PERFORMANCE AND CONTRIBUTION OF BEEKEEPING ENTERPRISES TO LIVELIHOOD IN SONGEA DISTRICT

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ABSTRACT

The study was carried out to determine the economic performance of beekeeping enterprises and their contribution to livelihood focused on level of income that a household earn from beekeeping in Songea district of Ruvuma region in Tanzania. Specifically the study was sought to (i)Determine the income generated from beekeeping enterprises in the study area, (ii) Determine the viability of a beekeeping enterprise in the study area, (iii) Determine the contribution of beekeeping on the smallholder farmer household income. Data were obtained using structured questionnaire, focus group discussions and key informants. Villages for the study were purposively selected to reflect where beekeeping is predominantly found within Songea district. A total of 120 respondents representing households, stratified into beekeeping participant and non-beekeeping participant households were randomly selected proportionately from the five (5) villages and used for the study. Descriptive statistics, Net Present Value and a two sample for means Z-test were used as analytical tools. The results indicate that,44.3% of beekeeping participant household had income generated from sales of honey and beeswax of between TZS.101 000-500 000 per household per year and 27.9% had an income between TZS. 26 000-100 000 while the average income was TZS 342 474. The net present value was positive (Tzs.272 828.03) implying that it is worth investing in beekeeping venture and the contribution of beekeeping to total household income was only 11% which was also reflected to the results for z-Test of a two sample for means which showed that, z-calculated value (0.181) was less than z-critical value (1.645) and p-value was (0.428) i.e. insignificant that led to a failure to reject the null hypothesis implying that the contribution of beekeeping to household income in the study area is insignificant. Bush fire burning, inadequate improved technologies exacerbated by lack of extension services and poor markets were some of the major problems militating against

beekeeping in the study area. This study recommends that, facilitation by government and other development stakeholders is required to link rural based beekeepers to formal national and international markets in order to create incentives for beekeepers to seek for improved beekeeping technologies that will boost up their production levels. Areas to be addressed are; (i) Increased use of improved box beehives and thus increased productivity (ii) Reduced bush fire incidences (iii) Increased market outlets and (iv) strengthened extension services.

DECLARATION

I, Msalilwa Godson Lunyamadzo, do hereby declare to the Senate of Sokoine University of Agriculture that, this dissertation is my own work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

_____ _____

Msalilwa Godson Lunyamadzo Date

(MSc. Candidate)

The above declaration is confirmed by

_____ _____

Dr. Evelyn Lazaro Date

(Supervisor)

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DEDICATION

To almighty God, the Lord and my shepherd. Also this work is dedicated to late AlatupyanilaMayemba my beloved mother and mzeeLunyamadzoMsalilwa my father for laying down the foundation of my education. May almighty God rest the soul of my mother in eternal piece and bless my father.

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ASFG	African Smallholder Farmers Group
DFID	Department for International Development
FAO	Food and Agricultural Organization of the United Nations
FAOSTAT	FAO statistics
FGD	Focus group discussion
IFAD	International Fund for Agricultural Development
MAFC	Ministry of Agriculture and Food Security
MNRT	Ministry of Natural Resource and Tourism
NPV	Net Present Value
SADC	Southern African Development Community
SLF	Sustainable Livelihood Framework
TZS	Tanzanian Shillings
UDS	University for Development Studies
UNCTAD	United Nations Conference on Trade and Development
URT	United Republic of Tanzania
USA	United States of America

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Rural people's livelihoods rely upon their accessibility to natural resources such as land, water and biotic resources while the improvement of people's lives and meeting their needs has been the most crucial and priority task by most developing countries all over the world (Veronica, 2011). In practice, beekeeping is adapted as a resilient livelihood strategy. However, beekeeping tends to be perceived by the general population as 'a hobby', or as 'a sideline activity'. This perception may often be true, but if actively observed, it is a resilient livelihood. In other words one that keeps people out of poverty or one that has access to a range of options. In this case, apiculture and related trades can be sources of valuable strength to countless numbers of rural people's livelihoods (FAO, 2009).

Estimates show that, more than half a billion Africans, or some 65% of the population, while in some countries more than 80% depends on small or micro-scale farming as their primary source of livelihood (ASFG, 2006). But these smallholder farmers live and earn their livelihoods in the world's most ecologically and climatically vulnerable landscapes such as hillsides, dry lands and floodplains and rely on weather dependent natural resources. They are at the forefront of the world's efforts to deal with climate change, environmental degradation, poverty and child labour (IFAD, 2006).

Smallholder farm systems are not a permanent phenomenon that should be maintained at all costs. Smallholder farmers have more opportunities to improve their livelihood strategies outside of the agricultural crop production.For example, as a way of adapting to

low domestic farm gate prices for maize, farmers have been changing to other crops. Sunflower production, for instance, is increasing in traditional maize growing areas as a result of falling maize prices and more extreme, in newly established NjombeRegion in southern highlands part of Tanzania, farmers were turning from maize to pine tree production (Hella*et al.,* 2011).

Several studies, Haug*et al.*(2009) for instance, identify several other sources of livelihood, ascertaining productivity and the contribution to livelihood for several food crops, livestock and cash crops while very little is done in ascertaining productivity and the contribution to livelihood of beekeeping enterprises. In the study by Haug*et al.* (2009) more than 16 household crop enterprises were identified plus livestock and other sources of livelihood while remaining silent about beekeeping. Similarly MAFC (2006) report, stipulates that, sales of agricultural products forms the main source of rural household income, accounting about 70% of the total income. Thus Bradbear (2004) concluded that, it is easy to visit villages and not see beekeeping, unless actively looking for it. One reason may be the focus of rural development, wherein crop production and livestock rearing are perceived to be dominant activities in rural areas. This perspective can render invisible the part beekeeping plays in social life, culture, and local economies (Chazovachii*et al.*, 2012).

Consequently, the role of bees in sustaining forests and forest dependent livelihoods remains poorly known and unappreciated while bees still remains a fantastic world resource for sustaining our environment as pollinators' of flowering plants and sustaining our agriculture by pollinating crops thereby increasing yields of seeds and fruits (FAO, 2009). Therefore in a real life practice, beekeeping has been a marginalized activity within most developing countries.

The benefits associated with beekeeping still remain a huge mystery for many whom have not ventured into this field while the importance of beekeeping in the grassroots of socio-economic development provides another option that is available for developing countries as a means of meeting the local needs of their people that has not yet been exploited (Berem, 2014).

1.1.1 Status of beekeeping in Africa

In many parts of the world, significant volumes of honeyare obtained by plundering wild colonies of bees, while elsewhere beekeeping is practised by highly skilled people but honey hunting of wild bee colonies still remains an important part of the livelihoods of forest dependent peoples in many developing countries (Bradbear, 2004). According to FAO, (2007), the total honey production in Africa by 2006 was 164 185 tonnes of which, Ethiopia contributed 25%, followed by Tanzania which produced 17% while Kenya and Angola produced 15% and 14% respectively. Other African countries produced less than 10% each (Table 1).

Table 1: African honey production 2006

Country	Production (Tones)	% of Total Production
Ethiopia	41 233	25
Tanzania	28 678	17
Kenya	25 000	15
Angola	23 767	14
Central African Republic	13 000	8
Egypt	8 000	5
Madagacar	3 986	2
Tunisia	3 060	2
Cameroon	3 000	2
Morocco	3 000	2
Algeria	2 991	2
Senegal	1 900	1
South Africa	1 500	1

Source: FAO (2007)

A study by Crane (1998) revealed thatSouth Africa had the highest of average honey yield in kilograms per beehive having 17.3 kg of honey per beehive. Tanzania was the next highest producer followed by Burundi with 15 and 9.8 kg of honey per beehive respectively.Table 2 illustrates the details for this fact.

Table 2: Beekeeping productivity in Africa

Country	Honey Yield (Kg/Hive)
Burundi	9.8
Ethiopia	8.3
Kenya	5.7
South Africa	17.3
Tanzania	15.0
Uganda	4.0

Source: Crane (1998)

The average national colony productivity for Tanzania with cylindrical bark or log hives is 15 kg of honey and 1kg of beeswax per year. In areas with more than one honey harvesting season, the annual production per colony will be higher (NBP, 1998). Based on these information, the Ministry of Natural Resources & Tourism estimated that in 2011 annual production was 9,380 MT of honey worth the value of USD 17.1 million, (TZS 27 bill) and average of 625.3 MT of beeswax worth USD 1,875,900 (TZS 2,813 bill) was produced, which is 7 % of the national potential. What is clear is that the national potential for production of honey and beeswax is huge and production is way below the potential (MNRT, 2013). Some economists believe that, the harvesting of bee products would increase by 50 per cent if the beekeeping potential were optimally exploited (Mlay, 1997).

1.1.2 Policies, programmes and acts in favour of beekeeping in Tanzania

1.1.2.1 National forestrypolicy

According to URT (1999), the overall goal of the National Forest Policy is to enhance the contribution of the forest sector to the sustainable development of Tanzania and the

conservation and management of her natural resources for the benefit of the present and future generations. Income generating activities such as beekeeping are introduced to help improve the incomes of communities, men and women beekeepers, in line with the Tanzania overall development goals. Involvement of communities in forest management including beekeeping has increased benefits accrued to communities and has also led to a considerable improvement in incomes.

1.1.2.2 The national beekeeping policy

Since 1998 the government in Tanzania developed a National Beekeeping Policy (NBP) to encourage active participation of all stakeholders in the establishment and sustainable management of bee reserves and apiaries. The policy encompasses a promotion of sustainable management of beekeeping in cross-sectoral areas for ecosystem conservation. The overall goal is to enhance contribution of the beekeeping sub-sector to sustainably contribute the development of the economy, as well as the conservation and management of its natural resources for the benefit of current and future generations (MNRT, 1998).

1.1.2.3 Thenationalbeekeepingprogramme

The National Beekeeping Programme is an instrument designed to put into practice the NBP with emphasis on stakeholders' participation in the planning, management, ownership and sustainable utilization of bee resources for poverty eradication, improved biodiversity development and environmental conservation. The programme has three sub programmes including Beekeeping Development Programme, Legal and Regulatory Framework Programme and Institutional and Human Resources Development Programme.

1.1.2.4 The beekeeping act and the village land act

The beekeeping act Number. 15 of 2002 was enacted by Parliament in April 2002. Its main objectives are: (i) to make provisions for the orderly conduct of beekeeping (ii) to improve the quality and quantity of bee products (iii) to prevent and eradicate bee diseases

and bee pests, and (iv) to improve revenue collection (URT, 2002). While the village land act number 5 of 1999 is one of the most important legislative texts that support community based natural resources management. It empowers the community at local level (village) by recognising it as the appropriate representative structure to implement natural resources management. Based on this, through village land use management system beekeepers can be allocated land for beekeeping development (Mwakatobe and Mlingwa, 2005). This then poses a challenge for the community to use this enabling environment created by the Policy, Programme and legal framework to encourage Tanzanians and other investors to take up beekeeping so that they can benefit in terms of income, poverty reduction and conservation of environment.

1.1.2.5 The national environmental action plan (2013-2018)

Based on recommendations of the Earth Summit that took place in Rio de Janeiro, Brazil in 1992.and the National Environmental Policy, 1997, the National Environmental Action Plan (2013-2018) incorporates the National Beekeeping policy of 2008 as one of the environmental management initiatives in order to meet the objectives of improving biodiversity, increase of employment and foreign exchange earnings through sustainable bee products based, industrial development and trade(NEAP, 2012).

1.1.2.6 The national agricultural policy 2013

The agricultural policy 2013 statement on environmental issues recognises the strong dependency of agricultural development on environmental resources such as land, forest, air and water and that sustainable utilization of these resources in agriculture is vital to safeguard the environment. This suggests for enhancement of public awareness on sustainable environmental conservation and promotion of environmental friendly crop husbandry practices (sustainable agriculture). It emphasizes that in the future there should

be full utilization of the underutilized resources which are environmentally more friendly. One of such resources is an increase in yield of different cultivated crops through crosspollination by honeybees. Therefore it includes the vital role that honeybees play in enhancing the productivity levels of different crops such as fruits and nuts, vegetables and pulses, oil and forage crops that has been always underestimated (URT, 2013).

1.2 Research Problem

Despite the potential of beekeeping sub-sector in Tanzania, production is still very low. The country has about 9.2 million honeybee colonies whose annual production potential is about 138 000 tonnes of honey, and 9 200 tonnes of beeswax, but currently the country is producing 4 860 tonnes of honey and 324 tons of beeswax per year which represents only 3.5% of the annual production potential of the country while the demand side data show that the country experiences shortage of honey to the extent of importing honey(Mwakatobe and Machumu, 2011). According to the United Nations Commodity Trade Statistics Database, the trend of honey import value for Tanzania for the period of 2005 to 2011 has been increasing. Data show that, the value of natural honey imports in USD had an annual increase of 14.3% and likewise the volume of imports in tons has been increasing by 14.3% within this period (UNCTADstat, 2012). Based on these data, on average Tanzania imports 22 380 tons of honey every year to meet the existing local demand thereby spending USD 24 million every year. About 45% of the total import is from Kenya followed by Switzerland 20%, Australia 17.5%, USA 15% and UK 2.5%. This indicates that, an opportunity exist for small farmers to increase income through sales of bees products (Ngaga*et al.*, 2005).

Moreover, evidence from earlier studies, Kihwele (1991) for instance, shows that, production of bee products during the colonial and early independence period was higher than what we have now and its contribution to the national GDP and international trade

counted higher than it is now. According to these data, the production of beeswax from Tanzania (i.e. then Tanganyika) increased from 320 to 905 tons during 1906 to 1952. Honey was estimated at an annual average production of 10 000 tons (Smith, 1958). According to Ntenga (1976), Tanzanian exports averaged 368 tons of beeswax and 467 tons of honey.

The annual honey production potential for Songea district in particular is 6000 tons while the actual production counts to 50 tons representing only 0.8% of the annual production potential (Mwakatobe and Mlingwa, 2005). This low production indicates that an opportunity exist to increase beekeeping activities to raise income and reduce poverty (MNRT, 2001). Moreover, the inauguration of the Africa`s best honey processing plant by the Tanzania's prime minister Hon MizengoPinda at Kibaha in the coast region of Tanzania with production capacity of 10 000 metric tons of organic honey expecting to export much of the honey to America, Europe and the Middle east is an obvious evidence that concludes for this fact (Lukumbo, 2012).

The 1998 National Beekeeping Policy explicitly recognizes the importance of beekeeping enterprises as an asset for rural livelihoods and subsistence. A number of efforts have been made at national level to encourage active participation of all stakeholders in the establishment and sustainable management of bee reserves and apiaries. Also there is a promotion of sustainable management of beekeeping in cross-sectoral areas for ecosystem conservation with the overall goal of enhancing contribution of the beekeeping sub-sector to sustainable development of the economy. Despite these efforts,there has been no adequate study at local level on addressing the dissemination of this policy in the country, particularly in the study area.

1.3 Study Objective

1.3.1 Overall objective

The overall objective of the study was to determine the economic performance of beekeeping enterprises and their contribution to livelihood in Songeadistrict.

1.3.2 Specific objectives

i. Determine the income generated from beekeeping enterprises in the study area
ii. Determine the viability of a beekeeping enterprise in the study area.
iii. Determine the contribution of beekeeping on the smallholder farmer household income.

1.4 Research Questions

The proposed study was guided by the first two research questions and the hypothesis below;

i. What level of income earned from beekeeping enterprises in the study area?
ii. Is it worth investing in beekeeping enterprises in the study area?
iii. What is the proportion of income beekeeping contributes to total household income?

1.5 Research Hypothesis

Ho: There is no difference in the mean household income between households with beekeeping enterprises and households without.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Theoretical Framework

This study was guided by the classical and neoclassical theories, theory of the firm in particular and the sustainable livelihood concept.

2.1.1 Theory of the firm

The classical economic theory was the first modern school of economic thought which assume that, all firms are profit maximizers). Moreover the theory of the firm is the microeconomic concept founded in neoclassical economics that states that firms (corporations) exist and make decisions in order to maximize profits (Olomi, 2009). Businesses interact with the market to determine pricing and demand and then allocate resources according to models that look to maximize net profits. The theory of the firm goes along with the theory of the consumer, which states that consumers seek to maximize their overall utility. Therefore honey production is a supply side part in the context of the theory of the firm clearly explained by the price theory. Assuming a perfectly competitive market by which producers and consumers are rational and there is free entry and exit into the market, in the real market, it is expected that, given existence of demand, more honey will be made available to the buyers. This is because the suppliers will be able to maintain a profit despite the higher costs of production that may be incurred in the course of production (Joseph and Kamil, 1996).

2.1.2 The sustainable livelihood concept

Livelihood comprises the capabilities, assets and activities required for a means of living (DFID, 2002). A livelihood is sustainable when it can cope with and recover from stresses

and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base(Chambers and Conway, 1992). According to Berhane (2010), beekeeping is a useful means of strengthening livelihoods because it uses and creates a range of assets. In order to make it possible to think about people's differing livelihoods, and to allow analysis, all assets may be allocated into one of five fundamental categories: human, physical, financial, social and natural (DFID, 2002). Natural capital includesbees, a place to keep them, water, sunshine, biodiversity and environmental resources while human capital entailsskills, knowledge, good health and strength, and marketing expertise. Physical capital comprises oftools, equipment, transport, roads, clean water, energy and buildings while social capital includeshelp from families, friends and networks, membership of groups and access to a wider society, market information and research findings. Furthermore, financial capital includescash, savings and access to credit or grants. An appreciation of this requires one to think about his or her livelihood and all the diverse assets needed that include one's skills, physical resources and social integration. No single category of capital asset, for example finance, is on its own a sufficient basis for creating a livelihood. Beekeeping reinforces human life through a variety of assets. According to Lemessa (2007), successful beekeeping can be achieved by drawing upon all of the five categories of capital assets.Therefore, beekeeping livelihoods are built upon natural resource stocks. That is bees, flowering plants and water. Bees collect gums and resins from plants and use plants and trees as habitat for nesting(Bradbear, 2003).

Figure 1 is a sustainable livelihood framework describing how livelihood outcomes are achieved for a chosen livelihood strategy by using the livelihood assets given the transforming structures and processes which includes, the national forestry policy, national beekeeping policy, national beekeeping act, National beekeeping programme, village land

act, national environmental policy, the National environmental action plan and the national agricultural policy that are necessary for counteracting the vulnerability context for a given community.

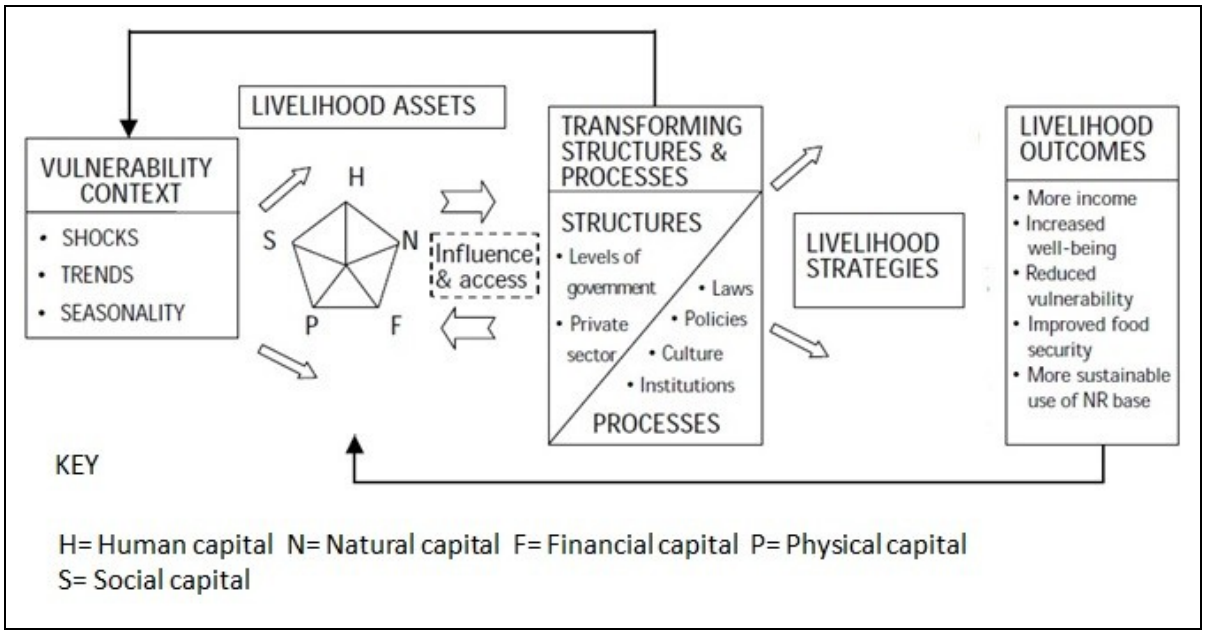

Figure 1: **Sustainable livelihood framework**

Source: Anandajayasekeram*et al.* (2008).

2.3 World Honey Production and Consumption

2.3.1 Honey production

Data collected in the year 2006 shows that China is the world's largest producer of honey. According to these data, the total production for China amounts to 306 500 tons which represents 23% of total world production. Argentina makes the second largest producer with 93 415 tons representing 7% of total world production, but is by far less than a third of China's production (Apiservices, 2007). Table 3 shows honey production for the world ten top producers in 2006.

Table 3: World honey production 2006: Top 10 producers

Country	Production (Tones)	% of total production
China	306 415	23
Argentina	93 415	7
Turkey	82 336	6
U. S. A.	70 238	5
Russia	55 000	4
India	52 232	4
Mexico	51 882	4
Canada	43 033	3
Ethiopia	41 233	3
Iran	36 000	3

Source: FAO (2007)

Tanzania makes the 12thworld's largest producer of honey after China, Turkey, USA, Ukraine, Argentina, Mexico, Ethiopia, Russian Federation, Iran, India, and Brazil. However, with a production of 28 thousands metric tons, Tanzania is second Africa's largest honey producer after Ethiopia (FAO, 2010). Table 4 shows the Africa's top three (3) honey producers.

Table 4: Africa's top three (3) Honey producers

Country	Production (Tones)
Ethiopia	41 233
Tanzania	28 678
Kenya	25 000

Source: FAO (2010)

2.3.2 World honey consumption

The European Union (EU) is the world's largest consumer of honey. The EU consumes approximately 22% of the world's honey production, however only 50% of this is produced in the EU. The majority of this honey is imported from the developing world. Total EU consumption in 2004 was 305 000 tonnes of which 6,500 tonnes were organic honey. The EU countries have increased the consumption of natural honey by 1.6 % annually from 1995 to 2004. From 2002 to 2004 the annual growth equalled 2.4%.

Within the SADC region, among the 15 SADC member countries, only Angola and Tanzania produce a substantial amount of natural honey. In 2005, these two countries were producing 23 000 and 27 000 tonnes respectively (FAOSTAT, 2005). According to these data the two countries did not export honey to other countries. Consumption was 24 000 tonnes in Angola where an amount to supplement was imported from mainly Portugal and 28000 tonnes in Tanzania where the supplement was imported from elsewhere. This implies that, the two countries were net importers. The honey consumed in both Tanzania and Angola is mostly from their informal sectors. Honey gatherers use old, traditional and relatively inefficient methods of attaining honey which is sold, generally unprocessed in their local markets.

2.4 HoneyProduction for Selected Districts in Tanzania

A study by Mwakatobe and Machumu (2011) classified beekeeping in Tanzania mainland into high producing, medium producing and unexploited areas. The findings in this study identified the actual production and potential production for each selected district in each classified category. For instance, it was found that, the actual production in the classified high producing area which includes the districts of Kahama, Mpanda, Sikonge, Urambo, Nzega, Tabora and Chunya was 7800 tonnes of honey against the potential production of 52 000 tonnes. Likewise, in the medium producing area which included the districts of Kondoa, Kiteto, Babati, Kibondo, Handeni, Kigoma, Arumeru, Rufiji and Nkasi it was found that the actual production was 1400 tonnes of honey against its potential production of 21 000 tonnes of honey.

Moreover, in the unexploited areas which include the districts ofLindi, Songea, Iringa, Biharamilo, Kasulu, Newala,Tunduru,Singida and Hai it was found that the actual production was only 180 tonnes of honey against 40 000 tonnes potential production of honey.

2.5 Analytical Methods

Economic analysis remains a key guide to a reasonable justification for committing resources to any chosen enterprise (Hochmuth*et al.*, 2010). Hasan and Süleyman (2009) for example, studied the effect of beehive type on honey production in which old and new type beehives were studied. This study used data from 80 beekeepers from Bursa province of Turkey and applied a Cobb Douglas econometric model which came up with the result that, while all the other variables remained the same, 1% increase in old type hives would cause a decrease of 0.29% in honey production while 1% increase in new type hives would cause a 0.47% increase in honey production. A study by Abdulai and Abubakari (2012),was conducted to ascertain technical efficiency of beekeeping for farmers in Tolon-KumbunguDistrict of Northern region of Ghana. The empirical stochastic production frontier model (via Cobb-Douglas) was applied in the analysis of Technical Efficiency of honey production. The estimates of the stochastic production frontier showed that, about 89.4% of the beekeepers were technically efficient in their production. This implied that, in the short run; it was possible to increase yield in the study area on average by 11% using the technology of best performers. Another study was carried by Tijani*et al.* (2011) to analyze the economics of beekeeping in Nigeria in 2011. The results from this study show that, from a sample of 100 respondents randomly and proportionately selected from three (3) wards and used for the study, the descriptive statistics and budgetary technique results indicate that, majority (90%) were male, most of them (56%) had between 20 – 40 colonies, 44% had primary education and 40% had between 16 – 20 years beekeeping experience in the study area. The Costs and returns analysis indicates that gross revenue, total cost and net farm income were N5, 260.65, N14, 234.17, and N8, 973.74 per colony, respectively. But inadequate credit, theft, bush burning, absconding of bees and inadequate improved technologies were some of the major problems that set back beekeeping in the study area. This led to conclusion that,Beekeeping, though not widely practiced in the

country is another economic enterprise that has over the years improved the living conditions and livelihood of many in the study area (Tijani*et al.,* 2011).

2.6 Economic Viability Analysis for Individual Beekeeping Enterprises

A study by Miklyaev*et al.*(2012) applied a net present value (NPV) to analyze the economic viability for individual beekeeping enterprises at Tigray and Amhara regions in Ethiopia. This study analyzed a three scenario intervention approaches which were applied in order to clearly display the variation in cost and benefit of modern versus traditional beekeeping technologies. These three scenario intervention approaches were; (i) Intervention A: Introduction of Three Modern Beehives per Beekeeper's Household(ii) Intervention B: Introduction of Three Modern Beehives per Beekeeper's Household, Plus the Tools Needed to Properly Manage Them(iii) Intervention C: Introduction of a "Package Solution" That Included (a)Introduction of Three Modern Beehives per Beekeeper's Household; (b) The Tools Needed to Properly Manage the Beehives; and (c) Training on Modern Beekeeping Methods while the base-case scenario was the "without" intervention scenario. The results showed that all NPV values were positive, but Intervention C: Modern Beehives plus Tools and Training showed to have the highest values of financial NPV for both regions. Table 5 shows the details.

Table 5: Varying NPV values from varying intervention package

Financial NPV	Amhara (USD)	Tigray(USD)
Intervention A: modern beehive	314.00	1 780.00
Intervention B: modern beehive plus tools	571.00	2 922.00
Intervention C: modern beehive plus tools and training	1 082.00	4 866.00

2.7Contribution of Beekeeping to Livelihood

The study conducted in Chunya, Songea and Nachingwea districts in the southern highlands and southern parts of Tanzania in the year 2005, to determine the contribution of beekeeping to household income in Tanzania, revealed that beekeeping contributes 27.4%

of a beekeeper's total cash income per year being second to agriculture which had 60.4% contribution of a beekeepers total cash income per year (Ngaga*et al.,* 2005). A similar study conducted to assess the contribution of non-timber forestry products to total household income in Zambia, revealed that the contribution of wild honey to total household income is 12% (Mulenga*et al.,* 2011).

2.8 Research Gap

Although there have been several empirical studies on the beekeeping subsector worldwide and Tanzania in particular but still several issues especially the viability of beekeeping enterprises as a decision criterion for investment are not well covered. For instance Mmasa (2007)conducted a study on economic analysis of honey production and marketing at Hai district in Kilimanjaro region of Tanzania. This study covered the realm of profitability of honey production, efficiency of honey marketing and role-played by various market participants and the contribution of beekeeping to household income. The situation is more or less similar to several other economic studies on the subsector. But, however, although this study bear some similarities to those other studies particularly that of Mwakatobe and Mlingwa of 2005 and that of Ngaga*et al.* (2005), yet it provides answers to one of fundamental economic questions on worthiness of investment in beekeeping ventures that seem to be not widely studied particularly in Tanzania.

CHAPTER THREE

3.0 METHODOLOGY

3.1 General Overview

This chapter explains the methods and techniques that were used in data collection, sources of data, type of data collected and techniques that were used in data analysis. Moreover, it presents the concepts that are related to this study. Therefore, it describes the conceptual framework, study area, sampling procedures used and states the main instruments used in data analysis and means of testing hypothesis.

3.2 Conceptual Framework

The conceptual framework is based on the sustainable livelihood framework. Figure2 conceptualizes beekeeping in Songeadistrict based on the sustainable livelihood framework. That is, beekeepers in Songea district are endowed with the livelihood assets which are: the natural capital comprising of bees, a place to keep them, water, sunshine, biodiversity and environmental resources.Human capital which includes skills and knowledge (Traditional). Also beekeepers are endowed with Physical capital which entails,tools, equipment, transport, roads and clean water whileSocial capital counts for help from families, friends and networks and membership of groups which provides a source labour for beekeepers in songea district. Financial capitalis the cash, savings and access to credit or grant as an important type of livelihood asset that finances the beekeeping venture.

The influence and access to these assets is dependent on age, education and sex while policies, institutions and processes particularly the 1998 beekeeping policy, beekeeping act number 15 0f 2002 and extension services are important especially to mitigate the

vulnerability context particularly the bush fire burning and unreliable markets so as to enhance beekeepers to adopt the beekeeping livelihood strategies in order to achieve the livelihood outcome.

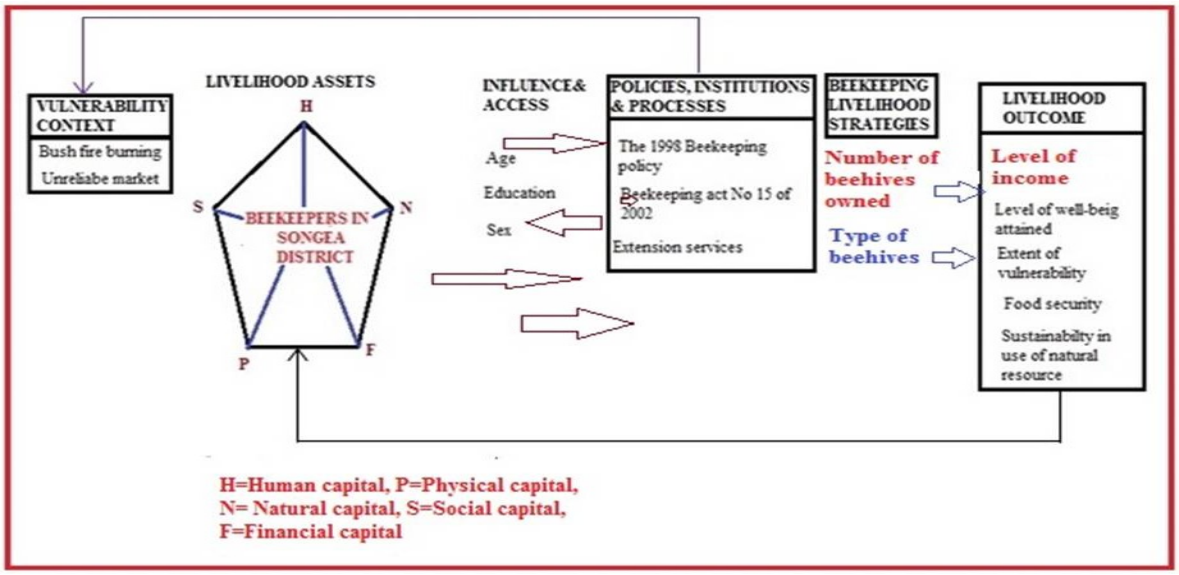

Figure 2: **Conceptual framework of creation of livelihood outcomes by beekeepers in Songeawithin the context of sustainable livelihood framework**

Source: Adapted from Anandajayasekeram*et al.* (2008).

3.3 Study Area

The study was conducted inSongearural district in Ruvuma region. Songea district was classified by Mwakatobe and Machumu (2011) as among the beekeeping unexploited areas within the country, therefore this study exposes the forgone benefits that has contribution to livelihoods.

3.3.1 Location

Songea district is situated in southern highlands part of Tanzania and located between the latitude 11^0 41` and $93^0$ 75` south and the longitude 35^0 10` and $36^0$ 45`. Songea District council is one of Ruvuma's six district councils, others being the Songea urban, Mbinga, Namtumbo, Tunduru and the newly established district council of Nyasa. According to the

2012 census, the districts have a population of 183,530 people (URT, 2013). The district occupies a total area of 16 727 km^2, accounting for 25% of the Ruvuma Region's total land area. The district shares borders with the Republic of Mozambique in Southern west, Mbinga District in the West, Namtumbo District in the East and Ulanga (Morogoro Region) and Njombe region in the North (URT, 2010). Figure 3 shows the map of Songea district with the villages of the study and its location in Ruvuma region within Tanzania mainland.

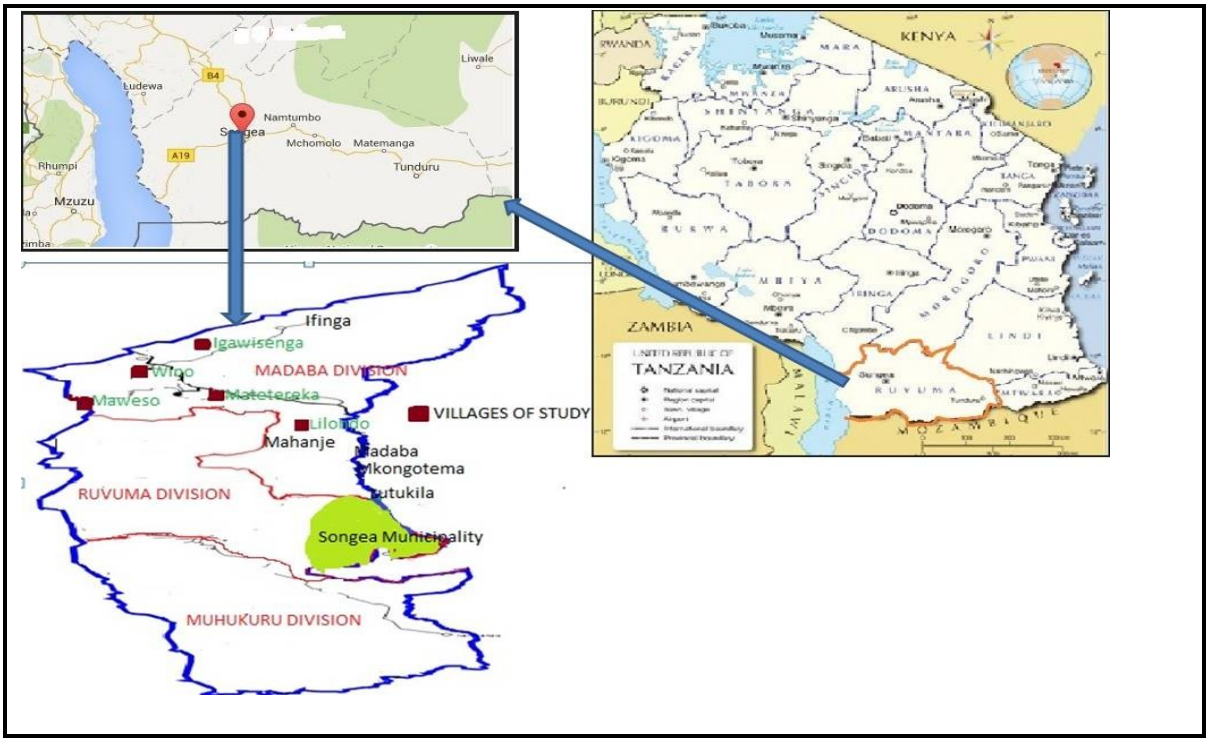

Figure 3: The Songea District showing villages of the study and its location in Ruvuma region within Tanzania mainland

Source: Google Map; www.mapsofworld.com/tanzania/

3.3.2 Climate

3.3.2.1 Temperature and humidity

The District has moderately mild temperatures averaging between 20^{o}C and 25^{o}C during day time while temperatures range twixt 15^{o}C and 17^{o}C during night especially in months

of June, July and August. The council experiences high humidity in the months of September, October and November.

3.3.2.2 Rainfall

The rate of rainfall, which Songea receives annually, is between 800mm and 1200mm. SongeaDistrict has only one rainy season (long rains) which is between November of the ending year to May of the year next.

3.3.3 Vegetation

The District vegetation consists of woodlands, bush land thicket, and grassland including the forest reserves which is dominated by Miombo Woodlands. These reserves include East Matogoro, Maposeni and Gumbiro which covers 1 000 000 hectors of land range. Also it includes the Selous National Park which is situated in the northern part of the district.

3.3.4 Economic activities

3.3.4.1 Agriculture

Agriculture is the main economic activity in the district. Out of 16 727km^2 district total area, 13 327.87 Km^2 (1 316 800 ha) are suitable for agriculture and livestock production but only 1 655.98 Km^2 (135 498.7ha) is currently covered for agricultural and livestock production which is equivalent to 9.9% of the total area while out of 183 530 people, only 79 634 people constitute a working age group of which 55 959 people is the population engaged in Agricultural activities. That is, 71% of the total working age population of Songea District Council engage in agriculture with very little animal husbandry though until now, the very traditional agriculture i.e. shifting cultivation with low yields makes the district agricultural characteristic however currently the council is introducing the use

of min tractors i.e. power tillers which is expected to improve the crop production. The crops grown in the district includes Maize, sunflower, sesame, Soya beans, cashew nuts, paddy, tobacco and coffee while the improvement of livestock for different Animal types is done by introducing dairy cattle breeds, Dairy goat breeds and other small stocks which has now increased the number of livestock in Songea District Council.

3.3.4.2 Trade

Business in Songea district council is being executed mainly by individuals and companies whom are associated with buying and selling agricultural produces mainly tobacco, maize, beans and groundnuts in some few parts of the district. Sometimes the market situations become so unfavorable to farmers. For example, for the financial year 2009/2010 business levels for maize and tobacco was much discouraging because the National Grain Reserve failed to buy maize by the quantity which was anticipated while the tobacco market was hit by down going price against the cost of its production.

Other sectors like mining are not well developed in Songea District council. This is attributed to lack of in-depth research on the type of mineralsfound in the district. However there are areas where individuals and other stakeholders involve in gemstones mining such as Muhukuru and Litisha ward.

3.4 Research Design, Sources and Types of Data

This was a cross sectional data research design study. A cross sectional data research design study involves the analysis of data collected from a population, or a representative subset of a population at one specific point in time (Olsen and George, 2004). Therefore, this study involved collecting primary and secondary data from sample households, sample village offices and the district forestry office. Moreover, in order to validate

data,key informants that included the district forestry officer, respective sample village agricultural extension officers, village leaders and focus group discussions that were formed in collaboration with the sample village leaders and respective village agricultural extension officers facilitated verification of data in the study area.

3.4.1 Key informants' selection and focus group discussion formation

Key informants were purposively selected where the village executive officer, village agricultural extension officer and two experienced beekeepers in each sample village were included. In each sample village, formation of FGD involved a purposive selection of ten (10) members who represented households where five (5) represented beekeepers households while five (5) represented non-beekeepers households.

3.4.2 Sampling procedures and sample size

This study used a multistage sampling technique where three stages were involved. In the first stage Songeadistrict was selected randomly from the list ofdistricts that constitute the beekeeping unexploited areas of Tanzania using simple random sampling method.In the second stage, five (5) villages out of 64 villages that constitute Songeadistrict were purposively selected based on where beekeeping is predominantly practiced within the district. The third stage was the selection of respondents where two sampling frames were obtained from each sample village office, that is, the list of households that participate in beekeeping and the list of non-beekeeping participant households. The proportionate stratified random sampling method was used to draw the sample from the two sampling frames. The classification of the two categories was based on the ownership of at least one beehive which is assumed as an important beekeeping production function unit to belong to the beekeeping participant category. Implementation of proportionate stratified

sampling requires establishing the sampling fraction where $r = \frac{n}{N}$ formula was used to determine the sampling fraction. That is, $r =$ Sampling fraction, $n =$ Sample size and $N =$ Sampling frame. A total of 120 sample households were proportionately selected for inclusion in the sample where 60 were representing the beekeeping participant households and other 60 representing the non-beekeeping participant households. This was adopted from Zewde (2011) who studied factors that affect development of beekeeping in rural areas in Ethiopia in 2011, where a sample of 60 traditional beekeepers and 60 improved beekeepers were sampled for the study. According to Israel (2003), using a sample size of a similar study to the one you plan is another approach of determining sample size provided that, a thorough review of the procedures employed in that study is done to avoid the risk of repeating errors that were made. The distribution of households and sampled households for each sample village involved in the study is shown in table 6

Table 6:Distribution of households and sampled households for each sample village involved in the study

Village	Non-beekeeping households	Sampling Fraction	Sample	Beekeeping households	Sampling Fraction	Sample
Matetereka	522	0.024	13	35	0.25	9
Wino	382	0.024	9	25	0.25	6
Maweso	555	0.024	13	58	0.25	15
Lilondo	801	0.024	20	45	0.25	19
Igawisenga	197	0.024	5	73	0.25	11
Total	**2457**		**60**	**236**		**60**

3.4.3 Data collection

Data for this study were obtained through primary and secondary data sources during field survey. Structured questionnaires were administered to respondents (Appendix 1) and

thediscussion guides (Appendix 3and4) were used to guide group discussions in focus group discussions for collection of primary data and validation of data obtained from secondary data sources (i.e. at the district forestry office and at each sample village).

Administered questionnaires comprised both close and open ended questions to capture qualitative and quantitative data for analysis to accomplish the objectives of the study. The questionnaires were administered by the researcher and one enumerator to each farmer using Swahili language. Farmers were interviewed by means of personal interview method. Individual farmers were interviewed in their homes or village offices after initial appointments through the village executive officer in collaboration with the village agricultural extension officer who introduced the researcher to all farmers to be interviewed. The objectives of the study were explained to each respondent which made them willing to cooperate. Majority of farmers showed positive response to questions asked.

3.5Data Analysis Tools and Analytical Methods

3.5.1 Data analysis tools

Statistical package for social science (SPSS) and Microsoft Excel were used for data analysis for this study. Responses from interviewed respondents were entered, summarized and analyzed.

3.5.2 Analytical methods

3.5.2.1 Objective 1: Income generated from beekeeping enterprises

Descriptive statistics method of analysis was used to characterize the income generated from beekeeping enterprises in the study area. Data on income that a household earn from sales of honey and beeswaxwere used to determine the mean income and percentages for

different grouped beekeepers where the distribution of income earned from beekeeping among beekeepers was determined.

3.5.2.2 Objective 2: The viability of a beekeeping enterprise

The net present value (NPV) as an investment decision criterion was used to determine whether periodic profits that accrue from beekeeping are worth justifying investment in beekeeping enterprises. According to Blas (2006), NPV method is used when a firm or an individual needs to decide whether to invest in a given venture or not. Therefore,based on current prices, primary data on stream of benefits less costs obtained from respondents(beekeeper) by using a structured questionnaire (Appendix 1 a) for six years were summarized and discounted in Microsoft excel computer software starting with year zero. A discount factor at an interest rate of 10% was chosen and used (Appendix 3) based on the interest rates paid by farmers in loans for agriculture (Koijen*et al.,* 2010).The decision of calculating NPV at the extreme of six years was reached as a result of all respondents whom were participants in beekeeping having a minimum of six years in their participation on beekeeping. Therefore, the lowest number of years the participant stayed in beekeeping was actually six. Data for analysis were drawn from 2009 to 2014 whereby the year 2009 was set as initial year of production that is year zero.

Secondary data were provided by the district forestry officer to supplement the primary data obtained from respondents. Benefits included income that a household earn from sales of honey and beeswax while the costs included the costs of buying the beehives or labour cost used by a traditional beekeepers in making the beehives, cost of bait plus the costs for transporting and installing the beehives to the site These data were analyzed using a Microsoft excel computational formula for NPV to obtain the result.

Discounted benefits less costs were computed using equation (1) below to obtain NPV.

$$NPV = \sum \frac{B_1 - C_1}{(1+i)^1} + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \frac{B_n - C_n}{(1+i)^n} \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

B – C = a periodic net cash inflow (benefits less costs)

i. e. B = Benefits

C = Costs

i = the target rate of return per period

3.5.2.3 Objective 3: The contribution of beekeeping on the smallholder farmer household income

(i) The contribution of beekeeping to livelihood in the study area was determined focused on the level of income a household earn from beekeeping. Therefore,the proportion of income earned by a household from beekeeping to the total household income was computed to determine the contribution of beekeeping to the total household income. The total income for beekeepers was computed from the data on income which a household earn from sales of honey and beeswax plus income earned from sales of the most commonly grown crops by almost all the households which mainly was maize, beans and groundnuts and the most commonly kept livestock by almost all the household which was chicken plus income earned from non-farm income sources in the study area.

(ii) In order to test whether the determined contribution of beekeeping to livelihood is significant, the two samples independent Z-test was used to test whether the mean household income for the beekeeping participant households is statistically different from the mean household income of the non-beekeeping participant households. Equation (2) is a computational formula for a Z-Test: Two samples for means.

$$Z = \frac{\bar{X}_1 - \bar{X}_2 - \Delta}{\sqrt{\frac{\delta_1^2}{n_1} + \frac{\delta_2^2}{n_2}}} \quad \text{..... (2)}$$

Where

$\bar{X}_1$ = Mean income for beekeeping participant households

$\bar{X}_2$ = Mean income for beekeeping non participant households

Δ = the hypothesized difference between the sample means

δ_1^2 And δ_2^2 = variances of the two samples

$n_1$and n_2 = the sizes of the two samples

The mean income for the beekeeping participant households was computed from the data on income which a household earn from sales of honey and beeswax plus income earned from sales of the most commonly grown crops by almost all the households in the study area mainly was maize, beans and groundnuts and the most commonly kept livestock by almost all the household which was chicken plus income earned from non-farm sources, while the mean income for the non-beekeeping participant households was computed from the data on income which a household earn from sales of the most commonly grown crops by almost all the households which like the former strata with exception of income earned from sales of honey and beeswax which was mainly maize, beans groundnuts and income from sales of the most commonly kept livestock which was chicken plus income from non-farm sources. This explained how the magnitude of the observed differences in income levels as a livelihood outcome between the two categories is contributed by beekeeping when adopted as a livelihood strategy.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the major findings of the study and their probable implication on economic and social welfare of small farmers in SongeaDistrict. Therefore this report shows the level of income that farmers generate from beekeeping enterprises, the worthiness of investing in beekeeping enterprises measured by the net present value, as an investment profitability decision criterion for a venture and the contribution of the beekeeping enterprises to livelihood measured by the proportion of income that beekeeping contribute to total household income and the statistical significance of the contribution is measured using the mean differences on household incomes between the beekeeping participant households and the non-beekeeping participant households in SongeaDistrict.

4.1.1 Demographicrespondents in the study area

The results show that, majority 96.7% of the respondents interviewed that participate in beekeeping were male and the remaining 3.3% were female as compared to 86.7% of the respondentsnon-beekeeping participant households interviewed who were male and the remaining 13.3% were female. 58% of respondents that representedbeekeeping participant households had ages above 50 years of age, 13% had age of between 41-50, 25% had age between 31-40 while the younger age of between 21-30 was only 3% as compared to non-beekeepers where the results shows that, 45.1% of respondents had ages above 50 years of age, 15.1% had age of between 41-50, 33.3% had age between 31-40 and the younger age of between 21-30 were 6.3%.

Education level as indicated in (Table 7) shows that 88.3% of the sampled beekeepers had attained primary education, 8.33% had attained secondary education, 3.33% didn't attend any formal education and none attained post-secondary education as compared to non-beekeepers where 83.3% of the sampled respondents had attained primary education, 13.3% had attained secondary education, 2% didn't attend any formal education and none attained post-secondary education.

Table 7: Socio-Economic characteristics of respondents

	Beekeepers		**Non-Beekeepers**	
Sex	**Frequency**	**%**	**Frequency**	**%**
Male	58	96.7	52	86.7
Female	2	3.3	8	13.3
Education level				
Never gone to school	2	3.33	2	3.33
Primary education	53	88.33	50	83.33
Secondary education	5	8.33	8	13.33
Marital status				
Married	54	90	53	88.3
Widow or widower	6	10	6	10
Age of respondents (Years)				
21-30	2	3.3	4	6.3
31-40	15	25	20	33.3
41-50	8	13.3	9	15.3
>50	35	58.3	27	45.1

4.1.2 Beekeeping activities

4.1.2.1 Number of beehives and type

The results in this study show that, about 38.3% of the respondents had between 1-20 beehives, 28.3% had between 21-40 beehives, 21.7% had between 41-60 beehives while only 1.7% had between 61-80 beehives and 5% had between 81-100% and 5% had above 100 beehives. The modenumber of beehives was 30 while about 95% of beekeepers use traditional cylindrical log hives while only 5% had improved box type beehives. This means that, majority of beekeepers in the study area have small number of beehives per

household and at large, knowledge of beekeepers in the study area is still rudimentary while suggesting that productivity per beehive and production per household will be low because traditional cylindrical log beehives are known for low productivity as compared to improved box beehives. However, this implies that indigenous technology on the subject matter exist in the study area thereby signaling that a potential exist that require improvement. This results is similar to the one obtained by Tijani*et al. (*2011) in Nigeria which reported that 56% of beekeepers in the study area had between 20 – 40 colonies. This study concluded that majority of the beekeepers in the study area were small scale farmers. Therefore, it can be deduced from these results that, beekeepers in songea district are small scale farmers. The distribution of number of beehives and type owned by the respondents is shown in Table 8.

Table 8: Distribution of number of beehives and type owned by the respondents

Number of beehives	**Frequency**	**Percentage**
1-20	23	38.3
21-40	17	28.3
41-60	13	21.7
61-80	1	1.7
81-100	3	5
>100	3	5
Total	**60**	**100.0**
Beehive type		
Traditional log type	57	95
Improved box type	3	5
Total	**60**	**100.0**

Plate 1 is a traditional cylindrical log beehives sited on a tree near water intake in Matetereka village while plate 2 is an improved box beehive hanged on a tree alongside the way to Maweso village in the study area

Plate1: Traditional cylindrical log beehives

Plate 2: **Improved box beehive**

4.1.2.3 Honey production

The results shows that, 73.3% of the respondents had an average harvest of honey of about between 1-60litres per year, 11.7% had between 61-100 liters per year while 15% had over 100 litres per year. This implies that, only few beekeepers harvest a substantial amount of honey in the study area. The overall average litres of honey harvested was 60.18 per household per year. Considering the averagenumber of beehives as reported in this study, it can be estimated that on average a beehive in the study area produces only 2 liters of honey per year which is far lower than that of improved box beehives which even though was owned by only five (5%) percent of the respondents but showed to have an average yield of 15 litres per beehive per year. Moreover, this is also far low when compared to the results of a similar study by Chazovachii*et al.*(2012) which reported an average of 20 litres per beehive per year. However this might have been made that much worse by the bush fire burning that is reported in this study and evidenced by the researcher (Plate 3) to be a serious problem militating against beekeeping by scaring away the bee colonies from the

hives or burning to ash the hives and the colony within in the study area. Table 9 shows the distribution of average harvest of honey in litres per household per year.

Table 9: Distribution of average harvest of honey per household per year

Household harvest of honey (Litres)	Frequency	Percentage
1-60	44	73.3
61-100	7	11.7
> 100	9	15
Total	**60**	**100**

Furthermore, the results show that, the total average annual honey production in the study area is 2548 litres which equals to about 4204kg or 4.2 tons of honey. This is far low compared to a similar study by (Mwakatobe and Mlingwa, 2005) within the study area which revealed that, the actual annual honey production in Songeadistrict was 50 tones which were still far low from the 6000tones estimated production potential. This therefore, implies that, beekeeping is drastically declining in the study area.

4.1.2.4 Beeswax processing

The findings shows that, of the respondents only 24.6% were processing beeswax for sell while the rest 75.4% were not processing beeswax for sell. This implies that, most beekeepers loose more revenue that could have been generated from processing and sales of beeswax. This exacerbates the low income that beekeeping contributes to total household income particularly in the study area. This might be an outcome of poor extension services and poor link to reliable markets as reported in this study. Table 10 shows the proportion of respondents who process beeswax to those who do not.

Table 10: Proportion of respondents who process beeswax to those who do not

Processing beeswax	Frequency	Percentage
No	46	75.4
Yes	14	24.6
Total	**60**	**100**

4.1.2.5 Problems facing beekeeping subsector in the study area

During the survey, key informant focus group discussion output and respondents, reported three main problems that beekeepers are facing in the study area. Bush fire burning was reported and ranked the most serious problem that leads to zero harvest to most beekeeper in some years. Lack of link to reliable markets was reported and ranked the second problem. They said, in order to sell their honey, they only have one buyer of their honey who buys and sell honey at Igawisenga village roadside market alongside Songea to Dar es salaam highway which imply that the price they receive is low due to lack of competition.

Lack of extension services was reported and ranked the third problem during the study, thus they said, the skills that they apply is mostly inherited from their ancestors though rarely they are visited by a bee officer from the district forestry office. They said “we never had a bee extension officer at the village or ward level”.

Figure 4 shows the problems that beekeepers face in the study area with their respective ranks, plate 3 shows the burnt jungle with the survived log beehive sited on the tree in Matetereka village while plate 4 shows the roadside honey market at Igawisenga village along Songea to Dar es Salaam highway.

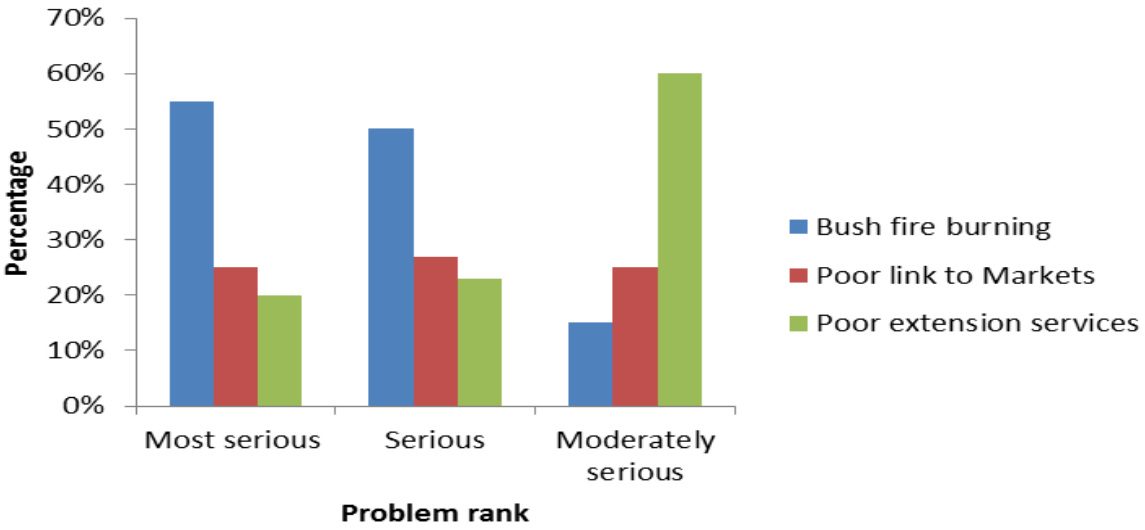

Figure 4: Ranks of problems facing beekeepers in Songea district

Plate 3: Fire effect in matetereka village

Plate 4: Honey market at Igawisenga village

4.2 Income Generation from Beekeeping Enterprises

To determine the income generated from beekeeping enterprises in the study area, data on income that a household earn from sales of honey and beeswax were used.The findings show that, 44.3% of beekeeping participant household had income generated from sales of honey and beeswax of between TZS.101 000-500 000 per household per year, 27.9% had an income between TZS. 26 000-100 000 while 16.4% had an income of over TZS. 500 000 and 11.5% had an income of between TZS. 0-25 000 per household per year. The average income was TZS 342 474. This is about similar to the results of a similar study by

Chazovachii*et al.*(2012) in Zimbabwe which reported an average income from beekeeping of USD 180 which is equivalent to TZS 360 000.It means that, a beekeeper earns only TZS 28 539 per month from beekeeping which is about a quarter of a minimum wage paid in private sector for agricultural services. According to URT (2013), the minimum wage paid in private sector for agricultural services is TZS 100 000.This suggests the income generated from the venture is lower than one would expect.Figure 5 is a graphical presentation of this fact.

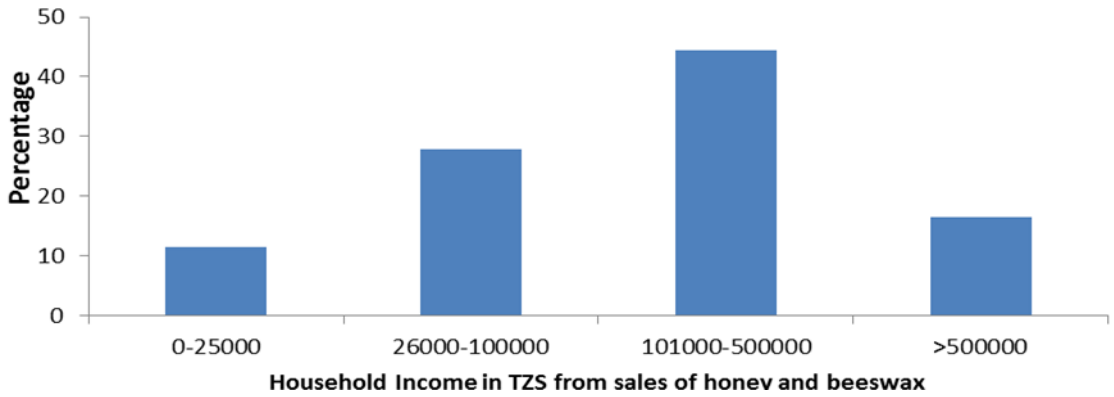

Figure 5: Household income from sales of honey and beeswax

4.3The Net Present Value Measure for Household Investment Worthiness on Beekeeping Enterprises in the Study Area

To determine whether it is viable for a household to invest in beekeeping enterprise, a net present value was computed based on the current prices of inputs mainly beehives and other variable costs such as labour and the output mainly honey and beeswax. The computational cost of beehives was based on thirty (30) traditional log beehives because the mode of beehives owned by respondents was thirty (30) and was used instead of the mean due to the skewedness of data as traditional log beehives were used by 95% of beekeepers. The findings then show that, the net present value was TZS.272 828, which is positive, implying that though beekeepers knowledge is still rudimentary with 95% using

traditional log beehives i.e. old technology and only 24.6% do process beeswax and despite the low income generated, still it is worth investing in the beekeeping venture in the study area.This is because the cost of making a traditional log beehive is at only TZS 5000 which can be paid back by the sale of only one litre of honey at the first harvest. Table 11 shows the net cash flow values in TZS with their respective present values (discounted values) for six years starting with year zero that were used to determine NPV in this study.

Table 11: Net cash flows, present values and NPV

Year	Net cash flow (TZS)	Present value (TZS)
0	(225 503)	(225 503)
1	46 636.44	42 396.76
2	46 878.33	38 742.42
3	180 478.3	135 596.02
4	179 201.7	122 397.17
5	253 170	157 198.65
NPV		**272 828.03**

4.4Contribution of Beekeeping Enterprises to Household Income

Findings in this study show that, beekeeping contributes 11% of the total household income in the study area. These findings are about similar to the findings by Mulenga*et al.*(2011) that studied the contribution of non-timber forestry products to total household income in Zambia and revealed that the contribution of wild honey to total household income is 12% but it is less than a half to another similar study by Ngaga*et al.*(2005) which studied the contribution of beekeeping to household income in the southern highlands and southern parts of Tanzania and revealed that beekeeping contributes 27.4% of a beekeeper's total cash income per year. These imply that, the contribution of beekeeping enterprises to livelihood in the study area is still meagre. This might be caused by low honey production per household per year and the loss of revenue due to not

processing beeswax as reported in this study. Figure 6 provides a picture for these findings.

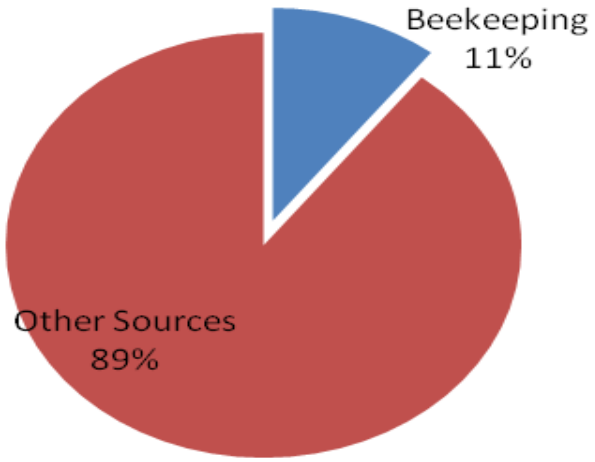

Figure 6: Proportion of income from beekeeping to total household income

To test for the hypothesis that, there is no difference in the mean household income between the households with beekeeping enterprises and those households without, data for average household income for both of the household categories were subjected to a two sample for means Z-Test (Table 16) and by so determining the statistical significance of the contribution of beekeeping enterprises to household income in the study area. The total income for beekeepers was computed from the data on income which a household earn from sales of honey and beeswax plus income earned from sales of the most commonly grown crops by almost all the households which mainly was maize, beans and groundnuts and the most commonly kept livestock by almost all the household which was chicken plus income earned from non-farm income sources in the study area while the total income for non-beekeepers was computed from data on income which a household earn from sales of the most commonly grown crops by almost all the households which mainly was maize, beans and groundnuts and the most commonly kept livestock by almost all the household which was chicken plus income earned from non-farm income sources.

The results shows that, z-calculated value (0.181) was less than z-critical value (1.644) also p-value (0.428) was insignificant and therefore the hypothesis was not rejected implying that the contribution of beekeeping to household income in the study area is not significant. This might be aggravated by the fact that, beekeepers knowledge in the study area is still rudimentary with 95% (Table 12) using traditional log beehives which are known for low productivity,bush fire burning that was reported to be the most serious problem that leads to zero harvest to most beekeeper in some years (Plate 3), small number of beehives per household (Table 11) which is implied to the amount of honey harvest in figure 4 and the average income earned from sales of honey and beeswax and furthermore, lack of link to stable markets which implies to uncompetitive pricing of honey as an outcome of a reliance to a sole roadside market located at Igawisenga village alongside Songea to Dar es salaam highway (plate 4). Table 12 shows the results of a two sample for means Z-Test.

Table 12: Z-Test: Two Sample for Means

	Average income for beekeeping participant households	**Average income for non-beekeeping participant households**
Mean	2491015.917	2374629.183
Known variance	1.86897×10^{13}	5.99165×10^{12}
Observations	60	60
Hypothesized mean difference	0	
Z	0.18	
P(Z<=z) one tail	0.42	
z Critical one-tail	1.64	
P(Z<=z) two-tail	0.87	
z Critical two-tail	1.96	

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study determined the economic performance of beekeeping enterprises and their contribution to livelihood. It focused on the level of a household income earned from beekeeping enterprises and the contribution to total household income in Songea district. Specifically the study determined the level of income generated from beekeeping enterprises, measuring the viability of these enterprises, determining the contribution of beekeeping enterprises to household income as a livelihood outcome and testing for significance of this contribution in the study area.

Based on the findings of this study, it can be concluded that, the income level generation from beekeeping is too low. The NPV obtained was (TZS 272 828.03) which is positive that suggest worthiness of investment in beekeeping venture. The realized contribution of beekeeping to livelihood (11%) based on the proportion of income generated from beekeeping to other household sources of income is meagre that led to an insignificant contribution result. This is caused by 95% of beekeepers use traditional cylindrical log hives which are known for low productivity against only 5% who use improved box type beehives which suggests that improved technologies with higher productivity are not yet adopted in the study area. Moreover the two severe classified problems of bush fire burning and poor link to market probably worsens the performance of beekeeping enterprises in the study area.

Therefore, based on the implication of the findings of this study it can further be concluded that, despite the shortcomings so realized, still beekeeping in the study area has a potential of contributing to livelihood improvement through income generation to the

beekeepers and the government, creating employment to the community and improving biodiversity if all the shortcomings are well addressed. It is the duty and responsibility of the government and any other development stakeholder to support community to utilize this potential to improve livelihood.

5.1 Recommendations

Based on the findings that conclude this study, to address the shortcomings so observed, this study recommends that, government and other development stakeholders facilitation is required to link rural based beekeepers to formal national and international markets in order to create incentives for beekeepers to seek for improved beekeeping technologies that will boost up their production levels and hence the income a household earn from beekeeping venture. Areas to be addressed are;(i) increased use of improved box beehives and increased productivity (ii) reduced bush fire incidences (iii) increased market outlets and (iv) strengthened extension services.

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APPENDICES

Appendix 1: Questionnaire

SOKOINE UNIVERSITY OF AGRICULTURE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSNESS

CONTRIBUTION OF BEEKEEPING ENTERPRISES TO LIVELIHOODS IN SONGEA DISTRICT

Respondents' questionnaire

i) Questionnaire Introduction

Name of the interviewer……Name of respondent……

Village……Ward……Division……Date……

I. RESPONDENTS GENERAL INFORMATION

Name of the respondent…….

1.0 Social characteristics of the respondent

1.**1.1 Age { [Tick]**	21-30 =1[ ]	31-40 =2 [ ]	41-50 =3 [ ]	>51 =4[ ]	**1.2 Sex [Tick]**	*Male* = 1 [ ]			
						Female = 2 [ ]			
1.3 Marital status [Tick]	Married	Single	Divorced	Widowed	**1.4 Education level [Tick]**	No formal	Primary	Secondary	Post-secondary
	=1 [ ]	=2 [ ]	=3 [ ]	=4 [ ]		=1 [ ]	=2 [ ]	= 3 [ ]	=4 [ ]
1.5 OCCUPATION [Tick]		Farmer = 1 [ ]		Employed =2 [ ]		Business =3 [ ]		Other[Specify] =4 [ ]	

2.0 Is beekeeping one of the enterprises your household has? YES/NO [YES =1 NO=2][ ]

If YES continue with the section A. below, if NO go to section B

A. A RESPONDENT BEEKEEPING ENTERPRISE AND OTHER ENTERPRISES INFORMATION

3.0 Beekeeping enterprise information

3.1 In which year did you start keeping bees……

3.2 How many beehives did you start with [Traditional /Improved]

3.2.1 Traditional log hives……

3.2.2 Improved box hives……..

3.3 How much did it costs were involved to start beekeeping

(a) Traditional log hives

Making/buying (TZs)	**Transporting (TZs)**	**Baiting (TZs)**	**Installing (TZs)**	**Follow up (TZs)**	**Harvesting (TZs)**	**Others (Mention) (TZs)**	**Total (TZs)**

(b) Improved box hives

Making/buying (TZs)	**Transporting (TZs)**	**Baiting (TZs)**	**Installing (TZs)**	**Follow up (TZs)**	**Harvesting (TZs)**	**Others (Mention) (TZs)**	**Total (TZs)**

3.4 How many beehives do you have now [Traditional /Improved]

3.4.1 Traditional log hives……

3.4.2 Improved box hives……..

3.5 How much costs were involved for the current expansion

(a) Traditional log hives

3.5(a) 1.Making/buying (TZs)	**3.5(a) 2 Transporting (TZs)**	**3.5(a)3 Baiting (TZs)**	**3.5(a)4 Installing (TZs)**	**3.5(a)5 Follow up (TZs)**	**3.5(a)6 Harvesting (TZs)**	**3.5(a)7 Others (Mention) (TZs)**	**3.5(a)8 Total (TZs)**

(b) Improved box hives

3.5(b)1 Making/buying (TZs)	**3.5(b)2 Transporting (TZs)**	**3.5(b)3 Baiting (TZs)**	**3.5(b)4 Installing (TZs)**	**3.5(b)5 Follow up (TZs)**	**3.5(b)6 Harvesting (TZs)**	**3.5(b)7 Others (Mention) (TZs)**	**3.5(b)8 Total (TZs)**

4.0 BEEKEEPERS HONEY HARVEST AND INCOME FROM BEEKEEPING [Fill the quantity in litres for each year for honey and kilograms for beeswax]

4.1 How much honey did you harvest in the year you started……

Can you remember how much honey you harvested the next two years **[YES=1, NO=2] [ ] If yes;**

4.1.1 What was the harvest in the next year after the first year……

4.1.2 What was the harvest in the next second year …….....

4.2 What was the price of honey per litre……

4.3 Did you process beeswax? **[YES=1, NO=2] [ ] If yes;**

4.3.1 How much bees wax did you get **[kg]**……

4.3.2 What was the price of bees wax per kg……

4.4 How much honey did you harvest last year [2014] ……

4.5 Can you remember how much honey did you harvest in two previous years before last year? **[YES=1, NO=2] [ ] If yes;**

4.5.1 The previous first year [2013] …….

4.5.2 The previous second year [2012] ……

4.6 What was the price……

4.7 Did you process beeswax? **[YES=1, NO=2] [ ] If yes;**

4.7.1 How much bees wax did you get (kg)……

4.7.2 What was the price of bees wax per kg……

5.0 PROBLEMS MILITATING AGAINST BEEKEEPING

5.1 List any three (3) problems that militate against your beekeeping activities

(A)……

(B)…….

(C) ……

5.2 Rank these problems based on intense of severity [**Most serious =1, Serious =2, Moderately serious =3]**

6.0 OTHER SOURCES OF INCOME AND THE RESPECTIVE AMOUNTS FROM EACH SOURCE.

a) Sales of crops

Year	2012				2013				2014			
crop	Qty (bags)	Stored food	Price per bag	Value Tshs	Qty (bags)	Stored food	Price per bag	Value Tshs	Qty (bags)	Stored food	Price per bag	Value Tshs
Maize												
Beans												
Groundnuts												
Farm renting												
Banana												
Oranges												
Soya beans												
simsim												
Timber/ polls												
Bamboo juice												

b) Livestock and livestock product sales

Year	2012			2013			2014		
Type of livestock/product	Number/ Qty (kg)	Price/unit (Tsh)	Total (Tsh)	Number/ Qty(kg)	Price/unit (Tsh)	Total (Tsh)	Number/ Qty (kg)	Price/unit (Tsh)	Total (Tsh)
cattle									
Pigs									
Chicken									
Goats									
meat									
milk									
Eggs									
Other(mention)									

c) Non-farm income sources

Year / Source	2013		2014	
	Quantity	Value (Tsh)	Quantity	Value (Tsh)
carpentry				
charcoal				
Mats making				
Baskets/makapu				
Tools handles				
Motorcycle hire				
Kiosk/shop				
Cooked food				
Tailoring				
Buying and selling crops				
Wages from labour sales				
Radio repair				
remittances				
Any other(mention)				

B. SOURCES OF INCOME AND THE RESPECTIVE AMOUNTS FROM EACH SOURCE FOR NON-BEEKEEPING PARTICIPANT HOUSEHOLD.

a) Sales of crops

Year	2012				2013				2014			
crop	Qty (bags)	Stored food	Price per bag	Value Tshs	Qty (bags)	Stored food	Price per bag	Value Tshs	Qty (bags)	Stored food	Price per bag	Value Tshs
Maize												
Beans												
Groundnuts												
Farm renting												
Banana												
Oranges												
Soya beans												
simsim												
Timber/ polls												
Bamboo juice												

b) Livestock and livestock product sales

Year	2012			2013			2014		
Type of livestock/product	Number/ Qty(kg)	Price/unit (Tsh)	Total (Tsh)	Number/ Qty(kg)	Price/unit (Tsh)	Total (Tsh)	Number/ Qty(kg)	Price/unit (Tsh)	Total (Tsh)
cattle									
Pigs									
Chicken									
Goats									
meat									
milk									
Eggs									
Other(mention)									

c) Non-farm income sources

Year / Source	2013		2014	
	Quantity	Value (Tsh)	Quantity	Value (Tsh)
carpentry				
charcoal				
Mats making				
Baskets/makapu				
Tools handles				
Motorcycle hire				
Kiosk/shop				
Cooked food				
Tailoring				
Buying and selling crops				
Wages from labour sales				
Radio repair				
remittances				
Any other(mention)				

Appendix 2: Questionnaire

SOKOINE UNIVERSITY OF AGRICULTURE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS

CONTRIBUTION OF BEEKEEPING ENTERPRISES TO LIVELIHOODS IN SONGEA DISTRICT

Village information

[To be filled by the village executive office]

1.0 Name of the village ……..

2.0 Name of the village executive officer…….

3.0 Hamlets, households and households participating in beekeeping

3.1 Name of the hamlet	**3.2 Total number of households**	**3.3 beekeeping-participant households [To be filled from a summary of a focus group discussion]**
TOTAL		

Total number of hamlets……..

Total number of households……

Total number of beekeeping participant household…….

Appendix 3: Focus group consent

SOKOINE UNIVERSITY OF AGRICULTURE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSNESS

CONSENT FORM

Title of the research: **CONTRIBUTION OF BEEKEEPING ENTERPRISES TO LIVELIHOODS IN SONGEA DISTRICT**

Name of Researcher: **MSALILWA GODSON LUNYAMADZO.**

Please tick all boxes

1. I confirm that I have read and understand the information sheet dated **28/3/2015** for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my legal rights being affected. ☐
3. I understand that relevant sections of my discussion notes and data collected during the study may be looked at by individuals from **SOKOINE UNIVERSITY OF AGRICULTURE** where it is relevant to my taking part in this research. ☐
4. I agree to take part in the above study. ☐

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Name of Person taking consent.	Date	Signature

Appendix 4: Focus group discussion guide

SOKOINE UNIVERSITY OF AGRICULTURE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSNESS

BEEKEEPING ENTERPRISES AND LIVELIHOOD IN SONGEA DISTRICT

Focus Group Discussion Guide

Introduction:

1. Welcome ladies and gentlemen

My name is Godson Msalilwa, a researcher/student from sokoine university of Agriculture and with me I am accompanied with MrYombage who will assist me in taking notes. As we continue, may every one of us please feel in the Sign-In Sheet that is passing around which will demands you to give some few of your personal details.

Review of the topics of our discussion:

- As we have introduced ourselves that we are researcher we are here with you and trying to trying to seek your understanding about beekeeping activities in your village.
- The information we get will help us to understand the current performance of beekeeping, the extent of involvement by the community in the beekeeping venture, problems that you are encountering in your endeavor and the contribution that is made by beekeeping to livelihood in your village
- So we asked you to participate because we believe that you are the ones that have the understanding about this subject in this village.

2. Explanation of the process

Before we proceed may we know please if there is anyone among us has participated in a focus group before. Sorry I am asking so because focus groups are being used more and more often in research of this kind, I hope your experience will benefit our discussion today.

- We will learn from you both your success and the constraints your encountering on your beekeeping activities.
- However even at times it might happen that we do not achieve consensus, but will have achieved gathering information
- By virtue in long lists: we will rank for priorities
- In this research, we are doing both questionnaires and focus group discussions. The reason for using both of these tools is that we can get more in-depth information from a smaller group of people in focus groups. This allows us to understand the context behind the answers given in the written survey and helps us explore topics in more detail than we can do in a written survey.

Appendix 5:NPV computation

YEAR 0 YEAR 1 YEAR 2 YEAR 3

$$NPV = \frac{324325-547828}{(1+0.1)^{0}} + \frac{375961.44-329325}{(1+0.1)^{1}} + \frac{371203.33-324325}{(1+0.1)^{2}} + \frac{324478.3-144000}{(1+0.1)^{3}} +$$

YEAR 4 YEAR 5

$$\frac{324754.7-146552}{(1+0.1)^{4}} + \frac{400222-147052}{(1+0.1)^{5}}$$

$$NPV = (225503) + 42396.764 + 3874.242 + 135596.018 + 122397.1725 + 15719.865$$

$$NPV = 27282.803$$