

**INFLUENCE OF VALUE ADDITION IN BEE-FARMING
PRODUCTS ON THE LIVELIHOOD OF BEE- FARMERS IN
KAKAMEGA CENTRAL SUB-COUNTY, KENYA**

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DECLARATION

This research project is my original work and has never been presented for the award of any degree in this or any other University.

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To my dear husband Aggrey Otieno Odindo who encouraged me to pursue this course, and my loving son Leroy Rendi Otieno, who gives me the motivation to be an achiever.

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ABBREVIATIONS AND ACRONYMS

ACORD	Agency for Cooperation and Research Development
A.M.I	Agricultural Management Institute (U.S.A)
ASAL	Arid and Semi-arid Land
B.A.R.N.E.S.A	Banana Research Network for Eastern and Southern Africa
BCE	before Christian era
CAADP	Comprehensive Africa Agriculture Development Programme
C.B.O	Community-based organization
CGIAR	Consultative Group on International Agricultural Research
C.I.G	Common Interest Group
DOWAF	Department of Water Affairs and Forestry (South Africa)
E.A.C	East African Community
ECOWAP	ECOWAS Agricultural Policy
E.U	European Union
EXT	Extension
FAO	Food and Agriculture Organization of the United Nations
FREQ	Frequency
G.D.P	Gross Domestic Product
G.O.K	Government of Kenya
GOVT	Government
ICIPE	International Centre of Insect Physiology and Ecology
IFAD	International Fund for Agricultural Development
K.A.R.I	Kenya Agricultural Research Institute
KSHs.	Kenyan shillings
KENFAP	Kenya National Federation of Agricultural Producers
MAFC	Ministry Of Agriculture Food Security and Cooperatives (Tanzania)
MATF	Maendeleo Agricultural Technology Foundation
MDGs	Millennium Development Goals
MoAFFS	Ministry of Agriculture, Forestry and Food security (Sierra Leone)
MoALR	Ministry of Agriculture and Land Reclamation (Egypt)
MOE	Ministry of Education

MOLFD	Ministry of Livestock and Fisheries Development
MoMSME	Ministry of micro small and medium Enterprises (India)
MoNRT	Ministry of National Resource and Tourism (Tanzania)
MTS	Metric tones
NAAS	National Academy of Agricultural Sciences (India)
NAFIS	National Farmers Information Services
NHB	National Honey Board (United States of America)
NEPAD	New Partnership for Africa’s Development
N.G.O	Non –Governmental Organization.
NSADP	National Sustainable Agriculture Development Plan
OECD	Organization for Economic Co-operation and Development
PATS	Programme on Agricultural Technology Studies (USA)
SNV	Netherlands Development Organization
TTA	Total Transformation Agriculture Limited (Botswana)
TUNADO	the Ugandan National Apiculture Development Organization
U.N	United Nation
UNIDO	United Nations Industrial Development Organization
UNESCO	United Nations Educational, Scientific and Cultural Organization.
USDA	United States Department of Agriculture
USAID	United States Agency for International Development
USD	United States Dollar
W.H.O	World Health Organization

ABSTRACT

Kakamega central sub-county is endowed ecologically with rainforests such as Malava and Kakamega forests which are well known to attract bees, hence bee keeping is a major practice in the area (IBRA, 2009). Bees are well known for their products that have a lot of economic value, they include honey, beeswax, Propolis and royal jelly (FAO ROME, 2011), the sub-county has the potential to produce 300MTS of honey per year (GOK, 2010). The extent of value addition on hive products and hence its potential benefits has not been established. This study sought to establish whether or not Value addition on hive products would increase income and hence improve the livelihoods of bee farmers, the indicators of which would be the food security status, health/type of houses owned and the education levels in bee farmers' households. Descriptive research design was employed for this study, the target population under study was 914 bee farmers of which 127 were selected using sampling tables by Krejcie & Morgan (1970). Systematic and stratified random sampling were used to select the respondents from the three strata namely, Municipality, Lurambi and Navakholo. Data was collected by the aid of questionnaires, the validity of the questionnaire was ensured by doing pilot testing, for the reliability, split half reliability was calculated for pilot questionnaires and Spearman's correlation coefficient computed. Data analysis was done using Statistical Package for Social Science (SPSS), version 16.0. Qualitative data analysis was done by summing up total scores on variables under study, and the final data was analyzed in the form of descriptive statistics (mean, frequencies, percentages and standard deviations) and presented in form of contingency tables. Bee farmers were categorized into three forms of value addition, basic (56.7%), advanced (22.6%) and non-value adders (20.8%). The findings revealed that basic value adders generated Kshs.170 per kilo of honey, advanced, Kshs.211 and non value adders, Kshs.140. Advanced value adders also generated an extra Kshs.150 from sale of royal jelly and Kshs.135 from beeswax. The study established that advanced value adders generated more income hence had better saving culture. Advanced and basic value adders had access to more meals per day and were less likely to suffer from nutritional deficiencies compared to non-value adders. The study concluded that advanced value addition increases income and in return enhances food security, health/housing and education levels of bee farmer families. The study recommended that farmers be trained on the importance of value addition and how to identify hive products and their uses. Financial empowerment of farmers through farmer groups was also recommended as a way of promoting value addition. Finally the study suggested further research to be done on the role played by NGOs that carry out value addition on hive products in the study area in improving farmers' livelihood.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study.

Beekeeping also referred to by the term apiculture, is derived from a Latin word *APIs* which means bee. Apiculture is the maintenance of honeybee colonies known as hives by human beings to collect honey and other products such as beeswax, Propolis, pollen and royal jelly. The location where bees are found is known as an apiary or a bee yard (Wikipedia). Carroll (2006) defined beekeeping as the art of managing bees in order to obtain honey, beeswax and other bee products for food and income.

Apiculture tends to be treated as a hobby or sideline activity, but it is an important occupation that is part of rural life worldwide (Bradbear, 2009). In rural areas in Africa, Kenya included, income sources are limited. Small-scale apiculture could be a major contributor to securing livelihood if measures are put in place to add value to the products from the trade. The history of beekeeping dates back to about 2400 BCE in Egypt. The venture was mainly practiced in the lower parts of the country which had extensively cultivated land, with bee chosen as a symbol of the country. Some of the produce which were harvested from the trade included honey that was used to satisfy the desire for the gods of honey and for making medicines and ointments; wax which was used in mummification, boat and ship building as a binding agent for paints and in metal casting (Texas drone). Today bee keeping is practiced across the globe, production and utilization of bee products vary widely from one country to the other.

The E.U has about 50,000 and 400,000 professional and amateur beekeepers respectively, all producing 130,000 tons of honey (Anon, 2001). Most of the E.U's honey is produced in the south of Europe i.e. France-31,000, Spain-30,000, Greece-15,000, Portugal-11,000 and Italy 10,000. North Europe that consists of Belgium, The Netherlands, Luxembourg, Germany and Denmark consists of amateur beekeepers whose products are sold locally (European Commission, 2002). Australia has 673,000

registered hives; the main products from apiculture are honey and beeswax while pollen, Propolis and royal jelly are minor products. The country produces 30,000 tons of honey and 545 tons of wax per annum. Honey producers are contracted by honey packers to supply specified volumes of honey per annum, which are then packaged and labeled for sale. Beeswax is used in pharmaceuticals and for making candles (Gibbs & Muirhead, 1998).

In the U.S.A, beekeeping was first introduced around 1860, by John Harbison who brought the practice to West coast in an area called Harbison Canyon, California. He later expanded the trade to other parts of the country (Coldeira, 2007). Until the 1980s, farmers who lived in rural areas and their relatives who emulated them mainly practiced beekeeping in America as a hobby. It is estimated the U.S.A has 115,000-125,000 beekeepers who mostly engage in the practice as a hobby, with each farmer having less than 25 hives. Commercial beekeepers are graded as those who own over 300 hives (Bee culture magazine, 2013). In the year 2012, honey production from U.S.A farmers with more than five colonies totaled to 147 million pounds down 1% from 2011. The average price per pound was USD1.951 Up 11% from USD1.765 in 2011 (NAAS, 2013). Almost half the honey produced in America is sold through retail channels; the rest is sold in bulk for use in the food industry (NHB, 2013).

Global production of honey increased by 10% from 1.4 million metric tons to 1.54 million metric tons between the year 2005 and 2010 (USAID, 2012). However, it is good to note that not all honey producing countries recorded this marked increase. For instance, Argentina recorded a drop from 110,000 MTS to 59000 MTS due to extreme weather conditions (USAID, 2012).China's bee farming industry is equally well established. In the year 2012, the country produced 398,000 MTS accounting for 26% of the global share by volume (USAID, 2012).

India has a long history in beekeeping. The country has some of the oldest records on apiculture in the form of paintings in prehistoric rock shelters. Beekeeping is practiced in forests with key areas being the sub-Himalayan tracts and Orissa and Pradesh (MoMSME, 2009). India's honey production stands at 65,000 MTS per year. 50% of the honey is exported to other countries while the remaining 50% is consumed locally. The collection, processing and marketing of wild honey and other apiculture products in India is not well organized; hence, statistics are not up to date (NAAS, 2002). Vietnam produces 200-400 tons of forest honey annually while Bangladesh and Sundarbans forests yield about 220 tons of honey and 55 tons of wax annually (FAO, 1994). Honey is mostly packaged in clean bottles, labeled and sold to retail outlets and confectioneries across Asia (UNIDO, 2012).

In Africa, Ethiopia is the largest producer of honey. The country's production increased by 26% from 36,000 MTS to 45,300 MTS in 2011 (USAID, 2012). Ethiopia is agro-ecologically endowed in honey production and boasts of a large number of bee colonies but production is still not at its maximum potential due to the use of traditional hives and lack of improved bee management techniques that can enhance quantity and quality of honey (Gebey et al, 2010). Women are noted to participate more in making value added products such as candles and honey beer, because the culture of the country confers the responsibility of childcare and performance of household chores to the female gender, hence value addition on bee farming products is an ideal opportunity for them to earn extra income (Bees for Development). One key challenge faced by rural bee farmers in Ethiopia is poor quality of honey because of use of traditional methods of harvesting, there is need to improve the quality of the products through improved packaging and processing (SNV Ethiopia, 2008).

Bee keeping in South Africa can be traced back around the second half of the 18th Century with the invention of the movable frame hive. The invention of the wax foundation, the centrifugal honey extractor and the bellows smoker greatly revolutionized beekeeping in South Africa (Preez & Moodie, 2012). Presently, the

apiculture industry in the country is characterized by under production although there is a ready and easy market for good quality honey and other bee farming products as the population moves towards consumption of natural foods. South Africa grades her farmers such that a commercial bee farmer is one who has more than 200 hives with a small-scale one having 200 hives or less. There is an estimated 4000 traditional/informal beekeepers in the country. On average, one beehive gives 15 kilos of honey a year, hence, the 105,442 hives available in South Africa produces 1580 tons of honey per year. The value addition industry for apiculture products is not well developed and there is need for a more centralized extraction, processing, packaging and branding framework that small-scale, economically challenged producers can capitalize on (DOWAF, 2005).

Botswana is traditionally a nation of honey hunters. Domestic beekeeping started more than 30 years ago. Groups manage many of the bee farming projects with a few being owned individually. The average bee farmer in Botswana usually has one colony of bees and he/she is mainly found in rural setting (TTA, 2005). Through government initiatives that have resulted in training of about 1000 individuals, honey production in Botswana has grown from 5 kilos per hive in 1980s to 15 kilos per hive in 2000 and 20 kilos per hive in 2004 (TTA,2005). This has however, come with its own share of challenges to the Botswana beekeeper. Notable constraints include low production efficiency, inadequate infrastructure, and lack of access to lucrative markets due to fragmented production units that make collection of inputs, acquisition, production, planning and output marketing difficult as well as absconding colonies. Value addition on the produce is also minimal as most honey is sold in raw form with minimal packaging. Packaging is done in food trays covered with clear plastic sheath (TTA, 2005)

Bee keeping in Zambia has undergone a major transformation in the last thirty years. The country has recorded declining production from once very high export peaks. However, apiculture has been identified by the government as a pro-poor, environmentally sustainable, forest-based income generating enterprise (Paumgarten

& Ingram, 2010). Key challenges facing the sector have been identified as poor marketing and management skills. In Zambia's case, Paumgarten and Ingram (2010) argue out that although bee keeping has been strongly advocated for as a major contributor to rural livelihood improvement strategy, without value addition and market access, it will be difficult to realize its potential. The most sold bee products in Zambia are honey and beeswax. Products such as jelly and Propolis are not utilized at all. Honey is used on a scale of 90% to brew local beer known as *Mbote*, with table honey being sold mostly in urban areas of the country. Beeswax is sold locally as a floor polish and for making candles, with a big proportion being sold to Tanzanian traders for the cosmetic industry in Eastern Africa (Kokwe, 2006).

Tanzania has a good environment for producing bee products due to availability of many plant species that produce nectar and pollen that attract honeybees. The main bee products include honey and beeswax. 75% of the honey produced in Tanzania is sold locally for use in bakeries and confectioneries. There is also a marked use of honey for making honey beer in hotels and tourist attraction sites. The country exports 200,000 tons of honey per year to Germany, Netherlands, Belgium and Italy (MoNRT, 2004). Tanzania is the second largest exporter of honey in Africa and the top African supplier to the European Union. Despite the good ratings, honey export levels dropped from 385 MTS to 327 MTS in 2011 as per the USAID market survey of 2012. The bee farming sector in the country faces a number of challenges such as presentation of low quality products to the market by beekeepers and lack of effective quality control and inspection systems (MoNRT, 2004).

Apiculture has been practiced over generations in Rwanda. Bee keeping plays a key role in the economy of Rwanda, as it is an income generating activity, has medicinal value, and supports agricultural activities by facilitating critical processes like cross-pollination and improving crop yields. Beekeeping also enhances forest conservation. The sub-sector however remains underdeveloped. There are about 45,000 beekeepers with 90,000 hives (SNV Rwanda, 2009). Rwanda produces about 30 MT of honey and 21 MT of bee wax per year (FAO, 2006).

Uganda has great predominance of traditional methods of bee keeping. Beekeeping is a seasonal activity, with honey being harvested twice a year with a primary harvest season between March and June and a secondary one between August and October. Many farmers in Uganda do not have modern pressing machines and hence, press the combs by hand therefore; there are many impurities in their honey. Production stands at between 800 MT and 1200 MT a year (Ochan, 2005). After being harvested; honey is extracted, warmed, strained and bottled. It is then sold at clinics for medicinal use to treat opportunistic infections mostly among people affected by HIV/AIDS virus. Uganda has the ability to produce 8000-9000 tons of honey per year, but the country has not yet reached its maximum production potential. Some of the constraints bee farmers in Uganda face include; Lack of policy and legislation framework governing the sub-sector, Lack of training for bee farmers on better management, limited market access due to poor quality of products and uneconomical production volumes (TUNADO, 2007).

Apiculture is mainly practiced in the arid and semi-arid areas of Kenya by both individual small-scale farmers and common interest groups. The enterprise can however, be sustained in other agriculturally potential areas of the country. The Ministry of Livestock estimates that beekeeping can be sustained in 80% of the nation (MoLFD, 2001). The apiculture industry has a potential to produce more than 100,000 MTS of honey and about 10,000 MTS of beeswax per annum, only a fifth of the capacity has been achieved so far (GOK, 2008).

1.2 Statement of the problem

The livelihoods of the small scale farmers in Kakamega Central Sub-county have been characterized by poverty of income for a long period of time. This in turn reflects on the food security status, health accessibility and affordability as well as access to education in the farmers' households. The sub-county depends mainly on agriculture for sustainability yet land sizes have been diminishing over time due to subdivision (Dose, 2007). It is important for the farmers to embrace other non soil dependent forms of agriculture so as to generate more income.

Kakamega central sub-county is well endowed ecologically with rainforests such as Malava and Kakamega forests which are well known to attract bees, hence bee keeping is a major practice in this area (IBRA,2009).Bees are well known for their products that have a lot of economic value, they include honey,beeswax,Propolis and royal jelly(FAO ROME,2011),the sub-county has a population of 914 beekeepers (Anyanje, 2011), with the potential to produce 300MTS per year of honey but so far, the current production stands at 10 MTS per annum (GOK, 2010). This honey is sold in raw form hence it generates minimal income to the farmer; this is because most farmers neither add value to their honey nor put to use the other hive products. The extent of value addition on hive products in the area has not been established hence its potential benefits have not been maximized. The study aimed at addressing this issue by establishing whether or not Value addition on hive products increases income and hence improving the livelihood of bee farmers in Kakamega Central Sub-county, the indicators of which would be the food security status, health/type of houses owned by bee farmers and the education levels in bee farmers' households.

1.3 Purpose of the study

The purpose of this study was to assess the influence of value addition on apiculture products on bee farmers' livelihood in Kakamega Central Sub-county.

1.4 Research objectives

This study sought to achieve the following objectives:

1. Determine how value addition in apiculture products influences bee-farmers' income in Kakamega Central Sub-county.
2. Investigate the extent to which value addition in apiculture products influences bee-farmers' household food security in Kakamega Central Sub-county.
3. Establish the level at which value addition in apiculture products influences the health and type of houses owned by bee-farmers in Kakamega Central Sub-county.
4. Determine how value addition in apiculture products influences household education of bee-farmers in Kakamega Central Sub-county.

1.5 Research questions

The study sought to answer the following research questions:

1. How does value addition in apiculture products influence income of bee-farmers in Kakamega Central Sub-county?
2. To what extent does value addition in apiculture products influence bee-farmers' household food security in Kakamega Central Sub-county?
3. To what level does value addition in apiculture products influence the health and type of houses owned by bee-farmers in Kakamega Central Sub-county?
4. How does value addition in apiculture products influence household education of bee-farmers in Kakamega Central Sub-county?

1.6 Basic assumptions

The researcher assumed that the respondent would understand the questions asked and give accurate information to facilitate data analysis and interpretation. The researcher acknowledged the influence of factors such as cultural beliefs, personal sentiments and gender issues on the study of this kind, as it was done at household level and in a rural setting. However, the researcher assumed that these factors would not hinder the study's success.

1.7 Limitations of the study

The rainy season was a major limiting factor to this study as the area experiences two rainy seasons, short rains between December and March and long rains between April and November. The rains made roads impassable and this affected the data collection process. The researcher addressed this by providing umbrellas, raincoats and subsistence money for the research assistants to hire motorbikes to transport them to the villages to collect data.

The other limiting factor to this study was the coinciding of the time of administering questionnaires to farmers and the time they were doing their daily chores such as tilling of land, attending to livestock or carrying out household chores. The researcher

to seeked audience with the respondents in due time and arranged for the most appropriate time, convenient to both sides so that the questionnaires were filled accurately without rushing through. The researcher sought the guidance of the extension officers working in the district, who were conversant with the schedules and different temperaments of the target bee farmers.

1.8 Delimitation of the study

The study aimed at making a comparison between bee farmers who add value on their produce with those who do not and how this influences their livelihood. This was done by analyzing data collected on four variables namely; income, household education, health/type of housing and food security. The research was limited to Kakamega Central sub-county because bee farming is a major source of livelihood in the district but the farmers are not yet self-sufficient in their farming activities because they have not fully adopted value addition.

Kakamega central sub-county has three divisions namely; Municipality, Lurambi and Navakholo. It has a population of 297, 394 people (Kenya, population census, 2009). There are about 914 apiculture farmers distributed across the three divisions i.e. Municipality, Navakholo and Lurambi (Anyanje, 2011).

1.9 Definition of significant terms

Value addition: Packaging of honey in hygienic bottles and labeling the bottles as a marketing strategy, putting the other produce such as Propolis, venom, royal jelly and beeswax into economic use.

Livelihood: Overall wellbeing of a farmer indicated by his Income, health status, the type of house S/he lives in, education of his/her household and the food security situation of his/her household.

Apiculture: Domestication of bees by farmers to harvest its products for sale or use in the household.

Bee products: Honey in its unprocessed form, Propolis, royal jelly and beeswax.

Food security: Having access to safe, sufficient and nutritious food all the time.

Income: Net proceeds from the sale of farm and non-farm produce

Household: The total number of people living and depending on a given bee farmer.

1.10 Organization of the study

The report is divided into five chapters. Chapter one explains the background of the study, the problem to be addressed, the purpose of the study, research objectives, research questions as well as the research hypotheses. The chapter also addresses the rationale of the study, basic assumptions to the study, limitations and delimitations to the study as well as definition of significant terms.

The second chapter is a study of different literature materials on value addition, its adoption, success and its failures. The section explains the concept of value addition, addressing the four variables of study as well as drawing comparison to benefits and success stories of value addition on other agricultural commodities.

Chapter three is on the research methodology and explains the research design used in the study, the target population, and the sample size selected as well as the sampling technique. This section also explains the instruments used for data collection, pilot testing of the named instrument, its validity and reliability. Finally, the chapter gives detailed information on the data collection procedure, data analysis technique and the ethical consideration for this study.

The fourth chapter is on data analysis, presentation and discussion. The chapter presents an analysis and interpretation of the collected data on the five variables of study. Chapter five is a summary of the study and gives a clear conclusion and recommendation including suggestions for further study and contribution of the study to the existing body of knowledge.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is a review of literature on value addition in various agricultural commodities in relation to how value addition acts to influence the objectives of study starting with income of bee-farmers, food security, health/type of houses owned by the farmers and the level of education of the farmers' households. The chapter also contains a conceptual and theoretical framework.

2.2 The concept of value addition

PATS (2005) defined value-addition in agriculture as “any activity that allows producers to capture greater value than would normally be secured through conventional commodity channels, achieved by carrying out activities such as processing to distinguish the products from the standard agricultural commodities. Value addition has often been understood literally as adding of worth or value to a commodity, however, NAAS-India (2002) brought a different point of view to the definition by explaining the concept from different angles: post-harvest level that involves primary processing by cleaning, grading and packaging of agricultural produce e.g. for vegetables, potatoes and fruits; level 2 that involves secondary processing, that basically entails packaging and branding e.g. for rice and *atta* and level 3 which is high end processing, supply chain management, modern processing technology, packaging for processed foods, branding, marketing etc.

Value addition takes two approaches that include; innovation and coordination. Innovation involves improving the existing processes, procedures, products or creating new products altogether. Coordination is focusing on arrangements among farmers who produce and market farm produce, coordination could be horizontal i.e. involving pooling and consolidation among farmers from the same level of the food chain such as broiler poultry farmers coming together to build a slaughter house for their market-ready broiler chicken. Coordination could also be vertical i.e. when

control of all segments of a production and marketing system are put under a single ownership (Coltrain et al, 2000).

A product is said to have more value when it achieves certain features such as quality; meets and exceeds the expectations of the end-user, functionality; serves the intended purpose, form; it is useful, place; can be accessed at the right place, time; can be accessed at convenient time when it is desired and finally, ease of possession i.e. it is affordable by the customer (Anderson & Hall, 2011). Once farmers decide to go into value addition, it is important that they understand their target customers and be able to define the customers' value. Anderson & Hall (2013) defined customer value as a reflection of the relationship between the benefit customers receive from a product and the price they are willing to pay for the product. A customer will place high value on a product that has more benefit relative to the price. It is however, important for a producer to recognize and appreciate the fact that customers' perception of value-added products is different and this forms their judgments on quality, convenience and selection of different products.

It is equally important for any farmer who is venturing into value addition to keep his production cost on the minimum by examining value-added processing and marketing activities. Boland (2009) observed that only the low cost efficient producers would be able to survive and compete in agricultural production, therefore, farmers should consider the economies of scale before resorting to any value adding measure. Farmers have to weigh in on options of maintaining the economies of scale. One such option suggested by Senechal et al (2009) is the formation of farmer alliances or organizations. The writers observed that farmer alliances are created to enable farmers to participate in processing and marketing of their commodities past the farm gate. Further studies by FAO, Rome indicate that farmer organizations play a key role in overcoming barriers faced by small agricultural producers especially women by empowering their members economically and socially to create sustainable employment, through equitable and inclusive business models that are more shock resilient. The importance of farmer alliances has also been highlighted by Chiukira &

Juru (2012) in their article titled, ‘*Agricultural value chain analysis-soya bean and maize chain analysis.*’

Value addition offers a strategy for transforming an unprofitable enterprise into a profitable one. For instance, a coffee farmer who harvests his coffee and sells to a local processor without adding any value is more likely to sell below the cost of production. However, his marketing strategy will not be economically sustaining in the end. This farmer can instead, decide to add value to his coffee by removing the cherry pulp, washing and drying the coffee beans thereby, making extra income from the sale of the produce and creating an economically feasible enterprise (Fleming, 2005)

2.3 Value addition in apiculture products

Value addition is the physical segregation of any agricultural commodity or product in a manner that results in the enhancement of the value of that commodity or product (USDA, 2002). Studies by Hilmi et al (2011) on adoption of beekeeping as a means of sustaining livelihoods indicate that bee products have a wider consumer preference and promote sustainable livelihoods for many small-scale farmers and other non-rural dwellers. Bee products with minimal processing can be made into value added products that may not be related to agriculture i.e. making candles from beeswax or using honey in baking bread and cakes (Krell, 1996). Table 2.1 shows a summary of the apiculture products and how value can be added to them.

Table 2.1 Opportunities for Value Addition on Bee-farming Products

NO.	PRODUCT	VALUE ADDITION MEASURES
1.	Honey	<ul style="list-style-type: none"> i. Making honey beer ii. As food iii. Industrial food production iv. As a food ingredient i.e. homemade recipes, cakes, confectioneries, preparation of marmalade and jams, in whole dried fruits and in non-alcoholic beverages.
2.	Wax	<ul style="list-style-type: none"> i. In metal castings and modeling ii. In cosmetics i.e. wax gives certain solidity to emulsified solutions that facilitate formation of stable emulsions and increases water-holding capacity of ointments and creams. iii. Used in food processing and packaging e.g. in cigarette filters and for protecting containers against the effects of acids from fruit juices or honey. iv. Candle- making v. Making medicines i.e. coating drugs vi. In textile industry to make batik and tie and dye fabric patterns vii. In making vanishes and polishes
3.	Propolis	<ul style="list-style-type: none"> i. Used traditionally to heal wounds in Europe and North Africa ii. In food technology as a preservative because of its antioxidant, anti-microbial and antifungal characteristics. iii. Used in cosmetics as an agent that facilitates skin rejuvenation and renovation.
4.	Royal jelly	<ul style="list-style-type: none"> i. Dietary supplement has therapeutic value and is a stimulant. ii. Ingredient in cosmetics, in dermatological products iii. An ingredient in medicine like products. iv. An ingredient in food products i.e. in honey to improve its taste.

Born (2001) found out that by adding value to bee products, the farmer has more products to sell and generate more income, he/she can tap into diversified markets,

gets more control over prices he sets for the products and, has guarantee to more stable and regular sources of income.

Studies on the apiculture industry in Australia by Gibbs & Muirhead (1998) indicate that the major products harnessed from the trade are honey and beeswax. The studies single out the role of value addition by showing that farm gate value of honey was USD.1.50 per Kg while after packaging the value rose to about USD.2.07 per kg in 1995/1996; the price went higher to USD.2.40 per kg for packaged honey in 1997. This is a clear indication that value addition increases income. There was also a notable difference between the value generated by selling wax at the farm gate and in value adding processing.

2.4 Value addition and farmers' income

Income is the profits and losses incurred through the operation of a farm. It is a measure of the economic viability for the operation of a farm. Income can be relayed as gross income; the monetary income received by farm operators before deducting incurred expenses or it could be net income which is the return on the farm, both in monetary and non-monetary form, for the farmer's labor, management and capital, after paying production expenses (USDA). When analyzing the benefit of value addition, the net income should be considered.

Studies by Ramirez (2001) established that value added agriculture contributed to a 350% increase in household income in Latin America, playing a key role in alleviating poverty by enhancing on-farm and off-farm employment creation, thereby generating more income. Further studies by Quagraine et al (2000) indicate that value addition enhances demand for primary commodities through improvement of product quality and by facilitating production of new and alternative products that create an outward shift in the demand curve for farm commodities thereby, increasing the commodity prices and quantities sold. The benefits of value-addition are usually achieved in the end, scaring away farmers who are not patient as highlighted in a workshop in Ontario by AMI (2012). The workshop findings indicated that most smallholder farmers in Ontario did not embrace agricultural value chain systems due

to issues such as lack of ownership which was as a result of poor connectivity between farmers and processors. The farmers also viewed value addition as a creation of more work of which they were not patient enough to wait for its fruits.

Value addition is applicable to a variety of agricultural products. Previous studies by FAO, Rome acknowledge the contribution of agriculture through value added products in reducing food insecurity by creating incomes and food availability. The study singles out major fish and horticultural exporting countries like Oman, Morocco and Tunisia which have focused their attention on quality and are value conscious, this has enabled them to break into European markets which stress very high quality standards for agricultural imports. Another study by Kumar et al (2011) shows that India had undergone great transformation as most farmers were concentrating on processing and proper marketing of agricultural produce, replacing the traditional way of food production by adopting manufacturing processes that entail value addition. Value addition was paying off for these farmers, for instance it was established that by adding value to *tur dal*, the farmers in Akola district of Maharashtra generated 19% more than by selling raw *Tur*.

China is one of the world's most populous countries, having a fifth of the world's population. China's government has however, been able to feed the growing population and even sell surplus to other countries by increasing agricultural productivity through the development of the manufacturing sector to add value to agricultural products. As a result, rural incomes have been increasing steadily i.e. the per capita annual incomes of rural residents who majorly practice farming was ten times higher in 2011 than in 1978 due to among other reasons increase in income generated from non-agricultural activities (OECD-FAO, 2013). World Bank has also established that poverty levels in China have gone down from 64% in 1999 to 12% in 2009 due to improvement in agriculture.

Hammarlund (2003) in his report titled, "Value-Added Dairy processing" stated that with increasing interest in the field of value-added dairy products in the state of

Kansas in the United States of America, the dairy farmers stood a great chance to diversify by providing a variety of milk products such as whole milk, cultured milk, light cream, heavy cream, yoghurt etc. either as individuals or in Common Interest Groups (CIGs). Hammarlund observed that value addition can be enhanced by formation of CIGs by small-scale farmers to meet economies of scale and that this would enable them to break into Midwest regions that often face milk shortages.

One of the facilitators of value addition is the value chain networks. Kumar et al (2011) defined value chain networks as a range of activities that are required to bring a product from its conception, through designing, sourcing of raw materials and immediate inputs, marketing and distribution to the final consumer. Trienekens (2011) termed a value chain as a vehicle by which new forms of production technologies, logistics, labor processes and organizational relations and networks are introduced. Value chains play a role in enhancing production of value added products. Value addition is created at different stages and by different actors throughout the value chain. The size of a value chain is decided by the end user's willingness to pay which is determined by quality generated by the chain. Zahoor (2012) observes that value chains involve value added to products. According to him, agricultural products can undergo value addition by differentiation of product based on food safety and functionality. The price a farmer can charge for a product will therefore depend on the incremental value attained from value addition measures. Fellow (2011) concluded that the financial rewards from a successful crop processing and marketing venture depend on the skill of the farmer and the type of buyers the farmer targets. Luisine et al (2007) came up with four pillars on which value is gauged; efficiency which is about utilization of resources in the chain and its measured by profits made, return on investment and inventory, production cost levels etc; flexibility which is the degree of responsiveness of the value chain to changing environment and is measured by customer satisfaction, delivery and lost sales; responsiveness i.e. the time spent on fulfillment of a request, whose indicators include product lateness, customer complaints, response time and errors in the final products and food quality which relates to product and process quality.

Anderson & Hall (2011) observed that the state of Texas generates several billion dollars from value added agriculture each year due to the economic impact of adding value beyond the farm gate but the trickle-down effect to the farmers was not much. This is because other entities in the value chain had superior control i.e. the processors. Farmers were however; keen to increase their profits by venturing into value addition with an aim of creating known brands for their products such as the Del Monte brand.

A study in Zimbabwe by Chiukira & Juru (2012) on value chain analysis of maize, which is the second most grown crop by small-scale farmers in the country after soya bean, a high value crop, indicates that by adding value to maize i.e. making maize meal, *maputi*, *samp*, *grit* and maize oil, a farmer generates more income than by selling maize in its pure form. For instance, farmers can form alliances to make maize meal and package it in 5 kg, 10 kg, 20 kg and 50 kg gunny bags. A tone of maize retails at USD.300, but by selling in the listed denominations, a farmer sells a kg of maize meal at USD.0.50c therefore, making USD.500 per ton and generating USD.200 in excess. Dry *maputi* on the other hand retails at USD.0.10c per 50gms, oil maize snacks at USD.0.20c and spiced *maputi* at USD.0.35c per 50 Gms; hence a 50 kg pack of dry *maputi* will fetch USD.100 more, maize snacks USD.250 and spiced *maputi* USD.150 more thereby generating a total of USD.150 in excess by adding value to maize.

Soya bean is another high value crop that could generate a lot of money to the farmer with value addition. Studies in Zimbabwe show that by making soymilk, soy yoghurt, soy flour and soy oil, small-scale farmers can create a local market that can increase their farm incomes tremendously. For instance, farmers can adopt the continuous pressing or screw pressing method of extracting oil from soy beans by a mechanical compressor, which the study views to be more affordable to middle and small-scale farmers in rural areas of Zimbabwe unlike the solvent extraction method. A small-scale farmer has the capacity to produce on average 10 liters of soy oil per day hence,

300 liters in a month. Considering a rural district with a population of 20,000 households each using 3 liters of oil in a month, the farmer will only be able to sell to 30 households. This is a clear indication of how large the market can stretch (Chiukira & Juru, 2012).

Primary processing is a form of value addition that presents a great opportunity to smallholder farmers to make additional income from their farms. This is because processing of agricultural crops on the farm requires minimal investment costs, and the products can be sold locally with minimal packaging and transportation. The government needs to provide adequate improvements in the local infrastructure i.e. roads and communication facilities, training and offer support through proper marketing to facilitate the process (Fellows, 2011). Processing offers opportunity to farmers who grow similar crops to avoid the effects of low prices and incomes when there are seasonal gluts at harvest time. It also enables the farmers who grow low value crops to add value onto them and increase household incomes. A good example is the agricultural producers in Asia who add value to fruits by making pickles and chutneys, while those in African countries add value to sorghum by making beer, thereby creating small businesses that generate off-farm incomes to households (Fellow, 2004).

According to Fellows (2011), value addition through processing can bring about improvements and benefits to smallholder farmers by generating linkages to commercial food processors and other buyers which results into higher prices for their commodity. This is supported by a study by Mufara (2011) in Zambia, amongst rice farmers, a Dutch development agency, SNV approached a local N.G.O, *Cinci wa Babili* to provide services to rice farmers through capacity building that resulted in the rice farmers coming together to form a savings and credit cooperative society through which they were able to get access to inputs, markets by contractual arrangements. They were able to create a trade relationship with a company by the name, Frontier Grinding and packaging Limited that purchased 250 MTs of paddy rice from the

farmers and offered them a better price; USD.10 per 50kg of paddy rice unlike what they were getting from traders i.e. USD.4-5 for 50 kg.

Farmers in Egypt get very low returns from their produce (MoALR-Egypt, 2009). Studies by IFAD (2011) indicate that there is low agricultural processing in Egypt hence; farmers get as high as 30% production losses for horticultural produce, 20% in legumes and tubers and 10% in cereals. Because of lack of processing measures, the farmers get low incomes, as low as 10-30%, from farm gate sales for their perishable produce.

A .C.O.R.D carried out a study in 2010 in Isingiro district of Uganda on the constraints facing small holder banana farmers .The study unearthed among other setbacks, the perishability of the banana fruit and the lack of appropriate technology to store the banana harvest hence, most farmers were falling prey to unscrupulous traders who were paying less for their bananas. The development partners taking part in the study however, advised farmers not to dwell on value addition so much noting that banana is a watery fruit and the process of drying is very involving. They also noted that on drying a 50 kg bunch yields 2kg of flour whose price is half the amount derived from selling a bunch of banana. Another research by B.A.R.N.E.S.A however, contradicts this advice as it advocates value addition on bananas i.e. by producing fiber products, quick snacks, flour and beverages stressing that it is a solution to the storage problems facing farmers.

Value addition on vegetables usually takes the form of growing better yielding varieties and wholesale marketing that is facilitated by production of good quality produce, sorting and cleaning of the vegetables and packaging in hygienic polythene bags or containers. An evaluation carried out by Farm Concern in Kiambu county between 2006 and 2009 involving farmers growing Traditional African Vegetables (TAVs) who were introduced to value chain approaches showed that over 90% of the farmers who took part in the program were able to produce enough quantities on an acre or less, which was the recommended average of land size for farming in the area.

The farmers marketed their vegetables through various channels e.g. wholesalers and retailers. The biggest breakthrough however, was the entry into formal markets i.e. supermarkets that resulted in a remarkable decrease in retail selling at the farm gate, generating more income to the farmers. Farm Concern noted that there was a great increase in the contribution of TAVs to annual farm income in Kiambu. In 2007, the main income generators on the farm were tea, livestock, remittances and exotic vegetables but with the value addition initiative, the contribution of TAVs rose by 23% from 17% in 2007 and up to 40% in 2009.

A recent study done by Muli (2013) in Makueni, Machakos county indicates that farmers in the region have been able to break into bigger markets by adopting village-based value addition processing units through a program called ‘The Village Value Addition for Food Processing Program’ initiated by an N.G.O known as Farm concern International. Until recently, the area was characterized by poverty-stricken peasant farmers who depended on donations to get by. The Farm Concern program introduced cassava farming to the farmers. Cassava is a highly perishable agricultural commodity that is very bulky making transportation an issue and goes bad within 72hours upon harvesting. Farmers are however, making remarkable incomes from the cassavas through value processing units within the villages. Adoption of the value adding measure has made it possible for the farmers to generate extra income and be able to put some money away as savings.

2.5 Value addition and farmers’ household food security

Food security is a situation that exists when all people at all times have access to sufficient, safe, nutritious food, to maintain a healthy and active life (The world Food Summit, 1996). Food security rests on three pillars; food availability which implies sufficient quantities of food being available on constant basis, food access, which means having sufficient resources to obtain appropriate foods for a nutritious diet and food use i.e. using food appropriately based on nutritional knowledge (W.H.O). USAID (1992) defined food security as a state in which all people at all times have both physical and economic access to sufficient food to meet their dietary needs and

lead a healthy life. The World Bank (2005) estimated that 1.4 billion people in the world live below the poverty line (USD1.25) whereas FAO (2010) studies indicate that 0.9 billion people around the world are undernourished. Further studies by Amoaka (2003) reveal that sub-Saharan Africa is the only region in the world where food insecurity and poverty situation are getting worse by the day. He estimated that the number of people living below the poverty line was increasing over the past fifteen years.

The U.N developed principles that should be followed in addressing food insecurity by increasing agricultural productivity i.e. target the vulnerable (smallholder farmers who include women and the youth) and improve equity, through promotion of participatory approach, access to resources and decent employment, empower women financially and technologically, improve processing, storage and preservation of agricultural produce and products thereby, retaining the nutritive value, providing longer shelf life, enhancing food safety and reducing food seasonality and expand markets and market access for vulnerable groups by marketing nutritious foods through innovative ways such as value addition. The Bill and Melinda Gates Foundation (1999) noted that, there is need for Africa to increase agricultural productivity through investments across the entire agricultural value chain from inputs into production processes by facilitating proper harvest, storage, marketing, processing procedures and advocating for behavior change programs geared towards increasing consumer demand for nutritional products. This will make small-scale farming economically viable and reduce poverty levels in the continent.

CGIAR (2011) reports stressed the need to reduce wastage in food systems by putting in place infrastructure, farming practices, processing, distribution and improving the ways in which households handle food. One most important way to achieve this is by assisting low-income producers to store food during periods of excess supply. The cassava for instance, is one crop in which this has been achieved. Cassava is cultivated mainly by marginalized smallholder farmers across forty countries in Africa and is considered as a poverty fighting food by providing 500 k cal per day in

the diets. Usually, the crop is processed and stored for much longer by drying. The concept of preservation can be applied to several other agricultural commodities, bee products included. Agro processing and value addition are important activities for agricultural development and poverty eradication as they generate employment. MAFC, Tanzania notes that there are limited value addition undertakings in Tanzania hence farmers export unprocessed products while the agro-processing industry cannot meet domestic demand. The result is usually high post-harvest losses i.e. 30% for cereals output, 70% for fruits and vegetables and 20% for fishery produce, hence food insecurity in the end.

Studies by FAO, Rome (2011) pointed out that investment in agriculture is very critical to sustainable long-term food security as it ensures that food is affordable, domestic production is competitive and farmers make more profits. The findings are supported by another food security study by Hermann (2009) that established that for a nation that is registering rapid population growth such as is the case with most developing countries in Sub-Saharan Africa, food security can be achieved if the nations, together with their development partners step up measures geared towards developing the agricultural sector.

Value addition increases the variety of food in the diet by enabling food to be stored for use in times of scarcity hence, ensuring that there is sufficient food to supply essential nutrients the whole year (Fellows, 2011). According to report by EAC Secretariat (2011), the East African region is always faced with frequent occurrences of food insecurity. This was further proven by studies conducted by FAO (2011) on the state of food insecurity in the world , revealing that small-import dependent countries in Africa were the most affected by volatile food prices between 2006-2008 and they were facing serious food and economic crisis, making it hard for them to achieve the MDGs. According to the report by EAC Secretariat (2011), one of the main reasons there is food insecurity is the inadequate food exchange or trade between times and places of plenty harvest and that of less. There are high post-harvest losses due to poor food storage technologies and inadequate processing

facilities. As a remedy, the report recommends adoption of value addition measures by small-scale farmers through agro-processing of food commodities in two major ways; reduction of post-harvest losses, extending the shelf life of food items by making the perishable agricultural produce tradable and easier to move over long distances i.e. from areas of plenty to those experiencing shortages.

A report by Practical Action (2005) showed that assistance from development partners of the underdeveloped countries has been export-oriented, but studies by the organization indicated that the African farmers were more concerned with among other factors, long term solutions that would ensure food security rather than direct provision of food aid. NEPAD, a leading development agency has been trying to solve this by maximizing the contribution of the agricultural sector for most African countries by enhancing farm productivity and value addition on farm produce so as to eliminate hunger, reduce poverty levels and improve the food security status in these nations by collaborating with other organizations such as FAO and CAADP (African Renewal, 2006).

By increasing productivity of subsistent farmers, there is a great chance to enhance food security for poor households in both rural and urban areas, as this will improve food supply and reduce dependence on purchasing food when there is high inflation (Baiphethi & Jacobs, 2009). However, to be able to achieve this, it is important to promote off the farm economy that entails processing and value addition. Studies by Reardon et al (2001) indicated that non-farm income accounted for 40% of rural household incomes in Latin America that enhanced their food security by boosting their income. Further studies by FAO (2012) reveal that the development of rural non-farm economy had a big effect on reducing poverty levels in countries such as Asia, North Africa and the near East. Sanvry & Sadoulet (2010) found out that subsistent rice farmers in Vietnam were able to reduce the poverty levels in their households by 28% in the mid-1990s by embracing the non-farm economy. Another important element of food security is food safety. Hanning et al (2012) defined food safety as an umbrella term that encompasses many facets of handling, preparation and storage of

food to prevent illness and injury. Food safety analysis involves scrutinizing the chemical, microbial and microphysical aspects of food safety.

It is important that food safety be maintained when processing, packaging or using an agricultural produce in value addition. Studies by Gereffi and Lee (2009) revealed that there is increasing compromise on food safety as agro-food production becomes more advanced, food products are increasingly being contaminated along food chains and this is affecting consumers' wellbeing. The researchers cite cases in the year 2008 in China where contaminated milk caused kidney stones and other illness in 300,000 children and left six infants dead. The manufacturers who added value to milk by making baby foods, apparently added melamine in the milk to increase the protein levels and be able to pass the nutrition content inspection tests. This was not good for business either, as it resulted in the banning of milk products from China in European markets.

The concern over food safety has forced major outlets that purchase from farmers to set high product quality standards to govern the products. Schwentesius & Gomez (2002) noted that in Mexico, farmers enter into contractual agreements with supermarkets for the delivery of fresh fruits and vegetables. The farmers add value to their produce by cleaning, packaging in specialized cardboard boxes and transporting the produce by refrigerated tracks to maintain the quality and safety. Hilmi et al (2011) emphasized the importance of ensuring safety and quality of bee products across all processing operations. Value addition on apiculture products could be processing honey by squeezing from combs and packaging in jars in liquid form or making candles from beeswax. It is important to package these products in clean packaging materials free from odors.

2.6 Value addition and farmers' health and type of houses owned by bee farmers

W.H.O (1948; 2003) defined health as a state of complete physical, mental and social wellbeing, which does not merely mean the absence of infirmity. Shelter means housing, which is a state of being covered or protected. It is a building or structure that an individual(s) and their family live in that meets certain federal regulations (Business dictionary).

A study in 2002 placed the average household size in Kakamega county at 4.8 members and a dependency ratio of 64.5/100 (G.O.K, 2002). The survey report showed that the district has a poverty rate of 52% and is characterized by a high population growing at an annual rate of 2.12%. The main income generating activity is agriculture and about 64% of the population in the district depends on farming as a source of livelihood (G.O.K, 2012).

It is important to sustain livelihood for the rural populations in Africa by putting in place measure that will enhance productivity in agriculture. Fuller (2011) carried out a case study of the goat-keeping sector and cassava farming in Nigeria, which is the largest producer of cassava in the world at about 40 million MTS. The study established that the waste from the cassava, which include the chaff and peel were never utilized, despite the fact that they are a key component of goat feed. It is key to note that Nigeria has about 64% of its citizens living below the poverty line (USD\$1.25/day) and the health care system is not well developed, with a HIV/AIDS prevalence of 3.9% (Fuller, 2011). The value addition project was initiated with a key objective of producing social change by increasing income of the poor rural farmers. There was marked success with a recorded monthly income increase by 39% from sell of cassava waste, that would be cleaned, dried and used to make goat feed. The farmers interviewed noted that they were now able to cover their necessities such as health care and school supplies.

A review of five project initiatives by MATF in Kenya, Uganda and Tanzania revealed that value addition among other agricultural undertakings has a huge potential of helping farmers access health care and improve the type of houses they have. In Kenya, Farm Africa initiated the tissue culture and indigenous vegetable project. The tissue culture project aimed at helping farmers to diversify markets and utilize the tissue banana through adding value onto it. The Tanzania initiative involved helping farmers to move from commodity coffee to specificity coffee through use of central pulperies, while the Uganda initiative was geared towards improving cassava production, processing and marketing in Nkasongola district. Both of these measures were based on the principle of value addition. An evaluation of the projects by Nyang' et al (2010) revealed that farmers were upbeat about the initiatives as they felt that they had gained a lot from them. Some key results were; being able to guarantee better nutrition for their households, getting better incomes that made it possible for them to meet their obligations such as pay school fees with ease for their children, afford medical care and other social expenses.

For a country to develop sustainably, it is critical to foster capacity building of the rural poor people to pursue viable livelihoods; health, shelter. One way of achieving this is by helping small-scale farmers to adapt and cope with changing market demands of high standard and quality of agricultural commodities. It is important to incorporate local farmers' knowledge and innovation and in so doing, encourage them to participate in agricultural markets value chains by improving their product quality and coming together to deliver commodities in bulk (Prato & Longo, 2012). Sierra Leone's government for instance, recognizes the fact that the country is one of the poorest nations ranked at 180 out of 182 countries based on the 2007 data by UNDP Human Development Index. The country has 79% of its population in rural areas living below the poverty line, 70% of the youth either unemployed or underemployed and about 50% of its population unable to meet their basic needs i.e. decent shelter and clothing most of the time. Sierra Leone also has the highest world infant mortality rates, 160 for every 1000 as of 2005 with 40% of the children below 5 years of age being malnourished (NSADP/ECOWAP/CAADP, 2010). With all these vices, the

government is left with a hard task of trying to promote better livelihood for its citizens. Among the sectors the Government has singled out to fast track development to solve the country's problems is agriculture. With right policies and infrastructural support, there is a chance for more intensified agriculture production, greater value addition and marketing both locally and in international markets that will generate more incomes and improve the livelihoods of the people of Sierra Leone (MoAFFSS, 2010).

The concept of value addition should be pursued with the ever-changing worldviews and orientation towards certain kinds of foods in mind. There is an increasing demand and interest in natural medicines based on the use of the natural medicinal plants and products (Gottret et al, 2005). Need therefore, arises for farmers to intensify production of these products, diversify and add value to them to cash in on their benefits.

Bees for Development organization; Krell (1996) identified various medicinal uses of bees and bee products, for instance honey can be used in various ways such as treatment of burns and deep wounds because of its high concentration of sugars and natural antibiotic activity that kills bacteria, soothing external sores, hygroscopic action of honey hence, absorbs pus from wounds. Adebayo and Adedoyin (2012) add that honey is used in Nigeria to treat measles, mouth infections, ear infections and stomach aches. Propolis, which is the other product of apiculture, has a variety of medicinal uses, they include being a strong antibiotic, anthelmintic, antifungal and a pain killer, relieving toothache and gum disease, soothing sore throats, cure of chest infections and stimulating the immune system (Krell, 1996; Adebayo & Adedoyin, 2012). Royal jelly is believed to have aphrodisiac qualities, although few studies exist in that area.

2.7 Value addition and the education status in the farmers' household

Coombs and Ahmed (1974) defined formal education as the hierarchically structured, chronologically graded education system, running from primary school through the university and including, a variety of specialized programs and institutions for full time technical and professional training. The UNESCO, International Standard Classification of Education further defines education as comprising organized and sustained communication designed to bring about learning (UNESCO, 1975).

Kenya's education system has undergone two major transformations since inception, between the year 1964 and 1985, the country embraced the 7-4-2-3 system of education modeled after the British education system. The system involved seven years of primary education, four years of lower secondary education, two years of upper secondary education and three years of university education (Buchmann, 1999). In 1981, the then president, His Excellency Daniel Arap Moi, formed a working committee to evaluate the education system and make recommendations geared towards improving the education system with a view of training more skilled workers and professionals in the nation. The committee designed the current 8-4-4 system that involves eight years of primary education, four years of secondary education and four years of university education (MOE, 2008).

Some key developments in the education system have been the introduction of free primary education in 2003, and a waiver on the secondary education school fees. Despite the milestones covered in the education sector in Kenya, The World Bank (2011) reports on the state of education in the country, indicate that distribution of the benefits from better education are unevenly distributed and the distribution is highly related to the income of citizens, the bottom expenditure decile; entails rural population that consists of peasant and small-scale farmers, has a net primary school enrollment rate of only 62% compared to the 82% for the top decile. The same inequality is seen in the secondary school enrollment with the bottom decile enrollment rate of 2% and the top decile at 20%.

Studies by Chapote et al (2013) in Zambia suggested that for Zambia, as a nation to be able to overcome poverty there is need for high labor productivity that will raise per capita income, enable households to free their children from farm labor and create more finances to send these children to school. Embracing production of high value commodities is one way of achieving this objective. The research showed that most of the farmers interviewed were more concerned about getting their children out of poverty by giving them an education.

Value addition on agricultural commodities plays a big role in generation of income that can be used to educate children from smallholder farming. UNIDO initiated a four-year long project in Mali to support valorization of agro-pastoral products in northern and southern regions of Mali by improving the quality of agro products such as Shea butter. The project built the capacity of women groups by training them on value addition and linking them to markets through a French cosmetic company known as Chiminox. An evaluation was done on this initiative, which indicated that, there was high agricultural productivity, resulting in increased incomes that enabling the women to invest more of their resources in improving their social life and sending their children to school to get a good education (UNIDO, 2012).

A case study in India on bee farming initiative by Vijaya Pastala, who started the, "Bees for poverty reduction" initiative in 2007 that would purchase honey from farmers, test, package, label and sell to various outlet stores and confectioneries, indicate that the project was beneficial to farmers who participated as they were able to make an extra USD160-195 per year from their business. The farmers were able to improve their livelihood and educate their children (UNIDO, 2012).

2.8 Theoretical Framework

The research is based on Tobit statistical model prepared by James Tobin (1958) that describes the relationship between a non-negative dependent variable Y_i and an independent variable or vector X_i . It is to be assumed that there is a lot of benefits that accrue from adding value to apiculture products and that the apiculture farmers who embrace the concept of value addition have better livelihood standards in terms of income generated, food security, the health status of their households, type of houses they live in and education status of their households. In addition to this, the decision to engage in value addition is to be predicated on higher expected utility. An interaction of these two decisions will therefore be reflected on the livelihood standards subsequently. The decision on whether or not to add value is considered under the general framework of utility or profit maximization (Norris & Batie, 1987). Farmers will decide to add value if the perceived utility or net benefit from this option is remarkably greater than it is the case without value addition. Although utility is not directly observed, the actions of economic agents are observed through the choices they make. Suppose that U_j and U_k represent a bee farmer's utility for two choices, which are, denoted by Y_j and Y_k . The linear random utility model is expressed as;

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

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 utility shifters, and Σ_j and Σ_k are error terms assumed to be independently and identically distributed (IID) (Greene 2000). For the case of value addition in apiculture products, if a farmer 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:

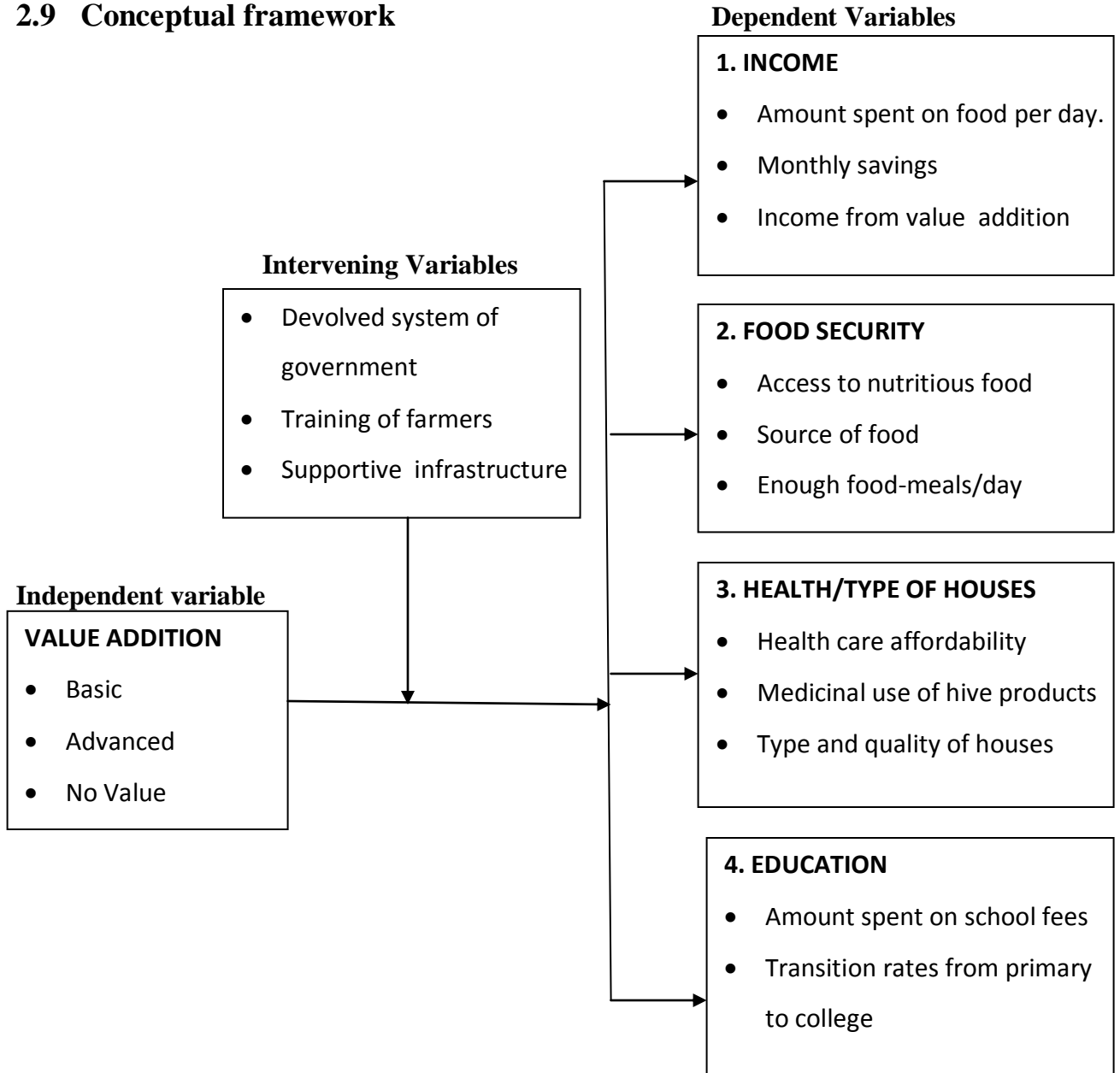
$$U_{ij}(\beta_j X_i + \Sigma_j) > U_{ik}(\beta_k X_i + \Sigma_k), \quad k \neq j \quad \forall i \quad (2.2)$$

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

$$\begin{aligned}
 P(Y=1|X) &= P(U_{ij} > U_{ik}) \\
 P(\beta_j X_i + \Sigma_j - \beta_k X_i - \Sigma_k > 0 | X) \\
 P(\beta_j X_i - \beta_k X_i + \Sigma_j - \Sigma_k > 0 | X) \\
 P(X^* X_i + \Sigma^* > 0 | X) &= F(\beta^* X_i) \\
 (2.3)
 \end{aligned}$$

Where P is a probability function, U_{ij}, U_{ik} and X_i are as defined above, $\Sigma^* = \Sigma_j - \Sigma_k$, 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 $F(\beta^* X_i)$ is the cumulative distribution function of Σ^* , evaluated at $(\beta^* X_i)$. The exact distribution of F depends on the distribution of the random disturbance term Σ^* . Depending on the assumed distribution that the random disturbance term follows, several qualitative choice models can be estimated (Greene, 2000). Any decision by a bee farmer on the alternatives is underpinned by this theoretical framework, the realization of which can be implemented by a critically thought out conceptual framework.

2.9 Conceptual framework



2.10 Summary of the Conceptual Framework

The conceptual framework shows how the independent variable (value addition in apiculture products) influences various components of livelihood (dependent variables) such as farmers' income, food security, health/type of houses owned by bee farmers and household education.

The intervening variables are the factors that will work to facilitate the successful adoption of value addition measures on apiculture products. The devolved system of government has resulted in the merging of the Ministry of Agriculture with that of Livestock and fisheries development hence; the roles of each segment are not well streamlined, resulting in lack of accountability. Training is a key component of adoption of any agricultural technology; farmers will embrace a technology if they are conversant with it, this emphasizes the importance of extension services to disseminate information on good agricultural practices and train the farmers on the same. Supportive infrastructure includes; access to credit facilities, a good transport and communication network that will enhance market linkages and development of beneficial value chains that a farmer can feel free to be participate.

2.11 Gaps in Knowledge

Value addition on bee farming products should address measures targeting not just honey but the other economic products such as Propolis, beeswax, royal jelly and venom (Hilmi et al, 2011). Previous studies in this area seem to focus on honey and gives minimal or no considerations at all for the other products that are potential income generators for the farmer. A study by Berem (2009) in Baringo focusing on constraints and effects of value addition in honey, emphasized the economic benefits of honey, leaving out the other products .Obare et al (2011) carried out a study in the same area titled, " Value addition in honey and poverty reduction", not only did the researchers focus on honey alone but also failed to clearly define and show how value addition on honey and other apiculture products would affect livelihoods. Poverty is a broad term that varies from one place to another, while a given region would have poverty of income i.e. absolute and relative poverty, some would be facing poverty of

access, that involves access to social services and amenities such as education, health facilities and housing .The research should have explained how value addition promotes reduction of the various forms of poverty.

Anyanje (2011) carried out a study in Kakamega central district to establish the factors influencing production of honey, the study stated factors such as demographic characteristics of the bee keepers, environmental management, support given to bee farmers and training of bee farmers. The researcher did not focus on production of the other bee products, the role and influence of value addition measures was not addressed despite the fact that it cannot be wished away. The Literature review on value addition on various agricultural commodities from various countries, established that value addition is still a new concept that farmers are still trying to embrace, but which could generate more income for them and improve their livelihood.

2.12 Summary of the Literature review

This chapter gives a review of literature on value addition as a concept, the opportunities and role of value addition on bee farming products as well as an analysis of the success stories as well as challenges farmers face as they embrace value addition on various agricultural commodities from various countries. The researcher discusses how value addition on various agricultural commodities resulted in an improvement in various components of livelihood such as income, food security, health/shelter and education of farmers' households in different settings. The main idea is to show that if value addition on various agricultural commodities improved the livelihood of the farmers involved, the same will apply for apiculture farmers in Kakamega Central District.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research design adopted, the target population of bee farmers in the study area, the sample size and sampling techniques used in getting the sample size, the data collection instruments used as well as the way in which pilot testing of the instrument was done. This chapter also covers issues of validity and reliability in the research. Data collection procedure, data analysis techniques and ethical considerations are also well discussed.

3.2 Research design

Descriptive research design was adopted for this research. A descriptive study is undertaken in order to ascertain and be able to describe the characteristics of the variables of interest in a situation (Sekaran, 2006). A descriptive study was best suited for this research because the researcher intended to find out how the independent variable, value addition on bee farming products influences the dependent variable, farmers' livelihood in Kakamega central sub-county.

3.3 Target population

Gitau (2008) defines a population as the entire group of individuals, objects or things that share common attributes or characteristics and may or may not be found within the same geographic location. The target population for this research was 914 apiculture farmers in Kakamega central sub-county.

3.4 Sample size and sampling procedure

The researcher has discussed the sample size and sampling procedure used in the study.

3.4.1 Sample size

The target population for this study was 914 bee farmers in the study area, obtained by reading from Krejcie & Morgan tables (1970), Note: S = sample size N = population size. The area under study had a total of 914 bee farmers. The table value of which is 127 bee farmers.

3.4.2 Sampling procedure

A sample is a subset of the population. It comprises some members selected from it (Sekaran, 2006). The study area was divided into three strata; Municipality, which has 301 bee farmers, Lurambi, 304 bee farmers and Navakholo 309 bee farmers as per data obtained from the MOLFD offices in Kakamega central district. These strata were purposively sampled, because they have the highest number of bee-farmers.

Systematic sampling was used to select the farmers from each stratum. Systematic sampling involves drawing every *n*th element in the population starting with a randomly chosen element between one and *n* (Sekaran, 2006).

Stratified random sampling was adopted so as to achieve correct representation from the three strata in district;

Municipality N1 -301 Bee farmers

Lurambi N2 -304 Bee farmers

Navakholo N3 -309 Bee farmers

$$n_i = (N_i / N) \times n$$

Where

n- Sample size of population in the whole district

N_i- population of each stratum (i=1, 2, 3)

N- Population target in the whole district (N=N₁+N₂+N₃)

n_i- sample size in each stratum/division where i=1, 2, 3

Therefore:

Municipality (N₁) = 301/914 × 127 = 41 Bee farmers

Lurambi (N₂) = 304/914 × 127 = 43 Bee farmers

Navakholo (N₃) = 309/914 × 127 = 43 Bee farmers.

3.5 Data collection instruments

Both qualitative and quantitative kinds of data were collected. Qualitative data is not numerical in form i.e. cannot be measured but it describes a given situation. Quantitative data is numerical in form and can be expressed in categories and ranked in units. Data collection also entailed analysis of secondary data from published books, Government publications, internet material, magazines on value addition in agricultural commodities, including bee farming and journals.

Primary data was obtained by the use of interviews facilitated by questionnaires. A questionnaire is a pre-formulated written set of questions to which respondents record their answers, within closely defined alternatives (Sekaran, 2006). For this study, the questionnaire contained both open-ended questions that allowed respondents to answer in any way they prefer, for certain variables as well as closed questions that required that the respondents choose between a set of alternatives provided.

While preparing the questionnaire, the researcher used easy to understand language as per the level of understanding of the respondents and also ensured the wording was appropriate as per the education level of respondents so as to avoid misunderstanding of intended meaning. The key terminologies were translated into the native language, Luhya so as to facilitate understanding by the respondents. The questionnaire was divided into seven sections, A containing questions seeking to establish general information on the respondents, Section B, on current household composition and characteristics, C on production from Apiculture, D on value addition measures, E on the saving culture, accessibility to credit facilities and farmer-group membership, F on food security status and G, on education in bee farmers' households and H had questions seeking to establish the type of houses owned by the farmers/ health accessibility and other household expenditures.

Interviews aided by questionnaires were used to source desired information on variables of concern. An interview is an oral administration of a questionnaire or an

interview schedule to respondents to solicit some kind of information (Mugenda & Mugenda, 2003).

3.5.1 Pilot testing of research instrument

According to Mugenda & Mugenda (2003), the sample to be used in pre-testing or pilot testing should be between 1% and 10 % of the sample size. The researcher first administered the questionnaire to selected 13 respondent bee- farmers from representative study area, Bukura that has a vast number of bee farmers, a month prior to the actual study in Kakamega central district; this was a perfect representation of the 127 farmers who took part in the study.

The aim of the pilot testing of the questionnaire was to check whether the questions were worded properly, in a manner the respondents could understand and give desired feedback, assess whether or not the three research assistants who took part in the study are well conversant with the research tool and put measures in place to rectify areas with hitches as well as highlighting areas not addressed by the questionnaire that were important in the success of the study. After pilot testing, the researcher presented the questionnaires to the supervisor in charge, who is an expert in the field of research who analyzed them and gave an expert's opinion.

3.5.2 Validity of the research instrument

Validity is a measure of whether or not the researcher's conclusion is true and corresponds to the actual state of the world (McBurrey & White, 2007). Validity measures the level at which the instrument captures the objectives of the study. This was achieved by doing a pilot testing of the questionnaire prior to the actual research to identify and address areas of ambiguity. Content validity was addressed by selecting a sample size that is a true representative of the 914 beekeepers by using a sample size method from Mugenda and Mugenda (2003) discussed in the previous sections.

The supervisor in charge analyzed the pilot testing questionnaires and gave an expert's opinion before the actual study; this was to ensure that the instrument actually captured the variables under study.

3.5.3 Reliability of the research instrument

Reliability indicates the extent to which the data is without bias or is error free, thus ensuring consistent measurement across time and various item in the instrument (Sekaran, 2006). Biasness in the data was avoided by performing test-retest reliability; the questionnaires were administered to the selected 13 respondents for pilot testing. Split half reliability was employed and Spearman Brown's correlation coefficient calculated.

Spearman Brown formula;

Steps to follow;

1. Administer questionnaire to target group
2. At random divide the score items into two groups i.e. odd numbered items and even numbered items
3. Each represents total score from the two groups compared
4. Correlation of the score from the two groups of items for all respondents. Use spearman's formula to compute correlation coefficient r

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{(n\sum x^2) - (\sum x)^2 - (n\sum y^2) - (\sum y)^2}}$$

The instrument is deemed valid if r ranges between 0.5 and 1

The computation of Spearman's coefficient using SPSS version 16.0 gave a value of 0.74, hence the instrument was deemed fit.

3.6 Data collection procedure

The researcher started by submitting the research proposal document to the supervisor in charge who analyzed and advised accordingly before making required changes to the final document. The research proposal was then defended to a panel of lecturers appointed by the University of Nairobi. Upon successful defense, the researcher got a letter of transmittal from the university and a research permit from the National Commission of Science, Technology and Innovation, before embarking to collect data from the study area.

The questionnaires were then administered and the respondents asked to tick where appropriate. The three research assistants guided the respondents by translating the questions in the local language and elaborating on some issues that were unclear.

3.7 Data analysis technique

After data collection, analysis of quantitative data was done by using computer software known as Statistical Package for Social Science (SPSS), version 16.0. The questionnaires were scored, data edited to detect errors, coded by assigning numeral symbols to answers in the questionnaire so that responses could be put into limited number of classes (Kothari, 2004) and the data entered into the computer for analysis. For qualitative data, analysis was carried out by summing total scores on the variables of study and data presented statistically by use of frequency distribution tables using descriptive and statistics. The results were tabulated, discussed and recommendations and conclusion made as per the research findings.

3.8 Ethical consideration

Farmers were encouraged to participate voluntarily, their privacy highly enhanced in the course of the study. Private information of the respondents was highly guarded from unauthorized access. The final research findings and the benefits accruing from the study has been put in public domain so that the target population of bee farmers benefit from it.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction

The purpose of this study was to investigate how value addition on bee farming products influences bee farmers' livelihood in Kakamega Central sub-county. This chapter presents the findings which have been discussed in line with the research objectives on the following themes; questionnaire return rate, demographic characteristics, income from bee farming and other farm enterprises, household food security, health and type of housing owned by bee farmers and education levels in bee farmers' households in Kakamega Central Sub-county.

4.2 Questionnaire return rate

120 bee farmers responded by providing information to be used in the study. Even though the researcher did not manage to get 100% response rate, the 120 received represented 94% return rate of the sample population under study. Hager et al (2003) set the questionnaire adequacy bar at 75% hence the 120 questionnaires were deemed fit for the research.

4.3 Demographic characteristics of the respondents

Demographic characteristics cover the background characteristics of respondents; including information on gender, marital status, education, main occupation, household characteristics, land ownership, Bee farmers' value addition categories and reason why bee farmers do value addition.

4.3.1 Gender of the bee farmers

The survey established that 63.3 % of the bee farmers are male and 36.7% are female. Table 4.1 shows the gender distribution of the bee farmers.

Table 4.1 Gender of Bee farmers in Kakamega Central sub-county

GENDER	FREQUENCY	PERCENTAGE
Male	76	63.3
Female	44	36.7
Total	120	100

There were a greater proportion of men than women undertaking bee keeping which is an indication that bee keeping is predominantly a male activity. However, this is likely to change in the near future as organizations such as CARD, NAFIS, ACK, Honey care and KENFAP are advocating for bee keeping as an income generating venture that should be embraced by the Kakamega central sub-county members as a whole. Women were noted to participate in value addition activities such as sieving, bottling and marketing of honey.

4.3.2 Marital status of the Bee-farmers.

The respondents were asked to record whether or not they were married and if yes the type of marriage they were in. Table 4.2 is a summary of the findings on marital status of the bee farmers in Kakamega central sub-county.

Table 4.2 Marital status of the Bee farmers in Kakamega central sub-county

MARITAL STATUS	FREQUENCY	PERCENTAGE
Married	95	79.2
Separated	10	8.3
Widowed	8	6.7
Single	7	5.8
Total	120	100

The results indicated that 95 (79.2%) of the bee farmers were married, 10 (8.3%) were separated and 8 (6.7%) were widowed and 7 (5.8%) were single. From these results it is evident that apiculture is practiced majorly by bee farmers who are

married, this is due to the fact that it is an extra income generating activity and given the household setting in the marriage institution, it is readily embraced due to labor availability.

4.3.3 Education level of the Household head in Kakamega Central Sub-county

The bee farmers were asked to state the level of education they had attained; this is summarized in table 4.3.

Table 4.3 Education levels of bee farmers in Kakamega central sub-county

EDUCATION LEVEL	FREQUENCY	PERCENTAGE
None	3	2.4
Primary	39	32.5
Secondary	50	41.7
Middle level	20	16.7
University	8	6.7
Total	120	100

50 (40.7%) of the respondents had received secondary education only, 39 (32.5%) had received primary education only, 20 (16.7%) had gone to middle level colleges, 8 (6.7%) had received university education and only 3 (2.4%) had not gone to school at all. Judging from these findings, apiculture farmers in Kakamega Central sub-county have low levels of education hence they cannot take up formal jobs that need higher education. This implies that value addition can go a long way in boosting their income as it does not require formal training for one to venture into it.

4.3.4 Main Occupation

Bee farmers were asked to state their main occupation. Table 4.4 is a summary of their occupation.

Table 4.4 Bee farmers' occupation in Kakamega central sub-county

OCCUPATION	FREQUENCY	PERCENTAGE
Informal	55	45.8
Business	38	31.7
Formal	27	22.5
Total	120	100

The results indicated that 55 (45.8%) of the respondents were engaged in informal employment, 38 (31.7%) were business people and only 27(22.5%) were formally employed. From these findings, it is clear that most bee farmers fall under the informal category of employment under which apiculture belongs hence the need to improve proceeds from the trade through value addition measures so as to increase their' income hence better their livelihoods.

4.3.5 Household Characteristics

Household characteristics surveyed included number of household members, age of household head and bee keeping experience in years. The results are presented in Table 4.5.

Table 4.5 Household characteristics in Kakamega central sub-county

CHARACTERISTIC	MEAN	STANDARD DEVIATION
Household members	6.04	1.817
Age of household head	51.01	10.644
Years practicing of bee keeping	4.452	4.083

On average, each household in Kakamega Central sub-county has 6.04 members, with an average household head age of 51.01; a previous study by Salanya et al (1998) estimated the average household head in Kakamega Central district to be 52.8 years, which is within the range of the findings of this study Most of the surveyed bee

keepers had engaged in the trade for about 4.4 years. This implies that bee keeping is a venture that the farmers have mastered over time hence need to boost its output by venturing in value adding measures.

The number of household members of 6.04 differs with that stated in the Kakamega District Development Plan of 4.8 members; this is attributed to the sample size used for the study. However the number is almost similar to that stated in a previous study in the same study area by Dose (2007) that found the household size to be 6.28. The large standard deviation of the age of household head was attributed to the fact that there were both young and aged farmers practicing bee keeping who were surveyed, the age of the farmers interviewed ranged from 29 to 87 years. This is equally the same for the bee keeping experience which ranged between 1 and 20 years.

The results indicate that apiculture is practiced by middle aged citizens in the sub-county and that it is a trade they have practiced over a long period of time. Based on this, there is need to improve proceeds from it through value addition so that the farmers gain more income, as it is a practice they are well conversant with.

4.3.6 Land ownership

Bee farmers were interviewed on the amount of land they own, amount leased in, leased out and that owned jointly by the extended family. Table 4.6 is a summary of the land ownership in Kakamega central sub-county.

Table 4.6 Land ownership in Kakamega central sub-county

LAND OWNERSHIP	MEAN	STANDARD DEVIATION
Owned	3.4	3.483
Leased in	0.326	1.231
Leased out	0.05	0.465
Communal (family)	1.385	3.632

The average size of land owned by a bee farmer family was 3.4 acre which is almost similar to a the size stated in a study by Salanya et al (1998), on average the size of land leased in was 0.326 acres with negligible sizes being leased out. Approximately 1.3 acres of land were owned communally/by the extended family.

There is a huge variation in the average size of land owned by bee farmer households which is indicated by the large standard deviation. This is attributed to the fact that some of the surveyed households owned larger pieces of land while a good proportion had very minimal land sizes, with surveyed sizes ranging from 0.25 to 20 acres. This is equally the case for the size of land owned by extended family which ranged from as low as 1 to 20 acres. Given the diminishing land sizes, as indicated by the large standard deviation, it is evident that farmers need to move away from soil dependent forms of agriculture to those that require less acreage of land, as is the case with apiculture. However, this is only sustainable if apiculture can generate more income to the farmers through value added processing of hive products.

4.3.7 Value addition on bee farming products

This study defined value addition as harvesting of honey combs, straining of honey from the combs, purification by sieving of honey, packaging, labeling, harvesting of beeswax, Propolis and royal jelly for nutritional, medicinal and other benefits.

4.3.8 Categories of Value adders in Kakamega Central sub-county

The bee farmers were categorized into three categories as per the kind of value addition they carried out on their hive products, Basic value adders who practiced straining of honey from combs and purification of honey by sieving to remove impurities, and advanced value adders comprised of those involved in packaging of honey in hygienic bottles, labeling of honey bottles, harvesting of beeswax, Propolis and royal jelly and finally non value adders, who do not carry out any form of value addition Table 4.7 is a summary of the findings .

Table 4.7 Categories of value adders in Kakamega Central sub-county

Value Addition Category	FREQ	%
Basic Value Addition	68	56.6
Advanced Value Addition	27	22.6
Non Value adders	25	20.8
Total	120	100

.68 (56.6%) of the bee farmers interviewed were engaged in basic value addition while 27 (22.6%) were practicing advanced forms of value addition. 25 (20.8%) of the respondents did not carry out any form of value addition on their hive products.

4.3.9 Reasons for doing Value addition

The aim of this section was to establish the reasons why farmers who add value do so and if they were aware of the benefits of value addition. Table 4.8 is a summary of the reasons farmers in Kakamega central sub-county choose to add value.

Table 4.8 Reasons for adding value to hive products

REASON	FREQUENCY	PERCENTAGE
Prolong shelf life	36	38
Generate more income	35	36.8
Maintain consistent supply	4	4.2
Create market for other products	2	2.1
Belong to a farmer group that add value	4	4.2
Avoid wastage in time of plenty harvest	4	4.2
Break into high end markets	10	10.5
Total	95	100

Out of the 95 bee farmers who were involved in the various forms of value addition, 36 (38%) of the cited prolonged shelf life as the major driving force for value addition and 35 (36.8%) generation of more income. Most of the farmers were less informed on the other benefits of value addition. Bee farmers who do not do any form of value addition to their products were either contracted by NGOs and other honey packers who harvest the products from the hives once they are due, did not have knowledge on value addition or their production capacities were too minimal and majorly consumed by the household .They accounted for 25 (20.8 %) of the sampled population.

4.4 Value Addition and Bee-farmers Income

The researcher tabulated income of the bee farmers from various farm and non-farm enterprises as well as income from bee keeping for both value added and non-value added hive products.

4.4.1 Annual Household Income categories

The Annual bee farmer family income was tabulated against annual expenditure so as to establish and be able to rate the bee farmers as per their annual income. Table 4.9 shows the household income against some of the key household expenditures.

Table 4.9 Annual income and expenditure

Annual Income per household (average)	Kshs 82453
EXPENDITURE	
Farm input	Kshs 41,304
Farm labor	Kshs 9364
School fees	Kshs 35,940
Food stuffs	Kshs 65,851
Clothing	Kshs 7430
Health	Kshs 8561
Entertainment	Kshs 2368

The average annual house hold income of the bee farmers in Kakamega central sub-county is Kshs.82453 which translated to Kshs.37.60 per person per day for a household of 6 people. This is quite low compared to the rural poverty line per capita income of Kshs.41 defined by the Government of Kenya (Republic of Kenya, 2000).Dose (2007) found the average income from small scale farmers in Kakamega who grew cash crops to be Kshs.75, 755 and Kshs.66, 112 for those who grew food crops only, there is a slight variation in this findings which can be attributed to the small sample size selected for this study.

The study then divided the annual family income into three categories, low (Kshs.0-50,000, middle (Kshs.51, 000-80,000) and High (over Kshs.100, 000) as per the three categories of value adders. The results are summarized in table 4.10

Table 4.10: Distribution of value adders across the annual income categories.

Category	LOW		MIDDLE		HIGH		TOTALS	
	Freq	%	Freq	%	Freq	%	Freq	%
Basic	20	16.7	43	35.8	5	4.2	68	56.7
Advanced	1	0.8	5	4.2	21	17.5	27	22.5
No Value	16	13.3	5	4.2	4	3.3	25	20.8
Totals	37	30.8	53	44.2	30	25	120	100

A big proportion of the bee farmers, 53 (44.2%) were in the middle income category, 37 (30.8%) in low income category and 30 (25%) in the high income category. The study findings further revealed that most, 43 (35.8%) of the Basic value adders were in the middle income category, most of the advanced value adders, 21 (17.5%) were in the high income category and a larger proportion of the non- value adders in the 16 (13.3%).

4.4.2 Income from Value addition on bee farming products

Bee farmers were asked to state the amount they generate from selling a kilo of the hive products they harvest. Table 4.13 is a summary of the findings.

Table 4.11 Income from hive products harvested by bee keepers in Kakamega central Sub-county

INCOME FROM HIVE PRODUCTS(Kshs/Kilo)					
CATEGORY	Honey/Kilo	Beeswax	Royal jelly	Propolis	TOTAL(Kshs)
Basic	170	-	-	-	170
Advanced	211	135	150	-	496
No value	140	-	-	-	140

Farmers who practice basic value addition, mainly on honey earned Kshs.170 per kilo, those who were involved in advanced value addition earned a total of Kshs.211 while non-value adders earned the lowest amount, Kshs.140. A kilo of processed honey fetched an average of Kshs.41 more for the bee keeper, while harvesting of the other hive products i.e. beeswax and royal jelly earned an extra Kshs.285 per kilo. A study in Kitui by KREP established that a kilo of unprocessed honey retailed at Kshs.150 (Maundu, 2006) which is quite low compared to findings from Kakamega, however this is quite the opposite compared with findings from Baringo by Mutsotso in 2013 that show that crude honey retails at Kshs.180. A further research by Berem (2011) in Baringo established that value addition on honey can generate as high as 150% profit for a bee keeper. Although bee farmers who add value were able to generate extra income unlike those who did not, a comparison with studies from other regions show that the potential from value addition has not been achieved yet by farmers in Kakamega Central.

4.4.3 Saving culture of bee farmers in Kakamega Central sub-county

The respondents were interviewed to find out if they were able to put some of their income in savings. Table 4.10 shows a summary of the amount bee farmers surveyed are able to save.

Table 4.12 Bee farmers' savings in Kakamega Central sub-county

Category	>2000		>1000		500		<500		No savings		Total	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Basic	14	11.7	20	16.7	21	17.5	13	10.8	0	0	68	56.7
Advanced	19	15.8	7	5.8	1	0.9	0	0	0	0	27	22.5
No Value	0	0	3	2.5	6	5.0	6	5.0	10	8.3	25	20.8
Totals	33	27.5	30	25	28	23.4	19	15.8	10	8.3	120	100

Basic value adders were the highest savers with 55 (45.9%) of them saving at least Kshs.500, all the advanced value adders, 27 (22.5) were able to save at least Kshs.500 while non-value adders saved the least as 16 (10%) of them saved Kshs.500 and below while 10 (8.3%) did not save at all. Only 3 (2.5%) of non value adders were able to save above Kshs.500. This findings show that value adders save more income unlike non value adders.

4.4.4 Saving Frequencies of bee-farmers in Kakamega Central Sub-county

To further ascertain the saving culture among bee farmers in Kakamega central sub-county, the researcher sought to find out how often the farmers save. Table 4.11 shows the saving frequencies of beekeepers in Kakamega Central Sub- County.

Table 4.13 saving frequency of Bee farmers in Kakamega Central Sub-county

	WEEKLY		MONTHLY		NOT OFTEN		TOTAL	
	Freq	%	Freq	%	Freq	%	Freq	%
Basic	16	14.5	12	10.9	40	36.4	68	61.8
Advanced	4	3.6	18	16.4	5	4.6	27	24.6
No Value	2	1.8	4	3.6	9	8.2	15	13.6
Total	22	19.9	34	30.9	54	49.2	110	100

From this findings, it emerged that a major proportion of basic value adders, 40 (36.4%) do not save oftenly, 16 (14.5%) save on weekly basis and 12 (10.9) save on monthly basis. For the advanced value adders, 18 (16.4%) save on monthly basis, 4 (3.6) save weekly and 5 (4.6%) do not save oftenly. 9 (8.2%) of the non value adders do not save often while 4 (3.6%) save monthly, only 2 (1.8%) save weekly. 10 (7.2%) of non value adders did not save at all. From these findings it emerges that saving frequency is inconsistent among basic value adders and even lower among non value adders. Advanced value adders save more frequently than the basic and non value adders. This further stresses the need to increase incomes through value added processing of hive products so as to improve the saving frequency.

An analysis of the mode of saving by bee farmers was done to establish were most farmers preferred to save their money Table 4.12 indicates the modes of saving preferred by the bee farmers.

Table 4.14 Mode of saving preferred by bee-farmers in Kakamega Central

Mode of saving	FREQ	%
Bank	69	62.7
Chama/Cooperatives	31	28.2
None	10	9.1
Total	110	100

Banks were the most common mode of saving with 69 (62.7%) of the 110 bee farmers who save identifying them as most favourable.31 (28.2%) of the farmers who save were members of either farmer cooperatives or Chamas (self-help groups).From this data, it is evident that most farmers are aware of the importance of saving. Banks and cooperatives play a greater role in the financing of value addition enterprises hence the need for this research to ascertain whether or not farmers had embraced their importance

Of the 120 sampled bee farmers, 40.8% had accessed credit facilities and 59.2 % had not.92 (73.8 %)were not members of farmer groups, only 28 (26.2%) of the farmers belonged to farmer organizations. The bee farmers who belong to farmer groups cited group harvesting, ease of market access and access to credit facilities as benefits that accrue to them for belonging to such organizations/groups. Bee farmers who belonged to farmer organizations had not used them to fully maximize on the benefits of value addition. A study by Berem (2011 on value addition on honey in Baringo revealed that bee farmers who are members of Farmer groups participated more in value addition; this enabled them to get funding from N.G.Os and penetrate wider markets. This is also supported by a research by Shiferaw et al (2006) established 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 thus increase their market power. This study however established that bee farmers in Kakamega had not capitalized on these benefits that accrue from farmer organizations.

4.5 Value Addition and household food security in the bee-farmers' households

The study sought to find out if bee farmers' households were food secure by collecting and analyzing data on key indicators of food security such as number of meals consumed per day, meal content(balanced diet),source of food and whether or not the farmer family had registered any nutritional deficiencies.

4.5.1 Number of meals per day

The respondents were asked to state the number of meals they were able to provide for their families. Table 4.14 is a summary of the number of meals farmer households in Kakamega Central sub-county consume per day.

Table 4.15 Number of meals per day in bee farmer households in Kakamega Central sub-county

CATEGORY	NUMBER OF MEALS						Totals	
	ONE		TWO		THREE		Freq	
	Freq	%	Freq	%	Freq	%	Freq	
Basic	0	0	9	7.5	59	49.2	68	56.7
Advanced	0	0	1	0.8	26	21.7	27	22.5
No value	0	0	18	15	7	5.8	25	20.8
Totals	0	0	28	23.3	92	76.7	120	100

The findings indicated that 59 (49.2%) of the basic value adders can afford three meals a day, 9 (7.5%) afford two meals.26 (21.7%) of the advanced value adders were able to afford three meals a day while only 1 (0.8%) had two meals a day. Most of the non value adders, 18 (15%) had access to only two meals a day as only 7(5.8%) could afford three meals a day. It was evident that non value adders had access to less meals in a day compared to both the basic and advanced value adders.

4.5.2 Meal content (access to a balanced diet)

Respondents were interviewed on the dietary content per day with an aim of finding out whether or not the diets contained key elements of a balanced diet; carbohydrates, fruits and vegetables and proteins. This was to further ascertain the food security situation as food security is determined not just by the number of meals but by how balanced the diet is. Table 4.15 shows how the respondents scored across each dietary component.

Table 4.16 Meal content in bee farmers' households in Kakamega Central sub-county

	DAILY		FREQUENCY		RARELY	
	FREQ	%	FREQ	%	FREQ	%
Dietary component						
Carbohydrates	93	77.5	27	22.5	0	0
Fruits & vegetables	33	22.5	82	68.3	5	4.2
Proteins	32	26.7	70	58.3	18	15

An analysis of the diet content revealed that carbohydrates were more common with 93 (77.5%) of the respondents having them on a daily basis; only 33 (22.5%) of the farmers have fruits and vegetables on a daily basis. Of the 120 farmers, only 32 (26.7%) of them have proteins in their diets on a daily basis. Proteins are less consumed by farmers mainly due to the cost aspect involved in purchasing animal protein. Carbohydrates are majorly grown hence much accessible. The energy levels in carbohydrates are also the reason why most households consumed them in plenty. Judging from the findings of this study, whereas bee farmers are able to access at least three meals in a day, the meals are not balanced hence there is need to boost the meals with other dietary components.

4.5.3 Source of food

To further access how food sufficient bee farmer households were, the researcher interviewed them on their source of food to establish whether they grow enough on their farms to feed their families or they purchase food stuffs. Table 4.16 indicates the findings of this research.

Table 4.17 Source of food

CATEGORY	GROW		BUY		BOTH		Totals	
	Freq	%	Freq	%	Freq	%	Freq	%
Basic	0	0	6	5	62	51.7	68	56.7
Advanced	0	0	3	2.5	24	20	27	22.5
No value	3	2.5	2	1.6	20	16.7	25	20.8
Totals	3	2.5	11	9.2	106	88.4	120	100

The results revealed that 6 (5%) of basic value adders get their food solemnly by buying from food markets while 62 (51.7%) grow their food crops but supplement with buying from food markets. 3 (2.5%) of the advanced value adders solemnly grow their food but 24 (20%) get their food by both buying and growing on their farms. 3 (2.5%) of non value adders grow their food, 2 (1.6%) buy while 20 (16.7%) both grow and buy from markets. From these findings it is evident that a big proportion of both value and non value adders gain food sufficiency by supplementing what they grow on their farms with purchases from food markets. This is supported by previous studies by Dose (2007) that established that expenditure on own staple food was 44.5% while own production accounted for 55.5%. This is a clear indication that there is need for more income to be spent on food stuffs in bee farmer households, hence validating the role of value addition on hive products.

4.5.4 Nutritional Deficiencies

To further ascertain if households were food secure, respondents were asked to record whether they had suffered from any nutritional related deficiencies. Table 4.17 shows the response from bee farmers on the various nutritional deficiencies.

Table 4.18 Nutritional deficiencies in bee farmers' households in Kakamega Central sub-county

Category	Basic		Advanced		No Value		Totals	
	Freq	%	Freq	%	Freq	%	Freq	%
Kwashiorkor	2	4.2	0	0	2	4.2	4	8.3
Anemia	4	8.3	3	6.3	16	33.3	23	48
Pellagra	0	0	1	2.1	0	0	1	2.1
Rickets	0	0	0	0	0	0	0	0
Scurvy	0	0	0	0	0	0	0	0
Hunger	5	10.4	0	0	15	31.2	20	41.6
Totals	11	22.9	4	8.3	33	68.8	48	100

48 (40%) of the respondents had registered nutritional deficiencies in their households, for Basic value adders, 4 (8.3%) had registered Anemia while 5 (10.4%) had registered Hunger. For the advanced value adders, 3 (6.3%) had experienced Anemia in their households and 1 (2.1%) Pellagra. Non value adders had registered more nutritional deficiencies i.e. Anemia 16 (33.3%), Kwashiorkor 2 (4.2%) and hunger 15 (31.2%), from these findings it is evident that Anemia and Hunger were the most prevalent nutritional deficiencies, with Anemia having been experienced by all categories of value adders and Hunger by basic and non value adders.

4.6 Value Addition and the Health/Type of houses owned by bee farmers

The researcher aimed at establishing whether or not the bee farmers in the study area had enough money to spend on their health or rather access health care and also if they were aware of the medicinal uses of hive products.

4.6.1 Health of the bee farmers in Kakamega central sub-county

An analysis of expenditure on health care revealed that the average household expenditure on health was Kshs.8561 per annum which translates to Kshs.1426 per person per annum for a household of 6 members. This is minimal considering the need for frequent health checkups and other health uncertainties that a human being is prone to today.

4.6.2 Medicinal use of hive products

The study sought to establish the level of knowledge on the medicinal use of hive products among the three categories of bee farmers. Table 4.18 is a summary of the findings.

Table 4.19 Medicinal use of hive products

Category	Basic		Advanced		No Value		Totals	
	Freq	%	Freq	%	Freq	%	Freq	%
Yes	8	6.7	14	11.6	3	2.5	25	20.8
No.	60	50	13	10.9	22	18.3	95	79.2
Total	68	56.7	27	22.5	25	20.8	120	100

The findings revealed that 25 (20.8%) of the respondents used hive products for medicinal purposes, The use of hive products for medicinal purposes was prevalent among advanced value adders with 14 (11.6%) having used them, like among basic value adders and non value adders.

4.6.3 Type of houses owned by bee farmers in Kakamega central sub-county

The researcher asked respondents to state the type of houses they own; this is because the study assumed that increased income from bee keeping would reflect on the kind of house a farmer lives in. The results are presented in Table 4.18.

Table 4.20 Type of houses owned by bee farmers in Kakamega Central sub-county

	TYPE OF HOUSING							
	Permanent		Semi-Permanent		Thatched		Totals	
	Freq	%	Freq	%	Freq	%	Freq	%
Basic	3	2.5	64	53.3	1	0.8	68	56.6
Advanced	16	13.4	11	9.2	0	0	27	22.6
No Value	1	0.8	20	16.7	4	3.3	25	20.8
Totals	20	16.7	95	79.2	5	4.1	120	100

The study revealed that 3 (2.5%) of the basic value adders live in permanent houses, 64 (53.3%) in semi-permanent houses and 1 (0.8%) in traditional/thatched houses. For the advanced value adders, 16 (13.4%) live in permanent houses, 11 (9.2%) in semi-permanent houses and for non value adders, 1 (0.8%) live in a permanent house, 20 (16.7%) in semi-permanent houses and 4 (3.3%) in thatched houses. It was established that advanced value adders live in better housing structure than both the basic and non value adders. The implication of this finding is that value addition on hive products generates more income which reflects on type of houses a bee farmer has.

4.7 Value Addition and Education in the bee farmers' households

The mean expenditure on school fees per annum in the bee farmers' household was Kshs.35940. Education is the third consumer of household annual income, the implication of this finding on this study is that there is need for more finance to channel to educating bee farmers' children. An analysis of the transition rate of farmers' children from primary to secondary and to tertiary institutions is summarized in table 4.21

Table 4.21 Education Transition rates in bee farmers' households

Education	Pri.		Sec.				College					
	Att.		Not.		Att.		Not		Att.		Not	
Category	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Basic	63	52.5	5	4.2	30	37.5	10	12.5	30	39	12	15.6
Advanced	27	22.5	0	0	15	18.8	0	0	9	11.7	1	1.3
No value	10	8.3	15	12.5	5	6.3	20	25	8	10.4	17	22.1
Totals	100	83.3	20	16.7	50	62.4	30	38	47	61	30	39

The data indicated that 100 (83.3%) of the bee farmers children had attended to completion, primary schools attendance was good for both categories of value adders with 63 (52.5%) of basic value adders, 27 (22.5%).of advanced and 10 (8.3%) of non value adders being able to educate their children through primary school. Transition from primary to secondary was however poor with only 30 (37.5%) of basic value adders, 15 (18.8%) of advanced and 8 (6.3%) of non value adders being able to educate their children through secondary. College accessibility was good for basic value adders with 30 (39%) of them being able to educate their children through college. The number of those not able to afford an education for their children was however higher among both basic and none value adders as 15(12.5%) of non value

adders could not afford to educate their children through primary school, 20 (25%) through secondary school and 17 (22.1%) through college. For the basic value adders, 5 (4.2%) could not afford to educate their children through primary school, 10 (12.5%) through secondary schools and 12 (15.6%) through college.

From this analysis it is evident that school attendance is remarkably good at primary level but reduces from secondary to college. This is because primary education is compulsory and free of charge in Kenya but costly from secondary school onwards. Given this scenario it is evident that extra income generated by value adders enables them to afford higher education for their children, hence the better education transition rates registered in their households.

CHAPTER FIVE
SUMMARY OF RESEARCH FINDINGS, CONCLUSION AND
RECOMMENDATION

5.1 Introduction

This chapter comprises of and is organized into the following subheadings; summary of the findings of the study, conclusion of the study, recommendation and the contribution of the research to the existing body of knowledge.

5.2 Summary of the research findings

The aim of this study was to establish how value addition in apiculture products influences the livelihood of bee farmers in Kakamega central sub-county, the main components of livelihood examined included income, food security, health/type of houses owned by bee keepers and education. The study employed descriptive research design; the target population was 914 bee farmers in Kakamega Central sub-county of which a total of 120 were sampled. Out of this sample, 63.3% were male and 36.7% were female.

The study categorized bee farmers into three categories namely basic value adders who were mainly engaged in straining of honey from combs and purification of honey by sieving to extract impurities, advanced value adders who package their honey in clean bottles, label the bottles and also harvest the other hive products such as Propolis, royal jelly and beeswax. Findings indicated that 68 (56.6%) of the farmers were engaged in basic value addition, 27 (22.6%) in advanced and 25 (20.8%) were not engaged in any form of value addition. Generation of more income was the main reason as to why farmers who add value chose to do so, while maximizing of the benefits of other hive products was the least of what drove the choice to venture into value addition.

The first objective of the study was to determine how value addition in apiculture products influences bee-farmers' income in Kakamega Central Sub-county. To ascertain this, the study sought to establish the income generated from both value added and non-value added bee products and the saving culture of the bee farmers. The findings revealed that crude honey Generated Kshs.170 per kilo while processed honey generated Kshs.211 per kilo. Beeswax generated Kshs.135 a kilo and royal jelly Kshs.150. From this analysis, it emerged that basic value addition generated less income for every kilo while advanced value addition fetched more.

The saving culture among the interviewed bee farmers was impressive among basic and advanced value adders with 55(45.9%) of basic value adders and all, 27 (22.5%) of the advanced value adders being able to save at least Kshs.500 .An analysis of the saving frequency however revealed that most, 40 (36.4) of the basic value adders did not save often but 18 (16.4%) of advanced value adders were able to save on monthly basis. The study therefore established that basic and advanced value adders save more money and on frequent basis than the non-value adders.

The second objective of the study was to investigate the extent to which value addition in apiculture products influences bee-farmers' household food security in Kakamega Central Sub-county. To assess food security the research focused on number of meals accessible to a bee farmer household per day, the meal content in terms of a balanced diet, source of food and nutritional deficiencies recorded in a household. The study findings established that majority of the households who were value adders were food secure, as 59 (49.2%) of basic value adders and 26 (21.7%) of advanced value adders had access to three meals a day. However, 18 (15%) of non value adders could only afford two meals a day. The study also found out that to achieve food security, most of the interviewed households had to supplement what they grow on their farms with purchases from markets, i.e. for basic value adders, 62 (51.2%), advanced 24 (20%) and 20 (16.2%). Daily meals mainly consisted of carbohydrates with only 33% and 26.7% of respondents being able to include fruits/vegetables and proteins respectively, on a daily basis. Nutritional deficiencies

were more prevalent in the houses of non value adders as 16 (33.3%) had experienced Anemia, 2 (4.2%) Kwashiorkor and 15 (31.2%) had suffered from hunger attacks. The study therefore established that value adders were less susceptible to nutritional deficiencies unlike non value adders.

The third objective was to establish the level at which value addition in apiculture products influences the health and type of houses owned by bee-farmers in Kakamega Central Sub-county. The study sought to establish health care affordability and also use of hive products for medicinal purposes. The study findings indicated that the average annual income spent on health was Kshs.8561, this translates to Kshs.1426. Farmers were either unaware or had not capitalized on the medicinal uses of hive products, of the interviewed bee farmers only 25 (20.8%) used hive products for medicinal purposes and that most of those who use hive products medicinally i.e. 14 (11.6%) were advanced value adders. Findings on the type of houses revealed that semi-permanent houses were common among basic and non value adders, with 64 (53.3%) of basic and 20 (16.7%) of non value adders residing in them. Permanent houses were common among advanced value adders, 16 (13.4%) lived in permanent houses as opposed to 3 (2.5%) and 1 (0.8%) for basic and non-value adders respectively.

The fourth Objective was to determine how value addition in apiculture products influences household education of bee-farmers in Kakamega Central Sub-county. To establish this, the study sought to find out the household expenditure on education as well as the transition rates from primary school to secondary and to college in bee farmers' households. The research established that education is the third consumer of the annual household income as on average most households spent Kshs.35940 per annum on school fees. It was further established that school attendance is remarkably good at primary level across all categories of bee farmers but reduces from secondary to college. Transition from primary to secondary was however poor among basic and non-value adders with only 30 (37.5%) of basic value adders and 8 (6.3%) of non value adders being able to educate their children through secondary. College

accessibility was good for basic value adders with 30 (39%) of them being able to educate their children through college.

5.3 Conclusion of the study

The purpose of this study was to establish the influence of value addition on bee farming products on the livelihood of bee farmers in Kakamega Central Sub-county. The study classified bee farmers into three categories of value addition, basic value adders who mainly engage in straining of honey from combs and purification to remove impurities by sieving, Advanced value adders who package honey in hygienic bottles, label the bottles and also harvest other hive products such as royal jelly, Propolis and beeswax, and non value adders who sell honey in its crude form. The majority of the bee farmers, 68 (56.7%) fell under the category of basic value adders, 27 (22.5%) were advanced value adders and 25 (20.8%) did not engage in any form of value addition.

The first objective of the study was to determine how value addition in apiculture products influences bee-farmers' income in Kakamega Central Sub-county, the study established that advanced value adders generated more income from sell of hive products compared to basic and non value adders .On the saving culture of bee farmers, the study concluded that basic and advanced value adders save more compared to non-value adders.

The second objective of the study was to investigate the extent to which value addition in apiculture products influences bee-farmers' household food security in Kakamega Central Sub-county. The study analyzed food security by addressing issues such as number of meals accessed in a day by a bee farmer household, meal content and source of food, although a majority of the farmers could afford three meals in a day,70 (58.3%) of those interviewed were not having a balanced diet on a daily basis while 106 (88.3%) of them access food stuffs by both growing and buying from food markets.20 (16.7%),which was the highest score attested to the fact that they had suffered from hunger in their households. Among those who had suffered from

hunger attacks in their households were basic and non value adders. On the basis of these findings, the study concluded that advanced and basic value adders were more food secure in terms of number of meals per day, source of food and vulnerability to nutritional deficiencies, this was attributed to the fact that they were able to generate more income than the non value adders.

The third objective of the study was to establish the level at which value addition in apiculture products influences the health and type of houses owned by bee-farmers in Kakamega Central Sub-county. The study established that the available income per household member to be spent on health in a year was Kshs.1426 which was quite low basing in mind need for regular medical check ups, based on this it is evident that health care accessibility is inadequate in the study area. The study further established that use of hive products for medicinal purposes was more common among advanced value adders unlike basic and non value adders. Based on this findings, the study concluded that value adders were less exposed to nutritional deficiencies and more likely to use hive products medicinally than the non value adders.

The fourth objective of the study was to determine how value addition in apiculture products influences household education of bee-farmers in Kakamega Central Sub-county. The findings of the study revealed attendance of primary education was good for both categories of value adders but the transition rates of bee farmers' children from primary to secondary schools were lower for basic and non value adders, compared to that of advanced value adders. The transition rates from secondary to college were even lower for basic and non value adders. This is due to the fact that primary school education is free and compulsory unlike secondary and college education. Based on these findings, the study concluded that basic and advanced value adders are more likely to afford higher education for their children compared to non value adders.

5.4 Recommendation of the study

Based on the findings of this research, it is essential that the government and relevant development partners work hand in hand to design and promote forums through which bee farmers can be trained on management of bee hives, identification of hive products and how to add value onto the products. The central Government in conjunction with the County government should carry out public education to sensitive the farmers on how agricultural services can be accessed given the new system of devolved governance. Most farmers did not know whether to seek advice from the former Ministry of Agriculture offices or the County Government offices.

Financial empowerment is also an essential determinant of whether or not bee farmers can venture into value addition .It is important for banks and other micro financing institutions to consider collaborating with NGOs working in the sub-county to train farmers on financial management and also lend them money so that they can start small industries that are geared towards manufacturing of value added products like soap, candles, packed honey and confectionaries. This will greatly improve bee farmers' accessibility to markets, far beyond the county level thereby increasing income from hive products. Farmers should also be encouraged to form farmer groups and actively participate in these groups so as to access credit, training and do collective marketing of hive products.

5.5 Suggestions for further research

Further research should be conducted on the role played by NGOs and other hive products processors in enhancing the livelihood of the bee farmers in Kakamega central sub-county. This will establish whether or not farmers benefit from their existence. There is also need to conduct a study on the factors influencing adoption of value addition in hive products so as to establish the hindrances to the same and hence be able to assist farmers in adopting value addition.

Finally, this research was conducted in Kakamega central sub-county, which is one of the key areas in Kenya where bee keeping is majorly practiced due to the benefits that

accrue from the surrounding Kakamega and Malava forests. The same study can be replicated in other bee keeping areas such as Kilifi, Kwale, Kitui and Baringo to establish whether or not farmers in these areas have adopted value addition on hive products.

5.6 Contribution to the existing body of Knowledge

OBJECTIVES	SUB THEME
1.Determine how value- addition in apiculture products influences bee farmers income in Kakamega central sub-county	<ul style="list-style-type: none"> • Expenditure on food per day • Monthly savings • Income from value addition on hive products • Value addition measures undertaken on hive products
2.Investigate the extent at which value addition in apiculture products influences bee farmers' household food security in Kakamega Central sub-county	<ul style="list-style-type: none"> • Access to nutritious food • Average meals per day • Access to a balanced diet
3.Establish the level at which value addition in apiculture products influence the health and type of houses owned by bee farmers in Kakamega central sub-county	<ul style="list-style-type: none"> • Health care affordability • Medicinal use of hive products • Type of houses owned • Number of people per house
4.Determine how value addition in apiculture products influences household education of bee farmers in Kakamega central sub-county	<ul style="list-style-type: none"> • Amount spent on education • Household head education level • Transition rates of bee farmers' children from primary to college

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WORK PLAN

FIGURE 5.1

DURATION

ACTIVITY	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Development of the research concept									
Writing of research proposal									
Defense of the research proposal									
Correction of mistakes in the document									
Acquiring research permit									
Data collection									
Data analysis/compilation of final report									
Defense of final report and submission									

FIGURE 5.2; BUDGET

ITEM	AMOUNT(Kshs.)
Stationery	4,500
Printing, Photocopy and Binding	6,500
Field allowances for 3 research assistants	9,000
Transportation cost	5,000
Mobile phone airtime	3,000
Payments for the 3 research assistants	18,000
Miscellaneous	10,000
Emergency (10% Of total budget cost)	5,600
TOTAL	61,000

APPENDIX 1: Krejcie and Morgan Tables (1970)

S	N	S	N
10	220	127	950
14	230	132	1000
19	240	136	1100
24	250	140	1200
25	260	144	1300
32	270	148	1400
36	280	152	1500
40	290	155	1600
44	300	159	1700
48	320	162	1800
52	340	165	1900
56	360	169	2000
59	380	175	2200
63	400	181	2400
66	420	186	2600
70	440	191	2800
73	460	196	3000
76	480	201	3500
80	500	205	4000
86	550	210	4500
92	600	214	5000
97	650	217	6000
103	700	226	7000
108	750	234	8000
113	800	242	9000
118	850	248	10000
123	900	254	15000

APPENDIX 2: INTERVIEW SCHEDULE

UNIVERSITY OF NAIROBI VALUE ADDITION IN APICULTURE PRODUCTS SURVEY 2014

Introduction

The aim of this survey is to study the impact of value addition in apiculture products on bee farmers' livelihood in Kakamega central sub-county in Western Kenya. The key motive of the survey is to assess whether or not value addition in apiculture products contributes positively to the key components of the farmers livelihood namely income, food security, health /shelter and education in the farmers' households. Respondents will be randomly selected to participate based on their own willingness, and any information they give will be handled confidentially.

SECTION A: GENERAL INFORMATION

Enumerator:

Respondent's Name:

Respondents Mobile Number:

Division:

Location:

Sub-location:

A1.GENDER (Tick where appropriate)

Male

Female

AGE (complete years)

A3.What is your highest level of education. (Tick where appropriate)

Not completed primary education	
Primary (Has KCPE certificate)	
Secondary(Has KCSE certificate)	
Middle level college	
University (Has degree certificate)	

A4. What is the size of your household, i.e. the number of people who reside in your house, for at least three months in a year?

Live alone	
2	
3	
4	
5	
More	

A5. For how many years have you been practicing bee farming?

.....

A6. What bee farming products do you harvest from your trade? (Tick on the appropriate product)

1. Honey 2. Beeswax 3. Propolis 4. Royal jelly

5. Other (specify).....

A7. Land ownership

	Owned	Leased in	Leased out	Communal(Family)
Acres				

SECTION B: CURRENT HOUSEHOLD COMPOSITION AND CHARACTERISTICS

ID	Name	Gender 1=male 2=female	Relationship to the head 1=head 2=spouse 3=child 4=parent 5=brother/sister 6=nephew/niece 7=worker 8=other(specify)	Number of months lived in the house in the last 12 months	Marital status 1=single 2=married 3=polygamous 4=monogamous 5=widowed 6=separated	Education status 0=none 1=primary 2=secondary 3=middle level college 4=university	Was the person involved in any income generating activity in the last 12 months? 1=yes 2=No	If yes state the activity	Months involved in the activity	Estimated income from the activity in Kshs.
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Household members: Persons who live together and eat together/share food, including hired labour, students and spouse living and working in another location but excluding visitors

Activity: 1=informal, 2=formal, 3=business, 4= other specify

SECTION C: PRODUCTION FROM APICULTURE

Kindly indicate your production from the past year (2013) across the apiculture products highlighted, where applicable.

Type of product	Quantity produced	Units of measurement	Quantity sold in crude form	Price per quantity(Kshs .)	Quantity processed	Price per quantity(Kshs)	Quantity consumed at home
Crude honey							
Beeswax							
Propolis							
Royal jelly							
Other(specify)							

Units of measurement; 1= kg 2=Gallon 3= Debe 4= litres

SECTION D: VALUE ADDITION MEASURES

The interviewer should use the bee farming products mentioned above to ask the following questions;

Type of product	Form in which it is sold, 1=crude 2=processed	Quantity (units)	Price per unit	Type of buyer	Reasons for choosing this buyer	Contract with buyer?	Distance from farm to selling point
Honey							
Beeswax							
Propolis							
Royal jelly							
Other(specify)							

Type of buyer 1= intermediary, 2=Supermarket 3=Individual consumer 4=Herbalists 5= Farmer cooperatives 6= Retail outlets 7= N.G.Os 8= Private processors 9= other (specify).....

Reasons for choosing a buyer;1=Good price 2= proximity to the buyer 3= purchases in bulk 4= consistency in purchasing and payment 5=have a contract to supply to the buyer 6= the buyer is the only option the farmer has 7= other(specify).....

D2. For all the value addition activities done, ask the following questions;

Value addition activity	Quantity	Units	Cost per unit	To what proportion of your produce do you add value 1= all 2=More than half 3= Half 4= less than half	What additional price do you fetch after adding value?

Value addition measures: 1= straining honey from combs 2= purification 3= packaging 4= labeling 5= using wax to make candles, in other industries such as shoe making, cosmetics etc 6=use of Propolis for medicinal purposes 7= use of royal jelly 8= other (specify).

D3. What is the reasons that drive you to add value to your products?

- Prolong the shelf life
- Generate more income
- Serve a diversified market clientele
- To ensure consistency in supply to my clients all year round
- To make other products which are in high demand in the County and beyond?
- Because I belong to a farmer group that is involved in value addition
- Avoid wastage in time of plenty harvest
- To be able to break into high end markets

D4. If the respondent does not add value to any of his products from apiculture, indicate his/her reasons

- 1.....
- 2.....
- 3.....
- 4.....
- 5.....
- 6.....

SECTION E: SAVING CULTURE, ACCESS TO CREDIT AND FARMER-GROUP MEMBERSHIP

E1.The interviewer asks the following questions to gauge the saving culture and ability of both value adders and non- value adders:

Do you save frequently? 1=Yes 2=No	If yes, how frequent? 1=weekly 2=monthly 3=whenever I have extra cash 4=other(specify)	How much do you save? 1=above Kshs.2000 2=above Kshs.1000 3=up to Kshs.500 4=less than Kshs.500	Where do you save? 1=Bank 2= Chama 3=Farmer cooperative	Are you able to access loans from your saving schedule to meet your needs i.e. upscale your production, pay school fees for your children, purchase an asset e.t.c.?1=Yes,2=No

E2.Did you acquire any credit in the last one year? (Jan-Dec.2013)..... (1=Yes, 2=No) If yes, indicate the amount in Kshs.....

E3.Do you belong to a farmer organization? (1=Yes, 2=No).....If yes, what activities are undertaken by the group? (Tick where appropriate)

Collective production of bee products

- Collective marketing of bee products
- Collective purchase of bee keeping inputs
- Collective processing of bee products

E5. Have you benefited in any way by belonging to a farmer group? (1=Yes, 2=No).
If yes please indicate how.

.....

E4. Where do you obtain technical advice on bee farming and value addition?
 Source1=KENFAP, source2=ICIPE, source3=Government extension officers,
 source4=NAFIS

SECTION F: FOOD SECURITY STATUS

E1. How many meals are your family members able to get per day..... [1, 2, 3]

E2. How often does your meals contain the following [indicate daily, frequently-at least three times a week, rarely-whenever available]

1. Carbohydrates [rice, ugali, potatoes, bananas etc]
 - Daily
 - Frequently
 - Rarely
2. Fruits and vegetables
 - Daily
 - Frequently
 - Rarely
3. Proteins [Beans, fish, milk, meat, chicken, eggs e.t.c.]
 - Daily
 - Frequently
 - Rarely

E3. Do you grow or buy most of your foodstuffs..... [1=grow 2=buy]
 E4. Have you had any of the following malnutritional diseases in your household [tick Yes or No]

	Yes	No
1. Kwashiorkor	<input type="checkbox"/>	<input type="checkbox"/>
2. Anemia	<input type="checkbox"/>	<input type="checkbox"/>
3. Pellagra	<input type="checkbox"/>	<input type="checkbox"/>
4. Rickets	<input type="checkbox"/>	<input type="checkbox"/>
5. Scurvy	<input type="checkbox"/>	<input type="checkbox"/>
6. Hunger (gone to bed without food at all)	<input type="checkbox"/>	<input type="checkbox"/>
7. Other [specify].....		

SECTION G: EDUCATION IN BEE FARMERS HOUSEHOLDS

G1. What is your children level of education [indicate 1=completed primary school, 2=completed secondary school, 3=completed college]

SECTION H: TYPE OF HOUSES, HEALTH CARE ACCESSABILITY AND OTHER HOUSEHOLD EXPENDITURES

H1. What type of shelter does your family live in?.....[Answer, 1=Permanent/brick/concrete, 2=semi-permanent 3=thatched/mud/traditional house, 4=other (specify)].....

H2. What household asset(s) do you/your family own now?[indicate assets purchased within the year 2013 that is priced at Kshs.3000/= and above.

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)

H3. Do you use bee products for medicinal purposes? [If yes, indicate the product and purpose]

H4. Household expenditures in the past year (2013)

CATEGORY	AMOUNT SPENT IN Kshs.
Farm inputs [seeds, fertilizers, pesticides, machinery e.t.c.]	
Farm labor	
School fees	
Food stuffs	
Clothing	
Health care	
Entertainment	
Other[specify]	

General comments about the

survey.....
.....
.....
.....
.....

THANK YOU

Appendix3



UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION

Our Ref.: UCN/CEES/KSM/HQ

University of Nairobi Plaza,
Oginga Odinga Street
P.O. BOX 925,
KISUMU.

Telephones: Kisumu 057-2021534

24th March 2014

TO WHOM IT MAY CONCERN

RE: ONDITI OMINDE GLADYS I.50/82216/2012

This is to inform you that the above named **Onditi Ominde Gladys** is a student in the University of Nairobi School of Continuing and Distance Education pursuing Masters Degree in Project Planning and Management in Kisumu Campus.

Gladys has completed her course work and examinations successfully and is currently undertaking research project work "*Influence of value addition in Bee-ferming products on the livelihood of Bee- farmers in Kakamega Central Sub-County, Kenya.*" as a pre-requisite for the programme in the second year. She has identified your institution as a resourceful centre for the information she needs for her research work.

We would therefore appreciate if she could be allowed to access information for her study as the data she needs is for academic purposes and not for other things. For further information do not hesitate to contact the undersigned.

Thank you.

DR. RAFAEL O. NYONG'E, PhD
SENIOR LECTURER
DEPARTMENT OF EXTRA MURAL STUDIES
UNIVERSITY OF NAIROBI
KISUMU CAMPUS



ISO 9001: 2008 CERTIFIED

The Frontiers of Knowledge Providing Leadership in Academic Excellence

Appendix4



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No.

Date:

NACOSTI/P/14/9384/1370

7th May, 2014

Gladys Ominde Onditi
University of Nairobi
P.O.Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Influence of value addition in Bee-Farming products on the livelihood of Bee-Farmers in Kakamega Central Sub-County, Kenya,”* I am pleased to inform you that you have been authorized to undertake research in **Kakamega County** for a period ending **18th July, 2014**.

You are advised to report to **the County Commissioner and the County Director of Education, Kakamega County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.


SAID HUSSEIN
FOR: SECRETARY/CEO

Copy to:

The County Commissioner
The County Director of Education
Kakamega County.




National Commission for Science, Technology and Innovation is ISO 9001: 2008 Certified

Appendix 5

THIS IS TO CERTIFY THAT:
MS. GLADYS OMINDE ONDITI
of UNIVERSITY OF NAIROBI, 0-506
NAIROBI, has been permitted to conduct
research in Kakamega County
on the topic: 'INFLUENCE OF VALUE
ADDITION IN BEE-FARMING PRODUCTS
ON THE LIVELIHOOD OF BEE-FARMERS
IN KAKAMEGA CENTRAL
SUB-COUNTY, KENYA
for the period ending:
18th July, 2014

Permit No. : NACOSTI/P/14/9384/1370
Date Of Issue : 7th May, 2014
Fee Received : Ksh 1,000



Applicant's Signature
[Signature]

Signature
[Signature]
POC Secretary
National Commission for Science, Technology & Innovation

ORIGINAL

OFFICIAL RECEIPT **AC: 01316**

Station: *Nairobi* **Date:** *14/5/2014*

RECEIVED from: *Ms Gladys Ominde Onditi*

Shillings: *One thousand only*

on account of: *Research fee*

Vote: *1-9*

Head: *1-9*

Item: *1-9*

Cash: *1-9*

Cheque No: *1-9*

Signature of Officer receiving remittance
[Signature]