo District

According to the Development plan for 1997-2001, honey production is estimated to have been 79,000 tones in 1995, the latest year for which statistics were available at the time of compilation of the plan (Office of the Vice President and Ministry of Planning, undated). Bee keepers earned Kshs.7.2 Million from the sale of honey and this compared favorably with other activities in the livestock-rearing sector. Milk, for example, earned farmers Kshs.6.6 million in the same period. It was expected that earnings could have been higher and lower incomes were blamed on an inadequate marketing infrastructure.

Gichora, (2003) found out that bee keeping is listed among the four most important income-generating activities in Baringo District. It is regarded as a separate activity from livestock keeping contrary to the official view where bee keeping falls under livestock rearing. In the highlands, for instance in Kituro where there is high potential for intensive agriculture, farming is ranked first with coffee as a cash crop. Bee keeping was third, after livestock keeping. In the

lowlands however, the potential for crop agriculture declines for instance in Marigat where livestock was first while bee keeping took the second position among the key income-generating activities. Crop production in these areas is only possible under irrigation. This shows that bee keeping is a viable option for diversification of economic activities in Marginal areas. When in season, hive products are sold to generate income that goes a long way in improving livelihoods and reducing poverty.

In Kenya, however, honey is sold in its raw form, particularly among producers, with very little value addition being done. This in turn infringes on income at farm level. The value addition done entails honey combs being broken down into small pieces, heated on fire so that honey can melt out of the combs and thereafter it is sieved by a linen cloth bag. The refined liquid honey is usually packed in jerry cans and empty soft-drink bottles, since most farmers cannot afford honey jars. Comb honey is packed in buckets.

1.2 Statement of the Problem

Poverty and food insecurity have defined the livelihood of people in Baringo District for a long time. Their livelihoods are mainly agro based, dependent on crop and livestock production. However due to poor climatic conditions characterized by frequent and prolonged drought, crop production has been very low. Livestock production has also been adversely affected by these trends, leaving honey production as the only viable alternative for smallholder farmers since it is less dependent on, or affected by climatic variations and is not resource intensive. However, majority of the farmers produce and sell raw honey, hence receive low value from the honey such that they cannot cover production costs. It is not yet clear firstly, why there is limited value addition by farmers given the potential benefits and the available market and secondly whether market orientation of apiculture through value addition can mitigate poverty effects in the area and other similar areas. This study aimed at address these issues and by so doing contribute to the existing body of knowledge on the apiculture sub-sector and its linkage to poverty eradication especially in arid areas.

1.3 Study Objectives

The overall objective was to provide insights into honey production in a multi-enterprise production system in an ASAL setting and in so doing contribute to a better understanding into the constraints to value addition and the effects of value addition on poverty reduction. The specific objectives were:

1. To characterize different systems of farming among bee keepers in Baringo District
2. To assess factors that influence the practice and extent of honey value addition
3. To assess the contribution of honey value addition to poverty reduction and elicit policy implications.

1.4 Research Questions

1. What are the different farming systems in Baringo District?
2. What are the factors that influence the practice and extent of value addition?
3. To what extent does value addition contribute to poverty reduction?

1.5 Justification

Honey production is an important revenue-generating activity for the people of Baringo District because of its ecological characteristics. Value addition has been identified as an important determinant of competitiveness of agricultural products in regional and global market. If carried out, value addition would increase the benefits obtained from honey production. A study by Unterschultz and Jeffrey (2005) suggests that farmers would be better off with increased prices of their produce as a result of value addition. The limited ability to add value to agricultural products coupled with high production costs makes Kenyan agricultural exports (honey included) less competitive in global markets (GoK, 2008), hence low farm incomes. This study targeted to generate imperative information that will elucidate the importance of value addition at farm level. Information generated by the study will guide policy making process in line with the achievement of vision 2030, which seeks to enable the transition of small scale farms into commercially-oriented and modern production units. This will facilitate increased market access through value

addition by processing, packaging and branding the bulk of agricultural produce. Furthermore, there is no other study that has been done on value addition and its effects among smallholder bee keepers in the study area.

1.6 Limitation and Scope of the Study

This study only focused on selected smallholder honey producing households in Baringo District. There are other aspects entailed in the integrated agro enterprise approach such as production, marketing, business organization and support services which were beyond scope of this study. It only emphasized on value addition, the factors that constrain it and its contribution to poverty reduction. This is because with value addition, there is potential for farmer prices to increase even up to 350 % (Ramirez, 2001).

1.7 Definition of Terms

Poverty: The Kenya Participatory Impact Monitoring (KEPIM) (2002) provides definitions from various communities that include lack of access to productive assets, lack of access to social services, dependency and inability to participate and lack of access to basic infrastructure.

Food security: It is defined as the "state when all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life (USAID, 1995).

Household: - is here defined as an independent male or female producer and his/her dependants (Ellis, 1988) who must have lived together for a period not less than six months. The members are answerable to one person as the head and share the same eating arrangement.

Value addition: is the transformation of raw agricultural commodities to consumer-ready food products. It includes local processing, packaging, or marketing, which improves the value of raw agriculture products (Tronstad, 1999).

Tropical Livestock Units: Comprises the natural assets which are the animals kept such as goats, sheep cattle and donkeys

CHAPTER TWO

LITERATURE REVIEW

Several studies have been conducted to assess the role of farm level value addition on various agricultural commodities both in developing and developed countries. Most value addition studies found in the literature have focused on the effects of value addition on household welfare indicators such as income and asset ownership as well as other socioeconomic variables such as education level and household enterprise mix. Value addition has been found to enhance poverty alleviation through its direct and indirect influence on the above mentioned variables. This section presents a review of literature on poverty studies and those highlighting the role of farm based value addition on agricultural commodities. Literature on value addition on the apiculture sub-sector is also reviewed.

2.1 Household Poverty Dynamics

According to the World Bank (2007), farming, migration and engagement in off farm labour activities are some of the key strategies for poverty alleviation. Jayne *et al.*, 2007 investigated the factors contributing to household poverty dynamics in Kenya and found that age and education of the household head, whether someone in the family has a formal job, land ownership, family size, and the distance to a tarmac road were the key factors influencing household asset-poverty levels. Household asset level determines the household capability to pursue different livelihood strategies that generate income. Further, the study highlights the importance of support for rural households in marketing their livestock products as a dynamic source of poverty reduction and growth. Second, greater support for poor households to enter and/or expand their participation in dairy and other animal product markets may provide a dynamic source of poverty reduction and growth.

2.2 The Role of Value Addition on Rural Households' Poverty

Various studies have been done to identify the pathways for rural communities out of poverty. However there is a synonymous agreement from various studies (e.g. Lundy *et al.*, 2002) that opportunities exist for rural households to improve their incomes and diversify their livelihoods through value addition, diversification of income generating activities, vertical integration, and

improved marketing arrangements through groups. In his study on the impact of value addition on household incomes, Ramirez (2001) found that value adding activities accounted for a 350 % increase in household incomes. In addition, value adding could prove useful as a poverty-reduction tool if it leads to increased on and off farm rural employment and income. In their work, Golleti and Samman (1999) highlight the poverty reduction potential of post-harvest and value added activities noting that gains in rural income and employment are complemented by reductions in food prices for urban dwellers and improvements in processing and market chains. The improvement of processing and market chains reduce traditional food preparation times, thus releasing time for more productive activities. The net result, therefore, may be positive for both the rural and urban poor.

Lundy *et al* (2002), however, argue that in order to take advantage of this potential, the resultant activities must be competitive, sustainable and involve low-income rural populations. The participation of low-income rural populations is critical to achieving poverty reduction. There is need, however, to come up with realistic organizational schemes, which utilize existing or easily achievable skills base rather than expecting smallholders to become independent entrepreneurs overnight. Stringfellow *et al.,* (1997) provides interesting evidence in this regard, showing that many of the benefits achieved by relatively autonomous smallholder owned and managed cooperatives can be captured by more dependent – i.e. less highly trained and skilled – groups if appropriate links are developed with other market factors.

A method for achieving both value adding and poverty reduction, outlined by Lundy *et al.,* (2002), is the strengthening of the rural enterprise sector in southern nations. Rural household processing enterprises exist in a wide variety of products (and are feasible in a great many more) generating added value and nonfarm employment opportunities for rural populations. Studies in this area show that rural agro-enterprise development and value adding can contribute to reducing levels of rural poverty. Examples may be found in a variety of products such as cassava, rice, tropical fruit, basic grains and others (see Gottret and Raymond 1999; Golleti and Rich 1998; Watts *et al.,* 1988).

It is important to note that for value addition to be effective in poverty reduction several key issues have to be addressed. Chief among these are the identification of market opportunities, access to appropriate processing technologies, implementation of effective business organization practices, more efficient farm to market channels, and the timely provision of key financial and non-financial business development services. These limitations can be overcome through the development of skills, services and alliances between local and external actors and agencies.

Several studies have shown that value addition benefit farmers most when there is some organization of farmers into groups as well as identification of buyers for farmers products. A good example, highlighted in Lundy *et al.,* (2002) shows how farmers in Peru, through differentiation and group participation managed to achieve 20% more in prices for black pepper. Likewise flower growers in Columbia managed to improve their income by sorting, grading and packaging flowers before dispatching them to their urban based customers. Through women groups these farmers established direct sales approach, in which they ended up selling floral arrangements rather than cut flowers (CIAT, 2002).

Unterschultz and Jeffrey (2005) carried out a study whose primary objective was to simulate the likely impact of value adding on commodity prices, quantities, and welfare of farmers. The procedure adopted to achieve the objectives of the project was first; to model the farm sector and the processing sector separately and second, use parameter measures from those sectors to simulate the likely impact of value adding on commodity prices, quantities and producer welfare. The functional forms used allow the evaluation of cross commodity effects. The supply and demand relationships are then used to build a synthetic model that is used for the simulation exercises. Model results provide insights into the effects of investment in value adding on prices, quantities and farmers' welfare. Overall, the various simulation results suggest that farmers would be better off with increased prices of grains/oilseed. However, the results indicate that increases in commodity prices cannot be realized in the short term from increased domestic demand for commodities.

Unterschultz *et al.,* (2000) studied the impact of investment in value added processing that may shift the derived demand curve for farm commodities in Canada. The researchers examined five

commodities: wheat, feed barley, canola, slaughter cattle and slaughter hogs in terms of the interrelationships of their production and assessed the effect of value addition on the farm sector. The study adapted a spatial policy analysis model to assess the effects of investment in value adding on prices, quantities and farmers' welfare. Functional equations representing the supply and demand for the commodities were applied in experiments based on the assumption of increased demand for the commodities. The study findings reveal downward sloping demand curves and existence of substitution and complementary relationships between the commodities. Also, the researchers found that increasing the quantity of processed agricultural commodities has no impact at the farm gate. Mango *et al.,* 2004 assessed the factors that drive households out of poverty in Baringo, Vihiga and Kakamega. According to this study, poverty is as a result of economic, political, social and environmental processes. Investment in education, diversification of on farm and off farm enterprises and social networks were found to be the main strategies for households to escape from poverty.

A study by Quangrainie *et al.,* (2000, concluded that if primary producers will have to participate directly in value adding industries, through direct ownership or through cooperatives. Alternative structures may be alliances between various players in the sectors or primary agricultural producers may have to move into niche markets where current demand exceeds the supply. However, typically, niche markets, unless consumer demand is growing rapidly, are often rapidly saturated and any "excess profits" at the farm gate removed. Although farmer involvement in processing can take many forms, the formation of new structures of co-operation and vertical co-ordination in the food chain must be given special attention. New management structures are required to meet the challenges of the new agricultural economy. The "New Generation Co-operatives" (NGCs) initiated in the US in North Dakota and Minnesota provide a potential model that may be followed. New Generation Co-operatives integrate farmers into domestic processing activities, with focus on vertical integration between these levels. Such arrangements provide farmers with a set price for their primary commodities as well as earnings from the processing and value adding activities. Thus, NGCs may have the potential with respect to first, their inherent ability to compete in value-added products market and second, providing ways of generating and sustaining producers' revenues from the market place.

With the advent of globalization, the agri-food sector has focused on vertical integration, market survival based on competitiveness, food quality, safety, environmental sustainability and an increased reliance on information and technology. This in turn has resulted in two important paths: a production oriented "agribusiness" path and a "consumer/market orientation" path. The first strives for price-based competitiveness based on the reduction of production costs through economies of scale, vertical integration and biotechnology. This is in the realm of large-scale production of basic grains and other commodities driven by productivity concerns. Market permanence in this path is based on low cost and volume, leading towards increasingly large farms, price based competition and low unit profits. The second path seeks competitiveness through product differentiation and the development of niche markets and is driven primarily by consumer preference. The smallholders who have adapted successfully to these new conditions have done so through the adoption of the "consumer/market" strategy based on organization, integration with market chains and actors and the acquisition of business and marketing skills (Wheatley, 2001). In light of these trends, rural livelihood strategies have begun to diversify beyond production to include both farm and non-farm incomes.

2.3 Honey Value Addition

Munguti *et al* (2007) studied the quality of honey processed using traditional methods in Kenya. In their study, a total of seventy two (72) honey samples, processed traditionally and ready for sale, were obtained from beekeepers or honey traders; 14 from Mwingi, 1 from Mbeere (Eastern Kenya); 23 from West Pokot, 26 from Baringo (Rift Valley), 2 from Mida creek, 2 from Tana River and 1 from Taita Hills (Coastal Kenya); 1 from Tiriki forest, 1 from the Nandi Hills (Western Kenya) and 1 from Kinangop Plateau (Central Kenya). Samples were collected within one month after harvesting between the months of June 2005 - January 2006 during the honey flow seasons of the respective regions. Collected samples were stored at room temperature (about 25 °C) away from direct sunlight, and analyzed within two weeks. Eastern Kenya, the Rift Valley and parts of Coastal Kenya (Tana River) is characterized mostly by savannah type of vegetation predominated by *Acacia* sp.; while Western Kenya where the samples were obtained is a remnant of the tropical equatorial forest, the honey is thus largely multifloral.

In their results, they established that the moisture content is the criterion that determines the capability of honey to remain stable and resist spoilage by yeast fermentation. High moisture content increases the probability/risk that the honey will ferment upon storage. The final water content of a honey sample depends on a number of environmental factors during production such as weather, humidity amounts inside the hive, nectar conditions and treatment of honey during storage and extraction. Only one sample of the 72 analyzed for moisture had higher moisture content than the acceptable minimum limit, an indication that most farmers harvest ripened capped honey and that generally honey is stored under suitable conditions. In view of the results obtained in this study, it seems that the quality of honeys harvested from traditional hives and subjected to traditional methods of extraction is of a quality largely acceptable for both domestic and international markets, particularly the EU.

These results contrast the common assumption that honey harvested and processed through traditional methods is generally of low quality. It seems that traditional methods for bee handling are well established and that the skills and knowledge are informally passed from one generation to the next. It seems that most beekeepers take deliberate measures to ensure that honey quality is maintained, for example, harvesting completely sealed combs and minimizing contact with humid air between harvesting and extraction regulates honey moisture content; harvesting only ripe honey ensures proper quality. Due to the variety inherent in honeys from different regions, there is a need for regional honey standardization to avoid unfair criticism of a sample, if standards for regional markets are not set (White 1967). It might therefore be fitting for different regions within the tropics to carry out mass analysis of their honeys and come up with a set of guidelines suitable for their particular regions. Such initiatives have been reported in Burkina Faso (Meda *et al.,* 2005) and Qatar *(*Al-Jedah *et al.,* 2003).

Kizilashan and Kizilashan,(2007) studied the factors determining honey production in apiculture in Turkey. In determining the relation between the factors affecting honey production in Turkey, Multiple Regression Method (MRM) was used. Cobb-Douglas type function was used in identifying the relation between honey production in Turkey and the factors that affect it. Honey production quantity was taken as the dependent variable. The variables that were included in the function as independent variables and the characteristics of the variables in the function areas

follows: honey production quantity, honey consumption per person, number of hives, money paid to producers, honey exportation value, wax production and trend. Among the factors that affect honey production, honey consumption per person, number of hives, fees paid to producers and honey exportation values are of statistical significance, although wax production and trend variables do not have statistical significance. Further, the same study concluded that honey quality control measures remain the biggest issue in the honey industry.

According to a study by Gichora (2003), 46% of bee keepers in Baringo District deal in crude honey while only 16% of bee keepers deal in semi-refined honey. A wide range of prices for crude honey is offered per season and it seems to rise and fall in multiples of Ksh 50.The range of prices reported was between Ksh.200 and Ksh.700 per a 4 Litre "gallon". The price that is offered on a particular day depends on how many middle men participate in the market and the volume of honey coming in (demand/supply) basis. When pricing crude honey, the only quality consideration that is taken into account is its wax content. Higher prices are offered for lower wax content. Semi-refined honey is retailed by bee keepers and middlemen alike in roadside kiosks or stalls along the main roads passing through the study area. It sold in prices ranging from Ksh.50 to Ksh.300. The range in seasonal price for bulk quantities of semi-refined honey tends to rise in multiples of Ksh.100 per gallon from a minimum of Ksh.500 to Ksh.1000.

From the study, it is apparent that semi-refined honey fetches higher prices than crude honey. It is also clear that majority of the farmers deal in crude honey while a very small percentage engages in processing. What have not been established therefore are the factors that contribute to non-processing by a majority of the farmers. While many previous studies have highlighted the benefits of value addition in boosting household income, welfare and poverty status, little attention has been given on constrains of value addition. Identification of these constraints will be useful for informing policy makers. The government policies, plan for modernization of agriculture and investment, if amplified with involvement of investors and donor support, will lead to remarkable changes in communities' livelihoods and in poverty reduction.

2.4 Theoretical Framework

We assume that a huge potential for honey processing exists and that households who exploit this potential will be well-off in terms of welfare as indicated by poverty status. We also assume that the decision to engage in value addition is predicated on higher expected utility. An interaction of these two decisions will be reflected on the welfare status subsequently. The decision on whether or not to add value is considered under the general framework of utility or profit maximization (Norris and Batie 1987; Pryanishnikov and Katarina 2003). Within this framework, economic agents, in this case smallholder honey producers will decide to add value if the perceived utility or net benefit from this option is significantly greater than is the case without it. Although utility is not directly observed, the actions of economic agents are observed through the choices they make. Suppose that *Uj* and U_k represent a household's utility for two choices, which are denoted by Y_j and Y_k respectively. The linear random utility model could then be specified as:

$$U_j = \beta_j X_i + \varepsilon_j \text{ and } U_k = \beta_k X_i + \varepsilon_k \quad (2.1)$$

where U_j and U_k are perceived utilities of value addition and non value addition choices *j* and *k*, respectively, X_i is the vector of explanatory variables that influence the perceived desirability of each choice, β_j and β_k are utility shifters, and ε_j and ε_k are error terms assumed to be independently and identically distributed (iid) (Greene, 2000). In the case of honey value addition, if a household decides to use option *j*, it follows that the perceived utility or benefit from option *j* is greater than the utility from other options (say *k*) depicted as:

$$U_{ij}\left(\beta_j' X_i + \varepsilon_j\right) > \left(U_{ik}\left(\beta_k' X_i + \varepsilon_k\right), \quad k \neq j \quad \forall\, i \quad (2.2)$$

The probability that a household will choose to add value, i.e. choose method *j* instead of *k* could then be defined as:

$$
\begin{aligned}
&P(Y=1|X) = P(U_{ij} > U_{ik}) \\
&P(\beta_j^{'} X_i + \varepsilon_j - \beta_k^{'} X_i - \varepsilon_k > 0|X) \\
&P(\beta_j^{'} X_i - \beta_k^{'} X_i + \varepsilon_j - \varepsilon_k > 0|X) \\
&P(X^{*} X_i + \varepsilon^{*} > 0|X = F(\beta^{*} X_i)
\end{aligned}
\tag{2.3}
$$

where P is a probability function, U_{ij}, U_{ik}, and X_i are as defined above, $\varepsilon^{*} = \varepsilon_j - \varepsilon_k$ is a random disturbance term, $\beta_j^{*} = (\beta_j' - \beta_k')$ is a vector of unknown parameters that can be interpreted as a net influence of the vector of independent variables influencing adaptation, and $F(B^{*}X_i)$ is a cumulative distribution function of ε^{*} evaluated at $B^{*}X_i$. The exact distribution of F depends on the distribution of the random disturbance term, ε^{*}. Depending on the assumed distribution that the random disturbance term follows, several qualitative choice models can be estimated (Greene, 2000). Any household decision on the alternative choices is underpinned by this theoretical framework, the realization of which can by implemented by a critically thought out conceptual framework.

2.5 Conceptual Framework

The conceptual framework in Figure 2.1 outlines the conceptualized interrelationships in the study, the key variables involved and how they are interrelated. The reasoning is that some farmers will decide to add value while others will choose not. The decision to add value is influenced by a number of factors discussed as follows. Market and institutional arrangements influence value addition as well as farmer and farm circumstances. Farmers who access credit for example can enhance their ability to practice value addition. Group participation enunciates the choice and ability to practice value addition. Group involvement ensures accessibility to credit, equipment and collective marketing which is more effective than individual marketing thus fosters value addition.

Value addition is also influenced by individual farmer and farm circumstances such as age, education level, gender, level of social capital and honey output. Education level may positively influence value addition in terms of training and skills required to grasp new techniques and

undertake value addition. The gender of household head may influence the ability of the household to adopt new technologies and the replication of these technologies. The quantity of honey produced will also positively influence value addition, with farmers having higher output expected to be participating in more value addition. Every household lives within a vulnerability context and pursues different strategies towards attaining poverty reduction. The level of value addition is therefore expected to influence some key household livelihood outcomes such as food security and value of assets owned. Value addition is expected to increase farm income hence enabling the household to reduce poverty. Eventually, we will expect to see differences in utility levels with farmers who have chosen to add value having higher utility hence different poverty status of the two groups which can be traced back to the decision to add value.

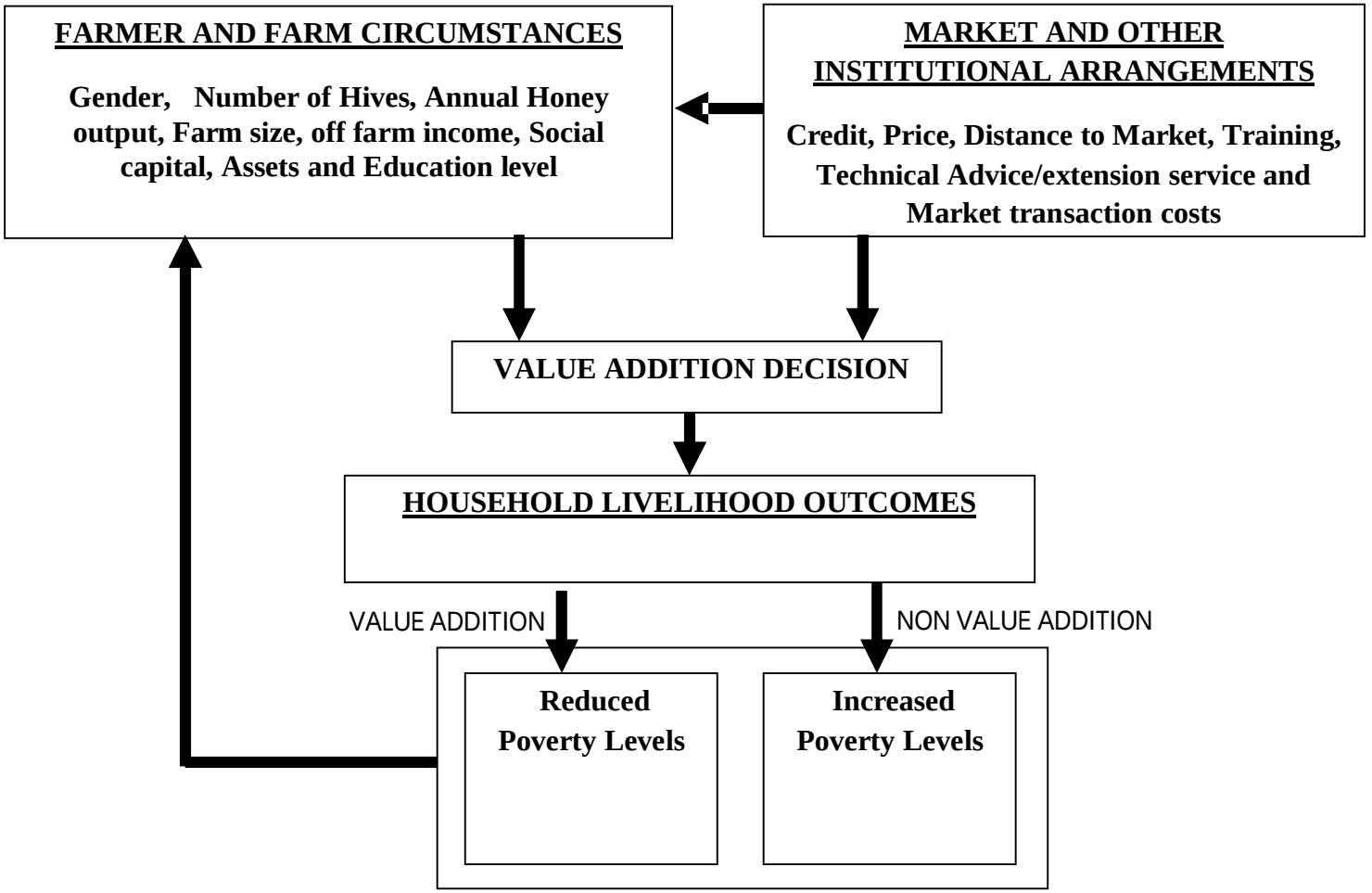

Figure 2. 1: Conceptual framework

CHAPTER THREE
METHODOLOGY

3.1 Study Area

Baringo is one of the seven Districts in Rift Valley province, and consists of eleven divisions and fifty eight sub locations. It borders Turkana District to the North, Samburu and Laikipia to the East, Koibatek to the South and Keiyo Marakwet and West Pokot to the West. The District covers an area of 8,655sq.km of which about 130sq.km is covered by water surface, and has a population of 510,655, projected from the 1999 census data. More than 50 % of this population live below the poverty line according to CBS (2005).The development plan for 1997 to 2001 reported that distribution of income is uneven, with over 50% of the population living below the poverty line. The share of income is generally lower in less educated households but this is accentuated by the fact that more income-generating opportunities exist in high agricultural potential areas than in areas with a marginal potential for agriculture.

Baringo District is one of the arid and semi-arid districts in the country. The district experiences a bimodal rain pattern, with the long rains starting from end of March to the beginning of July, and the short rains from the end of September to November. The average annual rainfall in the district ranges between 600 mm in the low lands and 1000-1500 mm in the highlands and is about 50% reliable. A larger portion of the district falls in the low land agricultural potential category. The rainfall distribution is such that major cropping activities are concentrated in the highland areas which have relatively adequate rainfall. These areas are Kabartonjo, Tenges, Sacho and Kabarnet divisions. The major farming activities include dairy farming and maize, ground nuts, cotton and coffee growing. The remainder of the district is the lowlands which are in the arid and semi-arid climate zone. This zone is essentially a rangeland with major socio-economic activities centering on bee keeping and livestock rearing. The study area is shown in Figure 1

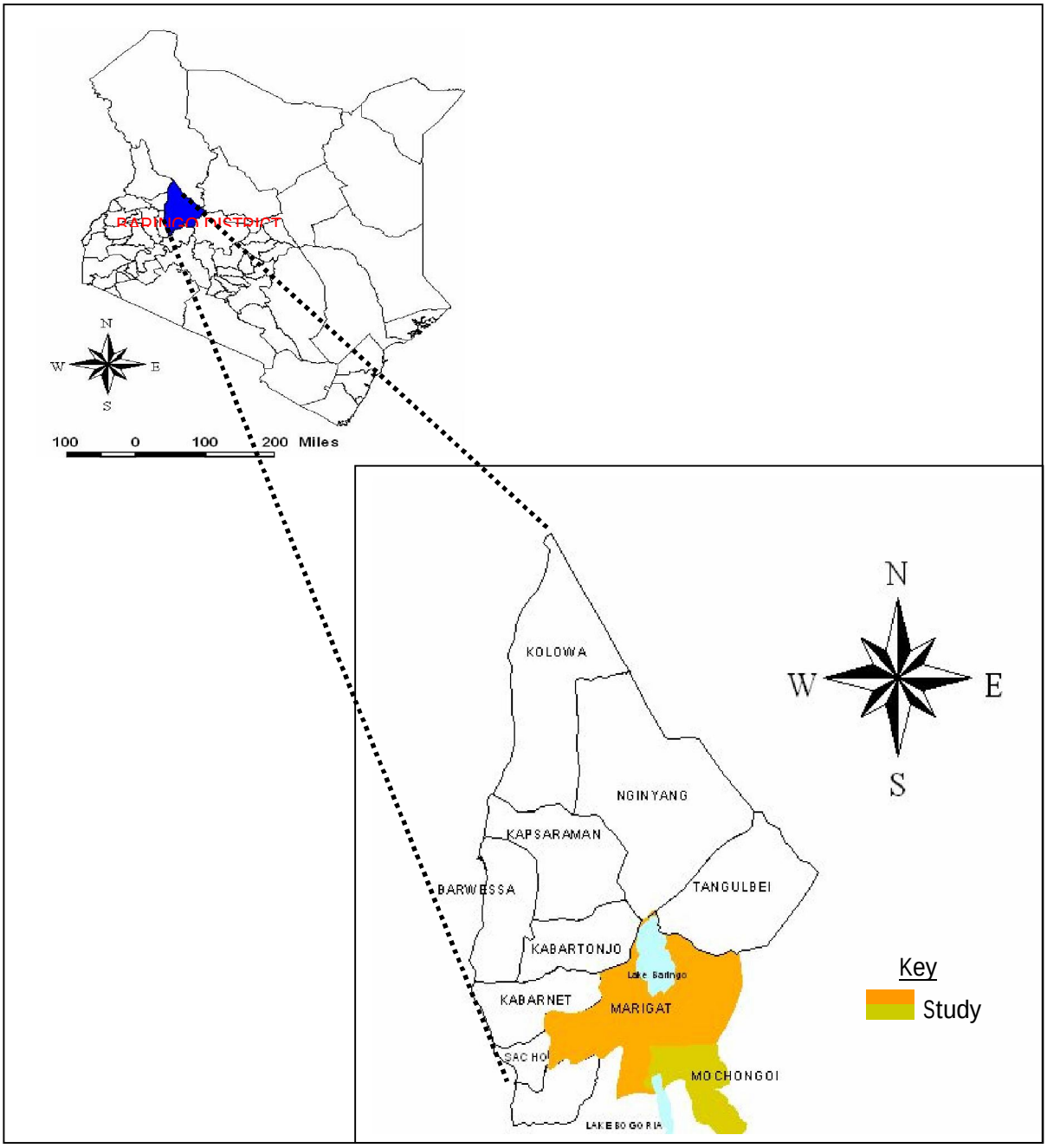

Figure 3. 1: Map of study area

3.2 Sampling Procedure

The target population of the study was smallholder bee keepers comprising of value adders and non-value adders. Multistage sampling was used in this study**.** The two divisions (Radat and Marigat) were first purposively sampled, because they have the highest production levels of honey in the District. Second the locations with the largest number of honey producers were purposively selected from each division. Third, the population of smallholder honey producers in the selected locations in each division was stratified according to value adders and non-value adders based on the sampling frames generated with the aid of provincial administration leaders. A sample was drawn, consisting of both farmers involved in value addition and those not involved. The determination of the sample size followed proportionate to size sampling methodology as specified by Kothari (2004) as follows:

$$n = \frac{z^2 pq}{e^2}$$

where n = sample size, p= proportion of the population doing value addition,

q = 1-p,

z = the standard variate at a given confidence level (α = 0.05),

e = the acceptable error (precision).

Using p = 0.5 assuming a conservative sample, z=1.96, q=0.5 and an acceptable error of 8.95% (e). q is the weighting variable and is computed as 1-P.

The sample is determined as:

$$n = \frac{1.96^2 * 0.5 * 0.5}{0.0935^2} = 110$$

The sample size, computed using the above formula was thus, 110 (60 value adders and 50 non-value adders).

3.3 Data Types and Sources

Primary data for this study was collected using a structured interview schedule administered to the sampled households. Primary data that was collected included farmers' quantity of output,

farm size, number of hives, methods of value addition, extent of value addition, group membership, asset ownership and other sources of income. Secondary data was collected from the Bee Keeping Association in Kenya (BKAK), Honey Care Africa (HCA) and the Government publications and data bases.

3.4 Analytical Techniques

To achieve objective one, descriptive analysis was used. This entailed cluster analysis to characterize the farming systems in the district while means and medians were used to summarize household socio-economic such as household characteristics, types of livestock, types of crops, time of harvesting, and hive position among others.

To address objective two of this study in which the practice and extent of value addition in Baringo District was to be assessed, the Heckman two stage selection model was used. As mentioned earlier, it was stipulated that the farmers' behavior is driven by the need to derive or rather maximize the utility associated with the practice. Depending on the farmers' perception on the utility they are likely to derive from the practice, a choice is made, either to add value or not. This farmers' behavior that leads to a particular choice is modeled in a logical sequence, starting with the decision to add value, and then followed by a decision on the extent of the value addition. Since the farmers utility maximization behavior cannot be observed, the choice made by the farmer is assumed to represent the farmers' utility maximization behavior. Based on the nature of these decisions, it is justified to use the Heckman two stage selection model whose estimation involves two stages. In the first stage, the decision to add or not to add value was assessed using a probit model. The choice of this model is based on the fact that the decision to add value is discreet; it is either one adds value or not. Furthermore, the study assumes a normal distribution and hence the choice of the probit model. The reasoning behind the two stage approach is that the decision on the extent of honey value addition (the volume of value added honey) is usually preceded by a decision to engage in the process of value addition. The probit model used in the first stage is as specified in Equation 3.1

$$\text{Prob}(Y_i = 1 | X = \int_{-\infty}^{X'\beta} \varphi(t)dt = \varphi(X'\beta) \quad (3.1)$$

where Y_i is an indicator variable equal to unity for households that add value, $\varphi(.)$ is the standard normal distribution function, βs are the parameters to be estimated and Xs are the determinants of the choice. When the utility that household j derives from value addition is greater than 0, Y_i takes a value equal to 1 and 0 otherwise. It follows therefore, that:

$$Y_i^* = \beta_i X_i + V_i \tag{3.2}$$

where Y_i^* is the latent level of utility the household gets from value addition and $V_i \sim N(0,1)$ Given this assumption, it follows that:

$$Y_i = 1 \text{ if } Y_i^* > 0 \quad \text{and} \quad Y_i = 0 \quad \text{if} \quad Y_i^* \leq 0 \tag{3.3}$$

Empirically, the model can be represented as follows:

$$Y = \beta_j X_i + \varepsilon_i \tag{3.4}$$

where Y is the probability of a household value adding given farm and farmer characteristics X_i, and ε_i is the error term.

In the second step the Inverse Mills Ratio (IMR) is added as a regressor in the extent of value addition equation to correct for potential selection bias. It was expected that the extent of value addition is self selected in the sense that only some farmers choose to add value, hence the decision of the extent of value addition is preceded by the decision to add value. Consequently this raises an empirical problem of self selection. To reconcile this problem, we treat the decision to add value endogenously in this study to control for the potential sample selection problem. Therefore, first the determinants of the decision to add value are estimated, then the mills ratio from the selected equation is used as an independent variable in the target equation, that is used to assess the determinants of the extent of value addition.

$$E(Z_i \mid Y = 1) = f(x_i\beta) + \gamma\hat{\lambda} + u_i \tag{3.5}$$

where E is the expectation operator, Z_i is the (continuous) extent of value addition measured by the proportion of value added honey output, x is a vector of independent variables influencing the extent of value addition and β is a vector of the corresponding coefficients to be estimated, $\hat{\lambda}$ is the estimated IMR and $U_i \sim N(0,\sigma_u)$. So Z_i can be expressed as follows:

$$Z_i^* = \beta_i X_i + \gamma\hat{\lambda} + u_i \quad (3.6)$$

Z_i^* is only observed if the farmer is doing value addition (Y=1), hence $Z_i = Z_i^*$.

Empirically, this can be represented as:

$$Z_i^* = \beta_i X_i + \gamma\hat{\lambda} + u_i \quad (3.7)$$

where Z_i is the extent of value addition given the farm and farmer characteristics, X_i, $\hat{\lambda}$ is the inverse Mills Ration estimated in step 1 of the Heckman model and u_i is the error term.

Equation (3.4) and (3.7) are then jointly estimated using the Heckman two stage procedure in STATA. The variables to be used in the two stage Heckman selection model are as shown in Table 3.1.

Table 3.1: Variables used in the Heckman Two stage selection Model.

Variable	Description	Unit of measurement	Expected signs
Dependent variables			
Valadd	Farmer adds value or not	1= adding value, 0=else	
Extvaladd	Quantity of honey value added	Kilograms	
Independent Variables			
Prkg	Price of value added honey/ Kg	Kenya Shillings	(+)
Age	Age of the household head	Years	(-)
Totland	Total land owned by the household	Hectares	(-)
Credacess	Access to credit	Dummy(1=accessed, 0=otherwise)	(+)
Equipment	Availability of value addition equipment	Dummy(1=yes,0=No)	(+)
Hhaeq	Household adult equivalent		(+)
Educlvl	Level of household education	Years	(-)
Gender	Gender of household head	Dummy(1=male,0 = female)	(+,-)
Totasset	Value of total household assets	Kshs.	(-)
Hivsnow	Number of hives owned		(+)
Honhvest	Quantity of honey harvested	Kgs	(+)
Offhrsda	Hours spent on daily off-farm activity	Hours	(-)
Distance	Distance to the nearest local market	Km	(+)
Grpmem	If member of a group	Dummy(1=yes,0=No)	(+)
Train	If farmer attended training	Dummy(1=yes,0=No)	(+)

Finally, to assess the contribution of value addition to poverty reduction as required of objective three of this study, a probit model was used. Universally, chronic poverty is defined as a condition whereby the average per adult income in a given household is less than 1 US$ per day. The chronic poverty level was computed by calculating the Daily Percapita Income (DPI[1]) for each household. Denoting the DPI by *X* and poverty line by *Z*, the level of chronic poverty will be 1 if $X < Z$ and 0 otherwise. To assess the influence of value addition and other socioeconomic factors on the level of household poverty a probit model was used. The model is given as:

$$\text{Prob}(Z_i = 1 | X = \int_{-\infty}^{X'\beta} \varphi(t)dt = \varphi(X'\beta) \tag{3.8}$$

where Z_i is an indicator variable equal to 1 if a household is chronically poor, and zero otherwise. $\varphi(\cdot)$ is the standard normal distribution function, βs are the parameters to be estimated and *X*s are the determinants of the dependent variable, in this case the level of household poverty.

The functional form of the probit model is specified as follows:

$$Z(0,1) = \log\left(\frac{p}{1-p}\right) = \gamma_{0j} + \alpha_{ij}X_{ij} + \beta_{ij}W_{ij} + \delta_{ij}V_{ij} + \theta_{ij}U_{ij} + \xi_{ij}T_{ij} + \varepsilon_i \tag{3.9}$$

where, Y is the probability for a household falling below the chronic poverty line α_{ij}, β_{ij} , δ_{ij}, θ_{ij} and ξij are vectors of parameters to be estimated, *p* is the probability of the event occurring, X_{ij} is a vector of household socioeconomic characteristics which include, age, gender, household size, education level, value of household assets, off-farm employment. W_{ij} is a matrix of farm characteristics such as farm size and number of bee hives V_{ij} is a vector of institutional factors including access to credit, extension services, NGOS and social capital (group membership and participation), U_{ij} is a vector of market characteristics such as distance to the market, T_{ij} is a vector of additional income after value addition and ε_i is the error term. $\varepsilon_i \sim N(0,1)$

The dependent variable was a dummy with those households living below a dollar per day per person represented by (1) implying they are chronically poor while those living above a dollar a day represented with (0) for the converse. Thus, factors that negatively influence the dependent

[1] Daily Percapita Income (DPI) = (Total household income per day/adult equivalents per household)

variable are those that reduce poverty while those with a positive influence increase the prevalence of poverty.

Table 3.2 presents explanatory variables with their hypothesized effects on chronic poverty, and as indicated, value addition was theoretically expected to reduce poverty through increased income as a result of higher prices, while the older the decision maker the less productive and consequently chronically poor such a household is expected to be. Access to education as well as exposure to agricultural workshops is hypothesized to reduce chronic poverty implying that the more educated the decision maker the better skilled and productive he or she is and consequently the less poor the household. Female involvement in decision making is hypothesized to have either positive or negative effects on chronic poverty. Traditionally, no theoretical foundations exist on gender and poverty. Nonetheless, in Africa more women than men are involved in rural economic activities such as farming, pointing at possible negative effects on chronic poverty. However, at the same time, women in Africa have no rights to property which infringes on their access to the input and credit markets which drags their households towards poverty.

Table 3. 2: Description and measurement of variables to be used in the probit model

Variable	Description	Unit of measurement	Expected sign.
Dependent variable	Level of poverty	1= chronic poverty, 0=else	
Independent variables			
Valadd	Decision to add value	Dummy(1=Yes, 0=No)	(-)
Yrschool	Level of household education	Years	(-)
Totlu	Total Tropical Livestock Units	Years	(-)
Hhnums	Number of household members		(+,-)
Totassets	Value of total household assets	Kshs.	(-)
Offhrsda	Hours spent on daily off-farm activity	Hours	(-)
Grpmem	If member of self- group	Dummy(1=yes,0=No)	(-)

Findings from a study by Jayne *et al.,* (2007) indicate that access to land plays an important role in rural household welfare. Constant access to transfers, livestock assets and engagement in off-farm activities presents households with additional income for productive investment and consumption smoothing, both which are expected to have a negative impact on chronic poverty. Farmers located in the higher tropics where rainfall is more reliable are hypothesized to perform better in other agricultural activities such as crop production and experience lower poverty levels as compared with their counterparts in Marginal areas who only depend on honey production. However, with respect to distance to the market, farmers located far away from product markets are expected to be poorer due to high transaction costs that infringe on their farm incomes.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Household characteristics

4.1.1 Honey Producers' Socioeconomic Characteristics

Of the 110 beekeepers interviewed, 96% were male with only 4% female. This arises from the traditional believe that bee keeping is a man's activity and women are therefore not allowed to venture into the activity. It is a taboo for women to harvest honey and therefore, the few women that are involved are required to employ men to undertake most of the tasks ranging from hive-construction, hanging of hives on trees and subsequently harvesting. The male predominance in bee keeping could change in the near future as most organizations are advocating for engendered bee keeping. However, although men dominate honey production and harvesting, women are mostly involved in value addition activities and marketing of honey, meaning that they are important actors in the value chain. The descriptive results of socio-economic characteristics of honey producers are as presented in Table 4.1.

Concerning education level of bee keepers, a large percentage (45.9%) of the respondents had not received any, 37.6% had acquired some primary education while 12.8% had gone to secondary. A small proportion (3.7%) had attained tertiary level of education, which included technical Colleges and Universities. Although traditional bee keeping does not require formal education since the skills are passed down informally from the older experienced farmers, this scenario has a negative effect on training of farmers. A number of organizations that undertake technical training of farmers on aspects of modern bee keeping face a challenge in communication and are forced to emphasize a lot on practical aspects for the farmers to grasp them. The literacy level has to a large extent an indirect influence on the managerial ability of the farmer. Better educated farmers have the capacity to understand, appreciate and respond to market trends. Education also enhances their potential to process information and make the best out of any situation hence enable them to minimize risk and face uncertainties.

Table 4. 1: Honey producers' socioeconomic characteristics

Characteristic	Frequency	Percent
Gender		
Male	105	96.3
Female	4	3.7
Marital Status		
Single	12	11.0
Monogamous	83	76.2
Polygamous	11	10.1
Widowed	1	0.9
Separated	2	1.8
Education Level		
None	14	45.9
Primary	41	37.6
Secondary	50	12.8
Tertiary college	4	3.7
Main occupation		
Informal employment	43	43.4
Formal employment	20	20.2
Business person/ self employed	36	36.4

***Source*:** Survey data, 2009

About 43% of the interviewed bee keepers are engaged in informal employment while the rest are in business or formal employment. Most of those in formal employment do not find time to engage in farming, in this case bee keeping. Furthermore, the perception of bee keeping as an activity meant for those who are unemployed limits the engagement of the formally educated in this economic activity. Therefore this can be an important tool for employment creation in the area with high unemployment. About 78% of the bee keepers are married, while 11.0% are single. The rest are either widowed (0.9%) or separated (1.8%).

As indicated in Table 4.2, the mean age of members of households involved in bee keeping is 43 years and this indicates that those involved in bee keeping are the active and energetic members of society. Each household has an average of 6 members, with average adult equivalents of 5 per household. The household size is slightly above the national average of 5 members (KNBS, 2007). With the region falling under the arid and semi-arid areas in Kenya, livestock play an important role in the livelihood of the people. The average number of livestock per household is therefore 13, way above many other regions in the country, and possibly above the carrying capacity of the available land and water resources considering that the region is classified as an ASAL area. This ownership can also be attributed to the cultural role of livestock among the Tugen (the exclusive ethnic group in the area). Those with large herds are regarded as wealthy and one with a large herd is thus highly respected in society. Livestock also play a crucial role in payment of dowry hence is highly regarded among these people.

Table 4. 2: Household demographic characteristics

Demographic variable	Mean	Std. Deviation
Numbers of household members	5.74	1.66
Age of household head	43.26	10.80
Adult equivalents per household	5.04	1.47
Total tropical livestock units per household	12.54	14.52
Household education level	9.53	1.82

***Source*:** Survey data, 2009

4.1. 2 Sources of Income

Household income in the study area is drawn from seven main sources namely: off farm sources, sale of livestock, sale of honey, sale of crops, remittances, land rent and rental buildings. Figure 4.1 shows the percentage contribution of different sources to total annual household cash inflow. Honey plays an important role in contributing to the sustenance of livelihoods in the area. Across the seven income categories, honey remains the third contributor to household income, after off-farm and sale of livestock. The fact that it accounts for a small fraction of income sources means that a lot of potential exists in promoting it as an important income source. From the figure, it can be seen that sale of honey contributes 8% of total annual household income inflow.

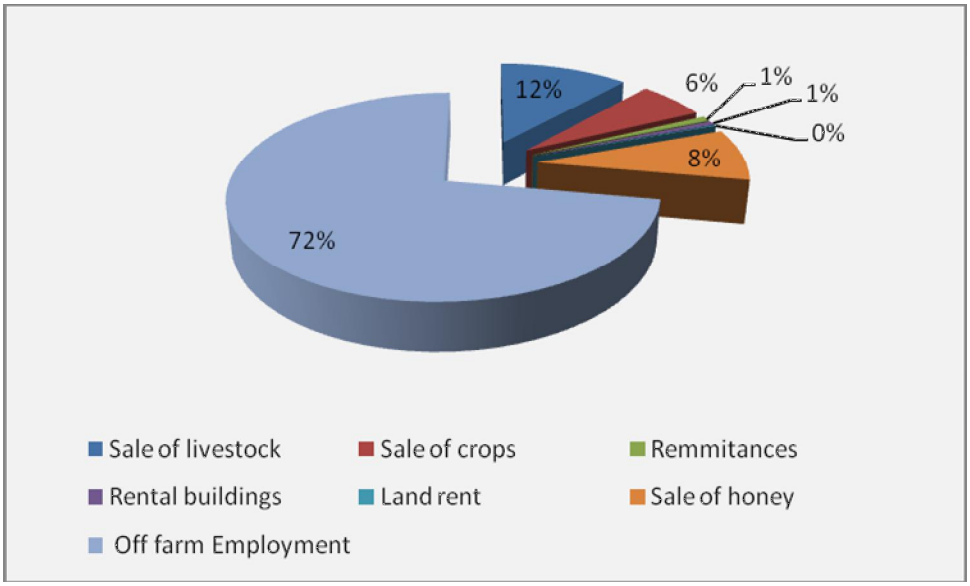

Figure 4. 1: Sources of income in Baringo District

4.1.3 Income and Wealth Indicators

The average annual income per household was Ksh.25331.90 which translates into a figure of about Ksh.4, 222 per person per year. This in turn gives us an average of Ksh.12 per person per day for an average household size of 6. This is an equivalent of USD 0.17($1=Ksh.70). This is lower than the rural poverty line per capita income of Ksh.41 ($0.6) defined by the government of Kenya (Republic of Kenya (2000).However, the income is not equally distributed, as indicated by high standard deviations. Due to this skewedness, a categorization was developed by splitting the sample into two income categories: Low and High. Table 4.3 shows income distribution across two income categories. Farmers in the low income category constituted 42.2% of the total sample. Compared to the farmers in the high income categories, the farmers in the low income category had relatively lower income from all major sources: off farm, crop sales, honey sales and livestock sales. The low income among this category can be explained by the low value of both physical and natural assets. The physical assets captured in the study included: farm houses, motor vehicles, bicycles mobile phones, farm tools and household furniture. The natural assets included the animals kept such as goats, sheep cattle and donkeys. Asset ownership is an

indicator of the ability of a household to generate more income or failure to do so depending on the total value and type of assets owned. .

Table 4.3: Sources of income and demographic characteristics

Characteristic	Income categories				t-test of difference in means
	Low		High		
	Mean	SD	Mean	SD	t
Numbers of household members	5.17	2.15	6.16	1.035	-3.179***
Adult equivalents per household	4.52	1.86	5.43	0.95039	-3.326***
Total household assets	58,219.89	40093.18	108851.70	13,9043.31	-2.395**
Total land owned by the household	6.24	9.05	12.77	23.85	-1.764*
Total household expenditure	85,871.52	48544.35	144,516.19	65,217.69	-5.144***
Total tropical livestock units per household	9.38	7.28	12.23	8.21	-1.872*
Annual Off farm income	57,688.04	39872.08	274403.17	19,0132.48	-7.600***
Annual income from honey	11,257.83	10538.63	28290.71	26,832.67	-4.078***
Sale of crops	4,172.17	8407.38	34152.38	43,968.63	-4.559***
Sale of livestock	14,761.48	18,050.95	16,189.84	19,911.54	-0.385

* Significant at 10% probability level, ** significant at 5% probability level, *** significant at 1% probability level; SD = Standard Deviation

***Source*:** Survey data, 2009

4.2 Characterization of Farming Systems in Baringo District

A number of approaches have been used to characterize farming systems, as found in literature (e.g. Kruska *et al.,* 2003; Waithaka, et al., 2000). However, there is an unanimous agreement that farming systems may be influenced by resource and availability; population density; type of crop rotation pattern, cropping pattern; livestock production pattern, water supply; type of implements used for cultivation and degree of commercialization. The current study adopts the

criteria used in the above mentioned studies to characterize farming systems in Baringo district. Two step cluster analysis was used to determine the farming systems in the study area, based on the following variables: land ownership, proportion of marketed output, crop yields, number of crop, Tropical Livestock Units (TLUs) and amount of honey produced per household. From the analysis, three systems were generated, 1) Small scale subsistence system 2) Small scale semi-commercial system and 3) Medium scale commercial system. The three systems are discussed below and some descriptive statistics distinguishing farmers in different livestock production systems presented in Table 4.4.

4.2.1 Small Scale Subsistence System

Majority of the farmers in this category produce majorly for home consumption and very little, if any for sale. Compared to members in the other two systems, farmers in this category own smaller sizes of land and have fewer household assets. A comparison of total household assets for instance between this category and the small scale semi-commercial system shows a significant difference with the later having more assets than the former. It is also imperative to mention that there is a significant difference in total household incomes among the three systems, with the small scale semi-commercial and the medium scale commercial systems having higher household incomes than the small scale subsistence system. Furthermore, the crop yields per hectare between this system and the medium scale commercial system are statistically different; the medium scale commercial system has more crop yields per hectare. On the other hand however, unlike the small scale semi-commercial and the medium scale commercial systems, all members (100%) in this category, add value to their honey. It is important to note however that despite the value addition done by this group, all 31 members are chronically poor (Table 4.3).

Table 4.4: Characteristics of farmers in different farming systems

Characteristic	Small scale semi-commercial system		Small scale subsistence system		Medium scale commercial system		ALL		Mean Difference (I-J)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Total household assets	107921.7	138569.7	55346.8	36589.5	90839.7	114035.8	87484.2	111352.9	52574.90* [1-2]
Number of cattle	6.22	4.19	6.63	5.11	12.0	13.9	8.0	8.8	-5.75* [1-3] -5.33* [2-3]
Number of calves	2.2	1.4	2.8	2.0	3.9	3.99	2.9	2.7	-1.77* [1-3]
Adult equivalents/ household	5.2	1.3	5.3	1.5	4.6	1.7	5.0	1.5	.5619** [1-3] .7258* [2-3]
Crop yields in Kgs/hectare	1459.7	954.3	881.1	1100.2	2239.6	2766.6	1545.5	1840.1	-779.9** [1-3] -1358.5* [2-3]
Proportion of marketed crops	0.26	0.3	0.14	0.2	0.3	0.26	0.3	0.3	0.1252* [1-2] -.1882* [2-3]
Number of crop types grown	2.65	1.3	1.58	1.1	2.9	1.46	2.4	1.4	1.0705* [1-2] -1.2765* [2-3]
Total household income	308239.5	167041.0	83261.8	43949.8	3104160.7	201336.6	244954.1	1861090.8	224977.76* [1-2] -227154.95* [2-3]
Land under crops	2.7		2.4		4.4		3.2		-1.67* [1-3] -1.92* [2-3]

* The mean difference is significant at the 0.05 level. ** The mean difference is significant at the 0.1 level.
***Source*:** Survey data, 2009

4.2.2 Small Scale Semi-commercial System

This system comprises farmers who practice small scale farming but unlike in the small scale subsistence system, are involved in marketing some proportion of their output. A test of the difference in the proportion of marketed output between the two systems indicates that this category markets more of its crops. However, compared to the medium scale system, this system has a smaller proportion of marketed output. With respect to the number of cattle and calves, it is worth noting that again, there is a significant difference between this system and the medium scale commercial system. The latter has more calves and cattle than the former. However, the former has a higher number of adults per household when compared to the medium scale commercial system. Interesting to note though is that only a small proportion of farmers in this category belong to farmer groups (approximately 37%), which could in turn explain the low participation in value addition, practiced only by 42% of the members. Despite this none-participation in value addition, all the 43 farmers in this category are non-poor.

4.2.3 Medium Scale Commercial System

This group is predominantly large to medium scale and is oriented towards marketing of most of their products. They own larger sizes of land produce higher yields and have the highest amounts of household incomes. There is a significant difference in terms of total household incomes between the small scale semi-commercial system and this system, and it is apparent that the members of this system recorded higher household incomes unlike their colleagues in the other two systems. Moreover, with reference to the land under crops, the medium scale commercial system tops the other two systems with its members cultivating larger pieces of land. This could explain why the same category leads in terms of the yields produced and inevitably in the proportion of marketed crops, and in turn in the total cropping income. It is important to note however that among the three systems, this system has the lowest number of adults per household. Furthermore, this is the system with the lowest number of farmers who practice value addition. Interestingly though, all the farmers in this category are none poor.

Table 4.5 gives a description of farmers in different farming systems. Generally, what comes out clearly is the fact that value addition is predominantly practiced by farmers in the small scale

subsistence system, all of whom are chronically poor (Table 4.3), while the practice gradually reduces with the transition of a farmer to the small scale semi-commercial system and eventually into the medium scale commercial system. This paradox can be explained by the fact that farmers in the small scale subsistence system are over-dependent on bee keeping in which case, the income earned is less than total household expenditure. Moreover, the number of household members in this category is higher than the national average hence higher incidences of poverty.The technology used in value adding can also be a pointer to this paradox. Another thing that is coming out is that the higher the farmers in a system are members of a group, the higher the tendency to practice value addition.

Table 4.5: Description of farmers according to farming systems

Characteristic	Small scale semi-commercial system		Small scale subsistence system		Medium scale commercial system		ALL	
	Frequency.	Percent	Frequency	Percent	Frequency	Percent	Frequency.	Percent
Main Occupation								
Informal employment	12	30.0	15	57.7	16	48.5	43	39.4
Formal employment	12	30.0	1	3.8	7	21.2	20	18.3
Business person/ self employed	16	40.0	10	38.5	10	30.3	36	33.0
Education level								
None	5	11.6	5	16.1	4	11.4	14	12.8
Primary	15	34.9	16	51.6	10	28.6	41	37.6
Secondary	22	51.2	9	29.0	19	54.3	50	45.9
Tertiary college	1	2.3	1	3.2	2	5.7	4	3.7
Group membership								
Yes	27	62.8	19	61.3	18	51.4	53	48.6
No			12	38.7	17	48.6	56	51.4
Honey value addition								
Yes	43	100.0	13	41.9	4	11.4	60	55.0
No	0	-	18	58.1	31	88.6	49	45.0
Location of hives								
Within home compound	6	8.0	7	13.7	6	9.4	19	10.0
In the bush	30	40.0	20	39.2	27	42.2	77	40.5
River bank	38	50.7	22	43.1	30	46.9	90	47.4
On top of hills	1	1.3	2	3.9	1	1.6	4	2.1
Credit access								
No	33	76.7	26	86.7	26	74.3	85	78.0
Yes	10	23.3	4	13.3	9	25.7	23	21.1

Attended farmer training								
No	13	30.2	7	22.6	9	25.7	29	26.6
Yes	30	69.8	24	77.4	26	74.3	80	73.4
Group membership								
No	16	37.2	18	58.1	18	51.4	52	47.7
Yes	27	62.8	13	41.9	17	48.6	57	52.3
Level of poverty								
Non Poor	43	100.0			35	100.0	78	71.6
Chronic poor	0	-	31	100.0	0	-	31	28.4

Source: Survey data, 2009

4.3 Determinants of the Practice and Extend of Honey Value Addition

The Heckman two step regression results are as presented in Table 4.6 and discussed in the next subsection.

Table 4.6: Heckman Two stage regression results

Variable	Target Equation		
	Coefficient	z	P>|z|
Age	-2.86	-2.29	0.022
Tot asset	-0.000	0.99	0.324
Credacess	19.428	0.90	0.366
Hhaeq	20.153	2.80	0.005
Distance	-0.979	-0.64	0.525
Honhvest	-0.029	-1.24	0.217
Totland	-0.974	-2.47	0.013
Grpmem	40.066	1.74	0.081
Yearscho	5.045	0.82	0.413
Price	-0.008	-0.18	0.858
Hivsnow	2.317	5.08	0.000
Train	1.431	0.08	0.939
Off-farm employnt	0.350	0.28	0.777
Constant	-36.812	-0.44	0.657

Results in both tables are significant at 10% level of significance

Variable	Selection Equation			
	Coefficient	Marginal effects	z	P>|z|
Age	-0.036	-3.260	-2.70	0.07
Credacess	-0.309	16.393	0.78	0.433
Hhaeq	0.20	20.153	2.80	0.005
Distance	0.005	-0.943	-0.62	0.533
Honhvest	0.003	-0.002	-0.04	0.969
Totland	-0.003	-1.002	-2.57	0.01
Grpmem	0.649	1.670	3.23	0.003
Yearscho	-0.186	3.147	0.54	0.588
Hivsnow	-0.01	2.228	4.96	0.000
Train	-0.238	-0.584	-0.03	0.975
Off-farm employnt	0.043	0.810	0.74	0.457
Constant	-36.812			
Lambda		15.449	0.50	0.615
Rho		0.418		
Sigma		36.89		

For comparison purposes, separate OLS and Probit models were generated and the results are as presented in table 4.7.The results of the two models were slightly different, more so in the significance of different variables. This difference is attributed to bias associated with non-accounting of the selection bias by the OLS Model.

Table 4.7(a): Probit results

Variable	Probit		
	Coefficient	**z**	**P>|z|**
Age	-0.038	-2.38	0.017
Totasset	0.001	1.10	0.271
Credaccess	-0.300	-0.86	0.389
Hhaeq	0.050	0.46	0.648
Distance	0.066	0.22	0.823
Honhvest			
Totland	-0.004	-0.62	0.534
Grpmem	0.567	1.96	0.050
Hhnums			
Yrschool	-0.160	-1.90	0.057
Prkg			
Hivsnow	2.325	0.82	0.349
Train	-0.271	-0.86	0.390
Offhrsda	0.051	2.68	0.007
Constant	2.046	1.96	0.050
R^2			
Prob>F			

Table 4.7(b): OLS regression

Variable	OLS		
	Coefficient	**t**	**P>|t|**
Age	-2.030	-2.98	0.004
Totasset	-0.000	-0.65	0.517
Credaccess	3.316	0.23	0.816
Hhaeq	57.14	3.23	0.002
Distance	-0.97	-0.80	0.428
Honhvest	0.127	3.09	0.003
Totland	-0.599	-1.95	0.055
Grpmem	29.437	2.51	0.014
Hhnums	-41.139	-2.81	0.006
Yrschool	-5.79	-1.82	0.071
Prkg	0.064	2.22	0.028
Hivsnow	-0.053	-0.70	0.485
Train			
Offhrsda			
Constant	95.743	2.06	0.042
R^2	0.3555		
Prob>F	0.000		

4.3.1 Determinants of the Choice to Practice Value Addition

The practice of honey value addition was found to be significantly influenced by household heads' age, total land owned, number of hives owned, group membership and household adult equivalents

The number of hives owned acts to represent the amount of honey harvested or the amount that a farmer anticipates to harvest come the harvesting season. The larger the number of hives owned, the higher the quantity of honey harvested hence the participation in value addition and vice versa Farmers with larger quantities of honey are more likely to engage in value addition as they see it as profitable unlike their colleagues who harvest smaller quantities of honey. This factor was reported as a major constraint to value addition with those who harvested little amounts reporting that they could not participate in value addition majorly because they viewed it as a waste of time and finances

The age of the household head also plays a key role in determining the participation of a household in value addition. The older the head, the less likely that a household will practice value addition. This arises from the fact that as the decision maker grows older, they become risk averse and are not willing to venture into new fields or take part in activities that they are not certain about. Value addition is not an exception thus there is a low probability of them undertaking it. Furthermore, older members are less energetic and therefore find it hard engaging in activities which require quite some energy. Value addition is one such activity.

Group membership plays a key role in determining participation in value addition. Most farmers who are members in different farmer groups participate in value addition. This is in line with major empirical findings. Some researchers argue that farmers in groups have an easy access to skills and information which in turn enable them to diversify their income sources and value addition is one such off-farm activity. Social capital (in this case group membership) is a key instrument for exchange of ideas and in essence, farmers benefit both economically and socially if they belong to groups This happens because the Government and donors target not individual farmers but farmer groups and cooperatives. These farmers are given grants and loans which enable them to engage in more off farm activities unlike their counterparts. Moreover, farmers in groups have a strong bargaining power when marketing their products and in turn receive better returns for their produce. This is in addition to penetrating wider markets and being offered contracts by major buyers. This case has been supported by Shiferaw et al., (2006), who argue that collective marketing, allows small-scale farmers to spread the costs of marketing and transportation and improve their ability to negotiate for better prices, and increase their market power. As is the case in many rural areas, farmers acting individually face high transaction costs because they deal in small quantities. However, there is hope for farmers as per a report[2] by Kindness and Gordon (2001).

[2] This report stipulates that farmer marketing groups can help reduce these costs by facilitating input and output market access and service delivery and in so doing promote commercial activities and technological change in agriculture. The scenario is no different in Baringo District where a large percentage of farmers who add value are members of farmer groups. They reported benefiting from value addition because they sell their products through their groups which have contracts with major buyers like CITES Enterprise, Honey Care Africa and Baraka and consequently get good prices as well as prompt payments for their products.

The larger the size of land owned, the less likely that a household will engage in value addition. This can be explained by the fact that owners of larger pieces of land tend to devote more of their time in other farm activities and very little to bee keeping.

Education level, which is measured by the year in school, has a negative influence on value addition in the sense that the more educated an individual is, the lower the probability of them engaging in value addition. This is explained by the fact that most learned members of households get formal jobs in towns and therefore reside far from their homestead and consequently are not directly involved on the day to day activities in their rural homes. Furthermore, as is the norm in most developing countries, the more educated an individual is, the lower their attachment to Agriculture. They migrate to urban areas in search of other means of survival and farming is therefore left to the less educated members.

4.3.2 Determinants of the Extent of Honey Value Addition

The extent of value addition is influenced by many factors among them age, adult equivalence, total land owned, group membership and number of hives owned.

Age of the member has a negative influence on the extent of value addition implying that the older the head of the household, the less likely for them to proceed with value addition. This could result from the fact that value addition requires some energy hence older members are less likely to engage in it. Furthermore, older members are known to be risk-averse thus they resist adoption of any new technology because of the perceived risks involved.

Household adult equivalents have a positive influence on the extent of value addition, implying that the larger the household in terms of adult equivalents, the higher the number of adults in a household, the higher the value addition done by the household. This could be related to the decisions being made pertaining to value addition and the energy required to undertake the activity. Most adults and youth own their own hives and practice value addition in order to increase returns from bee keeping.

The number of hives owned by the household, just like in the decision to add value, has a positive influence on the extent of value addition. This indicates that a farmer who has more hives, harvests more honey and is not only likely to add value but will take a step further and add value to a larger percentage of that honey. This can be explained by the theory of economies of scale. One who adds value to more honey is likely to incur reduced costs per unit and in turn is likely to benefit more from the value addition exercise because they are able to sell in bulk. This puts them in a position where they can negotiate for better prices as well as contracts with major buyers in which case therefore, are assured of a constant market.

Ownership of land is another key factor which negatively influences the extent of value addition. If an individual owns huge tracts of land, the chances of them engaging in value addition are low. If at all they are involved in value addition, the possibility of them adding value to large amounts of honey is also low. This can be explained by the fact that such farmers are normally involved in so many other on-farm activities like livestock rearing and crop farming thus leaving little time for value addition. If the returns realized from these other activities are more than what they get from honey, farmers are likely to divert all their time and energies on these other areas and very little, if any, on value addition.

Group membership positively contributes to the extent of value addition and this can be explained by the fact that individuals in groups are easily influenced by their associates than those in isolation. They get to exchange ideas and learn about the benefits of value addition and are thus willing to take the extra step of adding value to more of their honey. Members of groups also receive training on diverse issues among them value addition and are therefore willing to take up value addition and increase its extent as a means of improving their farm income hence poverty status. Furthermore, members of farmer groups are in a better position to pull their resources together and take advantage of economies of scale. They access wider markets and higher prices unlike their colleagues who are not members of groups.

4.4 Contribution of Value Addition to Household Poverty

The poverty status of the people in the study area was categorized into two, namely, chronically poor and non poor. A logistic regression was used in determining the factors that contribute either positively or negatively to the poverty status of the people. Among the key factors highlighted are *number of household members, education level, total household assets, off-farm income, total livestock units and the decision to add or not to add value, group membership and additional income obtained from honey value addition.* The results of the logistic regression model used to determine the factors that influence the level of household poverty are as presented in Table 4.6.

Table 4.8: Logistic regression results on determinants of poverty levels

Variable	Odds Ratio	Marginal effects	z	P>|z|
Number of household members	4.281	0.181	3.83	0.000
Log of Years in School	0.027	-0.449	-1.62	0.063
Log of Total Household Assets	0.320	-0.142	-1.86	0.062
Log of Off-farm Income	0.143	-0.241	-4.41	0.000
Total Livestock Units	0.873	-0.017	-3.20	0.001
Decision to Add Value(1=Yes,0=No)	0.104	-0.314	-1.98	0.048
Group membership	0.408	-0.113	-1.23	0.218
Additional income per Kg	1.007	0.001	1.69	0.090

The decision to add value is positive and significantly influences the probability of a household experiencing reduced poverty. This is in line with many empirical findings. Value addition has been found to reduce poverty levels through its positive contribution to welfare indicators including household income and food security. A household that adds value to its honey is guaranteed of higher prices as processed honey fetches about 150% higher prices than crude honey. This in turn increases the income of the household and in essence such households are able to exit chronic poverty as they are able to access more of lives' necessities.

An increase in a household's Tropical Livestock Units (TLUs) by one unit reduces the probability of a household becoming chronically poor by 0.017 units. This is the case because a household with more livestock is traditionally wealthy. In an arid area like Baringo District, the major source

of livelihood is livestock keeping. Farmers who own large herds of livestock receive more income from the sale of the animals and their products and therefore reduce poverty in their households.

From the results, it is clear that off-farm income, years in school and a household's total assets reduce the level of poverty. Involvement in off-farm income plays a key role in reducing the probability of a household becoming chronically poor. This is especially true in Baringo District which falls among the Arid and semi-arid regions in Kenya. An increase in off-farm income by one unit for instance, reduces the level of chronic poverty by 4.3 units. An increase in a household's assets by 1 unit reduces the level of poverty by 2.02 units. This implies that a household with more assets is likely to be wealthier thus have a higher income and this lowers their levels of poverty.

Education level has an inverse relationship with poverty in the sense that the more learned the members of a household are, the lower the levels of poverty. In a study to Predict Household Poverty, Mwabu *et al., (*2002), found out that education emerged as the most important determinant of poverty. They reported that in the year 2000, poverty rates among household heads with no education were 72.02% and 69.05% for rural and urban households respectively, which were highest among all groups. In addition, people with at least secondary education were less affected by the increase in poverty between 1997 and 2000 than those with lower levels of schooling.

CHAPTER FIVE
CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Conclusions

The study characterized and classified farming systems in Baringo District into three major farming systems, small scale subsistence, small scale semi-commercial and medium scale commercial systems. Majority of the farmers are in the small scale semi commercial and the medium scale commercials, with very few practicing value addition. The remaining farmers are in the small scale subsistence system and all are chronically poor, yet they are the ones who practice value addition to a large extent. However, as transition of farmers from this system into the small scale semi-commercial and medium scale commercial systems the practice of value addition occur, value addition declines drastically. This leads to the conclusion that value addition is a poor man's activity and only acts as a means of graduating from chronic poverty to non poverty and henceforth stopped. However, policies addressing the manner in which value addition is done can be used to reverse this trend. Some imperative implications for the enhancement of value addition can be drawn from the findings of this study.

From the findings of the study, it emerges that the decision to add value is influenced by a number of key factors including the fact that the older the member, the less likely that a household will be involved in value addition. This could be explained by the reluctance of the old people to adapt new techniques as well as the energy and time required for value addition. The years spent in school also has a direct influence on the decision to add value. An individual who has spent more time in school is likely to get some other form of employment in which case they have less time for farming activities including bee keeping. Moreover, their attitude towards farming is likely to change and in most cases such people do not want to be associated with farm activities. The study elucidated some of the key factors that influence the decision to add value and these include.

Group membership has both direct and indirect effects on the decision to add value. Members of farmer groups are likely to engage in value addition more than the non members because of the many benefits they get by being in groups. For instance, they get more access to training,

technical advice, funds and equipment from various organizations and government than other individual farmers. All these advantages motivate members and they therefore engage more in value addition. The more an individual spends time in off-farm activities, the higher the chances of them engaging in value addition. This comes indirectly through an increase in income hence the ability to invest in value addition. A strong justification for farmer organization according to Doward *et al.,* (2004), is their potential to play a critical role in both the delivery and marketing of agricultural outputs that will help reduce transaction costs related to the marketing of agricultural output.

5.2 Policy Implications

Bee keepers in Baringo District are in three distinct farming systems. Therefore, development planners and policy makers need to develop unique interventions targeting each group, as far as value addition is concerned. The study has drawn imperative leadings that can guide policy towards influencing value addition. This is in recognition that from the study it has been established that value addition can indeed be an important driver out of poverty. Across the three systems, policy needs to encourage interventions that can enhance the practice of value addition. Key among these is addressing the marketing of honey. The major reason why farmers do not practice value addition is primarily because of the impediments associated with lack of collective action and other market participation barriers. Certainty in the market and price for their product can influence production and value addition of honey. With the many known benefits of value addition, this will help the government in reduce poverty incidences in the arid areas.

Group membership and collective marketing efforts need to be a policy target. However there is need for newer approaches to the issue, especially because the cooperative movement in Africa has not born much fruit. Recognition of institutions that are embedded on people's cultures can be a good entry point towards facilitating farmer groups. Trust plays a key role in formation of informal groups and therefore recognition of this fact and assessing ways of tapping into the existing social kinship and ties and using knowledge in the strengthening of formal farmers groups can achieve much.

Further, there is need to encourage farmers to form farmer cooperatives. When in a group, farmers have a higher bargaining power and access wider markets for their products as well as getting good returns.

There is need for the Government and other development partners to encourage increased production of honey in the study area. From the findings, it emerged that the more the honey harvested, the higher the likelihood to engage in value addition. Farmers who harvest little amounts of honey do not practice value addition because they view it as a waste of time and resources. In light with economies of scale, higher quantities of honey will benefit farmers because they will be able to add value and sell in bulk thus getting more returns.

Farmers in the low education category were found to be engaging in value addition more. However, their low education status has an implication on the effectiveness and innovations on their value addition activities. There is therefore need for policy to address the limitation of such a category, through targeted training programs that will enhance the knowledge of such farmers on value addition. Finally, since age was found to negatively influence both the practice and extent of value addition, policy makers can tap into this opportunity for creating employment among the youth in the research area and beyond.

5.3 Suggestions for Further Research

This study focused only on the general constraints of value addition among bee keepers in Baringo District. However, according to classification of farmers done by the study, it has emerged that value addition is more prevalent in one category (small scale subsistence system) than in the other two categories. There is need to find out why this is the case and hence come up with the necessary measures to ensure that value addition is practiced by all farmers no matter the category. As mentioned earlier, there is still a lot of work to be done as far as marketing of honey is concerned. Issues of a secure market, good prices and professional value addition have to be investigated. There is need for measures to address these underlying issues if bee keepers are to benefit fully from their production.

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Appendix 1: Interview schedule

EGERTON UNIVERSITY
BEE KEEPERS SURVEY 2009

Introduction

This survey has the objective of assessing value addition on honey at household level: the extent, prospects and challenges. Respondents have been randomly selected to participate in this survey and their **VOLUNTARY** participation in this survey is highly appreciated. Respondents opinions will be completely **CONFIDENTIAL** and will be analyzed together with those of others in Rift Valley Province for academic purposes and to improve farmers conditions.

SECTION A: GENERAL INFORMATION

Enumerator _____
Respondent's Name_____
District: _____
Division _____
Location _____
Sub-Location _____

SECTIONA: GENERAL INFORMATION

A1. When did you start bee keeping? **yearstart_____**
A2. When you started how many hives did you have**?** **hivestart_____**
A3. How many hives do you have now? **hivesnow_____**
A4. What type of hives do you use? **Hivetype1_____Hivetype2_____ Hivetype3_____**
1= KTBH 2=Traditional log hive 3=other (specify) _____

A5. Where are the hives **located**? **hiveloc1**_____ **hiveloc2**_____ **hiveloc3**_____
1=Within home compound 2=In the bush 3= River bank 4= Other (specify)_____

A6. Where your hives are **positioned hivepos1**_____ hi**vepos2**_____**hivepos3**_____
1= Trees 2= Bee hat 3=Ground 4=other (specify) _____

A7. Indicate details on **Land ownership**.

	Owned	Rented in	Rented out	Communal
Acres	[____]	[_____]	[_____]	[_____]

SECTION B: DEMOGRAPHIC INFORMATION

B1. Please indicate the following details on all your household members in the last one year (January – December 2008)

ID	Name	**Gender** 1=Male 2=Female	Year of birth	Relationship to head 1=head 2=spouse 3=Child 4= Parent 5= Niece 6= Nephew 7= Worker 8= Other	Number of **months** living at home in the last 12 months	**Marital status** 1=Single 2=Monogamously married 3=Polygamously married 4=Divorced 5=Widowed 6=Separated 7=Other	**Education level** 0= none 1= Primary 2=Secondary 3= Tertiary college 4= University	Was this person involved in any **Income earning** activity in the past **12 months** ***1 = Yes 2 = No (got to next member)***	If yes, **Indicate the main activity** *(See Activity Code below)*	Months involved in the activity in the last 12 months	What was the monthly estimate of income from this activity (Shs)
1											
2											
3											
4											
5											
6											
7.											

Income earning activities: 1= Informal employment 2 = Formal employment 3= Business person/ self employed 4=other (specify) _____

SECTION C: HONEY PRODUCTION

C1. How many hives were **inhabited by bees** between Jan. and Dec. 2008 **hivinh**_____

C2. Please indicate details on **your production** in the past year (Jan-Dec2008).

Product type	**Quantity produced**	**Qty units** ***(See codes below)***	**Qty sold in crude form** ***(use harvest units)***	**Qty processed** ***(use harvest units)***	**Price per unit (Kshs)**	**Qty units** ***(See codes below)***	**Quantity consumed at home**
prodtype	**qprod**	**units**	**Qsold**	**Qprocess**		**prounits**	**qconsume**
Crude Honey- KTBH							
Crude honey- Log hive							
Crude honey- Underground							
Wax							
Propolis							
Bees venom							

Prodtype: 1= Honey 2= Wax 3=Propolis 4= other (specify) _____

Units: 1=Kg. 2= 4 L gallon 3=Debe 4= 100 ml bottle 4=Litres 5=other (specify) _____

C3. What methods do you use when **harvesting honey**? **harvmtd1____harvmtd2_____**
1=traditional methods 2=modern method 3= other (specify)_____

SECTION D: HONEY MARKETING AND PROCESSING / VALUE ADDITION

D1: **ENUME:** Probe for the products mentioned in table B2 and ask the following questions

Product type	**Form in which sold 1= Crude 2= Processed**	**Quantity**	**Quantity units**	**Price per unit**	**Buyer type**	**Reason for choosing this buyer type**	**Contract with buyer type? 1=Yes 2=No**	**Distance from homestead to the selling point (Kms)**
Punit	**btype**	**rsnbtype**	**procsold**	**putit**	**btype**	**rsnbtype**	**qconsume**	**distance**

Prodtype: 1= Honey 2= Wax 3=Propolis 4= other (specify) _____
Units: 1=Kg. 2= 4 L gallon 3=Debe 4= 100 ml bottle 4=Litres 5=other (specify) _____
Buyer type: 1=Middle man 2=Supermarket 3=Individual consumer 4=Herbal clinics 5= Farmer cooperatives 6=Retail shops 7=NGOs 8=traditional brewers 9=private processors 10=Other (specify)_____
Reasons:1=Good price 2=proximity 3=purchases in bulk 4=consistency 5= Have contract with buyer 6= Only buyer in the area 7= other (specify)_____

D2. For all the value addition activities perfomed, please ask for the following details

Value addition activity done	Quantity	Quantity unit 1=Kg 2= 4 L gallon 3=Litres 4=other(specify) _____	Cost per unit	Reasons for doing value addition **reasons**			Proportion of production value added 1=All 2=More than half 3=Half 4=Less than half	Additional price per unit after value addition (KSHS)
vacty	**qty**	**qtyunit**	**cunit**	**Rsn1**	**Rsn2**	**Rsn3**	**propva**	**addprice**

Value addition activity: 1=Grading 2=Packaging 3=Labeling 4= Separation of honey from wax 5= Purification 6=Other (specify)_____

Reasons: 1=get higher prices 2=demand by buyers 3= improve shelf life 4=increase sales
Qtyunits: 1=Kg. 2= 4 L gallon 3=Debe 4= 100 ml bottle 4=Litres 5=other (specify) _____

D3. If no in QC1 above please **indicate the reasons why**

……
……
……
……
……
……
……

SECTIONE: CREDIT, EXTENSION SERVVICES AND GROUP MEMBERSHIP

E1. Did any member of this household **acquire any credit (cash or in-kind)** in the last one year? (Jan-Dec2008). (1= yes 0=No) **creditacess**_____

E2. If yes **please fill in the following details**

Source of credit *(see codes below)*	Form of credit *1= cash 2= kind*	Amount of credit (Kshs)	Reason for borrowing *(see codes below)*	Granted? *1= yes 2= No*	Amount that was used in the **bee enterprise**	Interest rate (p.a)	If Not granted give reasons *(see codes below)*
csource	**form**	**drdtamt**	**rsnborrow**	**Granted**	**amtbee**	**Interest**	**nograntrsn**

Source of credit: 1= SACCO 2= Commercial bank 3= Microfinance institution 4= ROSCA 5=AFC
6= Employer/ company 7= Informal money lenders 8= other (specify)_____
Reasons: 1= Business 2= School fees 3= Household goods 4= Medication 5=Buy agricultural inputs 6=Bee keeping entreprise 7=other (specify)_____

Reasons for not being granted loan: 1= had outstanding loan 2= No securities 3= No enough savings 4= Defaulted previous loan 5= other (specify) _____

E3. If no in **QN D1** what was the **reason why none acquired credit? whynot**_____
1=No collateral 2=No lenders 3= High interest rates 4= No need 5=other (specify)_____

D4.Where do you usually **obtain technical advice on bee keeping**? ***(The main 3)***
advice1_____ **advice2**_____ **advice3**_____
1 = government extension officers 2 = World Vision 3 = SITE enterprise
4=Honey care Africa 5= Other NGO field officers Name: _____
6=other (specify) _____

E5. Have you or any member of your household **attended any training or seminar** on **bee keeping** in the **last two years**? 1=yes 0=No **train**_____

E6. If yes in QN D5 above, **what topics** were **covered during the training**?

tratopic1_____ tratopic2_____ tratopic3_____ **tratopic4**_____

1= Bee hive management 2=Honey harvesting 3= Record keeping 4=farm management and accounts 5=marketing of bee products 6= Wax making 7=Processing of bee products 8=other (specify)_____

E7. Are **you or any member of your household** a member of a **bee keeping related organized group** 1=yes 0=no **groupmem_____**

E8. If yes how many members of your household are members of such groups?

memgrp_____

E9. For each member who is in such a group indicate the following details

Member number ***(1,2,…,N)***	Activities undertaken by the group				Any position in leadership of the group?	Member in **any other group?** *(other than bee keeping group)* **1=yes 0=no**
memnum	**act1**	**act2**	**act3**	**act4**	**lposn**	**othergrp**

act1- act4: 1=collective production 2= collective marketing 3= training 4=group lending 5=collective purchase of inputs 6=other (specify)_____

E10. Has your bee production benefited in any way from the involvement in the group?

1=yes 2=No benefit_____

E11. If yes how?

.....
.....
.....
.....

SECDTION F: ASSET OWNERSHIP AND HOUSEHOLD EXPENDITURE

F1. Please tell us about the **assets** that you own **at the moment**

Item		Current number	*Unit value*	*Total current value*	Item		Current number	*Unit value*	*Total current value*
item		**cnum**	**Untval**	**totval**	**item**		**cnum**	**untval**	**totval**
KTBH	**1**				Farm house(s)	**11**			
Traditional Log hive	**2**				Furniture	**12**			
Thatched bee hut	**3**				Panga	**13**			
Honey storage barrel (*Keete*)	**4**				Jembe	**14**			
Smoker *(Sisto)*	**5**				Bicycle	**15**			
Drill *(Kolomeito)*	**6**				Vehicle(s)	**16**			
Harvesting bag *(Tokolta)*	**7**				Mobile phone	**17**			
Wedge *(shon'geito)*	**8**				Other	**18**			

Wooden hive tool *(Sekete)*	**9**				Other	**19**			
Chisel (*Kipkongoito)*	**10**				Other	**20**			

F2. Other household expenditures in the past one year (2008) in Ksh.

Category	**Amount in Ksh**
Expenditure on fertilizer	
Expenditure on seeds	
Expenditure on crop chemicals	
Expenditure on labour	
Expenditure on School fees	
Expenditure on Foods	
Expenditure on clothing	
Expenditure on rental	
Expenditure on Health	
Expenditure on Transport & fuel	
Expenditure on entertainment	
Expenditure on gifts, weddings ets	
Other expenditures	

SECTION G: DEMOGRAPHIC INFORMATION

G1. Please indicate the following details on all your household members in the last one year (January – December 2008)

ID	**Name**	**Gender** 1=Male 2=Female	Year of birth	Relationship to head 1=head 2=spouse 3=Child 4= Parent 5= Niece 6= Nephew 7= Worker 8= Other	Number of **months** living at home in the last 12 months	**Marital status** 1=Single 2=Monogamously married 3=Polygamously married 4=Divorced 5=Widowed 6=Separated 7=Other	**Education level** 0= none 1= Primary 2=Secondary 3= Tertiary college 4= University	Was this person involved in any **Income earning** activity in the past **12 months** ***1 = Yes 2 = No (got to next member)***	If yes, **Indicate the main activity** *(See Activity Code below)*	Months involved in the activity in the last 12 months	What was the monthly estimate of income from this activity (Shs)
1											
2											
3											
4											
5											
6											
7.											

Income earning activities: 1= Informal employment 2 = Formal employment 3= Business person/ self employed 4=other (specify) _____

G2. Please indicate **annual income** from the following **other sources** in the last one year

a) Sale of **crops** (Kshs.) _____

b) Sale of **livestock products** (Kshs.)_____
c) Sale of **assets** (Kshs.)_____
d) **Remittances** from relatives (Kshs.)_____
e) Income from **rented buildings** (Kshs.)_____
f) Income from land **rented out** (Kshs.)_____

General comments about the **survey**

……
….....

THANK YOU FOR YOUR COOPERATION