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Socio-Economic Factors influencing Apiculture in the Eastern Cape Province, South Africa

by

Luntulwandile Peter

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Supervisor: Prof. B.J. Bester

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DECLARATION

I declare that this thesis is my own work and that all sources used for this thesis have been duly acknowledged. This thesis is submitted in fulfilment of the requirements for the MSc Agric in Agricultural Economics at Fort Hare University and will be made available to borrowers at the University's library, under the rules of the library.

I solemnly declare that this thesis has not been submitted to any other institution anywhere for the award of any academic degree, diploma or certificate. No part of this work/thesis may be quoted unless it is properly acknowledged as the source.

14 December 2015

L. Peter Date

DEDICATION

This piece of work is dedicated to my wife, Pheliswa Constance Halu-halu, and my lovely son, Batembu Jr Peter. It was my wife who encouraged me to re-register for my Master's programme in 2012 and she played a major role in motivating and supporting me. It was her encouraging words that made me persevere after I first registered for the programme in 2008 and quit the same year.

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ABSTRACT

The aim of this study was to assess socio-economic factors influencing apiculture in the Eastern Cape Province. In addition, production costs and profitability of beekeeping were determined, and opportunities and challenges to beekeeping were identified.

The data was generated from 58 individual interviews using pre-tested structured questionnaires and checklists. This was supplemented by secondary data collected from different published and unpublished sources. Gross margin analysis was employed to examine the income contribution of honey production to household income, and a Linear Regression Model was used to identify the determinants of honey production. Of the twelve variables included in the regression model, only six were found to be statistically significant. These were gender of the beekeeper, access to credit, availability of labour, price of honey, distance to the market, and number of bee colonies owned.

On average, each beekeeper owned and operated 35 bee colonies, with an average production of 9 kg of honey per colony per annum; the latter is well beyond a potential production of 35 kg per colony per annum. Beekeeping contributed an average of R12 231.80 per beekeeping household per annum. Except for the honey, no other bee products were produced and marketed. The beekeepers could access the market (retailers and consumers) readily and efficiently; the latter having been determined through calculation and analysing marketing margins.

The major constraints to production identified and prioritised by beekeepers in the study area were drought, pests and insects, the shortage of bee forage, and the lack of adequate beekeeping skills. Based on the study results, interventions required to raise the marketable supply of honey produce are recommended.

***Keywords**: Socio-economic, Apiculture, Beekeeping, Profitability, Gross Margin, Honey, Colonies, Rural Households.*

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LIST OF ACRONYMS

BCM	Buffalo City Municipality
BLUE	Best Linear Unbiased Estimator
CC	Contingency Coefficient
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism
DRDAR	Department of Rural Development and Agrarian Reform
DRDLR	Department of Rural Development and Land Reform
ECDC	Eastern Cape Development Corporation
ECHOPA	Eastern Cape Honey Producers Association
EPOPA	Export Promotion of Organic Products from Africa
EU	European Union
FAO	Food and Agriculture Organization
ITC	International Trade Centre
Kg	Kilogram(s)
NMMM	Nelson Mandela Metropolitan Municipality
POSA	Pollination Service Association
RD	Rural Development
SABA	South African Beekeepers Association
SABIO	South African Bee Industry Organisation
SABS	South African Bearer of Standards
SAPS	South African Police Services
SPSS	Statistical Package for Social Sciences
SSA	Statistics South Africa
UN	United Nations

DEFINITION OF TERMS

Apiary: Bee colonies, hives and other equipment assembled in one location for beekeeping operations

Bee venom: Poison secreted by special glands attached to the bee stinger

Beeswax: A complex mixture of organic compounds secreted by special glands of the worker bee's abdomen, used for building the comb

Colony: A social community of several thousand of worker bees, usually comprising a queen and a few drones

Beehive: A man-made structure for housing bees, especially honeybees, or a container in which bees build their nest

Honey: Natural sweet substance produced by honeybees from the nectar of flowers, from secretions of living parts of plants, or from the excretions of plant-sucking insects

Pollination: Transfer of pollen from the anther (male part) to the stigma (female part) of flowers

Pollinator: An agent that helps transfer pollen, thus enabling pollination

Propolis: Sap or resinous substance collected from trees or plants by bees and used as a cement or sealant in the construction of their combs; also called bee glue

Pollen: Male reproductive cell bodies produced by flower anthers and collected and used by honeybees as a source of protein

Royal: A highly nutritious jelly-like glandular secretion from young worker bees, used to feed the queen and young brood

Comb: Mass of hexagonal wax cells built by honey bees in nests to contain larvae and stores of honey and pollen

CHAPTER ONE:
INTRODUCTION

1.1. The definition of apiculture

Apiculture is also known as beekeeping. According to Cadwallader *et al.* (2011), it is the art of raising and harvesting bees for the purpose of collecting honey and other beekeeping products such as bees wax. Scientifically, the honeybee belongs to the genus *Apis* which, in Latin, means "bee". The prefix "api" is often used in beekeeping terms such as "apiarist", a beekeeper or honey farmer; "apiary", a location of bee hives; "apiculture", the cultivation or farming with bees; and "apitherapy", the use of bee products for health purposes (Kapil, 1971). The official common name for *Apismellifera,* as approved by the common names committee of the Entomological Society of America, is the "honey bee". Other English names include "honeybee" (without a space), "Western honey bee", and "Eastern honey bee" (Lindauer, 1957).

A bee lives in a colony of several thousand bees and belongs to the order Hymenoptera, family Apidae, and subfamily Apinae (Lindauer 1957). There are other honey bee species which are not popular in South Africa and in Africa like *Apiscerana* Fabricius, also known as *Apis* (*cerana*) *indica,* which is native to Asia. This species is also cultivated for honey and pollination. Two other species in the genus *Apis* are native to Southern Asia but cannot be cultivated. These species, *Apisdorsata* Fabricius, the giant or rock bee and *Apisflorea* Fabricius, the little or dwarf bee, build only single comb nests with minimal amounts of harvestable honey (Lindauer, 1957). Throughout the remainder of this study, the common name "honeybee" or "bee" is used with reference to *Apismellifera,* unless otherwise specified.

1.2. General background to the study

Recorded European evidence of traditional apiculture in Southern Africa dates back to 1594 in Angola, when David Livingstone noted the presence of log and bark hives in the upper Zambezi area in 1854 (Clauss, 1992). The relevance of this form of economic activity today is evidenced by statistics from a single district, Babati, in Tanzania, where some 6 000 bee colonies produce a total of 60 000 - 90 000 kilograms (kg) of honey per annum, with a value equivalent to US$11 000 - $17 000 (Wakjira, 2010).

In South Africa, apart from robbing wild nests, there is no indication that there were any indigenous apicultural activities before the European settlement. The reason could be that there was no suitable indigenous vegetation from which to produce reliable nectar flows and also because there were no trees suitable for making bark hives (Johannsmeier, 2001a). According to Anderson (1985), domestication of honeybees began during the earlier stages of European settlement. Only when the fruit industry started to develop in the Western Cape, the need emerged to use domesticated honeybees for pollination.

During the Anglo-Boer War (1899-1902) and the depression years of the 1930s, people used honey as a survival food, again mainly by robbing wild nests. Where colonies were kept in hives, prevailing conditions necessitated the use of available materials such as the wooden boxes in which paraffin containers were transported. Modern or commercial beekeeping or apiculture started only when the first Langstroth hives were imported from England and the first association of beekeepers was founded in 1907 in Johannesburg, namely the South African Beekeepers Association (SABA) (Johannsmeier, 2001b). In 1909, the beekeepers in Natal followed suit and in 1927 the Natal Honey Producers Co-operative was formed. Various associations were formed thereafter, of which the Pollination Service Association (POSA), formed in 1984, is well known.

During the 1970s, the honey industry boomed. Honey was exported and honey prices climbed. The main source of nectar was from saligna (Eucalyptus saligna) gum plantations. But this boom was followed by the arrival of droughts, acid rain, young trees (that did not have as many flowers as older established trees) and nectar flies (Drosophila Flavohirta Malloch), that made the nectar unacceptable for honeybees, all of which had negative impacts on the industry (Johannsmeier, 2001a).

However, the economic marginalisation and frequent failure of past development interventions encouraged local communities in rural areas of the Africa continent to secure economic survival and focus on indigenous knowledge and self-reliance strategies (Russouw, 2002; Schehle, 2011). The academic and policy attention that is increasingly being paid to these considerations represents a fundamental shift in development of, and a concentrated response to, the perceived negative effects of structural adjustment programmes in rural Africa (Shackleton, 2004).

According to Russouw (2002), these issues have resulted in the introduction of indigenous apiculture in the rural areas of the countries that make up the Southern African Development Community. As stated by Allsopp, De Lange & Veldtman (2008a), the migratory beekeeping (i.e. the large scale movement of hives) also developed as part of the apicultural industry to keep up with the demand for pollination services and honey production. Hence, with reference to Stubbs (2010), this has led to the commercialisation of beekeeping, the development of the whole apiculture industry and the exploration of market opportunities, and it has induced a change of government policies and programmes to focus on new enterprise developments, such as apiculture.

Apiculture is an ecologically and technically appropriate form of income generation for communities in some of the most economically and environmentally poor areas of Africa. Its role in promoting economic self-reliance and the need to enhance this role were identified in the important Banjul Bee Declaration of 1991 (Bees for Development, 2009). Although beekeeping can rarely become the sole source of income and livelihood for people in developing countries, its role as a source of supplementary earnings, food and employment should not be underestimated. Key points in the argument that beekeeping is an important element in promoting rural self-reliance are the following:

- Beekeeping promotes rural diversification and hence is an alternative source of income and employment, particularly in areas where arable land is restricted and demographic growth is resulting in insufficiently profitable landholdings (Allsopp *et al.*, 2008a);

- Beekeeping is a farming activity that has successfully been adopted by women in many parts of the African continent (Claus, 1992);
- Beekeeping also allows for a degree of risk avoidance by providing a reliable, high-value product that enables rural farmers to survive in times of economic crisis. This is particularly true of beeswax, which can be stored indefinitely (Apiservices, 2007); and
- Beekeeping clearly is a low-cost, sustainable undertaking with a low environmental impact. The spin-off of enhanced plant pollination is an invaluable one (Apiservices, 2007).

Although honey is not a primary source of food, it can be used as a dietary supplement (Department of Health, 2004). In addition, its cultural significance should not be ignored (*Ibid.*).

Apiculture is a resource-efficient, low-cost, low labour-intensive enterprise and does not require a lot of land and sophisticated inputs. This makes it viable for women, youth and other disadvantaged groups – the category of society least likely to access production territory. Across Africa, women are actively involved in beekeeping and the processing of bee products: honey, beeswax (candle-making, etc.), while the youth is involved in beekeeping, making beekeeping equipment and vending honey (Bees for Development, 2011).

1.3. The statement of the problem

Despite the potential significance of beekeeping as a poverty alleviation agent for rural communities, it has largely failed in South Africa, even though over R100 million has been injected into small-scale and emerging beekeeping projects since 1994 (the advent of inclusive democracy in South Africa) by the South African government and other corporate CSI funders (Engelbrecht, 2010). Over 2 000 people have received training and equipment in the past 20 years (as from 1994 to date), and yet there is not one sustainable project or individual that has been retained from this “immense and total waste of money”, as Schehle (2011) put it.

For example, according to Steenhuisen's (2011) political statement, the provincial beekeeping project set up by KwaZulu-Natal's Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) was aimed at positioning the province as a key producer of honey. However, it has been described as a failure, with only R7 710 generated in revenue by 97 beekeepers in 2011, despite the provincial government having invested almost R2 million into establishing the scheme (*Ibid.*).

Numerous in-depth studies in southern Africa and abroad have recommended beekeeping as an excellent vehicle for rural poverty alleviation in developing countries (Debissa, 2007). The reason for this recommendation is that sustainable beekeeping has a minimum environmental impact and strong positive environmental, agricultural and social benefits (Lundall-Magnuson, 2011). Tanzania, Angola, Ethiopia and Zambia have seen thousands of small-scale farmers coming out of poverty through beekeeping (Bees for Development, 2011). Section 7 investigation (2008) mentioned that South Africa produces up to 1 500 tons of honey annually, but consumes twice this amount (3 000 tons) and therefore has to import the balance. By contrast, Ethiopia exports over 40 000 tons of honey every year, while Tanzania and Angola produce around 25 000 tons each.

Regardless of the significance of beekeeping, there is little or no empirical evidence on the potential and actual contribution of beekeeping to the income generation and forest management in South Africa and, for this study, in the Eastern Cape Province in particular. In addition, there is currently limited information available on the challenges and constraints faced by beekeeping in the honeybee subsector.

1.4. Objective of the study

The overall objective of this study was to examine the socio-economic factors influencing the economic performance of apiculture in the Eastern Cape Province. The study examined the income and cost structure of the beekeeping enterprise and analysed the determinants of honey production. The study further explored the constraints hindering the development and growth of small and emerging beekeepers in the rural areas of the Eastern Cape Province. In doing that, the potential impact of rural development projects (specifically beekeeping projects) on improving rural livelihoods or living standards was examined.

The overall objective was broken down into four specific objectives, as follows:

1) To examine the socio-economic characteristics of beekeepers in the Eastern Cape Province

   In order to achieve this objective, the socio-economic information of beekeeping households was obtained and analysed via descriptive statistics. The information was collected by means of a questionnaire, with a section designed for data on gender, age, marital status and household size, source of income, level of education, major farming enterprises and experience in beekeeping.

2) To examine the economic and marketing structure of beekeeping in rural communities

   In order to realise this objective, information on marketing processes, market prices and production costs (both variable and fixed) incurred was collected by means of a well-structured questionnaire. The information was analysed using Gross Margin analysis to determine the gross margin of the beekeeping enterprise.

3) To identify the major constraints, opportunities of production and supply of the commodity to the market

   In identifying major constraints and opportunities, descriptive statistics were used from the data collected by means of the questionnaire. A section of the questionnaire was designed to collect information on the major constraints of honey production and opportunities for further adoption and development of the enterprise.

4) To analyse the determinants of honey production in the study area

   In order to analyse the determinants of honey production, information was collected on twelve variables by means of a structured questionnaire. The variables had been identified through a literature review, and included the gender, age and marital status of the beekeeper, household income, education level, access to extension services, number of colonies, access to credit, availability of labour, price of honey in Rands per kg, market access and the distance to the market. The variables were analysed by using a Linear Regression Model to identify those variables with a statistically significant impact on honey production.

1.5. Research questions

The research seeks to address the following questions:

- What are the main socio-economic factors affecting emerging and smallholder beekeepers in the Eastern Cape Province?
- What is the income contribution of beekeeping to the emerging beekeepers?
- What are the major constraints hindering the development and growth of beekeeping in rural areas of the Eastern Cape Province?
- To what extent do the demographic and socio economic characteristics of beekeeping households influence the productivity of emerging and smallholder beekeepers in the province?

1.6. Limitations and delineation

This study was limited to only the rural areas of the Eastern Cape and the emerging and resource-poor beekeepers that have been in operation for at least one year. The focus on rural household-beekeeping is based on the aim to learn more about beekeeping as a potential agent of development. The focus on beekeepers who had been in operation for at least a year is based on the fact that, in developing beekeeping as a business, sales of honey and other bee products are not expected to occur during the first year of operation. Therefore, including beekeepers who had been in operation for less than a year would have distorted the findings of the study.

The study included all known rural beekeepers in the Eastern Cape Province, while urban beekeepers fell outside the scope of the study; a study of urban beekeeping would be a project on its own, as it takes place in an entirely different socio-economic and production environment.

1.7. The significance of the study

Most of the available research material on beekeeping in South Africa appears in the form of scientific documents, with little information aimed at analysing the socio-economic factors influencing beekeeping and the potential of employing beekeeping for rural development. Therefore, there is a need for information that can be used by rural development planners and implementing agents, who are interested in the potential impact of beekeeping on rural development. This study aimed to generate useful information for re-structuring of policies and programmes that focus on the development of beekeeping projects and guidelines for interventions that would improve rural likelihoods through honey production. The potential users of the findings would be government officials involved in beekeeping programmes, farmers (honey producers), traders and government and non-government organisations that have an interest in intervening in honey production potential for poverty alleviation. Researchers who want to pursue further investigations into beekeeping and rural development could also use the results from this study.

1.8. Outline of the study

Chapter 1 of this dissertation has provided an introduction and background (including the definition of apiculture and the historical background) as well as the statement of the problem, objectives, limitations and delimitations, the significance of the study, and an outline of the dissertation. Chapter 2 provides a review of relevant literature, focusing on beekeeping from the household food security point of view and from an African and South African perspective. Chapter 3 focuses on a description of the study area, while Chapter 4 describes the research methodology including selection of respondents, collection of data, and the methods used to analyse the data. Chapter 5 presents the research results and the last chapter, Chapter 6, contains the summary and conclusions, recommendations based on the study, and suggestions for further research.

CHAPTER TWO:
LITERATURE REVIEW

2.1. Apiculture and the rural household economy

As indicated by Ahmad, Joshi and Gurung (2007), rural development aims to help households manage their livelihoods better through the sustainable use of the available resources. It provides households with greater social and economic power by offering rural communities the opportunities to work according to their capacity, without hampering the eco-services provided by their environment.

Beekeeping and honey hunting have been practised by different societies since ancient times and have always been linked to development. Honey hunting, that is collecting honey from wild bee colonies, is an ancient practice. The history of beekeeping is rooted in and linked to honey hunting and associated practices. As settled farming became common, the idea of keeping bees in hives emerged. Gathering wild honey is still a common practice in many parts of the world. In India, it is estimated that 22 000 tonnes of wild honey is collected by honey hunters annually. This is twice the amount of honey produced by the managed beekeeping sector (Bees for Development, 2011).

Different societies in Asia, Europe and North America have evolved their own beekeeping methods, investing in such diverse areas as bee genetics, hive design, management operations, managed pollination and honey processing and marketing. *Apismellifera* is a particularly fortunate bee species among hive bees. Scientists and development workers have studied it for more than 150 years. Continuous selection and breeding have improved the bee's genetics, and Langstroth's hive design, which is based on optimising bee space (the space required for the movement of bees) in the hive, has helped beekeepers and bee enterprises to produce more honey in a sustainable manner (Bees for Development, 2011).

The mass introduction of Langstroth's hive coincided with the start of large-scale application of pesticides in North American agriculture. This phenomenal shift in agricultural husbandry reduced pollinator diversity considerably, and farmers then felt the need to use honeybees as a source of pollination rather than simply as honey producers. The introduction of Langstroth's hive also facilitated the large-scale transportation of bee colonies for managed pollination, honey production, mass queen rearing and overall management of apiaries. Beekeeping has thus contributed to rural development through the centuries by supporting agricultural production, providing honey, wax and other products for home use, and by providing income for both farmers and the landless (Johannsmeier, 2001b).

2.2. The Importance of beekeeping for rural development

According to Ahmad, Joshi and Gurung (2003), the prospects of helping beekeepers of developing countries to raise their living standards through the development of beekeeping activities are promising. Beekeeping has many advantages that help beekeepers to improve their well-being. Its advantages can be itemised for the socio-economic impact of beekeeping. For instance, successful beekeepers raise their socio-economic standing in areas with subsistence agriculture, and farmers in developing countries can substantially supplement the family income, sometimes even double it. This means the family is food secured. Furthermore, some of the relative advantages and importance of beekeeping are discussed in detail in the next section.

2.2.1. Promoting security and sustainable livelihoods

A SABIO (2007a) press statement concluded that beekeeping has holistic benefits that relate to health (medicinal product and food); the economy (directly through sales of honey and other bee products, indirectly through increased productivity of pollinated crops, as well as bee enterprise activities); employment (honey production and pollination services); and the environment (ensuring pollination of wild species). Bees for Development (2011) stated that beekeeping can contribute to securing sustainable livelihoods by transforming vulnerabilities into security. It can be carried out by resource-poor farmers, and is particularly suitable for under-privileged, landless and low-income groups as well as for women, as it requires minimal start up investment and generally yields profits within the first year of operation. Some of the different roles played by beekeeping in rural development are described and discussed in more detail in the following sections.

2.2.2. Physical security

The link between beekeeping development and the physical security of societies and communities may not seem immediately obvious, but it does exist and is based on the pollination services that bees provide. As with all pollinators, bees both from managed apiaries and the wild play an important role in combating soil degradation by enhancing the replenishment cycle: more pollination, more seed sets, more plants, more biomass returned to the soil (Ahmad *et al.*, 2003), leading to less soil erosion, less flooding, and a more conducive environment for sustainable living.

Pristine areas play a pivotal role in maintaining the replenishment cycle by conserving and absorbing water, obstructing and regulating flash-floods, disseminating important plant and weed seeds for regeneration, and providing a habitat for a large number of plants and animal species. Wild and feral bees (domestic bees that have escaped to the wild) play an important role in pollinating flowering plants in pristine areas, hence increasing the vitality and viability of these physically secure environments (Ahmad *et al.,* 2007).

2.2.3. Economic security

Beekeeping can help economically vulnerable communities to achieve economic stability. Honey production, pollination services, agriculture and forestry are but a few of the economic benefits of beekeeping. Bee products such as propolis, royal jelly, beeswax, and bee venom are also high-value and low-volume green products. In addition to the direct income from bee products, beekeeping generates farm employment opportunities in many fields including hive carpentry, honey trading, renting and hiring of bee colonies for pollination, and bee-based micro-enterprises (Ahmad *et al.,* 2003).

2.2.4. Crop productivity

According to Ahmad *et al.* (2007), beekeeping contributes to economic security in another way: through the positive effect on pollination in agriculture in the rural areas of developing countries. Even though pesticide use is still on the rise in modern agriculture, managed pollination has been able to make up for certain pollinator deficiencies, and has increased productivity and thus incomes. As stated by Fletcher (1977), in places like the USA, Canada, Europe and Japan, honeybees have long been used for the pollination of crops like apples, almonds, pears, plums, cucumbers, melons, watermelons and berries. Honeybees were first used for pollination in the USA in 1895. In the early 1990s, the worldwide annual contribution of pollinators to the value of agricultural crops was estimated to be US$54 billion. Honeybee pollination alone accounts for an estimated US$15 billion in crop production in the USA. Similar estimates were made for other countries. The increase of poor farmers' income from honeybees also contributes to the success of rural development efforts and activities.

2.2.5. Social security

The definition of social security, according to Farooq *et al.* (2007), depends on the level of social and economic development of communities and nations. In the developed world, pension schemes, health care, and insurance policies give households a sense of security. In developing countries, social security has a different meaning for different households and communities. In most cases the rural poor rely on livestock, a piece of land, or their beehives or bee colonies in the nearby forest to provide them with a sense of social and economic security, as cash flow is not reliable and often inaccessible. In these situations, beekeeping development is also integrated into rural development efforts.

In Southern China, for example, special efforts are being made to conserve local and indigenous honeybee species. A comprehensive conservation and development programme for *Apiscerana* has been initiated, which is facilitating the conservation of 780 000 colonies of *Apiscerana* in the Yunnan province alone. Ethnic and other communities keep these honeybees in log, wall, and moveable frame hives. As a result of regular selection and breeding programmes, the bee species in such an area produces an average annual yield of 10 to 15 kg of honey, 1 to 2 kg of pollen, and 1 kg of wax per colony. In the best case scenario, honey production of *Apiscerana* can reach 90 kg per colony (Oxfam International, 2008). This example shows clearly how beekeeping development using indigenous resources can contribute to social and economic security.

2.2.6. Conservation of resources

The natural environment can only be maintained in a healthy state through the interest and active involvement of local people. Beekeeping is a good way for people to earn an income without damaging the environment; at the same time honeybees and other pollinators play an important role in the conservation of plant resources by providing pollination services (Lepetu *et al.* 2001). These services also support diversification, which is necessary for the process of evolution. Much of the time, conservation of wild flora is an 'unnoticed' activity that happens under the cover of bush, canopy, and the darkness of the forest; pollinators participate by supporting the gene flow, which is a vital process of life. Resource conservation is an important aspect of rural development activities and it also includes development programmes for bees like the Asian hive bee *Apiscerana* and other wild honeybee species. These activities and programmes mainly aim at conserving bee resources in a way that serves both poverty alleviation and biodiversity conservation (Bees for Development, 2011).

For example, the International Centre for Integrated Mountain Development (ICIMOD) runs a programme based on conservation apiculture, which focuses on improving the productivity of the Asian hive bee through selection and multiplication. Therefore, efforts are being made to involve beekeeping communities: farmers and beekeepers receive economic and social incentives to participate in the selection and multiplication activities. The communities have clearly benefited from the programme: at one of the project sites in Nepal, the number of farmers and beekeepers in the project has increased, and the selected bee colonies produce more honey (Bees for Development, 2011).

Furthermore, the importance of beekeeping as an income-generating activity is due to the fact that many people use honey as food, medicine and for sale. Beekeeping offers a great potential for development and is comparatively less demanding in terms of investment, labour and time. Hence, the development of beekeeping will ensure increased income and food security at household and national levels, thereby achieving the national and United Nations (UN) development millennium goals of poverty reduction (UN, 2009). Also, beekeeping is advocated to improve human welfare by alleviating poverty through increased household income: it is a source of food and nutritional security, raw materials for various industries, medicine, increased government revenue through levies and taxes, improved biodiversity conservation and enhancing environmental resilience (Lundall-Magnuson, 2010).

Beekeeping gives local people and the Government an economic incentive for the retention of natural habitats, and is an ideal activity in any forest conservation programmes (Mariki, 2007). Furthermore, it is a positive tool in rural areas of developing countries. It requires little capital or land, and is accessible to those with limited financial resources, and it can as well, improve agricultural yields through pollination; it is also dependent on renewable natural resources.

2.3. Beekeeping: an African perspective

2.3.1. Impact on food security

On the 26th of September 2012, Ethiopia hosted the largest gathering of smallholder beekeepers, honey traders, researchers, policy makers and other kinds of stakeholders from the African continent. This was the event of *ApiExpo Africa* and it was the third such gathering with the theme “Beekeeping for food security and combating climate change”. It is known that almost one billion people globally are food insecured and at least 70% of these very poor people live in rural areas in developing countries, mostly in Africa. Most of these people are engaged in fragmental farming activities (Okello & Kisenyi, 2012).

It has been estimated that the world's human population will grow to 9.1 billion by 2050. Natural resources are fast getting degraded, fossil fuels are becoming scarcer, and climate change has become an impending reality (Cordaid, 2010). Illgner *et al.* (1998) argued that, this being the case, the critical reality is that to nourish the growing population and meet the challenges, it is necessary that the unused potential of small-holder producers - including beekeepers - be tapped. Today, smallholder producers already provide 70% of the world's food supply and therefore have a proven capability to be part of the solution.

As mentioned by Okello & Kisenyi (2012), the rural poor in Africa often spend up to 80% of their earnings on food because they do not produce enough or are forced to sell their produce at low prices. They do not own sufficient land and lack alternative income opportunities and possibilities to add value to their agricultural produce. Secondly, while staple food crop prices have risen in recent years (attributed to poor harvests, a growing global demand, speculation on commodity markets that adds to price volatility, the rising oil prices, and competition for land to produce animal feed or fuel), smallholder producers have hardly benefited (Okello & Kisenyi, 2011). This confirms the already known imbalance in the global food system, in which the poor are at a disadvantage. Thirdly, there is the problem of climate change which increases the frequency of devastating weather events, causes permanent changes to local climates, and creates erratic weather patterns. These all have negative effects on agricultural productivity and increase the frequency of occurrence of pests and diseases (Okello & Kisenyi, 2010).

Massive environmental degradation mainly triggered by poor agricultural practices such as mono-cropping and over-reliance on fossil fuel-based inputs. These destroy ecosystems that provide, for example, food, water, and climate regulation (Smith, 2005). There are also problems related to marketing and post-harvesting losses where more than 30% of the food in the poorest countries is lost through spoilage and poor storage (Everatt & Zulu, 2001).

In the 1980s and 1990s, most African governments also faced some kind of 'forced trade liberalisation and economic restructuring', exposing smallholder producers to extreme competition from low priced imports from the developing world. This has been made even worse by the fact that over the last two decades governments and donors have curtailed investments in agricultural development, causing cuts in public services and subsidies, thereby weakening smallholder production further (Van Loon and Koekoek, 2006).

The 2003 Maputo Declaration on Agriculture and Food Security aimed to reverse this trend. African heads of states decided that within five years, 10% of their respective national budgets should be spent on agriculture and rural development. Nine years later, only a few countries had achieved this target (UN, 2009).

ApiExpo Africa was being organised against this challenge and with the prospect that beekeeping can play a significant role in contributing to food production through increased pollination (of food crops and cash crops) and production of bee products for the market. Beekeeping can also foster sustainable environmental management practices such as planting of bee-loving trees (bee forage) and providing alternative secondary livelihood sources to the smallholders in Africa (Stubbs, 2010).

2.3.2. Beekeeping as a contribution to food security

There are more reasons to believe that beekeeping can cause a revolution in Africa. The honeybees contribute over US$200 billion to the global economy through crop pollination and production of honey and other bee products. In Sub-Saharan Africa, beekeeping plays an important role in the livelihoods of thousands of communities, and is a low risk, sustainable, house-hold-level enterprise, feasible for rural people who are too financially poor to invest in more cash-intensive crops. It does not only serve as 'safety net' (a source of cash income when needed) for the poor, but has the potential to contribute to wealth creation (Okello & Kisenyi. 2012a). According to the Okello & Kisenyi (2012b), the incentives to do beekeeping are obvious, from Accra in the West to Addis in the East of Africa. According to Clauss (1991), in North West Cameroon, for instance, some communities deliver up to 50% of their livelihoods through selling honey and other beekeeping products. This is consistent with the findings of many studies in Zambia which show that communities in the North West Province (Milombo Woodlands) derive 25-50% of their incomes from beekeeping, which has been their tradition.

The impact of apiculture on the lives of communities in Uganda cannot be over emphasised. Women have adopted apiculture which has created a great effect to the household food security. Women are involved in trading the products, and directly earn money which is used to pay school fees for children, build better houses, and pay medical bills and also to invest in other businesses. To date, Uganda remains one of only five African countries accredited by the EU to export honey to 27 countries of the European Union. This is due to the existence of strong segments of the apiculture value chain coordinated by the Uganda National Apiculture Development Organisation (UNADO), the umbrella body for apiculture in Uganda. Government support has also been increasing over the years; district local governments in the country have incorporated honey in their enterprise promotion plans (Okello & Kisenyi, 2011).

In February 2012, Ghana shipped 18 tonnes of its premier consignment of natural honey to the European Union (EU) market. The honey was harvested from the Nkwanta District of the Volta region and packaged under Atlas Foods Ghana Limited for markets in Ireland. This puts Ghana among five other African countries - Uganda, Tanzania, Cameroon, Ethiopia, Zambia - which are accredited to export honey to the EU market. According to the results of the study conducted by the Netherlands Development Organisation, the viability of honey production in Ghana reduces poverty among communities involved in beekeeping (Okello & Kisenyi, 2012).

When it comes to forestry management, about half of the world’s original forests had disappeared by 2011, the majority during the past 50 years (Shackleton, 2004). Since 1990 half of the rain forests have disappeared. This implies that more than a half of the animals and plant species which live in the tropical forests are also increasingly being lost. The results of the efforts of African Renewal (2000) in different African countries to introduce beekeeping in communities that are adjacent to forested areas are showing that this is one of the most successful participatory forest management approaches that have inspired several communities. For example, in the case of Mudzimu Village in Hurungwe of Zimbabwe, people reported that beekeeping has changed their perspective on their forests. Hence, they have started taking more care of forests because it is where bees live and build natural hives. As a result, people in the village are making more money on honey production and their lives are now improving (Okello & Kisenyi, 2012a).

According to Okello & Kisenyi (2010), development initiatives by *Honey Care Africa Tanzania Ltd* (assisted by Swiss and Netherlands develpment agencies) in 2004 have contributed substantially to livelihood enhancement and forest conservation in the Tobora region of Tanzania. Its efforts have made a profound difference in the villages with which it partners. The lives of beekeepers are changing; having improved housing materials from grass roofing to corrugated iron sheets. Beekeeping households are now able to meet considerable day to day domestic needs, and at the same time the pollination services by bees are ensuring food security as well (*Ibid*.).

The ApiTrade Africa calls for serious re-thinking and re-prioritization of policies, not only towards beekeeping but also other agricultural enterprises which are driven by the smallholder producers' model. There must be a commensurate increase in the investment in terms of national budget funding, human resources, and in research and development (R&D) programmes, with the ultimate aim of improving the organisation, competitiveness and resilience of the farmers (Okello & Kisenyi, 2010).

2.3.3. Honey production and marketing

Table 1, shows African honey production for specific years from 1961 to 2006 and ranked according to 2006 production. According to the FAO 2007, statistical data used, Ethiopia had the largest honey production in 2006 (41 233 tons) followed by Tanzania (28 678) and Kenya (25 000). Angola also produced a significant amount (23 767). South African was the 13th largest producer with 1 500 tons and the top four African honey producing countries are responsible for 72% of the total African honey production. This corresponds to a certain extent with the Miombo woodland area of

Central and East Africa (where honey producing *Brachystegia* and *Julbernaridia* trees are found).

Table 1: African honey production data

COUNTRIES	PRODUCTION (TONS)							
	1961	**1970**	**1980**	**1990**	**2000**	**2004**	**2005**	**2006**
Ethiopia	14 400	17 400	20 500	23 000	29 000	39 652	41 233	41 233
Tanzania	5 200	7 500	9 500	18 000	26 000	27 980	28 678	28 678
Kenya	5 000	6 800	10 840	20 000	24 940	21 500	22 000	25 000
Angola	20 000	16 263	16 000	19 000	23 000	23 000	23 767	23 767
C. A. Republic	2 200	5 000	6 000	9 034	13 000	13 757	14 226	13 000
Egypt	2 140	5 359	7 241	10 025	8 267	7 996	8 000	8 000
Madagascar	9 300	9 600	3 072	3 700	3 930	3,965	3 986	3 986
Tunisia	240	220	620	990	2,500	2,855	3 060	3 060
Cameroon	1 850	2 050	2 200	2 700	2 950	3 043	3 073	3 000
Morocco	2 000	2 250	6 300	2 885	2 500	2 400	3 000	3 000
Algeria	800	1 200	1 600	500	1 054	2 800	2 991	2 991
Senegal	90	90	170	106	500	800	1,246	1,900
South Africa	350	386	900	900	900	900	1,500	1,500
Total	**66 972**	**77 342**	**88 806**	**116 150**	**143 669**	**155 599**	**161 808**	**164 185**

Source: FAO (2007)

2.3.4. Organising smallholder beekeepers

The vision of ApiTrade Africa is to see a well-coordinated and competitive apiculture sector in Africa. Small-holder producers are not only linked with markets as sellers, but also buy food, agricultural inputs and other consumer durables. If producers organize, access to reliable market information can be improved and useful inputs such as hives, harvesting kits, and government support in the form of extension services can be provided (Okello & Kisenyi, 2010).

Producers are also better able to negotiate with buyers, and get better and more reliable prices for the produce. Also, organisations guarantee a more reliable product supply than individual farmers, meeting a key requirement for many markets. Finally, organisation leads to better informed producers who use inputs in an efficient and sustainable manner and are able to advocate more strongly for support from government, and financial and research institutions (Okello & Kisenyi, 2011).

2.3.5. Competitiveness in the honeybee industry

Improved market linkages as a core objective of *Api-Trade Africa*, can help small-holder producers increase their own supply of honey and other bee products. *Api-Trade Africa* works with market actors and private-sector entities which promote sustainable beekeeping practices. These actors encourage producers to improve their production systems (Cordaid Annual Report, 2011).

Evidence from Cameroon, Ethiopia, Zambia, Uganda, Tanzania and other major honey trading countries shows that private sector involvement can make a difference when linking producers to markets. For instance, one of the major market actors, the Body Shop International, is involved in the certification of production systems of honey and beeswax in Cameroon and Ethiopia. In Cameroon, over 2 000 smallholder beekeepers are certified to meet organic and fair trade standards. These beekeepers are all involved in the development and implementation of a quality management system which enables them to identify major production and marketing risks (Okello & Kisenyi, 2011).

With marketing support provided by *Guiding Hope CIG* (Cameroon) and *Tropical Forest Products Ltd* (UK), beekeepers have been able to increase the quality of their honey and beeswax and boost household incomes by more than 50%. And as the demand for sustainable, high-quality products, including those certified as organic, fair trade, climate-neutral, or bio-diverse, is increasing in both the global north and south, African beekeepers are increasingly motivated to embrace practices that are better adapted to climate change and are more resource conserving (Okello & Kisenyi, 2012b).

2.3.6. Challenges related to beekeeping

Okello & Kisenyi (2011) stated that African honey is in demand within Africa and around the world. However, both local and export demand are not sufficiently met due to the highly unpredictable supply. The supply is generally affected by inefficient production and poor processing and handling of honey, as well as lack of collaboration among beekeepers for processing and marketing. The challenges in beekeeping in Africa include:

- Low returns from beekeeping – Many farmers have left beekeeping because of lack of profits and low yields and due to the amount of work and the investments that are required for hives and equipment.

- Poor apiary husbandry – Especially in the migratory beekeeping system, but also in fixed apiary system, bees are left to look for own forage and water, and to provide own security from invaders. During times of scarcity, like dry seasons, hives swarm and abscond and hence the farmer loses potential yield from such hives.

- Pests and diseases – The varroamite as well as other pests and diseases are threatening beekeeping in Africa, and farmers lack knowledge on their proper management.

- Poor harvesting methods – Rudimentary harvesting methods, for example, using too much smoke or burning the hives, leads to destruction of the bee colonies as well as to contamination of the honey harvest.

- Quality control challenges – Due to limited availability and improper use of harvesting equipment, honey becomes susceptible to contamination and adulteration. The resulting low quality honey cannot enter the formal market chain, but ends up in the informal markets being used as an ingredient for making local brews or herbal products. Sanitary requirements have also greatly affected honey export to premium markets.

However, beekeeping is still an important economic activity and a potential source of income for farmers in Africa. It is therefore, necessary to devise means to improve production and returns from beekeeping.

2.3.7. Investment in the apiculture value chain in Africa

Some key questions that thousands of beekeepers and promoters of the apiary business in Africa have been pondering over include, “Can investment in the honey value chain be sustainable and profitable business for beekeepers, and processing and trading companies at the same time?” and, “Can one ensure volume of supply while avoiding destruction of the natural environment and the local communities?” A recent evaluation by the Dutch Development Agency (known as CORDAID), of two honey business initiatives in Zambia and Ethiopia confirms that the honey sector has good potential and can make a real impact on poor people’s livelihood and good business sense provided a number of conditions are met (Okello & Kisenyi, 2010).

In that evaluation Cordaid reviewed some 25 projects in Africa and South America supporting direct SME - small producer linkages under institutional arrangements such as contract farming and export supply contract. The evaluation assessed the relevance and effectiveness of Cordaid support to SMEs as an entry point to enhance the income and position of smallholder farmers in agricultural value chains. Two of the projects in Africa concerned the honey sector. In the case of Zambia, the evaluation reviewed the performance of the North West Beekeeping Association (NWBKA), a structure that has been promoting the production and marketing of honey from about 6 000 beekeepers (Okello & Kisenyi, 2010).

In Ethiopia the performance of *Beza Mar Agro Industry* was reviewed. Bezamar is a company that is procuring organically certified honey from some 4 500 beekeepers in the Sheka zone in South West Ethiopia, selling on the local market and exporting honey to Europe. The evaluation showed that investment in the development of the honey sector can be beneficial for local beekeepers and for processing and trading companies at the same time. Development of this sector can be a win-win. Yet it warned that these development outcomes can only be achieved if a number of conditions are met. In both cases the study confirmed that the marketing of various bee-related products for local, regional and international markets can be a viable strategy; the production of honey and related products also fits well with livelihood strategies of the poor and is suitable to the local environment (Okello & Kisenyi, 2010).

Okello & Kisenyi (2012) also mentioned that the long term financial viability at producer and company level is also quite good and can be enhanced by investment in bulking capacity. In both countries, moreover, there are conditions for building stable commitments and developing trusting relationships with cooperatives and producer associations, with local traders, and with local institutions. Strikingly, while many initiatives to promote SME-producer linkages in other agricultural products are conceived in isolation, both honey cases demonstrated a strong investment of various support actors (donor agencies and BDS providers alike) towards the development of a true pro poor value chain approach.

It is an investment that takes some time and long term commitment, but is beginning to show results. In order to avoid false competition of buyers, honey exporting companies in Ethiopia have developed a code of conduct, a practice that does not yet exist in many other African countries and might help curtail opportunistic behaviour of newly emerging honey trading companies that are not making significant investments in the sector (Okello & Kisenyi, 2010).

Balanced risk sharing between the beekeepers and SME can be promoted by identifying quality, quantity and other risks, and clearly defining responsibilities of the producers and the company. Yet the evaluation showed that the results so far in Ethiopia and Zambia are quite different. In Ethiopia the combined initiative of beekeeper producer associations and the SME Bezamar has already shown very remarkable positive outcomes: honey and beeswax production have increased by about 40% and producer incomes have risen, and also Bezamar sales and financial performance have increased (Okello & Kisenyi, 2011).

In Zambia, the significant development outcomes at producer and company level are still under way. This difference in performance is largely explained by the poor management capacity of the local producer association and of the SME in Zambia as against a very good management capacity of the various players in Ethiopia. This same management capacity also explains why the Ethiopian players have more capacity to adapt to changes in market demand, production risk and competition risks, while the Zambian players are still more fragile (Okello & Kisenyi, 2010).

2.3.8. The opportunities in the organic market

Honey has the potential to more fully participate in the growth of organic foods and fair trade market segments. In a very comprehensive way, honey is part of the global drift towards green foods that are environmentally friendly and yield numerous social and economic benefits, notably in developing countries (Bees for Development, 2011).

This explains why Export Promotion of Organic Products from Africa (EPOPA), a programme supported by the Swedish International Development Agency (SIDA), was implemented in Uganda and Tanzania. EPOPA began by supporting the development of organic value chains for commodity products, such as coffee, cotton, cashew and cocoa, but in the second phase of the programme, it looked at non-traditional organic export options, including bee products, mainly honey and beeswax (Okello & Kisenyi, 2011).

Two companies were supported to develop organic production and exports – one in Tanzania and one in Uganda. Organic certification was achieved through "Small-holder group certification" where beekeepers were linked to the honey buyer through an "Internal Control System" (ICS), which describes the measures being taken to ensure bee product production is organic. Such beekeepers were contracted to the buyer, and trained by field staff employed by the buyer in key points regarding organic apiary management, and possible risks to organic integrity, along with associated mitigating actions, are stated. Unfortunately, in both cases, organic bee product production only reached the "in-conversion" stage, not due to problems in managing the bees in an organic manner, but due to competition from other buyers operating on the local and regional markets (Okello & Kisenyi, 2011).

These spot buyers had not invested in the bee-keeping systems in the production areas and could, therefore, offer higher prices, but also benefitted from the extra quality of honey due to the extension input of the organic project. The companies aiming for organic exports could simply not buy enough honey to make international supply economic. It is great when companies are willing to invest in value chain development for improved bee-product production and are able to offer long term and sustainable markets for contracted beekeepers, and it is a role for industry promoters to ensure that investors are rewarded through reliable supply bases. As a successor to Agro-Eco, which implemented the EPOPA programme, Agro-Eco Louis Bolk Institute (AELBI) is committed to continuing its support to developing the quality, output and markets for African bee-keepers and is happy to be working with Api-trade and its members in supporting African Apiary development (Cordaid, 2010).

2.3.9. Sustainable development and beekeeping

There is a global recognition that sustainable beekeeping is a key ingredient for food security, now and in the future, and this is according to Okello & Kisenyi (2012a). The United Nations Environmental Program (UNEP, 2010) highlighted the following key facts relating conservation efforts to beekeeping, climate change and food security:

- An estimate of 20 000 flowering plant species, upon which many bee species depend for food, could be lost over the coming decades unless conservation efforts are stepped up.
- Increasing use of chemicals in agriculture, including 'systemic insecticides' and those used to coat seeds, is being found to be damaging or toxic to bees. Some can, in combination, be even more potent to pollinators, a phenomenon known as the 'cocktail effect'.
- Climate change, left unaddressed, may aggravate the situation in various ways including by changing the flowering times of plants and shifting rainfall patterns. This may in turn affect the quality and quantity of nectar supplies, and hence the volume of honey production.
- Bees are early warning indicators of wider impacts on animal and plant life. Measures to boost pollination could not only improve food security but the fate of many other economically and environmentally important plants and animals.

Today, as mentioned by Allsopp (2000a), the honeybees contribute over US$200 billion to the global economy through crop pollination and production of honey and other bee products. In Sub-Saharan Africa, beekeeping plays an important role in the livelihoods of thousands of communities, and is a low risk, sustainable, household level enterprise, feasible for rural people who are too financially poor to invest in more cash-intensive crops. The EU market (known as the largest honey market in the world and not easy to enter because of market requirements) is also accepting honey from six African countries, i.e. Ghana, Tanzania, Uganda, Ethiopia, Zambia, and Cameroon. Hence, the sustainable beekeeping among the rural poor smallholder farmers in Africa is the key for development and sustainability.

2.4. The beekeeping industry of South Africa

2.4.1. The situational analysis of the industry

The honey industry in South Africa is dominated by about 400 commercial beekeepers that produce about 80% of the nearly 2000 tons produced locally and about 2950 hobbyists largely from the first economy. These beekeepers have had many years of experience. However, South Africa still fails to produce enough honey for its domestic needs and export despite the fact that the country has the potential to produce a surplus (Section 7 investigation, 2008).

The exploitation by the previously disadvantaged farmers of the opportunities presented by beekeeping, according to SABIO (2007b), has been limited due to a number of cross-cutting constraints. Since the Agricultural Research Council (ARC) has adopted the commodity approach in agriculture and farmer development, it is critical that a business approach be implemented for beekeeping. According to the section 7 investigation committee (2008) and the Department of Agriculture (2007), the country experiences a shortfall of honey in the excess of 1000 to 1500 tons annually. The active participation by emerging beekeepers could fill this growing shortfall in the honey industry in South Africa.

Beekeeping by previously disadvantaged farmers is active in all the nine provinces of South Africa, with the Eastern Cape beekeepers producing the highest quantities in the region of eight tons per year, followed by KwaZulu-Natal, Limpopo, Mpumalanga, etc. In most provinces, beekeepers have come together under the guidance of the ARC to collectively practice beekeeping (Total Transformation Agribusiness, 2008). In the Eastern Cape, emerging beekeepers have a processing facility in Umtata and a Board of Directors is in place to provide strategic guidance to the honey processing project in Umtata.

Although many thousands have been trained, there are about 1000 plus active emerging beekeepers (in South Africa) working closely together with the support of the ARC. Emerging beekeepers are generally poorly organized at Provincial and National levels and only localized groups, associations and cooperatives exist. None of the processing facilities is importing honey to supply contracts when honey is in short supply as other beekeepers in the first economy do. None of the groups is involved in pollination services and the groups are not linked to beekeepers in the SADC region (Section 7 investigation, 2008).

Although interest in beekeeping in the second economy is huge and increasing, the return in terms of income to beekeepers is still very low and unattractive. Methods which enhance honey production and other services such as pollination and bee removal are not well developed. The individual profit motives are not recognized and encouraged. Changing the present emerging beekeepers to commercial honey producers is critical if the beekeepers have to earn a reasonable living from beekeeping (ARC, 2007).

Furthermore, with reference to the Water Affairs and Forestry’s honey trade (2005), the honey industry in South Africa is characterised by under-production. There are ready and easy markets for honey of reasonable quality. Eucalypt plantations of the country’s forestry industry offer a real and significant opportunity for developing honey production projects for the poor. Government support is being provided to support rural communities to enter the sector.

2.4.2. The legal requirements

Registration of all households with hive colonies in South Africa is mandatory as specified in the Government Notice R1 674 of 24 December 1998 under the Agriculture Pest Act 36 of 1983. Registration is managed by the South African Beekeeping Industry Organisation (SABIO). Registration involves supplying the name and postal address, and paying the registration fee. Every registered beekeeper is allocated a registration number. This number must be displayed clearly and legibly on all hives and all apiary sites of the owner. In urban and peri-urban areas, the registration pertaining to the keeping of bees is issued by the municipality of an area. All imported honey is required to be irradiated before it can be used in South Africa. It is not allowed to keep imported honey in bulk. It must be repackaged immediately for retail (Section 7 investigation, 2008).

2.4.3. Employment, skills and labour absorption

Although accurate information is currently not available, it is estimated that the beekeeping industry provides approximately 3 000 direct jobs (some estimates put this at 10 000). According to SABIO (2010) the bee industry job multiplier is 2.3. It is estimated that the honeybees are indirectly responsible for between 300 000 and 500 000 jobs.

According to ARC (2007), the bee industry is in the hands of a small nucleus of entrepreneurial individuals, combined in loose associations of various sizes, interests and activities. Beekeeping is very labour intensive. Most of the operators still prefer to use labour rather than high technology and capital intensive equipment. The geographical and infrastructural and other limitations are mainly responsible for this state of affairs.

Employment of permanent assistance is normally limited to the more commercial operators where an average of an additional assistant per 500 hives is employed (depending on the level of extensiveness of the operator, i.e. whether honey is only produced as a commodity, packed, if pollination services are provided, and equipment manufacture or trading are a portion of the enterprise). Most of the smaller beekeepers employ an assistant on a casual and/or part time basis, with many of these assistants used for a single operation or task (often on a weekend basis) only (Bees for Development, 2011).

2.4.4. Estimated value added by the honeybee industry

Beeswax, queen bees and bees are considered to be by-products of honey production, while pollination could be considered as an output of the hive. The direct value of honeybees in South Africa (only considering honeybee products) is estimated to be in the region of R100 million. With total direct employment in the region of approximately 3 000 and approximately 2 000 hobbyist beekeepers the beekeeping industry on the surface appears to be a relatively small industry (Allsopp, 1999). However, according to Allsopp (2000a), value-added by commercial beekeepers in terms of increased production of crop plants through commercial honeybee pollination has been estimated to be approximately R4.1 billion per annum.

More recently Allsopp *et al.* (2008b) have calculated the value added at present by managed honeybee pollination to the South African deciduous fruit industry to be at least R189 - R828 million per annum (16 - 69 times the R12 million that beekeepers presently receive for this service). A similar re-calibration would apply to all the other crop types with a total honeybee added value estimated to be between R400 – R1 600 million per annum.

Therefore, if assessed purely in terms of honey and honey products, the industry is small and relatively insignificant in relation to the overall agricultural sector. However, in terms of value added to other industries it is an extremely important industry.

2.4.5. Impact on other sectors

The beekeeping industry provides vital inputs to other industries such as; food industry, retail industry, deciduous fruit industry (pollination), seed production industry (pollination), vegetable industry (pollination), biodiversity/environment, tourism, property values (ManukaHoney, 2007). For example, it is estimated that honeybees are indirectly responsible for 30% of all foodstuffs consumed in South Africa. (National Agricultural Directory, 2007). All the additional income generated directly and indirectly in these other industries by the beekeeping industry would be at risk if the honeybee population of South Africa is threatened. While honey can be imported in case of insufficient local production, the same is not true of pollination of commercial crops and indigenous flora. This becomes an important consideration when assessing the structure and funding of the industry (Allsopp, 2000c).

2.4.6. Challenges facing the industry

Though little appreciated by the state authorities, beekeeping is a vital component of South Africa's agriculture. In year 2000 the annual benefits from selling honey and other bee products was estimated to reach about R100 million (12.5 million US dollars) for the country, but the primary importance of apiculture for South Africa's economy consists in the provision of pollination services to the fruit industry. The added value of fruit pollination by commercial bee colonies in the country is estimated at about R3.2 billion ($0.4 billion) per year (Allsopp, 2000a), and some 100 000 persons are provided employment thanks to these pollination services. However, apiculture in South Africa has experienced a serious decline, resulting from a variety of socio-economic and environmental causes. The foremost challenges presently facing the country's beekeepers are as follows:

i. Massive colony and production losses due to theft and vandalism, beginning from the early 1970s (Stubbs, 2010), to remove honey has been identified as a major threat to South Africa's beekeeping industry. Theft and vandalism peak during the December festive period, when honeycombs are very much sought-after (as the basis for homemade alcohol). In this season some beekeepers in the country are robbed of as many as 80 hives each. Indeed, the resulting losses can be so great as to force a certain number of beekeepers to close businesses, and others are known to undertake extreme defensive measures, such as encircling their apiaries with electric fences and razor wire.

ii. There is so-called Capensis problem caused by the human assisted movement of the Cape honeybee into the rest of South Africa from 1990. Originally an endemic of the Western Cape Province, this form has proven capable of invading the colonies of *A. m. Scutellata* found throughout the rest of the country, which in most cases results in their elimination. In less than a decade, it destroyed at least 300 000 commercial honeybee colonies across the country. Another result of its spread is that most South African beekeepers outside the Western Cape Province now find it hard to maintain a colony for much more than 12 months (Allsopp, 2000b).

The emergence of Varroa mite (*Varroa destructor*) and its subsequent rapid spread over the country, this ecto-parasite has inflicted massive damages to both domestic and wild honeybee colonies almost worldwide, and its appearance in South Africa is likely to have the same consequences, leading to the virtual loss of its wild bee populations and the frequent use of expensive pesticides to maintain commercial colonies (Allsopp, 2000b).

iii. Increased loss of habitat and forage necessary to sustain honeybee colonies associated with urbanization. It must be noted that beekeepers in South Africa are particularly vulnerable to changes in land use, since they usually do not own the plots on which their hives are kept and are, therefore, at the mercy of local landowners. In fact, most South African commercial beekeepers now reside in urban areas and may keep their apiaries hundreds of kilometres away, so that they often have to move with the hives in search of flowering plants or to pollinate farmers' crops and orchards. As bee forage becomes scarcer, while industrial pollution becomes more severe, they are forced to move further and further to find suitable habitats to sustain their colonies (Christopher, 2010).

In the recent years, the problem of forage loss has been exacerbated by the nation-wide 'Working for Water Programme'. This initiative, launched by the Department of Water Affairs and Industry in 1995, involves large-scale clearing of alien trees that impact severely on water resources. Its main targets include the eucalyptuses, which are the most important bee plants in South Africa, with nearly all varieties producing good nectar and pollen (Allsopp, 2000c). The planned massive removal of these trees, which currently accounts for about 80% of the honey produced in the country, would undoubtedly reduce the number of commercial bee colonies.

iv. Reduced nectar flows have occurred in many parts of the country, caused by multiple factors including acid rains, the selective breeding of trees for apical growth (resulting in fewer side branches and, therefore, in fewer flowers), and sometimes an abundance of competitors such as fruit flies and Argentine ants (Allsopp, 2000c).

v. Colony disturbances and production losses caused by various pests, such as the Argentine ant, the banded bee pirate, the fork-tailed drongo, the honey badger, and the European foul brood are also a major problem. In addition, it must be noted that South African beekeepers have thus far failed to organize themselves sufficiently in order to deal with these threats. For example, by the mid-2000s, one year and a half after the authorities had ordered that all the beekeepers in the country must formally register their businesses, only 340 individuals (or 10% to 20% of the estimated total number of South Africa's beekeepers) actually passed the procedure (Allsopp, 2000b).

2.4.7. Emerging beekeepers in the rural household economy

Most rural communities in South Africa practice honey hunting (i.e. robbing of wild hives), and are therefore generally familiar with the habits of honeybees. They also know about beekeeping with hives, and some now keep bees in rudimentary containers. Large scale 'traditional' bee-keeping is not common in South Africa however; this is because nectar production in woodlands is not as productive as those in South-Central Africa. Traditionally, hives are made by stripping the bark from the trunks of large trees to produce a hollow cylinder, which is then plugged at both ends and suspended by bark ropes in large trees (Christopher, 2010).

2.4.8. Description of a smallholder beekeeper

With reference to Water Affairs and Forestry's honey trade of 2005, persons with 200 beehives or more are termed "commercial bee-farmers". There are only about 400 in South Africa who between them own about 60 000 hives in total. A "small-scale" beekeeper has 200 hives or fewer: there are over 2 000 of these in South Africa. There are also an estimated 4 000 informal (traditional) beekeepers.

The majority of smallholder bee farmers are from historically disadvantaged groups. In other words, these are black farmers who did not take part in commercial beekeeping as defined above. A recent study by the Agriculture Research Council (2007) focused on small-scale beekeepers in South Africa. This involved 32 beekeeping projects with about 96 beekeepers in seven provinces (the study excluded the Western Cape and Northern Cape Provinces of South Africa.

Table 2: Smallholder beekeepers attended the beekeeping conference

Province	**No. of groups**	**Gender**	
		M	**F**
Eastern Cape	15	15	14
Free State	2	0	1
Gauteng	3	3	3
KZN	2	1	2
Limpopo	4	6	6
Mpumalanga	5	5	5
North West	1	0	1
Total	**32**	**30**	**32**

Source: NAMC Report, 2014.

Most of these farmers are located in rural areas with the highest number in the Eastern Cape. These smallholder beekeepers have less than 10 years of beekeeping experience according to ARC research. With reference to the ARC study, 60% of the smallholder beekeepers have less than five years' beekeeping experience. Most beekeepers are not affiliated to any provincial or national beekeeper association or structure. The majority of the beekeepers are between the ages of 30-40, while a considerable number are in the age range below 30 years. All of these beekeeping projects were set up by grant funding and donations from the ARC, the Government's Poverty Relief Programme and local municipalities (ARC, 2007).

2.4.9. The governance approach

The group approach, in the form of cooperatives and projects, is the most commonly used approach by government and non-governmental institutions to organise smallholder beekeepers. Approximately 87% of the smallholder beekeepers manage and own their apiaries as groups. For an example, in Uitenhage three beekeeping projects were initiated by the Uitenhage Dispatch Development Initiative (UDDI) with funding from the Nelson Mandela Metro Municipality. Thirty unemployed youth were selected as beneficiaries and beehive were placed in three different locations; each youth in the group was assigned one box to look after. This approach proved to be very costly in that the project was not profitable to sustain 30 individuals at allowances of R400 a month (ManukaHoney.com, 2007).

Thirty members became difficult to manage due to conflicts amongst the group as well as impatience among members who expected quick financial returns in the project. This resulted in the group losing 19 members and 4 bee hives absconded while eight boxes were unsuitable for beekeeping (ManukaHoney.com, 2007).

The group approach to beekeeping has a number of constraints when it comes to production. The study by ARC reflects that 88% of production loss is a result of bee absconding. However, the study failed to explore the various factors linked with bee absconding. These factors include: conflict within the beekeeper group, poor apiary and bee hive management, and pests, e.g. wax moth. Apart from absconding there are a number of production constraints outlined in the study: absconding (87), theft/vandalism (74), finance (71), diseases & pests (63), limited land & space (54), forage supply (51), group approach (23), lack of knowledge (14) and each of these factors were measured independently at 100% of all the respondents (ManukaHoney.com, 2007).

Currently, most of the smallholder beekeepers use the top bar beehive and this top bar is suitable for small-scale producers. It is relatively cheap, easy to construct and manage.

2.4.10. Production potential

The area of eucalypt (gum) plantations in South Africa in 1999 - 2000 was estimated at 506 122 hectares (ha). Generally, only mature gums (three years and older) yield significant amounts of nectar. If the average age of gums at felling is eight years, then the total area of gums at nectar-producing age can be estimated at 316 326 ha. It is estimated that an average of three hives can be sustained per hectare of good nectar producing trees (DWAF, 2007). This means that the 316 326 ha could potentially support 105 442 hives of bees.

Taking a minimum yield of 15kg of honey per hive per year, 105 442 hives could potentially produce 1 580 tons of honey per annum. Using the average retail price of R40/kg for honey, the potential value of honey production from gum plantations in South Africa is R63.2 million per annum. However, this potential is not being achieved, and the primary reason is the threat of theft and vandalism of hives left in plantations. Plantations do not have the same levels of security as smaller, privately owned and intensively managed farms. As a consequence the incidence of honey theft is much higher in hives left in plantations than on farms with crops such as sunflowers or citrus (DWAF, 2007).

2.4.11. Training of beekeepers

Most beekeeping training in South Africa is done by white commercial beekeepers' associations sometimes in partnership with tertiary education institutions. The training and development of black beekeepers is mainly done by the ARC through its Beekeeping Development Program initiated in 2003 (ARC, 2007). This programme is aimed at targeting at least 5 000 beneficiaries. The aim is to address historical inequalities within the South African beekeeping industry and increase its size by 50%. According to the ARC (2007) study, 97% of smallholder beekeepers were trained and gone through mentorship beekeeping development programme. The training of smallholder beekeepers is very critical to the commercialization agenda.

The existing beekeeping training in South Africa has a number of weaknesses. It is not accessible to all beekeepers due to costs associated with it. For example, at the Grahamstown Brewery to train 10 people in Beekeeping Level 2 costs R36 272 (in 2009) including the price of an extractor. In most cases this money has to be paid upfront prior to the commencement of training. For a long time training of beekeepers has been the domain of white commercial beekeepers belonging to associations. Thus, smallholder beekeepers do not belong to associations and therefore are excluded from participating in training. The emphasis in content is most likely to focus on creating group projects rather than commercial beekeeping businesses (ARC, 2007).

Partnership between training providers and educational institutions is a good practice and must be replicated elsewhere because it entrenches beekeeping in institution's curricula. Most beekeeping training targeting smallholder producers is government funded. Little technical support comes from the Eastern Cape Departments of Agriculture now called or known as Department of Rural Development and Agrarian Reform (ARC, 2007).

2.4.12. Business opportunities in the honey trade

The establishment of honey production enterprises operated by previously disadvantaged communities is already being undertaken by a number of government departments and NGOs in association with many of the commercial forestry companies in South Africa. These honey production initiatives address skills and capacity development among developing beekeepers on a range of issues including technical beekeeping issues, enterprise management, and marketing. However, these initiatives are outsider driven and operated. There is little opportunity for developing beekeepers to independently establish and operate individual initiatives as do the current commercial beekeepers (Section 7 investigation, 2008).

The establishment of a national co-operative or several regional co-operatives, for emerging honey producers would assist in the growth of the sector according to Section 7 investigation (2008). It could develop a system of bulk purchasing equipment for redistribution to smaller development beekeeper enterprises (thereby benefiting from economies of scale). It could also negotiate competitive prices for its members and avoid the low prices achieved by bulk selling of honey to existing wholesalers (ManukaHoney.com, 2007). As concluded by Manuka Honey, over and above this, such an institution(s) could focus on:

- Centralised extraction, processing and packaging
- Distribution, branding and marketing of honey
- Offering extension services including specialist services
- Making information available to prospective honey producers
- Bulk purchase of equipment and sale to members
- Training

2.5. Beekeeping in the Eastern Cape Province

In the Eastern Cape Province of South Africa, beekeeping has been practised for ages by a few white commercial farmers as well as some hobbyist beekeepers (those farming with no intentions of commercialisation). Most black communities held the belief that bees were their ancestors and thus they cannot farm with bees. The concept of beekeeping as a farming enterprise came to the black communities through the research that was conducted by the Agricultural Research Council (under the Poverty Relief Programme) throughout the country in the year 2000, looking at the potential of beekeeping for poverty alleviation. In the Eastern Cape province, the study was conducted in the former Transkei region (OR Tambo district). The study areas were selected based on the availability of forage for bees. (ARC, 2007)

Farmers were trained on beekeeping and each farmer received beekeeping equipment for the commencing beekeeping business including 30 beehives and the protective clothing. According to the results of the study, beekeeping was found to have a significant impact on the livelihoods of households involved. Hence, more farmers wanted to explore the opportunities that can be opened by beekeeping and approached the Eastern Cape Provincial Department of Rural Development and Agrarian Reform (DRDAR) for further funding (*Ibid.*).

Following the positive outcomes of the ARC research, the DRDAR started funding beekeeping projects in all six district municipalities in 2008. Beekeeping is also funded by the district municipalities, ECDC and government departments. According to the ARC website (2007), the foremost bee-keeping development initiative in the country is the *Bee-keeping for Poverty Relief Programme* established and conducted by the ARC. The rapid development of this programme has demonstrated that some modest expansion, particularly within gum plantations, is possible.

The project has successfully established arrangements to supply honey to a market with 30% share of the honey market in South Africa (Johannesburg). This market required 50 tons of honey per annum from the emerging farmers. The current volumes are below the expected levels required by the formal market. Pick n' Pay in the Eastern Cape Province, for example, was contacted by the beekeeping business in Port St Johns for marketing its honey and Pick n' Pay has shown willingness to purchase. The Honey House was established for this project in preparation for this marketing opportunity. There are also other opportunities that are available for the beekeeping business in the Eastern Cape, for example the beekeeper in Tsolo is selling honey to Wimpy in Umtata (DRDAR, 2012).

Currently, farmers market their honey in various forms: as bottled honey, honey combs and bulk buckets. The communities around, are used as a market for produce. The communities can now access honey at affordable prices and improves their nutrition levels. The following are the OR Thambo beekeeping projects which were funded by the ARC in the Eastern Cape Province under the poverty relief programme (ARC, 2007).

Table 3: The ARC funded beekeeping associations in OR Tambo District

Name of Beekeeping Association (BA)	Location of Project
Cheka BA	Tsolo, Eastern Cape Province
Hombe A BI	Lusikisiki, Eastern Cape Province
Hombe B BA	Lusikisiki, Eastern Cape Province
Jam-Jam BA	Qumbu, Eastern Cape Province
Lithobeni Beekeeping Project	Libode, Eastern Cape Province
Mqanduli BA	Mqanduli, Eastern Cape Province
Ndungwana Honey Project	Umtata, Eastern Cape Province
Ngoswana BA	Umtata, Eastern Cape Province
Notisila BA	Ngqeleni, Eastern Cape Province
Qandu BA	Port St Johns, Eastern Cape Province
Thekwini BA	Port St Johns, Eastern Cape Province
Upper-Mjika BA	Tsolo, Eastern Cape Province
Vusi Sizwe BA	Ngqeleni, Eastern Cape Province
Zibungu Phila BA	Libode, Eastern Cape Province

Source: www.arc.ca.za

It is also important to note that, according to the Section 7 Investigation committee (2008), most of these projects which are also available in other provinces are no longer economically viable. Secondly, the association of commercial beekeepers in the Eastern Cape Province (i.e. the Eastern Cape Beekeepers Association) is also not functional. The only active beekeeping structure of the province focusing on the development of rural beekeepers is the Eastern Cape Honey Producers Association (i.e. ECHOPA).

There are about 48 beekeeping projects in the Eastern Cape Province which are supported by the Department of Rural Development and Agrarian Reform, and these projects are found in the data base of subsidized projects through beekeeping programme. The programme was designed to improve honey production in the rural areas of the Province and to fight against poverty and under development.

Table 4: List of beekeeping projects supported by DRDAR in the Eastern Cape Province

District Municipality	Number of Projects	Male	Female
Western District	11	9	2
Alfred Nzo	12	4	8
Chris Hani District	8	7	1
OR Thambo District	12	8	4
Amathole District	5	4	1
Total	**48**	**32**	**16**
Percentage	**100**	**66.67**	**33.33**

Source: DRDAR 2012

It is evident from Table 4, that the majority of beekeeping projects in the Province are owned and managed by males (67%) as compared to females (33%).

2.5.1. Organisation of rural beekeepers in the Eastern Cape

Total Transformation in Agribusiness (TTA) working with the DRDAR mobilized beekeepers and facilitated the formation of the Eastern Cape Honey Producers Association (ECHOPA). Most of the beekeepers joined the association at a provincial level and also managed to organize themselves into their respective districts. All districts were represented in the Provincial ECHOPA and in the first year, the membership was about 350 farmers. The beekeepers with proven experience and their own investment and training in beekeeping considered themselves adequately prepared to be groomed into commercial beekeepers. Although during the inception of the association there were 350 farmers, currently the number of active members is far below that as most members do not activate their memberships and hence are assumed not to be part of the association (DRDAR, 2012).

2.5.2. Capacity building

According to the DRDAR reports (2012), Provincial based beekeeping programmes on the market-driven agribusiness development model addressed the identified constraints. Hands-on training programmes and mentoring were provided to enhance the producers' technical and management knowledge and skills for production that meets market requirements in terms of quantity, quality and timeliness of delivery.

The beekeepers were trained in the basic beekeeping (introduction to beekeeping) courses and there were about 25 farmers. Hands-on training on beekeeping management was also provided, including hive inspection and proper harvesting practices for the selected beekeepers. The National Development Agency (NDA) also funded this project for capacity building, and 75 farmers were then trained. All these farmers were given five beehives each, basic beekeeping tools and protective clothing.

In December 2008, the DRDAR-EC provided R729 000 for the acquisition of 860 beehives to be allocated to beekeepers who are on the "selected beekeeper" programme. The farmers started producing honey in all the six districts as the first funding from DRDAR-EC was a pilot. There were four farmers funded in each district. Each farmer received 80 beehives, basic beekeeping tools and protective clothing. The harvesting of honey started in 2009, but the harvest was low, ranging from 100 kg to 250 kg per beekeeper with 80 beehives. Farmers who managed to harvest from their hives were from two districts (Amathole and OR Tambo). The other four districts were not able to harvest from their hives. This was due to climate change. There was drought for a very long time and after the drought period, rain was heavy and bees couldn't work. In the 2010 production season, the kilograms of honey produced by the emerging farmers improved and the number of hives for some farmers increased (DRDAR, 2012).

Table 5: Harvest of the selected beekeepers in the Eastern Cape Province

Farmer	**District**	**No. of hives**	**Honey harvested (kg)**
Mtambeki	OR Tambo	80	300
Ngudle	OR Tambo	80	340
Nazo	Cacadu	43	260
Sityebi	Amathole	80	300
Kobese	Amathole	80	280
Maphekula	Amathole	80	700
Gomna	Amathole	300	1 600

Source: DRDAR-EC, 2012

These farmers employed casual employees to assist in harvesting beehives. For the farmer with 300 hives five casual workers were employed for three days. Other farmers in the Table 5, employed casual workers ranging between two and three for two days. There were other farmers who harvested in the 2011/12 season with kilograms ranging from 5 to 10 kg. Additional funding of 145 beehives and processing equipment was provided by the DRDAR for farmers who had shown increasing production.

CHAPTER THREE:
DISCRIPTION OF THE STUDY AREA

3.1. Introduction

The Eastern Cape is located on the southern coast of the African continent, and it is the second largest of South Africa's nine provinces, covering around 14% of the country's land mass. The province has six district municipalities that include areas that are in the former Transkei or Ciskei (Provide, 2005). The districts of the Eastern Cape are: Alfred Nzo, Chris Hani, Amathole, OR Tambo, Joe Gqabi, and Cacadu. The province also has two metropole (metropolitan area or city), the Nelson Mandela Metropole and the Buffalo City Metropole (Department of Water Affairs, 2007).

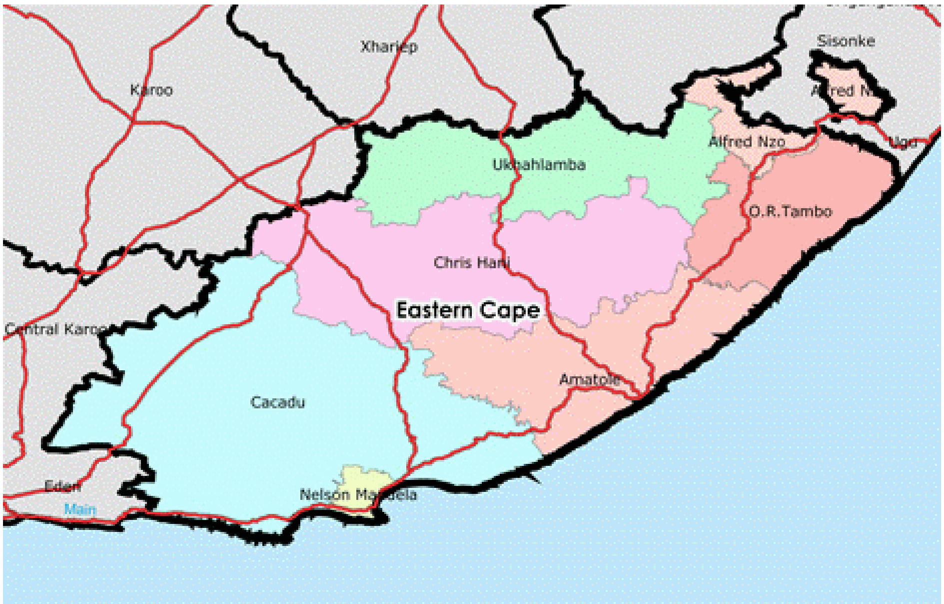


Figure 1: District municipalities in the Eastern Cape Province

Source: Demarcation Board (www.demarcation.org.za).

According to the Eastern Cape Department of Economic Development and Environmental Affairs (2011), these district municipalities are playing a very important role in local economic development (LED) through the provision of public services and through development projects, especially in the poorest areas. These districts have drawn up Integrated Development Plans (IDPs) to identify their priorities for supporting economic and social development in their respective local municipalities. The larger district municipalities are taking on growing responsibilities for infrastructure, including rural roads, water and sanitation, and housing.

The Eastern Cape Province has 6.6 million people according to 2014 mid-year estimates, with a provincial share of 13% of the South African population and this share has been decreasing as from 2002 from 14%. But, the province has the third largest population in the country with the nation life expectancy estimate of 59 year for males and 63 years for females. However, 65% of the Eastern Cape population live in rural areas (Statistics South Africa, 2013). In addition, as mentioned by Statistics South Africa (2013), most of the remaining population live and work in towns and cities, especially the two main cities of Port Elizabeth and East London. Two thirds of the population live in the former homeland, or areas of the former Transkei and Ciskei.

3.2. General overview of the Eastern Cape Province

South Africa is a land of great diversity, because the country contains seven biomes or ecological zones, and offers an unrivalled range of climates, landscapes and cultures (Department of Water Affairs, 2007). The Eastern Cape exemplifies all that South Africa has to offer (Provide, 2009), hence the province is still a frontier for the tourist, industrialist or investor; it is a frontier of diversity, potential and economic opportunity. For the people who live in it, the province is a frontier at the cutting edge of social and economic transformation (Eastern Cape Department of Economic Development and Environmental Affairs, 2011).

3.2.1. The economic setting of the province

Just as the climate and terrain of the Eastern Cape varies tremendously from the dry Karoo to the rolling hills of Transkei, so the economy of the province changes between its different districts. Each district has its own strengths, challenges and opportunities. The province is divided into two worlds: one of severe underdevelopment and one of modern growing industry. By many measures, it is still the country's most impoverished area, having inherited the apartheid government's deliberate underdevelopment of the homeland areas. The province is, however, steadily instituting programmes and strategies to address underdevelopment, lack of jobs and poor services while harnessing the enterprise and skill of rural households in these former homeland areas (Eastern Cape Department of Economic Development and Environmental Affairs, 2011).

According to the Eastern Cape Department of Economic Development and Environmental Affairs (2011), the economy of the province is increasingly modern and export oriented, with great potential for the growth of existing industry and the establishment of new industries. The geographic location, quality sea and air ports, abundance of natural resources and infrastructure are particularly well suited for the growth of export-oriented industry. Total exports from the Eastern Cape are growing by an average of 20% yearly and in real terms from the year 2000 to date. The province is committed to providing high-value goods to the world, rather than cheap raw materials.

The province is using innovative ways to draw rural people, who survive mostly on subsistence agriculture, migrant labour and welfare grants, into the mainstream economy. One of the most important of these interventions is the Provincial Growth and Development Plan (PGDP), formulated by the Provincial Government and its social partners in line with the national policy framework for socio-economic planning at provincial level. The PGPD is aligned with the national Accelerated and Shared Growth Initiative for SA (Asgi-SA), launched in July 2005 (Provide, 2009).

The Provincial Government has registered and prepared the institutional foundations for a special purpose vehicle, Asgi-SA Eastern Cape (Pty) Ltd, which was tasked with two mega projects in the eastern part of the province. The projects are: the Mzimvubu Development Zone (agriculture sector) and the Forestry and Timber Expansion Project (forestry sector). This initiative aims to draw together the public entities and private businesses to stimulate growth in labour-intensive sectors (Eastern Cape Department of Economic Development and Environmental Affairs, 2011).

The provincial Gross Domestic Product (GDP) increases by an average of 4.5% yearly since 1994, compared to the national GDP average growth rate of 5% yearly. Prospects for further sustained growth trends from 2007/8 are extremely favourable in both the provincial and national economic systems. In 2013, the provincial economy's estimated value was R97-billion, making up 8% of South Africa's GDP. Statistics South Africa figures show that the Eastern Cape economy grew by 3% during 2013, up from just 1% the previous year (Statistics South Africa, 2013).

General government services make up 28% of the provincial economy. Real estate and business services industry make up 18% of provincial GDP, and the important and growing manufacturing sector makes up 17%. Stats SA figures show manufacturing in the province grew by about 5% in 2006, compared to 4% in 2005. This has been attributed mostly to the Eastern Cape's strong automotive and components sector, but also to contributions from food processing, textiles and clothing, chemicals and machinery products. Construction activity, meanwhile, reflects both industrial growth and infrastructure investment – growth in construction in the province was estimated to be 11% in 2006, 10% in 2005 and 9% in 2004 (Provide, 2009).

Unemployment remains a challenge, but as the economy has grown, improvements have been evident. The province created 152 000 formal jobs between 2004 and 2006, reducing unemployment from 32% to 22% (Statistics South Africa, 2013). As mentioned by McDonald (1999), government is ensuring the environment is attractive to investors. Apart from supporting the establishment of two sophisticated Industrial Development Zones (IDZs), the provincial government is working with its partners to develop a provincial industrial strategy/policy. The point of reference is the Department of Trade and Industry's National Industrial Development Framework. The policy framework is focusing on key growth areas, especially automotive, agro-processing, tourism and forestry.

3.2.2. Sectors and industries

The Eastern Cape Province offers favourable infrastructure which can serve as a basis of opportunities in several sectors for investors, and for development and growth. These sectors include: Agriculture and minerals: crops, fisheries, forestry and wood products, livestock, minerals; Agro-processing: dairy products, food processing, furniture, leather/leather products, wool and mohair; Manufacturing: automotive, electronics and ICT, metals and engineering, pharmaceuticals, plastics, textiles and clothing; Tourism: various parks, museums, craft markets, reserves and resorts; and Electronics and ICT: call centres, software development (Provide, 2009).

3.2.3. Farming and natural resources

The Eastern Cape is abundantly rich in natural resources, from grazing land to forests, marine life to rich farming soils, water to wilderness. With all seven of South Africa's ecological zones, the province's climate allows for the production of a wide range of crops. Crops as diverse as pineapples, tea, tomatoes and chicory are successfully cultivated. Pondoland, in the east of the province, holds some of the richest soils in the country. Natural forestry and plantations are another strong area of agriculture, with major commercial plantations established. This is the only province where forestry can be extended under the existing forestry permit system (Department of Water Affairs and Forestry, 2007).

The National Forest Inventory (NFI) identified 226 997 ha of natural forest in the Eastern Cape. The NFI shows that 139 944 ha are named, and are assumed to be legally demarcated forests. The total of 87 053 ha of forest, shown on the NFI maps, are not identified by any names and are assumed not to be legally demarcated. For the purposes of this report, these unnamed groups of forests are referred to by the names of nearby localities. These natural forests are owned and managed by the state (DWAF, DEDEAT, and Municipalities), private farmers, traditional authorities and various conservation authorities. The greatest number of individual forests are managed by DWAF and clustered into “patrols” (Department of Water Affairs and Forestry, 2007).

The vegetation group referred to as “woodlands” has recently become the responsibility of DWAF with regard to the protection and promotion of equitable and sustainable use. The National Forest Act, according to Willis (2002), defines woodlands as “a group of trees which are not a natural forest, but whose crowns cover more than 5% of the area bounded by trees forming the perimeter of the group”. A strategic framework for the implementation of a woodlands policy was formulated in 2005 (DWAF, 2005). Unlike the data pertaining to forestry plantations and, to some extent, natural forests, much work still needs to be done to carry out a reliable inventory of the woodlands.

The province has always been a livestock farming area. Colonial wars once raged for possession of prime grazing lands and, still today, rural Xhosa people see their cattle as a symbol of wealth and status. Today the province is the country’s premier livestock region and presents excellent opportunities for meat, leather and wool processing. Secondly, with a long coastline, fishing and fish farming are well-established industries. Game fishing and whale and great white shark watching are drawing increasing numbers of people through tourism (Provide, 2009).

3.3. Suitability for smallholder beekeeping

Poverty in the Eastern Cape is both widespread and deep, with 43% people living in poverty conditions (Shackleton, 2004). Most of these are concentrated in the former Bantustan areas, which now make up O R Tambo, Alfred Nzo, and parts of Amathole, Chris Hani and Ukhahlamba districts.

The Eastern Cape Province has wooded biomes and plantations of about 2 218 600 ha which are suitable for apiculture or honey production and this makes it possible for rural dwellers to supplement their incomes through economic activities that are suitable for such conditions. Secondly, while poverty is concentrated in rural areas, there is also significant urban poverty, with growing township and informal settlement populations (Shackleton, 2004).

The Eastern Cape has the opportunity to develop the beekeeping industry. If done successfully, it could contribute significantly to alleviation of rural poverty and food insecurity. Also the development of new enterprises like beekeeping in rural communities is highly supported and funded by the Government of the Province.

CHAPTER FOUR:
RESEARCH METHODOLOGY

4.1. Introduction

This chapter describes the method and steps followed by the researcher in an attempt to acquire as much relevant information as possible. The following are covered in this chapter; the conceptual and analytical framework, overview of similar previous studies, data requirements, sampling frame and procedures, development and pre-testing of the questionnaire, data collection, data cleaning, data coding and the methods of data analysis.

4.2. Conceptual framework

This study intended to address the question of why South African beekeeping has remained stagnant despite massive investments for sustainable development. This would necessarily entail answering a number of questions related to the socio-economic factors influencing apiculture, income contribution and the attractiveness of the subsector and what this means for the beekeeping and, indeed, provincial development in the Eastern Cape context. The different viewpoints and perspectives on the subject were examined. It is clear that a focus on beekeeping as a subsector of the agricultural sector is appropriate because of its potential role in rural poverty alleviation. The unique structure of the beekeeping enterprise of the Eastern Cape Province where the dominant small-holder population faces almost identical physical and socio-economic environments creates the sort of homogeneity that justifies its consideration as an entity. Examining the income contribution of the enterprise also recognizes its primacy in terms of employment creation and poverty alleviation.

The factors inhibiting enterprise development in South Africa are those that, when addressed, will enhance the enterprise's sustainability. Thus, models that facilitate the determination of the inhibiting factors will also provide a basis for indirectly assessing sustainability. Similarly, an assessment of the enterprise's income contribution ultimately implies an analysis of the enterprise's income and cost structure in technical and economic terms to the extent that it enables measures of the enterprise's contribution to food security. Hence, this study employed the descriptive methodology used by Abebe (2009) in a Masters' thesis submitted to Haramaya University analysing market chain of honey production in the Atsbi Wemberta District of Ethiopia. In addition, income contribution was analysed as well as the determinants of honey production and the constraints inhibiting the development and growth of the beekeeping enterprise in the Eastern Cape Province.

The study employed a variety of procedures to generate the data, including searching population sample databases and farm-level surveys. Survey-derived data on the production and marketing costs of honey production was collected from sample beekeepers. The study was provincial and covered honeybee producing areas of the province. The data was collected by means of structured questionnaires that capture a range of production-side factors. A linear regression analysis was performed on the data to derive estimates of linear dependence among the variables and the relative importance of production-side factors.

4.3. Analytical framework

This study used a Linear Regression Model to identify the socio-economic variables influencing apiculture, such as Gender, Age of beekeeper, Marital status, Household income, Education level, Extension services, Colony size, Hives number, Access to credit, Labour hours, Market access, Distance to market and the Market price. The regression model is used to estimate the unknown effect of changing one variable over another (Argyrous, 2006). When running a regression, there are two important assumptions to make:

- There is a linear relationship between two variables (i.e. X and Y),
- This relationship is additive (i.e. $Y = X_1 + X_2 + \ldots + X_N$).

Technically, linear regression estimates how much Y variable *(*as dependent) changes when X variables (as independent variables) change by one unit (Peck *et al.*, 2008).

When using this model for analysis, according to Argyrous (2006), there are other statistical results to look for:

The **P – Value**: It tests whether R^2 is different from 0. Usually we need a p-value lower than 0.05 to show a statistically significant relationship between X and Y.

R-square: shows the amount of variance of Y explained by X. Adjusted R^2, shows the same as R^2 but adjusted by the number of cases and number of variables. When the number of variables is small and the number of cases is very large then adjusted R^2 is closer to R^2. This provides a more honest association between X and Y.

The t-values: test the hypothesis that the coefficient is different from 0. To reject this, a t-value greater than 1.96 (at 0.05% confidence) is needed. The t-values can be computed by dividing the coefficient by its standard error. The t-values also show the importance of a variable in the model. In this study, percentage was the most important.

A correlation matrix: for all variables in the model is needed. Numbers in Pearson correlation coefficients go from -1 to 1. Closer to 1 means strong correlation. A negative value indicates an inverse relationship (roughly, when one goes up the other goes down).

Beta: Measures the influence of each observation on the coefficient of a particular independent variable (for example, X_1). This is in standard error terms. An observation is influential if it has a significant effect on the coefficient.

On the other hand, this study also used the concept of Gross Margin Analysis to analyse the income contribution of honey production and marketing. Gross Margin Analysis focuses on the difference between income and costs incurred by the producer in the production process. The Gross Margin Analysis (also referred to as Contribution Margin Analysis) will indicate how much a product contributes to the income of a household. The contribution margin is the amount left after the direct costs are deducted from the income produced by a given product. Direct costs are those incurred for production and usually separated from fixed costs which are those expenses that would occur whether or not anything was produced.

However, the Gross Margin Analysis is static and does not take into account the time value of money as compared to investment analysis. Nevertheless, it is a useful tool which can assist in improving the overall management as it addresses resource productivity in a given period of time.

Determinants of Gross Margin for Beekeeping Enterprise: **Gross Value of Production** less **Directly Allocable Costs** [pesticides, feed costs, contract work (specific), casual labour, marketing costs, hired transport, crop insurance, packing material, miscellaneous] less **Not Directly Allocable Variable Costs [**fuel, repairs (vehicles and machinery), spares, electricity, other] equals **Gross Margin.**

4.4. Overview of previous similar studies

There are several similar research studies on beekeeping which were carried out in the African continent - in Ethiopia, Tanzania and Botswana - and the findings of these studies are similar:

In 2007, a research project was carried out by the International Centre for the Integrated Mountain Development (ICIMOD) in Ethiopia; the primary objective was to promote the development of an economically and environmentally sound mountain ecosystem and to promote the living standards of the mountain population. The results of the study were that beekeeping has holistic benefits that relate to health, the economy, employment, and the environment. It also find that beekeeping can be carried out by resource-poor farmers and is particularly suitable for under-privileged, landless, and low-income groups as well as women as it requires minimal start up investment and generally yields profits within the first year of operation (Farooq *et al.*, 2007).

A study was also conducted in the Mangrove forests and the Miombo woodlands of Tanzania by Lalika and Machangu (2005), assessing beekeeping for income generation and coastal forest conservation. For the study, 120 households were interviewed, 30 in each village and the Participatory Rural Appraisal (PRA), household questionnaires, a checklist of questions and participant observation were used for data collection. Socio-economic data was analysed using descriptive statistics while data collected through PRA was analysed with the help of the local community.

Major findings were that, the beekeeping industry is economic viable in Tanzania and it has an important impact on the national goal of reducing poverty, improving community livelihoods and maintaining sustainable natural resources. Hence, it was also concluded that beekeeping has a potential contribution to make to the incomes of smallholders in Kilwa and Lindi rural districts. This income is generated through selling honey and beeswax. Constraints on the efforts of beekeepers include the poor marketing system, and inefficient road and communication infrastructures. Marketing of bee products in the villages is poorly organised, such that honey is used within the villages as food and medicine.

Lepetu *et al.* (2001) conducted a study in the Gaborone region in Botswana, assessing the potential of the beekeeping industry in enhancing rural household incomes. A total of 47 beekeeping projects with 112 bee colonies (five agricultural districts) were sampled. Data collection was from the October 2001 honey flow period. The bee colonies produced 2 578 kg of comb honey, which generated a total income of P36 930.00. Some bee colonies were not harvested at all. Average annual honey production per colony was 37 kg for individual beekeepers, 26 kg for beekeeping clubs, and 35 kg for government apiaries respectively. Most beekeepers were supplementary feeding their bee colonies with sugar solution.

The study found that the availability of natural and artificial bee pastures planted around apiaries played an important role in increasing honey production per colony. Comb honey was mostly being produced and wax that is supposed to be processed was wasted. The beekeeping calendar was not followed; some beekeepers were hobbyists, that is, they keep bees for pleasure without any interest in profit. The beekeepers' major problems were lack of bee management skills (79%), insufficient visits by beekeeping personnel 70%), attacks by ants (53%) and bee pirates (32%). A conclusion was that inadequate technical assistance prevented farmers from attaining maximum production in the beekeeping projects.

Another similar study was carried out by Yirga and Ftwi (2010) in the Department of Biology at the Mekelle University of Ethiopia in 2010. The study was conducted to assess the potential of beekeeping for rural development and to identify the major constraints faced by beekeepers in a village called Hangodo in Saese Tseada Enba District Tigray, North Ethiopia. Data was collected through semi structured interviews with 85 randomly selected beekeepers representing 88% of the total beekeepers in the village. Generally, the instrument was designed to generate information in the following areas: annual income, number and type of beehive owned, constraints of beekeeping, honey yield/hive, year of adoption of modern beehives and beekeeping experience.

The results of the study were that beekeeping had a positive impact on income generation. The following major constraints were identified; pests and predators, absconding, shortage of bee forage and drought. The similar previous studies reported above, have all been undertaken elsewhere in Africa; no record could be found of such studies in South Africa.

4.5. Data requirements

Primary data was collected using survey questionnaires for beekeepers (honey producers). The survey acquired information from the beekeepers concerning their demographic and socio-economic profile, output of honey, production expenses, household size, years of involvement in beekeeping and the number of hives used. In order to use the Linear Regression Model, the following additional information was obtained; total honey production (yield) in kg; gender; age of beekeeper; marital status; household income level; education level of the beekeeper; extension services accessibility; and colony size, number of hives, access to credit, labour hours, market access, distance to market, and the market price.

In addition to the Linear Regression Model used to estimate the determinants of honey production per household, the information obtained was also used to calculate gross margin, using estimates of gross revenue, variable cost, returns to labour and management, imputed interest on credit, imputed rents on forest reserve/land, depreciation of tools and equipment, and imputed costs of non-paid labour.

Since this was a quantitative descriptive study, it required identifying the characteristics of observed variables or exploring possible correlations among two or more phenomena (Leedy & Ormrod, 2010). Hence, this research examined the beekeeping situation as it is and did not involve changing or modifying the situation under consideration. Therefore, for this study (survey research), quantitative information was obtained and summarized through descriptive statistical analysis like mean, standard deviation and percentiles. This enabled the researcher to describe beekeeping practices in the province. Secondly, econometrics models were used to assess the determinants of and possible constraints to productivity and marketable supply of honey.

4.6. Selection of respondents

The research purposively included all the beekeeping projects and cooperatives which were accessible through the data bases of the Eastern Cape Department of Rural Development and Agrarian Reform (DRDAR), and only economically active beekeeping projects were included the study. A list of possible respondents was constructed from district-level lists of individual beekeepers, which are kept by district-level beekeeping coordinators (extension officers). These lists, in turn, are compiled from ward-level and municipality-level lists kept by beekeeping coordinators.

In selecting the active projects, the following criteria were used:

- The license or land title of the beekeeper was not taken into consideration; this is because most of household beekeeping projects lack land titles, and are using community forestry biomes and plantations. This criterion intended to include in the sample all the project units that are in the study area.

- Only beekeepers that were accessible and known through the data base of DRDAR.
- The project bee-enterprise should have been operating for at least one year as of the end of last financial year prior to the survey, i.e. the 2012/13 financial year. This criterion was intended to include in the study all projects with performance records.

Using these criteria, a total of 58 qualifying beekeepers was included in the study as respondents.

4.7. Ethical considerations

Most societies and institutions have legal rules that govern behaviour, and ethical issues tend to be broader and more informal. Although laws are mostly used to enforce widely accepted moral standards and ethical and legal rules use similar concepts, ethics and law are not the same. An action may be legal but unethical or illegal but ethical.

It is important to adhere to ethical norms in research. First, norms promote the aims of research, such as knowledge, truth, and avoidance of error. For example, prohibitions against falsifying, or misrepresenting research data promote the truth and avoid error. Second, since research often involves a great deal of cooperation and coordination among many different people in different disciplines and institutions, ethical standards promote the values that are essential to collaborative work, such as trust, accountability, mutual respect, and fairness. Third, many of the ethical norms help to ensure that researchers can be held accountable to the public.

Fourth, ethical norms in research also help to build public support for research and this also promote a variety of other important moral and social values, such as social responsibility, human rights, animal welfare, compliance with the law, and health and safety. Ethical lapses in research can significantly harm human and animal subjects, students, and the public.

Given the importance of ethics for the conduct of research, University of Fort Hare have adopted specific codes, rules, and policies relating to research ethics, just like many other South African Universities. Before embarking on collection of data, the researcher had to apply for Ethical Clearance for the project from the University of Fort Hare Ethics Committee. The application was granted, the Ethical Clearance Certificate is shown in Appendix 3.

The research participants were all informed of the study during their quarterly study group meetings and were willing to participate. There were no challenges regarding voluntary participation because participants knew the researcher from the same beekeeping study groups; furthermore, research in beekeeping was always encouraged by senior government officials. In addition, the local authorities and traditional leaders of each community involved in the study were informed about the study and its purpose, and the approval document from the University was presented as well.

4.8. Development and pre-testing of the questionnaire

A survey questionnaire was used as the primary research instrument. The questionnaire consisted of two sections. The first section contained questions seeking information about the owner (beekeeper) of the enterprise such as gender, age, employment, business activity, education, age, marital status and weekly working hours. The second section of the questionnaire was designed to collect information about the production processes. This section contained questions related to technical, management information and communication technology, financing sources, family assistance, outsourcing or subcontracting, expenses, sales and marketing and production constraints.

An English version of the questionnaire was developed and pilot-tested using one (1) beekeeper from the Sikhobeni community at Chris Hani District Municipality. The purpose of pre-testing the questionnaire was to identify and remove any ambiguity in the wording of the questions. The pre-testing also helped to identify items that needed to be deleted and those that needed to be added to the questionnaire.

4.9. Collection of data

The questionnaire was administered during a face-to-face interview with each respondent individually. The respondents had a chance to ask for clarity where and when the question was not understood. Quota controls were imposed on the level of education, gender and age in order to ensure an even split for better analysis. As mentioned earlier, a total of 58 face-to-face interviews in all district municipalities of the province were conducted lasting no longer than 20 – 30 minutes. The screening criteria were also imposed on age (only adults aged 18 – 65 years old were interviewed).

The interviews were conducted by trained enumerators, in isiXhosa. The enumerators used were all beekeeping coordinators from the district municipalities concerned. These were all officials of the Eastern Cape Department of Rural Development and Agrarian Reform (DRDRAR) working as agricultural economists. All these officials were already familiar with beekeeping practices and known to the respondents. They were all trained as enumerators during the quarterly beekeeping study group meetings. In addition, some agricultural economics interns were used as enumerators, also after proper training, and working under the direct supervision of full-time permanent departmental officers.

4.10. Data cleaning

In order to avoid drawing the wrong conclusions based on incorrect data, care was taken to "clean" the data set. As much as half of the total time needed for analysis was typically spent on "cleaning" the data, although the data set was small (i.e. less than 100 cases and 13 variables). The key variables (Beekeeper level of education, gender, marital status, age, colony size, market price of honey, labour, access to credit, access to extension services, and level of household income) were the first ones to be examined and corrected. Mistakes originating in the question, from measurement, or from the questionnaire responses were also corrected although it was difficult to detect unless they were out of range. Where deemed necessary, follow-up visits were made to respondents in order to verify and/or correct "suspect" responses.

As a result of the rigorous verification and "cleaning" processes undertaken, the data could be used with confidence and findings and conclusions based on the data can be regarded as reliable.

4.11. Data coding

A suitable coding scheme was designed, and applied to the data as recorded in the questionnaire. Coded data was captured onto Microsoft Excel spread sheets. Both coding and capture were double-checked, and any errors were corrected immediately.

4.12. Analytical technique

The Statistical Package for Social Sciences (SPSS) version 22 was used for the analysis of quantitative data. Simple descriptive statistics was employed to provide a summary description of the data collected. This involved the use of percentages, means, frequency distributions, and standard deviations to describe parameters such as socio-economic characteristics, honey yields and output, hive ownerships, and so on. The production function, income and cost budget was used to analyse production of honey and the economic contribution of beekeeping to the household incomes. On the other hand, the potential of beekeeping for rural development was also assessed in that regard.

4.12.1. Gross Margin analysis

The Gross Margin analysis was used to determine the structure of income and costs to beekeeping enterprise. The equations are outlined thus:

$$GM = \Sigma/I = iGR - TVC \ldots\ldots\ldots\ldots (3)$$

$$RLM = GM - \Sigma/I = i\,(r + R_i + D + Lu) \ldots\ldots\ldots\ldots (4)$$

Where

GM = gross margin,

GR = gross revenue,

TVC = total variable cost,

RLM = returns to labour and management,

r = imputed interest on credit,

R_i = imputed rents on forest reserve/land,

D = depreciation on tools and equipment, and

L***u*** = imputed costs of non-paid labour.

4.12.2. Econometrics model specification

The analytical framework used in this part of the study was based on the linear regression model. The model was used to determine the relationship between beekeepers' socio-economics characteristics and honey production. The model was specified as:

Y = f (gender, age, price, access to market, distance to market, access to extension services, education level, experience in beekeeping, access to credit, etc…).

The model specification in matrix notation is estimated by;

$$Y = \beta_0 X_1 + X_2\beta_2 + \ . \ . \ . + X_{12}\beta_{12} + e \ldots\ldots\ldots\ldots (1)$$

Equation (1) was then linearized by taking the natural logarithm, which yielded the following equation:

$$Ln\ Y = \beta_0 + \beta_1 lnX_1 + \beta_2 lnX_2 + \ . \ . \ . + \beta_{12} lnX_{12} + e \ldots\ldots\ldots (2)$$

Where:

Y = total honey production (yield) in kg;

X_1 = gender;

X_2 = age of beekeeper;

X_3 = marital status;

X_4 = household income level;

X_5 = education level of the beekeeper;

X_6 = extension services accessibility;

X_7 = colony size,

X_8 = access to credit,

X_9 = labour hours,

X_{10} = market access,

X_{11} = distance to market,

X_{12} = market price,

β_0 = constant term;

β_i, = coefficients of the regression model;

Ln = natural logarithm, and

e = error term.

Table 6, presents a summarised description of the variables used in the regression model.

The variables are described fully in Section 4.12.3, following Table 6.

Table 6: Description of variables used in the model

Variable	Unit	Description	A priori expectation
Y	Kg (per year)	Honey output	+
X_1	Dummy (1=male, 0=female)	Gender	+/-
X_2	Continuous variable (Years)	Age of beekeeper	+
X_3	Dummy (Single = 0, Married = 1, Divorced = 2, Widow = 3)	Marital status	+
X_4	Continuous variable (Rands/month)	Household income	+
X_5	Dummy variable (primary = 0, secondary = 1, tertiary = 2)	Education level	+/-
X_6	Dummy	Extension services	+/-
X_7	Continuous variable	Colony size	+
X_8	Dummy variable (yes = 0, no = 1)	Access to credit	+
X_9	Continuous variable. Hours	Labour hours	+
X_{10}	Dummy	Market access	+/-
X_{11}	Kilometres	Distance to market	+
X_{12}	Continuous variable. R/kg (2014 values)	Market price of honey	+

4.12.3. Definition of Variables

Y Dependent variable

Quantity of honey produced (PRODUC): Is the dependent variable measured in kilograms per year. The variable is explained by the independent variables included in the model.

X_i Independent variables

The explanatory variables expected to influence the dependent variable are the following:

Gender of the beekeeper (GENDER): This is dummy variable that takes a value of (1) if the beekeeper is male and (0) otherwise. Both men and women participate in beekeeping and the production of honey. Male beekeepers have informally been observed to perform better than female beekeepers in beekeeping and production and supply of honey, but this has not been formally tested.

Age of the beekeeper (AGE): Age is a continuous demographic variable measured in years. The expected influence of age is assumed to be positive; it is a proxy measure of farming experience of the beekeeper. Older beekeepers are believed to be more rational in terms of decision making and to have acquired skills in beekeeping, hence they are expected to produce and supply more honey than their younger counterparts.

Marital status (MARITAL): This is dummy variable that takes a value of (0) if the beekeeper is single, (1) if married, (2) if divorced, (3) if widowed. Being married was expected to have a positive relationship with the dependent variable (honey production). This was based on the assumption that married people are more organised and responsible in conducting production activities for the benefit of their family.

Household income level (HHINCM): This is a continuous variable measured in Rands and refers to the level of income of the household. This variable was expected to have a positive relationship with honey production because, as the level of income increases, households would be able to invest more money in the beekeeping activities, buying more beehives resulting in high productivity. On the other hand, as the level of income increases, the priorities in investment could shift away from beekeeping to other farming activities resulting in a fall in honey production.

Education level of the beekeeper (EDUCA): It is a continuous variable measured in terms of primary, secondary and tertiary education level. This refers to the formal schooling of a respondent during the survey period. Those beekeepers who had formal education ability their readiness to accept new ideas and innovations, and ease to get supply, demand and price information and this enhances farmers' willingness to produce more and increase the volume of sales.

Extension services access by beekeepers (EXTSION): This variable is measured as a dummy variable taking a value of (1) if the beekeepers has access to honey production extension services and (0) otherwise. It is expected that extension service would broaden the beekeeper's knowledge with regard to the use of improved beehives technologies. Therefore, a positive impact on the volume of marketable surplus honey is expected. Farmers who have frequent contact with the Department of Rural Development and Agrarian Reform will have better access to information and could adopt better technology that would increase their marketable honey production.

Number of colonies (COLONY): This is a continuous variable measured by the number of bee colonies the beekeeper owns. This variable was expected to have a positive relationship with the amount of honey produced. Honey production is expected to increase with the number of colonies owned.

Access to credit (CREDIT): Access to credit is measured as a dummy variable taking a value of (1) if the beekeeper has access to credit and (0) otherwise. Access to credit is assumed to have a positive relationship with the marketable supply of honey because a farmer who has access to credit service will be able to purchase improved beehives and hence increase the productivity.

Availability of labour (LABOUR): This is a continuous variable measured by the number of hours spent in beekeeping activity or in honey production. This variable was expected to have a positive relationship with the dependent variable as more labour applied to beekeeping is likely to lead to better care of bees and hives, leading to higher levels of honey production.

Price of honey in kg, 2014 prices (PRICE): It is a continuous variable and is measured in Rands per kilogram of honey. This variable is expected to influence honey production positively. When the price of the product is higher, producers are motivated to increase their production. Also, if for some reason some producers are able to achieve higher prices than others, they can be expected to produce more honey than those receiving lower prices. For these reasons the level of honey production is expected to be positively related to the price of honey.

Market access (MACC): This is a dummy variable taking the value of (1) if the producer had access to market and (0) otherwise. It is expected that market access will motivate and enable beekeepers to increase their production and supply; hence market access is expected to have a positive relationship with the level of honey production. This is also similar to the access to market information: the better information farmers had the more likely they are to produce more honey for the market.

Distance to nearest market (DSTMK): It is a continuous variable and is measured in kilometres from the nearest market. Distance to the market affects transportation time and costs, so that a greater distance to the market will result in a lower "farm-gate" product price and a higher "farm-gate" input costs, compared to producers who are closer to the market. Therefore a negative relationship is expected between distance to market and level of honey production.

4.12.4. Test for non-linearity

When the assumptions of the Classical Linear Regression (CLR) model are violated, the parameter estimates of the OLS model may not be the Best Linear Unbiased Estimator (BLUE) (Leedy & Ormrod, 2004). Hence, it is important to test for the presence of heteroscedasticity among the variables that may influence the production of honey in the study area.

There are a number of test statistics available for detecting the presence heteroscedasticity; however, according to Gujarati (2003) there is no ground to say that one test statistics of heteroscedasticity is better than the others. Therefore, due to simplicity, a scatter plot diagram was used in this study to check the linearity between dependent and independent variables. It was concluded that heteroscedasticity did not present a problem in the data used in this study.

CHAPTER FIVE:
EMPIRICAL RESULTS

5.1. Introduction

This chapter presents the results of the descriptive statistical analysis which was used to describe socio-economic and demographic characteristics as well as the beekeeping activities of the respondents. It also presents the results of the Linear Regression analysis which was used to identify variables with a statistically significant impact on production of honey by the respondents.

5.2. Geographic distribution of beekeepers

As per Figure 2, approximately 31% of respondents representing beekeepers in the sample were from the Amathole District Municipality and this was the highest percentage of sampled respondents in the Province. This was followed by Joe Gqabi District and the Western District with 24% and the last two districts were Alfred Nzo and OR Tambo with 7% and 5% respectively.

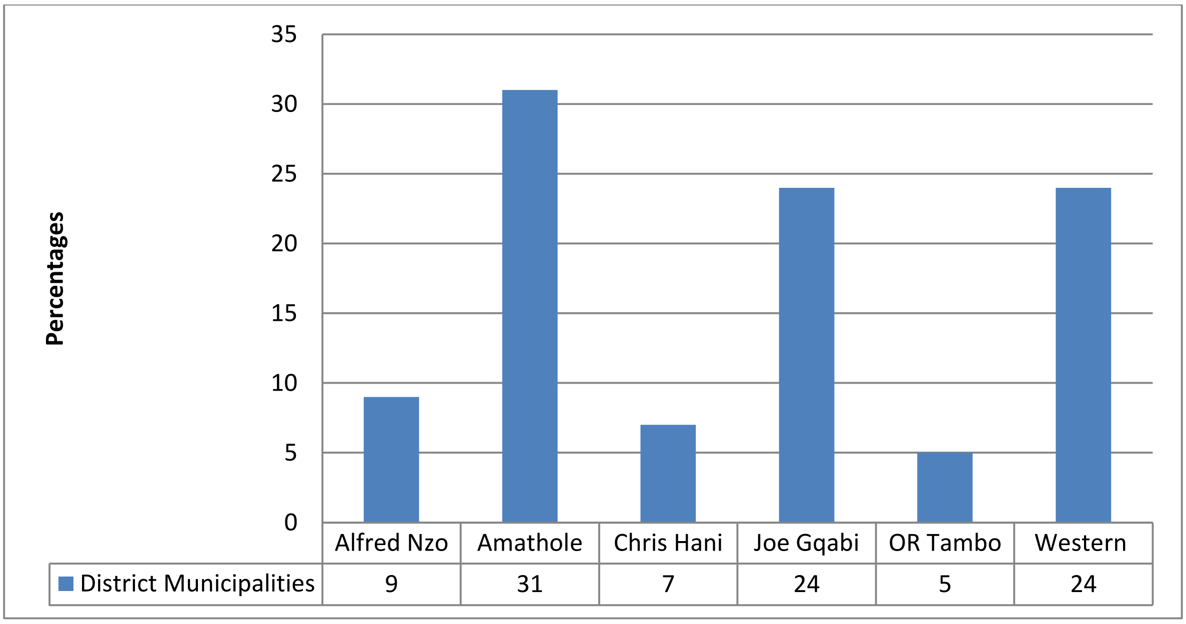


Figure 2: Percentage of respondents per district municipality

The sampled beekeepers were also disseminated according to their local municipalities, this was done to look for the local municipalities with higher concentration of beekeepers in district municipalities and this presented a reflection of or the contribution of respondents per local municipality. This is illustrated in Figure 3:

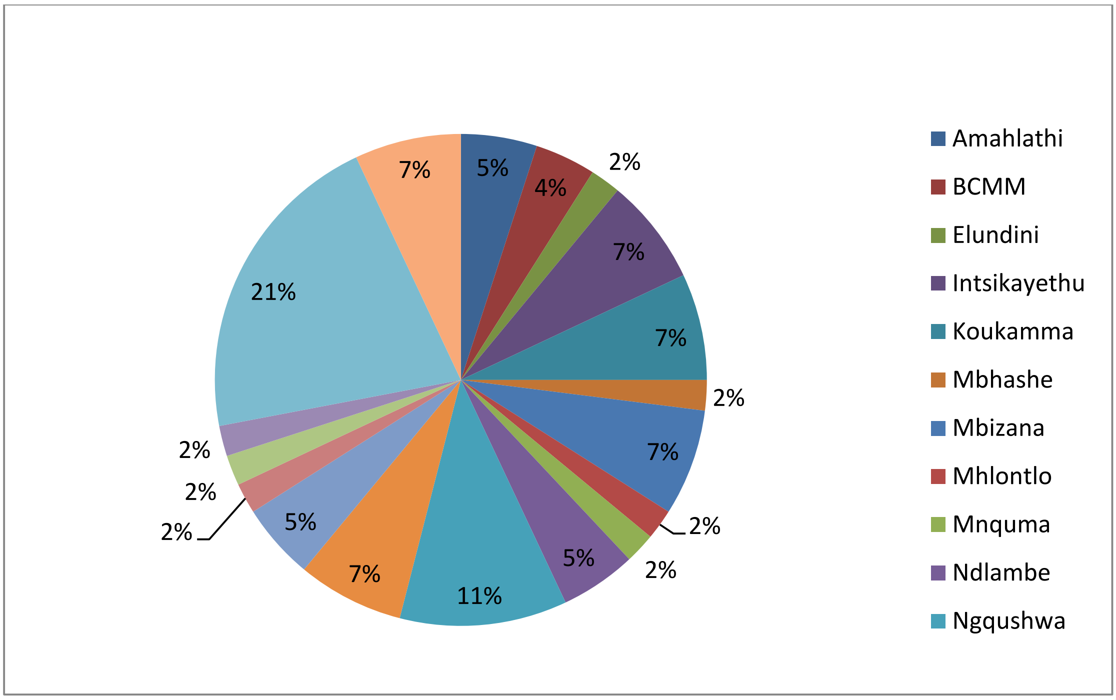


Figure 3: Distribution of beekeepers per local municipality

The local municipality of Joe Gqabi i.e. Senqu local municipality, had the highest (21%) percentages of beekeepers in the sample followed by 11% from Ngqushwa local municipality from Amathole District. Intsikayethu, Koukamma, Mbizana, Nkonkobe and SRVM local municipalities were approximately 7% of the sample. Other municipalities contributed approximately 2%. This is illustrated in Figure 3.

As it will be explained later, it is important to highlight that, Senqu local municipality had the highest number of beekeepers. This was because of the wrong interpretation and implementation of the beekeeping programme during the initial stages where it was said that beekeepers must be grouped in groups of 30 members and boxes were allocated per group. In Joe Gqabi, individual beekeepers were selected in Senqu and five bee hives were allocated per individual.

5.3. Socio-economic characteristics of sample beekeepers

This section provides the socio-economic profile of the sampled respondents with regard to their age, gender, marital status, education level, employment status, level of income, sources of household income and farming activities. This was carried out to achieve the first objective of the study which is to examine the socio-economic characteristics of the beekeeping households in the Eastern Cape Province.

5.3.1. Age

The age distribution of respondents is shown in Table 7. Approximately 71% of respondents were between 22 and 55 years of age while 16% were below 22, and 14% above 55 years of age. The overall mean age of the respondents was 37.6 and the standard deviation was 0.92. This information shows that, as mentioned by Randel (2005), the way people interact with each other is reflected in their social norms and their culture, and this is based on age groups from childhood, youth and adulthood.

Table 7: Distribution of sample respondents by Age

Age Group	Frequency	Percentage	Cumulative Percentage
18 - 21	9	16	16
22 - 36	21	36	52
37 - 55	20	35	86
56 and above	8	14	100
Total	58	100	100

Mean = 37.6 and Std. Deviation = 0.92177

Standard deviation measures how concentrated the data are distributed around the mean; the more concentrated, the smaller the standard deviation (Argurous, 2006). Since the standard deviation of 0.9 is small; it means that the values in a statistical data set are closer to the mean. Therefore, there were no huge differences in age distribution of the respondents.

Beekeeping in the province is mostly dominated by the youth and this is reflected by the 52% youth respondents aged between 18 – 36, and 71% were economically active people aged between 18 and 55 year old. Older people (aged 56 and above) were in lower percentages, i.e. 14%, meaning that old people are not actively or productively involved in beekeeping and the activity is mostly accepted by youth.

5.3.2. Household size

The average family size of beekeepers during the survey period was six people, with maximum and minimum family size of nine and two people, respectively. Amathole, Chris Hani and OR Tambo had the family size of six, five and five people respectively. Out of the total sampled respondents in the survey, 52% were male-headed (Table 8). This conforms to the common understanding that beekeeping is not the man job due to labour requirements (Illgner, Nel, & Robertson, 1998).

5.3.3. Gender

As shown in Table 8, nearly half (48%) of the beekeepers were female. This distribution is in line with the objective of empowering females through rural development projects in South Africa.

Table 8: Distribution of sample respondents by Gender

Gender	Frequency	Percentage
Female	28	48
Male	30	52
Total	58	100.0

5.3.4. Education levels

Considering the education status of the household head and the involvement in beekeeping among the sampled respondents, about 26% had primary education, while a greater majority (50%) had a secondary education (Table 9). The rest of the respondents had a tertiary education, i.e. 24%. More specifically, 15 and 29 of respondents had primary and secondary education respectively and 14 had tertiary education.

Table 9: Education level of the beekeeper

Education Level	Frequency	Percentage
Primary	15	26
Secondary	29	50
Tertiary	14	24
Total	58	100

As shown in Table 9, beekeeping in the Eastern Cape is highly practised by people with secondary education. With reference to some reports received from the beekeeping coordinators from the Department of Rural Development and Agrarian Reform in the province. The department had a beekeeping programme that has been recruiting entrepreneurs in the beekeeping industry. To qualify for the programme, entrepreneurs need to have a basic understanding of English language to be trained in beekeeping and receive funding after the training. Hence, most beekeepers had secondary education because of the implementation approach of the beekeeping project in the Province. This is because; the department is working closely with farmers and is so active in the introduction of new enterprises like beekeeping.

5.3.5. Employment and current sources of income

Most of the interviewed respondents during the survey period were also receiving social grants and old age pensions as the main source of income. Limited number of respondents had employment (permanent and temporary) outside beekeeping as the main source of income but many of those with tertiary education were formally employed by government and private organisations. Consider the Figure 4:

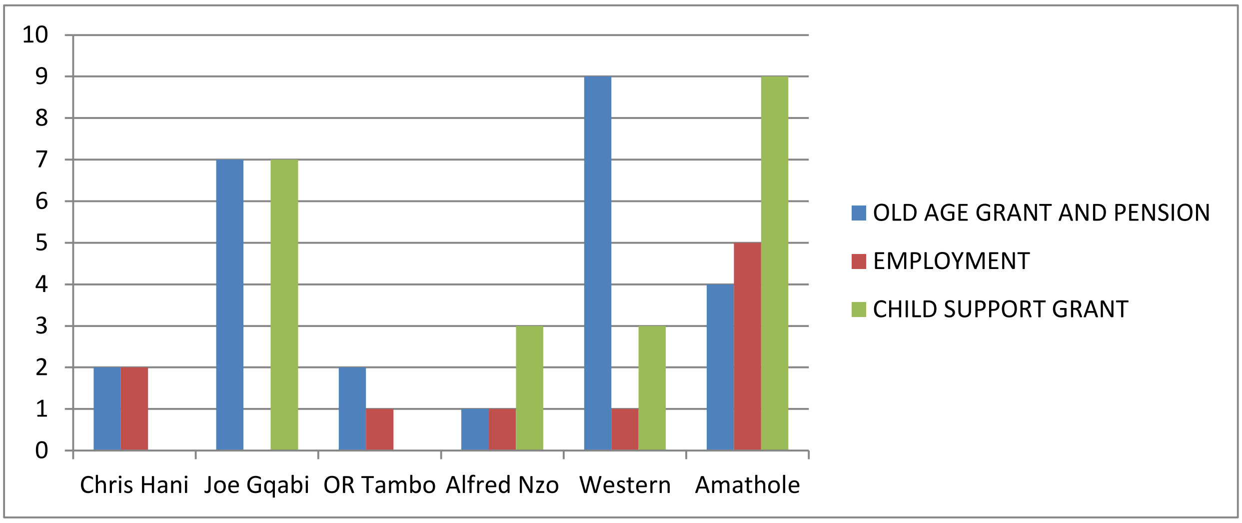


Figure 4: Employment and current source of income

Amathole had the highest number of respondents depending on child support grants, employment, old age grants and pensions as the main source of income. It is also important to mention that, apart from beekeeping, all the interviewed respondents were also involved in other farming activities on a small scale, i.e. vegetable, grain or crop and livestock production. But these beekeepers were not well informed of the positive externalities (additional benefits) that can be derived through beekeeping in the form of pollination services. Beekeeping was not the main source of income, but an additional income just like other farming activities.

5.3.6. Marital status

As mentioned by Christopher (2010), the marital status of households is usually used to determine the stability of a household in African families. It is normally believed that married household heads tend to be more stable in farming activities than unmarried heads. The household size can also be determined by the marital status in African families. In terms of the African culture, married people are expected and allowed to have children, unlike unmarried people. If this holds true, the marital status of household heads will affect honey production and hence, marketing (Randela, 2005). For the results of the study, consider Figure 5:

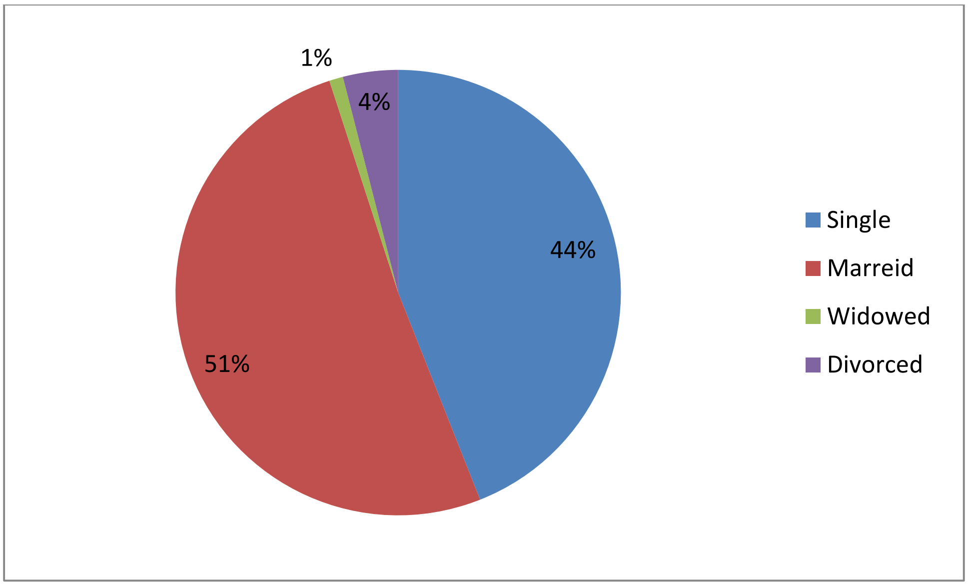


Figure 5: Marital status of respondents

The marital status of the respondents was divided into four main groups namely single, married, widowed and divorced. Approximately, 51% of the respondents were married, which indicate that such households are relatively stable in the beekeeping farming environment. The remaining percentage (49%) of respondents fall into the single, divorced or widowed groups with 44% of respondents being single.

When it comes to family size, a larger household size discourages selling because the household needs to supply household consumption before it decides to sell. It becomes even more difficult to produce and sell where the household is comprised of either very old or very young members (dependencies) who cannot assist with farming (Randela, 2005).

5.4. Honey production

Honey production as one of the important economic activities in the remote areas of the Province. The Amahlathi Local Municipality is one of the local municipalities of the Amathole District with high potential for beekeeping development. According to the Department of Rural Development and Agrarian Reform annual reports (2012), the Province had 2567 honeybee colonies with high contributions from the Amathole

District making it one of the high potential areas for developing beekeeping in the Province.

The annual crude honey produced in 2007/08 per beehive was 12.77 kg (according to the annual reports submitted in the Province by beekeepers). The number of honeybee colonies per beekeeper in the districts and the number beekeepers in the sample is summarized in Figure 6 below. The majority of the sampled (58) respondents in the districts had a honeybee colony holding size that ranges from 1 to 40 beehives and a few (9%) of the sampled beekeepers owned 1-5 bee colonies during the survey period.

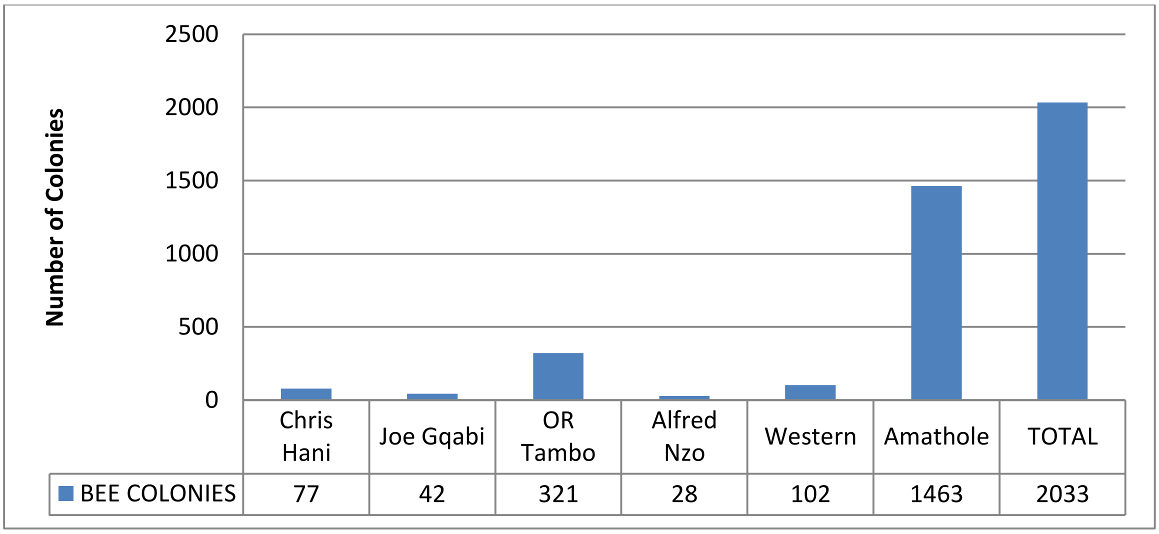


Figure 6: Honeybee colony holding size of sample beekeepers

Figure 6, shows the number of bee colonies per district municipality and Amathole was leading with 1 463 colonies followed by OR Tambo District with 321 colonies. The total Provincial colonies during the survey period were 2 033 colonies for 58 sampled honey producers.

5.4.1. Experience in beekeeping

The level of beekeeping experience is considered to be the number of years that an individual has been continuously engaged in beekeeping activity. The majority (96%) of the respondents had above six years of beekeeping experience (Table 10). The average years of experience for the entire sample was about six years, with the minimum and maximum years of experience being 6 and 13 years respectively. Having improved knowledge of how to keep bees is a prerequisite for the ability to obtain process and use information related to the practice.

Table 10: Beekeeping experience of sample respondents

Years		Frequency	Percentage
Valid	6.00	56	96
	8.00	1	2
	13.00	1	2
	Total	58	100.0

It is important to highlight that most of the sampled beekeepers started beekeeping in 2008 through the Rural Development and Agrarian Reform beekeeping programme. These beekeepers were selected, trained and funded by the Department six years ago and only two beekeepers from Amathole and OR Tambo District were already involved in beekeeping with no formal training in beekeeping and they were also included in the programme after they received training.

5.4.2. Beekeeping equipment

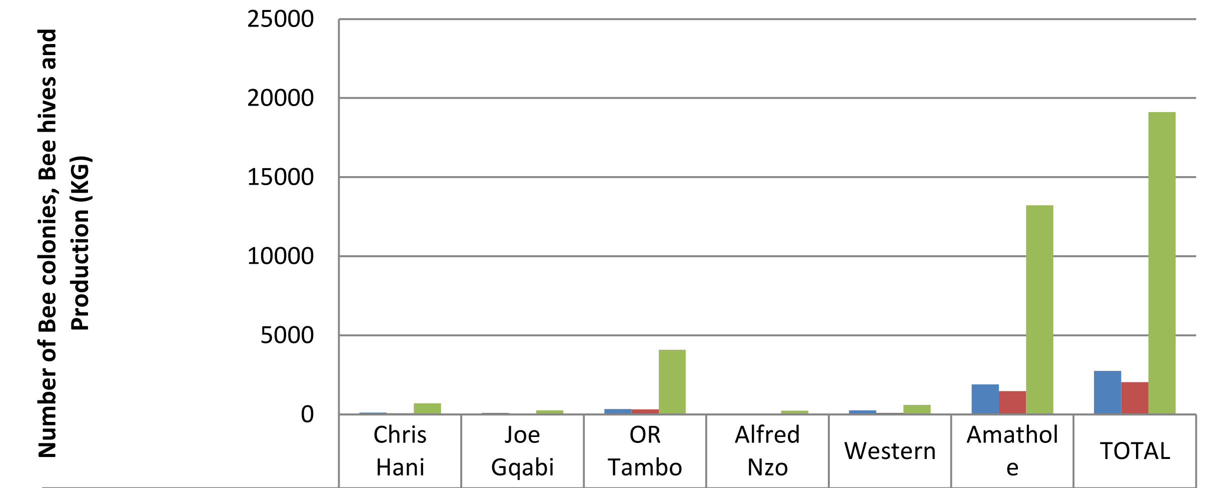
During the survey, respondents were found to make use of wooden improved beehives boxes that were drawn from the same source. It was found that all improved beehives were prepared by a private micro enterprise manufacturing centre in Macleantown near East London. The centre was owned and operated by a commercial beekeeper. At the time of the initiation of the programme in 2008, the price of one improved box beehive was R750.00.

When beekeepers were asked to list the equipment they use for beekeeping, the respondents mentioned a wide range of equipment and tools, prices and service periods that goes hand in hand with beekeeping practices. The full ranges of accessories and tools as the follows: smokers, gloves, bee suits, boots, water sprayer, bee brush, queen lauder, knife, honey container, honey presser, and honey extractor. It was learnt during the survey that, apart from the known basic hive tools, many of the materials are either non-existent or kept by quite a small number of respondents.

5.4.3. Bee hives, bee colonies and honey production

Honey is mostly harvested in the Province from August to December (peak periods) in each year. Among the total of 58 respondents, 65% of them harvest honey twice within this period of the year, whereas 35% of the sampled farmers responded that they harvest once in a year in the same period. It was reported that any production obtained in the remaining periods of the year would be left as food for the colony to strengthen it for the next harvest.

As indicated in Figure 7, the total annual production obtained by the sampled respondents from 2 746 beehives boxes during the survey period was estimated at 19 123 kg for the entire Province. Out of these 2 746 beehives boxes, 2 033 had bees representing bee colonies, meaning that 713 beehives boxes had no colonies at all and are in-active in production (had no impact on total honey production). All this was during the survey period and the condition might change as time goes on.



	Chris Hani	Joe Gqabi	OR Tambo	Alfred Nzo	Western	Amathol e	TOTAL
BEE HIVES	117	90	330	46	258	1905	2746
BEE COLONIES	77	42	321	28	102	1463	2033
HONEY PRODUCED (KG)	699	265	4092	237	605	13225	19123

Figure 7: Distribution of respondents by annual total production

As shown in Figure 7, the District with highest number of beehives boxes, bee colonies and highest production was Amathole during the survey period and this was followed by OR Tambo District. However, it is individual beekeepers from Athole district (Amahlathi local municipality) that has a highest contribution in the district and in the province with highest number of beehives boxes, bee colonies and the highest honey production. Other districts had a very low number of beehives, colonies and production and it is reflected that total honey production depends on the total number of beehives and colonies obtained. Considering Table 11:

Table 11: Average annual production

	N	Minimum	Maximum	Mean	Std. Deviation
BEE HIVES BOXES	58	1	920	47.3448	124.92939
BEE COLONIES	58	1	631	35.0517	89.38041
HONEY PRODUCTION	58	3	4417	329.7069	707.74782
Valid N	58				

The annual mean of honey production by the respondents was 329.70 kg in the same year. The survey results also show that the honey production per beekeeper ranged from 3 kg to 4 417 kg, and about 35% of respondents reported that their annual production during the time was between 111 kg and 156 kg. In the same manner, 30% and 29% of respondents reported that their annual total production was between 25-65 kg and 66-110 kg respectively. However, only few respondents scored the highest production (3.3 and 2.5%, in that order).

5.4.4. Annual gross value of honey production

In the Province, honey is used for consumption and commercial purposes. During the survey, with the given size of holdings of improved beehives, the total annual gross value produced by sample beekeepers from the sale of 19 123 kg (Table 11) of honey output at an average price of R58 /kg (R29 per 500g bottle) was estimated at R1 109 134 .00 (Figure 8).

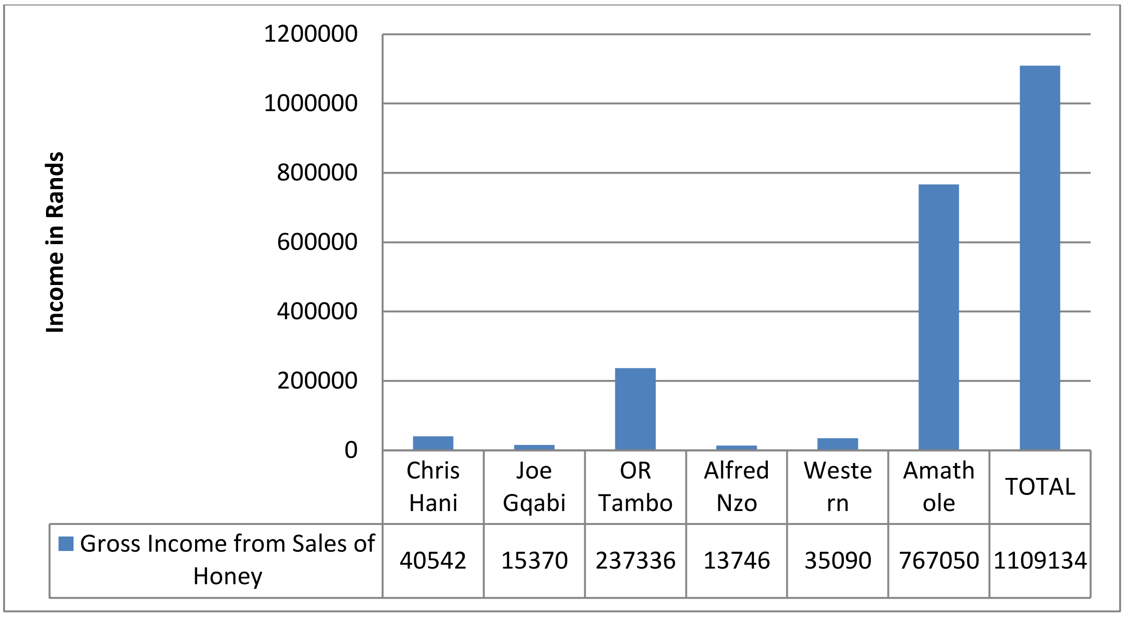


Figure 8: Distribution of beekeepers by annual income

As shown in Figure 8, the leading District with the highest gross income was Amathole district with R767 050.00 (highly influenced by individual beekeeper) followed by OR Tambo District (R237 336.00), Chris Hani District (R40 542.00) and Western District (R35 090.00). The Districts with lowest gross incomes were Alfred Nzo (R13 746.00) and Joe Gqabi (R15 370.00). Therefore, the gross income earned is highly determined by the amount of honey produced and the number of colonies owned and managed.

The annual gross income of respondents from the sale of honey output in the study areas ranged from R174.00 to R256 186.00. The maximum proportion (9.2%) of sample respondents earned an annual gross income of between R41 940.00 to R256 186.00 and about 63.3% of sample beekeepers obtained R10 175 to R41 000.00. On the other hand, very few respondents (2.5%) obtained annual income of less than R1 000.00. Likewise, the mean annual gross income per sampled beekeeper during the survey time was about R7 008.00.

5.4.5. Access to services

Access to different services could be essential to improve production and productivity of emerging beekeepers. More specifically, access to credit, access to extension contact and market information are the most important factors that promote production and marketing of honey production and thereby increase the income of the beekeeper. However, from the total sampled beekeepers that were asked whether they willing to take credit (loans) to fund business operations, about 96% were not willing to loans for honey production but only 4% of them had received some credit from the Eastern Cape Rural Development Agency.

The reason for the respondents’ reluctance for the credit service was because of the financial support in the form of grants from government institutions like DRDAR, ECDC and DEDEAT. The other reason was the high interest rate charged by financial institutions. Eastern Cape Rural Development Agency (ECRDA) as a subsidized Government entity has a low interest rate of 3% per year to support Rural Development and Commercial Banks has above 9% of rates.

Even though farmers in the study were reluctant to credit to finance different inputs to enhance the quantity and quality of the honey production, the short repayment period as well as the high interest rate of the service was not suitable to the individual respondents. Apiculture extension advisory service is provided by the District Departments of Rural Development Offices. As a result, about 100% of the sample respondents had access to extension services to promote beekeeping and thereby increase the quantity and quality of the commodity at production level.

With regard to access to the market information, 100% of the sampled respondents had access to the nearby market price information and at Kola Honey Production and Marketing Business respectively. But in most cases the price is determined by the market forces of supply and demand; hence the price differs from one local municipality to another. Furthermore, all the sampled beekeepers were quarterly attending the beekeeping Provincial study group for information sharing between beekeepers and government officials from DRDAR and invited relevant private institutions like SABIO and SABS.

5.5. Production constraints and opportunities

Beekeepers confronted several problems related to production and marketing. Major problems in beekeeping arise from bee characteristics and environmental factors that are beyond the control of the farmers. Figure 9 and 10 show major constraints identified and prioritized by the respondents.

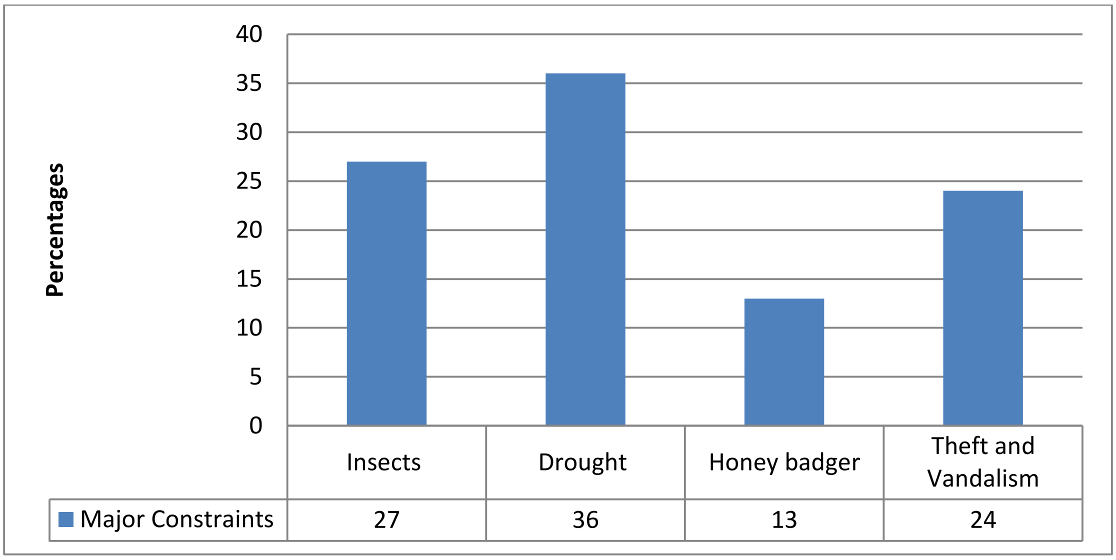


Figure 9: Beekeeping problems encountered by sample respondents

As in Figure 9, the majority 36% of the respondents see drought as the major problem followed by theft and vandalism and honey badger problem. Beekeepers were not feeding their bees during drought periods; this was because of lack of knowledge. When it comes to theft and vandalism, as reported, it was mainly caused by young boys (aged 14 to 20) and these cases were reported to the nearest police station but not taken seriously by the police.

The rural communities also believe that beekeeping cannot be taken as a business and bees belong to anyone (no one can own bees) and hence even the local authorities does not take it as a serious case. Honey badger is the animal that also vandalises beehives for the purpose of getting honey for consumption. Beekeepers, especially from Nelson Mandela Metropolitan Municipality, experienced the honey badger as one of the major challenges destroying their beehives. Insects, as in Figure 10, were the most mentioned constraint followed by the honey badger, monkeys, lizards and snakes. Shortage of bee forage (drought) is the primary constraint in beekeeping development identified by beekeepers in the study area during the survey. It affects the feed source (bee forage) and water adversely. NDA (2007) documented that the major source of feed in South Africa is from the natural bush (about 70% of the requirement) and the rest is from home-prepared pulse flour and sugar.

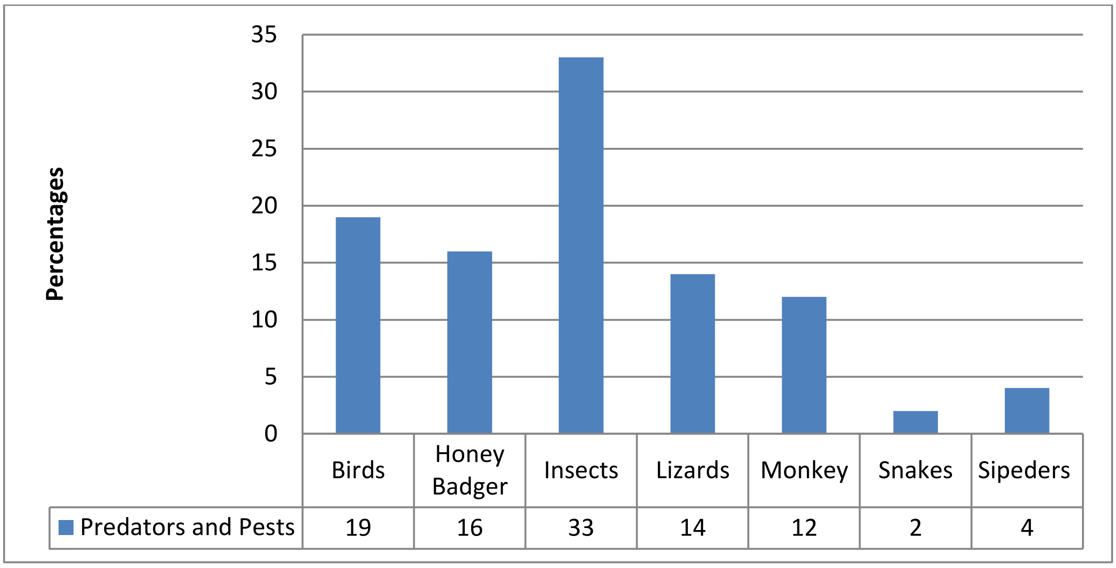


Figure 10: Animals and Insects as a challenge

Another problem mentioned is that of rust which affects the flower, because of which the honeybee cannot get nectar and pollen. Therefore, the honeybee colony absconds to areas where resources are available for their survival. The prevalence of disease and pests also forces the colonies to abscond. In order to enable safety, protective materials such as a veil, gloves, an overall and a smoker are essential for the beekeeper farmers. In the study area the distribution of improved box beehives was encouraging, but in most cases the protective materials did not accompany them.

5.5.1. Honeybee management practices

About 59% of the respondents visit their hives every day while 33% of them visit their hives every three days and the rest visit their bees to check if the hive was occupied with bees and at least during honey harvesting seasons. Internal hive inspection is almost not practiced by most of the farmers. About 90% of them were cleaning the areas around the beehives and put ash under the hives to avoid small ants and ant-like insects from climbing the box beehives, while the rest (10%) do not clean. About 65% of the interviewed beekeepers feed their colonies in order to sustain them and be able to harvest honey in the second unplanted seasons. During the survey period it was also observed that some beekeepers do not manage their apiaries properly.

5.2.2. Opportunities

There are important honey production opportunities in the Eastern Cape Province. Among the different opportunities, the existence of a favourable policy framework in the rural development sector manifested by assigning development agents in each district and infrastructure development could facilitate honey production and marketing. The existence of some development programmes like CASP, the IMVABA fund, and the LRED fund provide credit for honey production (supply of bee colonies) and creating a link between buyers and farmers is another opportunity for farmers of the district.

New enterprise development is the main focus for each government department working towards the development of rural communities, including development agencies. Hence, funds are always available for such business initiatives like beekeeping. Formal and informal marketing is open for honey marketing, and honey producers package their own produce with the assistance from funding departments and institutions.

5.6. Market structure

In this part of the study, honey markets, their roles and linkages, and the marketing channel for honey production are discussed. This was carried out to realise the objective of studying the market structure of beekeeping in the province.

5.6.1. Honey market

During the survey period, beekeepers used different markets to sell their produce (honey) within the province. Honey markets in the study area include honey producers, retailers, processors and final consumers of the product.

Honey producers: Producers sell their honey to different buyers involved in honey marketing in the districts. The market place/form that is the closest to the residence of the farmers is the first chosen with regard to minimization of transportation costs. According to the respondents, in the 20013/14 production year, 2%, 7%, 21%, 31%, 12%, 2%, 24% of their annual sale of honey was sold to consumers, beekeeping awareness campaigns and retailer shops respectively as specified in Table 14.

Table 12: Amount of honey supplied (kg) to different markets (2013/14)

		Frequency	Percentage
Valid	Cafes	1	2
	Farm stalls	1	2
	Awareness campaigns	4	7
	Supermarket	12	21
	Spar	18	31
	Kola	7	12
	Local	1	2
	Pick n’ Pay	14	24
	Total	58	100

5.6.2. Honey marketing channel

Marketing channel is the sequence through which the honey passes from farmers to consumers. The analysis of marketing channel is intended to provide a systematic knowledge of the flow of the goods and services from their origin (producer) to the final destination (consumer). During the survey, the following honey marketing channels were identified.

Channel I: Beekeepers - retailers - consumers (77%)

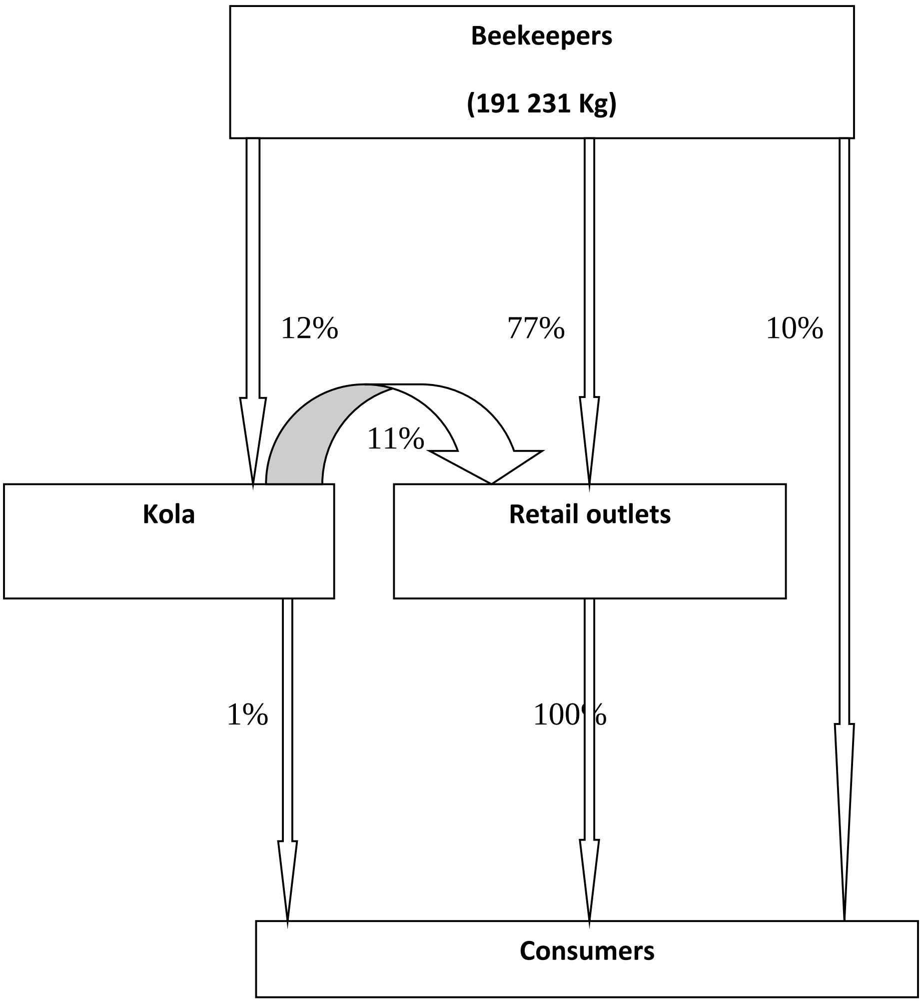
Channel II: Beekeepers - consumers (10%)

Channel III: Beekeepers - Kola – retailers - consumers (11%)

Channel IV: Beekeepers - Kola - consumers (1%)

As can be understood from Diagram 1, the main receivers from the beekeepers were retailers, consumers and Kola with an estimated percentage of 77%, 10% and 12% in that order. It is also important to note that all the honey produced was marketed in that order and there was no lack of market access.

Diagram 1: Marketing channel



5.6.3. Market conduct

Market conduct refers to the patterns of behaviour of firms. This implies analysis of human behavioural patterns that are not readily identifiable, obtainable, or quantifiable (Pomeroy and Trinidad, 1995). There are no agreed-upon procedures for analysing the elements of market conduct. Rather, some points are put to detect unfair price setting practices and the conditions under which such practices prevail. In this study conduct of the honey market was analysed in terms of the price setting, purchasing and selling strategies.

Honey is one of the important cash income generating commodities in the rural areas of the districts. During the survey, beekeepers pointed out that supply of honey to the market occurs mainly from October to February. About 27%, 25% and 18% of the total yearly sale of honey was made in December, January and February, respectively. The remaining portion of the output – 6%, 9% and 12% - was sold in September, October and November, respectively. Respondents also reported that there were no significant sales in the months of March-August. During the study, it was observed that the frequency of honey supplied to the market by some beekeepers was twice a year and almost 100% of the beekeepers' terms of sale were on a cash basis.

In the study area, beekeepers are organized in terms of groups. However, every beekeeper produces and sells on an individual basis. This affects their bargaining power during the sale of honey. Of the 58 respondents, 97% of reported that, generally, for the last five years, the price of honey had shown an increasing trend. According to the farmers, the main reason for the increase in price was the an increase in the quality of honey produced due to the introduction of improved beehives.

5.6.4. Performance of the market

Marketing margins were used to analyse the performance of different marketing channels used by the beekeepers, method employed for the analysis of the honey market performance were done by taking into account associated marketing costs for key marketing channels. Hence, the performance level was conducted for the 2013/14 production year, based on the costs and purchase prices, and the margins of the beekeepers and retailers.

A marketing margin is the difference between prices at two market levels. For example, it may describe price differences between producer and wholesaler, or between the wholesale and retail prices. In the context of producers, the term is most commonly used to refer to the difference between producer and retail prices of an equivalent quantity and quality of a commodity; it is usually expressed as a percentage of the retail price: The smaller the marketing margin, the bigger is the producers' share of the retail price.

Table 15 summarizes the different marketing channels used as well as the average retail price and the marketing margin for each marketing channel.

Table 13: Average price of honey and marketing margins (2013/14)

	Frequency	Percentage	Market Margin %	Prices per 500g bottle
Cafes	1	2	17	R35.00
Farm stall	1	2	0	R30.00
Awareness campaigns	4	7	0	R30.00
Supermarket	12	21	20	R36.00
Spar	18	31	27	R38.00
Kola	7	12	25	R37.50
Local	1	2	0	R30.00
Pick n' Pay	14	24	25	R37.50
Total	58	100		

Table 15 shows that the marketing margin ranges from 17% to 27%, with cafes at 17% and Spar at 27%. Spar was used most frequently used marketing channel (18 beekeepers, or 18%) followed Pick n' Pay (24%) and other Supermarkets (21%). The three supermarket outlets accounted for 76% of all beekeepers, and for these channels the marketing margin ranged between 20% and 27%.

5.7. Cost and profitability analysis

This part of the study was done to determine the income contribution of honey production. Therefore, the focus was on activities related to producing honey at farm level. This gives an indication about the performance of the honey market. Average costs and sales prices of the producers were used. Diagram 2 below, indicates that, the cost and profitability analysis of honey production for 2013/14 production year in the study area was not encouraging enough regarding its profitability. This shows that a farmer with 9.41 kg annual average production of honey per bee colony with average market price of honey R29/500g bottle (R58/kg) at farm gate would generate an annual return of R349.48 per colony.

Diagram 2: Cost and profitability analysis

Costs	**Cost per colony (R) per year**	**Percentage**
Feeding costs	-	-
Labour cost	R 130.00	66%
Pesticides costs	R 8.00	4%
Transport costs	R 12.50	6%
Tax	-	-
Equipment costs	R 45.80	23%
Total costs	R 196.30	100%
Average yield (kg/colony)	9.41Kg	-
Average price (R/Kg)	R 58.00	-
Gross sales	R 545.78	-
Profit/ Loss	**R 349.48**	

Source: Own computation, 2014

For this study, as indicated, the total number of bee colonies for the entire sample of respondents was 2 033, the average holding size being 35 colonies. If we consider the yield and the profit that is obtained from a given holding size, a farmer can generate an annual profit of R12 231.80 (R1 019.32 per month) from the beekeeping sector per year. With regard to the cost items, labour cost is the highest (66%) followed by equipment costs (23%). However, beekeepers were subsidised with the equipment costs through government grant funding from different departments including DRDAR and ECDC. When equipment costs (23% of total costs) are excluded, the annual profit margin amounted to R13 934.80 per year (approximately R1 152.90 per month).

Beekeepers were not feeding their bee colonies, not even when they were supposed to do so during periods of drought; hence they reported drought as one of the major constraints to productivity. When it comes to the South African Revenue Services (SARS) in terms of paying tax, not all of the beekeepers were complying with SARS since they were not registered as businesses. This was because some of them were having very low profit margins and hence they were exempt from paying taxes by SARS with tax clearance certificates. As it has been mentioned that, these beekeepers are subsidized by the government department programmes with beehives, bee suits, and necessary equipment like extractor machines, ladders and smokers. Hence, all the basic equipment they receive through grand funding including basic beekeeping training for beginners. On their own, they only have to buy small and inexpensive equipment like knives.

5.8. Results of the Linear Regression Model

A Linear Regression Model was used to determine the socio-economic factors influencing apiculture in the Eastern Cape Province. Twelve explanatory variables were identified and examined to determine their influence on beekeepers' level of honey production. Among the identified variables, only six variables were found to have statistically significant impact on the amount of honey produced; Gender, number of Colonies, Access to Credit, Labour availability (in hours), Price of honey, and Distance to the nearest market influenced the marketable supply of honey by beekeepers as expected. The remaining six variables (Age, Marital status, Market access, Extension services access, Household income level, and the Education level of the beekeeper) were found to have no statistically significant effect on honey production. The results of the regression analysis are summarised in Table 16.

Table 14: Results of the Multiple Linear Regression Model

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.875	1.721		1.670	.102
	GENDER	.837	.413	.120	2.029	.049*
	AGE	-.288	.260	-.076	-1.107	.274
	MARITAL	.245	.419	.037	.584	.562
	HHINCM	.181	.304	.034	.597	.554
	EDUCA	-.272	.317	-.055	-.857	.396
	EXTSION	-.156	.682	-.020	-.229	.820
	COLONY	1.115	.200	.852	5.572	.000**
	CREDIT	1.584	.697	.221	2.272	.028**
	LABOR	.691	.272	.164	2.537	.015**
	PRICE	-1.240	.423	-.201	-2.933	.005**
	MACC	.256	.576	.032	.445	.659**
	DSTMAK	-.932	.401	-.164	-2.325	.025**

a. Dependent Variable= PRODUC, N = 58, R = 0.940, R Squared = 0.884, Adjusted R Squared = 0.850, Std. Error of the estimate = 1.357.

b. ** and * denote statistical significance at 0.01 and 0.05 respectively.

5.8.1. Significant variables

As mentioned earlier, Table 16 shows that Gender, number of Colonies owned, Access to credit, Labour availability, Price of honey, and Distance to the nearest market were the only statistically significant variables.

Gender of the beekeeper (GENDER): The results from the regression model shows that, there is a positive statistically significant relationship between Gender of the beekeeper and the quantity of honey produced per year. This indicates that male beekeepers are more likely to produce more quantity of honey than their female counterparts. The coefficient suggests that male beekeepers produce about 0.837 kg of honey per annum more than the female beekeepers. This is in contrast with the findings by Abebe (2009) in Ethiopia, where Gender was found to be statistically insignificantly affecting the marketable supply of honey.

Bee Colonies (COLONY): The results from the model indicate a statistically significant positive relationship between the number of colonies and the amount of honey produced per year. The more bee colonies owned and managed, the higher the production of honey. The coefficient suggests that, an increase in colony size by a unit would result in an improvement in honey production by 1.115 kilograms of honey per year. This is in agreement with findings by Berem *et al* (2010) that the number of hives in production (representing the number of colonies) is positively related to the amount of honey harvested or the amount that a farmer anticipates to harvest during a harvesting season.

The larger the number of hives, the higher the quantity of honey harvested hence the participation in the marketing activities. Lepetu, Thelo and Sebina (2001) also found significant influence of colony size on honey yield. Number of hives with a bee colony was also found to be statistically significant at 1% significance level by Fakayode, Babatunde, and Adesuyi (2010) in Nigeria, where the aim of the study was to examine beekeeping facilities and activities under the Ekiti State Agricultural Credit Agency (ESACA) lending scheme.

Access to Credit (CREDIT): Credit access had a statistically significant positive relationship on the amount of honey produced. The coefficient of credit availability further suggests that, an increase in credit availability by one unit would result to the improved production of honey by 1.584 kilograms per year. This might be because; beekeepers had more financial requirements to buy more inputs like beehives (boxes), extractor machines, protective clothing (bee suit), and smokers etc. to increase their production levels. Credit accessibility was also encouraged by the availability of government subsidised loans for financial assistance.

The study conducted by Baiyegunhi and Fraser (2010), analysing the determinants of household poverty in rural regions of the Eastern Cape Province of South Africa, found credit availability to have a significantly negatively related to vulnerability to poverty. This means that increased access to credit would be likely to improve the ability to produce more, and hence reduce poverty levels. Baiyengunhi and Fraser (2010) citing Adugna and Heidhues (2000) concluded that households with access to credit are less likely to be vulnerable to poverty as increased access to credit enhances a household’s welfare through the provision of investment funding to boost household income.

Availability of Labour (LABOUR): Labour (measured in hours spent on daily beekeeping activities) has a statistically significant positive relationship with the total amount of honey produced. The findings suggest that an increase in the labour hours in honey production activities would result in an increase in honey production. The more labour involvement tends to have better abilities to produce more and work is made easier by more labour hours. If more hours of labour and more labourers are available in production, it would be easier the practice division of labour according to the activities. Hence, this would contribute towards productivity in the entire production process leading to improved output quantities. This was also found by Berem, Obare, Owuor (2010), assessing value addition in honey as a panacea for poverty reduction in Kenya. The results were that, the increase in hours of labour in honey production would also improve honey production.

Price of honey in kg, 2014 Prices (PRICE): The coefficient of price of honey shows a negative statistically significant relation to the quantity of honey produced. This relationship was expected to be positive because producers should observe the price of honey before production, for their best benefit and produced more as the price increases. The negative and significant statistical relationship between the variables indicates that as the price of honey at market rises, the quantity of honey produced declines, which in turn decreases the quantity of honey sold per beekeeper per year. The study of Abebe (2009), on market analysis of honey production in Ethiopia, also found a significant positive relationship between honey sold and current price.

The coefficient of the variable also confirms that a unit price increase in the honey market directs the beekeeper to decrease yearly honey production by 1 240 kilograms per colony. This may be because of the inverse relationship between quantity demanded and the market price, which then affects the quantity of honey produced by beekeepers. Hence, as the market price of honey increase, the quantity demanded by consumers will fall and this will discourage the retail outlets from buying more honey from emerging beekeepers. Therefore, this will discourage beekeepers to produce more. For the producers to earn more profits from higher prices also depends on the elasticity of the product produced, which is also determined by the availability of substitute products. In this case, there are more substitute products when it comes to honey consumption and the switching costs to substitutes are low. Hence, there is a negative statistical relationship between the amount of honey produced and the market price.

Distance to nearest the market (DSTMK): The coefficient of this variable shows the negative statistically significant relationship to the amount of honey produced and the distance to the nearest market. Berem, Obare, Owuor (2010), had similar results and conclude that, if the farmer is located in a village or distant from the market that alone indicates weak accessible to the market. The closer to the market the less would be the transportation costs and time spent. Therefore, it was expected that this variable would be statistically negatively related to honey production. The results were as such. The coefficient suggests that, when the beekeeper is situated away from the market by one kilometre, the amount of honey produced would fall by 0.932 kilograms per annum.

5.8.2. Model summary

The key important explanation in the model summary is the R-squared of the regression, which is the fraction of the variation in dependent variable that is predicted by independent variables. The R-squared is generally of secondary importance, unless the main concern is using the regression equation to make accurate predictions. The P-value tells how confident one can be, when each and every individual variable has some correlation with the dependent variable. Considering the Model summary in Table 17:

Table 15: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.940[a]	.884	.850	1.357	1.891

a. Predictors: (Constant), DSTMAK, MARITAL, HHINCM, MACC, PRICE, GENDER, EDUCA, EXTSION, LABOR, AGE, HIVES, CREDIT, COLONY

b. Dependent Variable: PRODUCT

The results in Table 17 reveal that, 88.4% of the variation in honey production is explained by six significant variables in the model, while 11.6% is due to error. This is because the results revealed that honey production is significantly determined by gender, colony size, access to credit, labour availability, price of honey, and distance to the nearest market ($P < 0.05$). On the other hand, Durbin-Watson gives an indication to determine whether there is autocorrelation in the residuals of a regression. The statistics ranges from 0 to 4 with 0 indicating positive autocorrelation and 4 indicating negative correlation. The value of 2 indicates no auto correlation in the sample. Hence, the Durbin-Watson of 1.891 in the Table 17, is too close to 2, meaning there is no auto correlation in the sample.

In statistics, the correlation coefficient R measures the strength and direction of a linear relationship between variables in the model; the closer the value of R to 1, the stronger the relationship (Peck and Devore, 2012). In this case, R is equal to 0.940 which indicates the strong relationship between honey production and the independent variables in the model. This can also be examined through the scatter plot diagram in Figure 11. According to Mann (2011), if the scatterplot doesn't indicate that there is some linear relationship, the correlation will not mean much. Therefore, there is no point to measure the amount of linear relationship if there is not enough of one to express.

Furthermore, according to Argyrous 2006, one can consider the idea of no linear relationship in two ways:

- If no relationship at all exists, computing the correlation is not meaningful because correlation only applies to linear relationships.
- If a strong relationship exists but it is not linear, the correlation may be misleading, because in some cases a strong curved relationship exists. Hence it is critical to examine the scatterplot.

Therefore, there was also a need to test for the linearity and to check for the strength of the correlation or relationship between variables in the model as to make correct conclusions.

5.8.3. Homoscedasticity and Heteroscedacity tests

This section will use scatterplot to diagnose problems of non-linearity, both by looking at the scatterplots of the predictor and outcome variable, as well as by examining the residuals by predicted values. This was done to check whether the assumption of linear relationship between variables in the model is not violated. If this assumption is violated, the model will be invalid. Therefore, wrong conclusions will be made and hence wrong recommendations. In order to avoid this, another analytical model must be chosen if the assumptions on linear regression model are violated through the existence of Heteroscedacity problem. To gain confidence on the results of the model used, the test must yield the results of the homoscedacity. The strict definition of homoscedacity is that the variance of the error term (residuals) of the regression is constant.

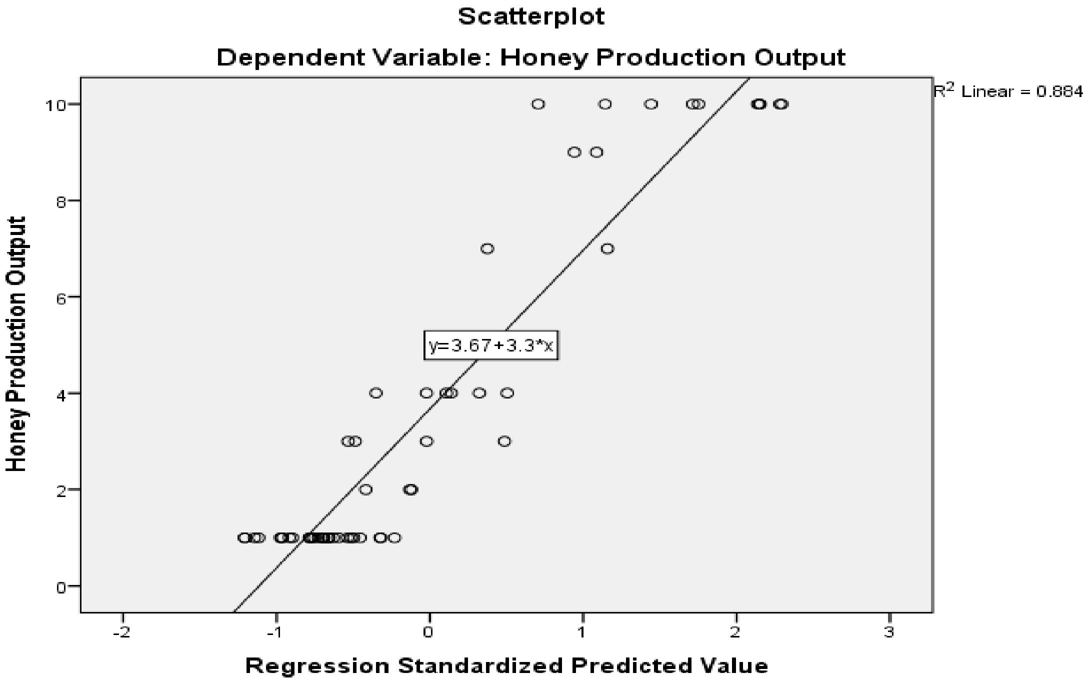


Figure 11: Scatterplot diagram

With reference to Figure 11, the spread of the data points around the regression line is fairly constant over the length of the regression line. Since the data points do not fall far away from the regression line, this is the case of homoscedacity. When the data points fall away from the regression line, this would show the problem of heteroscedacity. The presence of heteroscedacity would cause the significant test on the value of R to be invalid, so that we are unable to generalize from the sample results to the population. Figure 11, also shows examples of what various correlations look like in terms of the strength and direction of the relationship. It shows a very strong uphill linear pattern.

5.9. Chapter conclusion

It has been observed that there is high youth involvement and participation in beekeeping, including participation by economic active people aged from 18 to 55 years. That is good for the apiculture industry (beekeeping industry) and the economy of the Province, i.e. creating job opportunities and fighting poverty and underdevelopment. Women are also involved in this economic activity (beekeeping) and it is highly adopted by literate people with a secondary education or higher.

Amathole District has the highest potential for beekeeping followed by OR Thambo, Alfred Nzo and Nelson Mandela Metropolitan Municipality. The beekeeping programme was erroneously implemented by Joe Gqabi District, since it was supposed that the beekeepers would be arranged in groups and allocated 30 beehives boxes per group. Instead, beehives boxes were distributed to individual beekeepers. But, on the other hand, the group approach did not work even in other districts. Groups were organised and registered as primary cooperatives just to receive funding and later the cooperatives were individually operated and managed. All the members are then organised when there is financial assistance in the form of a grant funding for cooperatives.

As it has been observed on the model results, beekeepers' experience doesn't have a significant impact on honey production. That might be the result of the implementation of the beekeeping programme, as the programme was implemented in 2008 and the yearly production of honey by selected beekeepers as from 2008 was not observed or taken into consideration. This is because, during the survey, the beekeepers had no such records of their produce and hence the previous year's outputs were examined.

Bee colonies as well have shown interesting results that could bring up the issue of management and technical skills. The results have shown that, although there is a need for colonies to produce honey as the results were significant, the highest number of bee colonies does not mean highest honey production. Other variables that were found to have a significant impact on honey production were Gender of the beekeeper, Access to credit, availability of Labour, Price of honey and the Distance to market. Household incomes, Education level, access to Extension services, number of Beehives and Market access had no significant impact on honey production. If the selected beekeepers were not subsidized, the profit margins could be very low.

Considering the computed current profit margin of R12 231.80 per 35 bee colonies, this margin is moderately attractive and is just about a thousand Rand per month (R1 019.25).

By international standards, according to the Honey Magazine (2011), the annual honey production per traditional beehive boxes should be 15 kg per hive per year, 25 kg for a transitional beehive per year and 65 kg for a modern beehive boxes per year. According to Lepetu, Thelo and Sebina (2001), the annual average honey production colony per year is 35.51 kg in Botswana. Gallmann and Thomas (2012) investigated beekeeping and honey production in South Western Ethiopia and it was found that the average annual honey production per colony per year fell within a range of 35kg to 40kg. In South Africa, Michael Maclntyre (the Western Cape beekeepers) who owns a honey business called Mac Honey. MacIntyre as a beekeeper, has been able to achieve higher than national honey yields of 35 kg per hive in an average year (Maclntyre, 2010).

If the sampled beekeepers can produce 35 kg per colony per year from 2033 colonies and 71 155 kg will be produced and marketed at R58 per kg to produce annual gross income of R4 126 990.00 (compared with the current gross income of R1 109 134.00) for 58 beekeepers, this will give us R71 155.00 (compare with the current R19 123.00) per beekeeper per annum. This would be a very attractive figure and would attract more entrepreneurs in the beekeeping industry in the Eastern Cape Province.

However, the beekeeping industry in the Eastern Cape Province is reasonably attractive and does motivate the beekeepers to stay in the business. Although the profit margins are lower than the average expected, this is a reasonable contribution and a good reason to stay in the business. Hence, the beekeepers of the Province are dependent on grants and are not willing to invest their own savings in the business or to take production loans. Secondly, only honey as a beekeeping product is produced and marketed by the selected respondents. This must not be the case; other products like bee wax, bee venom, and propolis could generate some income as well. Hence, the issue of advanced training in beekeeping is critical.

CHAPTER SIX:
SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1. Summary and conclusion

The study was conducted with the objective of understanding the socio-economic factors influencing beekeeping in the Eastern Cape Province of South Africa. Honey has been identified in the province as a one of the important cash income generating commodities and as an important market-oriented commodity especially for rural communities. The Eastern Cape Province has a potential in honey production. There are about 2033 honeybee colonies owned by the sampled emerging beekeepers in the province using wooden beehives boxes to contain bee colonies. The price of one wooden beehive box was R750 and honeybee colony was R550 during the survey in the study areas, and pure and crude honey costs an average of R58 per kg respectively.

The analysis was made with the help of gross margin analysis, the descriptive statistics and econometric model using SPSS version 22. The data was generated from individual interviews using pre-tested questionnaires. This was supplemented by secondary data collected from different published and unpublished sources. The results from the Linear Regression Model indicated that, Gender of beekeeper, number of bee Colonies, access to Credit, availability of Labour, Price of honey in Rand per kilogram and the Distance to the nearest market were found to be significant variables determining the amount of honey produced. The results of the descriptive analysis of farmers' data indicated that the average number of honeybee colony holding size per beekeeper in the study area during the survey period was approximately 3 colonies and the average honey productivity per honeybee colony was 9.41 kg. This is far below the national average honey yield of 35 kg per colony per year.

The majority (96%) of the respondents had about six years of beekeeping experience and the average years of experience acquired for the entire sample was about six years. The result also indicate that, the total production of honey by respondents during the survey period was 19 123 kg and which was marketed through different marketing channels, with an average price of R58 per kg. The results of the study also indicate that, the total gross income generated by the respondents from the annual sales of honey was about R1 109 134.00 and the average gross income was estimated at R19 123.00 per annum per beekeeper. This has resulted to a profit margin of R12 231.80 per annum and per beekeeper with the average of 35 bee colonies. If the subsidy factor is included and discounted on the equipment cost, this margin is approximately R13 834.80 per annum.

Poverty is defined as whether individuals have enough resources or abilities to meet their needs; or consumption or other attributes across the population. According to the World Bank, if an individual cannot have a $1.25 per day to make a living, such as person is classified as being in extreme poverty or below the poverty line. The average exchange rate between Rand and a Dollar during the year 2014 was $1 = R9.226. Thus, the absolute poverty in South Africa can be measure by having the amount of Rand below R11.53 per day and R345.97 per month (30 days). Therefore, looking at the annual profits from the honey production, it can be enough for the household of three or less people to be lifted out of extreme poverty. Since the current average family size per household in the sample is three individuals, hence beekeeping is playing a significant role in improving the likelihoods of sampled beekeepers. Although the profit margins are not attractive enough (being below the value of the old age grant of R1 410.00 per person per month), but the income contribution of beekeeping in this case cannot be ignored.

Beekeeping in the province is mostly dominated by youth (52%) and economic active people (71% aged between 18 and 55 years) and females also play a significant role as compared to other farming activities. This is because, most emerging beekeepers started beekeeping as the government initiative to fund entrepreneurs in beekeeping and the funding program had funding requirements. Such funding requirements included the level of education, gender, age, previously disadvantaged groups and need to attend government funded introductory course in beekeeping (the course is presented in English). Hence, 74% of all respondents in the sample had at least secondary education. Even the remaining 26%, is literate enough to read, write and communicate in English.

The district offices of the Department of Rural Development and Agrarian Reform as the institution for the extension advisory services have been mandated to support different levels of farmers (from small scale, emerging and commercial) including beekeepers. Although, all the beekeepers had access to extension contact with different frequencies, but extension officers are not trained in beekeeping and this activity was not part of the academic curriculum during schooling. In other words, extension officers in the Eastern Cape Province have no formal training in beekeeping and the department is only training beekeepers in the introductory course to beekeeping.

There are a number of highlighted problems that impede the further development of honey production in the Eastern Cape Province. About 36% of the respondents reported that the most serious problems were feed shortage (drought), pests and insects, theft and vandalism and honey badger. Theft and vandalism were also among the constraints which contribute to the reduction of production. The increased honey production during the harvest period was found to coincide with periods of low prices. As a result, 28% of the sampled beekeepers indicated that there were no profitable markets to attract their produce. The other problem related to production and marketing problems of honey was the poor quality of the product due to improper handling and harvesting methods.

This study has also highlighted many opportunities that can enhance the productivity and quality of honey products in the future regardless of the constraints and challenges presently facing the honey bee sector. Recognizing the role of beekeeping as another form of income generating activity for rural people and its key role in natural resource conservation, recently much emphasis is given to the sector by the South African government and many NGOs. The presence of unexploited resources for apicultural development in the province in particular and the country in general, high demand for honey and beeswax both at local and international markets, European permission for the import of honey and beeswax from South Africa, emergence of honey and beeswax processors and exporters in the sub-sector and the establishment of beekeeping supporting institutions are some of the opportunities which could help to develop the sector in the near future. There is huge potential for the production of specialty honey such as coffee honey. There is also a great potential for diversification of hive products. Apart from honey, other hive products are not well utilized (beeswax) or hardly produced (Propolis, venom and royal jelly).

Furthermore, since the major constraints which were identified at Local Municipality level are; limited training services, theft and vandalism, honey badger, lack and high costs of modern beekeeping equipment, lack of access to rewarding markets, colony absconding due to poor hive management, limited capacity of the District Rural Development officers and extension officers (lack of trained experts in honey production) to support the beekeepers and poor rural infrastructures. There was no active producers association in the province which could help the beekeepers in input acquisition and marketing of honey. Lack of training on the use of modern beekeeping equipment, honey harvesting, processing and post-harvest handling resulted in low honey productivity. Moreover, the on-going destruction of vegetation poses a great risk to the sector and this is insufficiently addressed. Hence, the following recommendations can be concluded:

6.2. Recommendations

Possible recommendations that could be considered in the future as intervention strategies which are aimed at improving honey production and marketing of the study areas are as follows:

These results confirm that, education develops the willingness of the beekeeper to allow new technology and information which in turn extends the readiness to produce more and thereby improving the amount of honey produced. Accordingly, the districts' DRDAR and other apiculture development partners should practically support beekeeping training in which the focus is on pre- and post-harvest management of honey production and marketing. The only training which was introduced to the beekeepers was an introduction to beekeeping and hence the widening and deepening of such training is required. In other words, it is recommended that, beekeepers should be taken to intermediate and advanced level of training in beekeeping as the introductory course has done as expected when it comes to basic understanding of beekeeping.

The availability of timely and precise market information increases producers' bargaining capacity to negotiate with buyers of their produce. In order to obtain this advantage there is a need to improve the extension system which focused on market extension linkage farmers with markets. This is necessary to ensure a reliable market outlet for beekeepers of the province. This should be further strengthened by marketing organisations such as cooperatives, commodity groups and other honey marketing institutions by communicating with the honey producers and the ultimate consumers so that beekeepers can sell their produce at reasonable and profitable prices.

Feed shortage (drought) is one of the major problems identified and prioritized by farmers in the study area. To reduce this problem, it is essential to integrate beekeeping activities with water harvesting to secure their livelihood. The research organization should select moisture stress tolerant potential bee forage suitable to the area and promote them widely in collaboration with the beekeeping extension, NGOs, and the private sector. Similarly, the existing indigenous bee forages which flower even in the winter season should be promoted and also grown in area enclosures. As it has been identified, beekeepers in the province are not feeding their bees even during the drought period and hence this also brings the issue of technical training in beekeeping.

The survey result indicated that the overall honey marketing system of the Province during the survey period is more traditional and under developed. Thus government actions are required to licence, inspect and compute honey product traders to ensure the achievements of minimum hygiene and quality standards in order to facilitate the honey production and marketing process. Hence, there is a need for high investment by government in the entire value chain of beekeeping in the province. Since according to the econometrics results, the two variables being the price of honey and the distance to the nearest market were found to negatively affecting the production of honey in the study area. It is not normal to have a negative relationship between price and production, suppose when the prises increases, producers must be motivated to produce more. Therefore, this also means underdevelopment of the entire value chain.

Providing the necessary exposure and skills, and institutional support in the form of workshops, conferences, training to gain experience in improved beekeeping methods and marketing linkages need to be addressed simultaneously. All the problems faced by beekeepers cannot be addressed by a single organization but by various actors including research, extension, decision makers, input suppliers and credit agencies all need to be collaborating in search of appropriate solutions and implement them.

Beekeeping has played a significant role in household livelihoods in the remote areas of the province, although the emphasis was not given by concerned stakeholders. Nevertheless, it is recognized by this study that beekeeping contributes to the socio–economic status of the rural communities particularly in food insecure households. Furthermore, the socio-economic benefits obtained from beekeeping in the area are food, income and medicine and pollination services were not considered. Beekeeping is also complementary to biodiversity conservation. As it was observed in several survey areas, beekeeping could be integrated into agro-forestry practices and organic farming (horticultural and crop production trough pollination). Thereby, it could play a mutual role in increasing crop yield and quality besides the income generated from honey sales. Hence, training is also important in this regard to advice beekeepers about the significance of beekeeping for medicine and pollination services.

There must be a promotion of integrated beekeeping and horticultural activities in any development endeavours to enable the communities in drought areas to be food self-sufficient because this allows for food and income diversification and then improves the overall socio-economic development of rural communities.

Also important is the initiation of rigorous training programmes by the local social promoters and other development agents who know the local language and culture and who can train the communities with due emphasis on practical beekeeping and the involvement of women and youths in improved beekeeping. Even formal training in English should not be a problem, since most beekeepers had secondary to tertiary education level and all can read, write and communicate in English and local languages.

Extension services on beekeeping equipment and the construction of beehives from locally available materials and protective clothes need to be provided while also establishing relationships with interested and committed parties in government, the private sector and other NGOs in supporting beekeeping in the province. In some districts like Amathole and OR Tambo, improved beekeeping (beehive) can be more productive and sustainable because of their higher floral resources, climatic conditions, altitudinal factors and further indigenous beekeeping knowledge. Finally, there should be a market network for the community to sell the bee products at fair prices.

Districts' DRDAR offices should encourage and facilitate the establishment of producers´ associations for input acquisition and dissemination, honey collection, primary processing and marketing of honey products. These newly formed producers´ associations should be supported and encouraged to strengthen funding systems to reduce dependency on other institutions. Until this has been realized, district agricultural officers and NGOs should facilitate access to funding.

Honey processors and exporters in collaboration with district agricultural officers should promote and encourage out-grower (contract farming) schemes to enable smallholder beekeepers to access modern beekeeping technologies and training services. Creating a long-term relationship between beekeepers and large honey processors will considerably improve honey productivity, quality and supply consistency. Awareness creation on the use, processing system and market value of beeswax and other hive products (such as propolis, royal jelly, etc.) are required to increase and diversify beekeepers´ income from the beekeeping activity.

District agricultural officers and large honey processors purchasing honey from the district should facilitate the establishment of honey and beeswax collection centres with necessary facilities for harvesting, semi-processing and storage in potential production areas of the district to minimize postharvest product losses and quality deterioration.

Therefore, beekeepers should be aware and trained on colony multiplication and marketing. Given that reasonable areas of the district´s land is covered by natural dense forests and the use of commercial pesticide for crop production is rare, there is a great potential for the production of organic honey in the Province. It is, therefore, important for honey producers and exporters to seek for niche markets through organic certification.

Generally, the following possible recommendations can be drawn from this study:

- Strengthening of the extension services of the province in bee keeping exploiting the potential.
- Conduct training on beekeeping and its management (including pests and diseases management, bee forage development, colony management, honey harvesting, extraction, processing, etc.), quality control and link model beekeepers with big traders, exporters and processing factories.
- Introduction of beekeeping learning areas from the institutions of higher learning from the public TVET colleges, technical colleges and universities with agriculture.
- Conduct study on the existing apiculture input supply system to develop innovative methods of input supply system in the province.
- Honeybee diseases & pests which were explained locally by beekeepers should be confirmed by scientific research.
- Most beekeepers lack adequate financial resources to invest on improved honey production technologies, storage, processing facilities and packaging. Thus, proper market link & credit facility should be available to individuals who are willing to be organized and involve in the production, collection, processing, packing and marketing of honey and other hive products.
- Given that reasonable area of land in the province is covered by natural dense forest and the use of commercial pesticide for crop production is rare, there is a great potential for production of organic honey in the study area. It is, therefore, important for honey producers and exporters to seek for niche markets through organic certification.
- One of the emerging problems in the province is shortage of bee colony due to colony absconding. Colony multiplication and marketing are currently considered

as offensive in the local community. Therefore, beekeepers should be sensitized and trained on colony multiplication and marketing.

- Districts Rural Development offices and honey processors purchasing honey from the districts of the province, should facilitate the establishment of honey and beeswax collection centres with necessary facilities for harvesting, semi-processing and storage in potential production areas of the district to minimize postharvest product losses and quality deterioration.
- Awareness creation on the production, processing system and market value of beeswax and other hive products (such as propolis, royal jelly, etc.) are required to increase and diversify beekeepers´ income from beekeeping activity.
- Practical oriented training should be given for the farmers on the use of modern hives and its accessories, improved hive management practices, post-harvest honey handling and product marketing systems to increase adoption of the new technologies, productivity and supply of honey.
- To prevent theft and vandalism, local authorities and SAPS officer need to be sensitized on the importance of honey production as the business. This would mean that, the cases of theft and vandalism by local people will be taken seriously just like the stock theft.

6.3. Areas for further research

It has been identified through the literature review of this research study that, there is no enough information on the potential impact of beekeeping to food security. Hence, rural development, food security and the role of beekeeping need to be studied further. Very limited current information is also available on the impact of the pollination services of honeybees to food production in South Africa. This study focused on domestic honey production and market access but the role of international honey importers, retailers and marketing value chains were not covered. Further study is required to investigate the impact of the domestic honey value chain actors.

Moreover, further research is needed to study income distribution along the honey value chain, the role of public-private partnerships and innovation systems. As the study area has a huge potential for organic honey production, research should be done to investigate the feasibility of organic and fair-trade certification and their impact on small-scale beekeepers. Deforestation is one of the major beekeeping threatening issues in South Africa. Therefore, there is a need for research into how to integrate forest conservation efforts with beekeeping development.

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APPENDIX 1:
THE QUESTIONNAIRE

FACULTY OF SCIENCE AND AGRICULTURE

Department of Agricultural Economics and Extension

Socio-Economic Factors influencing Apiculture in the Eastern Cape Province, South Africa

Reference: CH-DD-MM-YY-No.

Questionnaire by : **MR. Peter L. (200255673)**

Mobile: +27-796219454 **Email: claren1983@yahoo.com**

Superviser : **Professor Ben Bester**

Confidentiality: This research is carried out for academic purposes, the identity of respondents will remain unknown and the results from this survey will only be the summary of combined responses from different beekeepers of the Province.

SECTION A

1. DEMOGRAPHIC INFORMATION AND SOCIO-ECONOMIC CHARACTERISTICS

1.0. **Type of the business e.g. cooperative/projects______________________________________**

1.1. **Fill in the relevant information and mark with an X where necessary:**

A.1. GENDER		**A.2. AGE (Years)**						**A.3. MARITAL STATUS**				**A.4. HOUSEHOLD SIZE**			
M	**F**	**<19**	**19-29**	**30-39**	**40-49**	**50-59**	**≥60**	**Single**	**Married**	**Widowed**	**Divorced**	**<16**	**16-60**	**>60**	**Total**

1.2. **What is the highest education level of the household head?**

No formal education	**Primary school only**	**Secondary/high school**	**Tertiary education**	**Other (specify)**

1.3. **What is your employment status and under which income class do you fall?**

EMPLOYMENT STATUS		**INCOME CLASS (Rand per month)**					
	Tick	**<700**	**700 - 1500**	**1500 - 3000**	**3001 - 5000**	**5000 – 10000**	**>10000**
Full time farmer							
Part time farmer							
Formally employed							
Pensioner							
Unemployed							
Other (Specify)							

1.4. **If formally employed, what is your occupation?**

____

1.5. **Which type of farming are you involved in (apart from beekeeping) and indicate the amount of land in use**

a. Land holding in ha	b. Arable	c. Covered by forest	d. For grazing	e. Other

1.6. **Beekeeping activities, potentials and honey 'crop' harvesting**

1.6.1. **Do you keep honey bees? 1. Yes 2. No**

1.6.2. **If yes, for what reason?**

a. Honey production	b. Honey products	c. Pollination services	d. Other
Commercial or subsistence	*Name products*	*Name which crops/trees*	*Specify*

1.6.3. **When did you start beekeeping? ____________year**

1.6.4. **How did you start beekeeping?**

No	Sources	Quantity
a	From parents	
b	Catching swarms	
c	Buying	
d	Government grant	
e	Others(specify)	

1.6.5. **If the answer for the question above is buying, is there a sale of bee colonies in your locality? 1. Yes 2. No**

1.6.6. **If yes, what is the price of one colony? _____________Rands**

1.7. **Major Crop Productions**

No	Types of crop	Land size(ha)	Yield (kg)	Purpose of production				Others
				Consumption	For seed	For sale	For livestock	
a.								
b.								
c.								
d.								
e.								
f.								
g.								
i.								
Total								

2. SOURCES OF FUNDING OR FINANCIAL ASSISTANCE

2.1. **Did you ever receive financial assistance from any government or nongovernment institution?**

a. Yes b. No

2.2. **If yes, from which institutions?**

Name of institution or organization	Type of assistance	Value in Rands

2.3. **If no, why ?**____

3. TECHNICAL AND MANAGEMENT ASPECTS

3.1.**Do you inspect your colony?** **1. Yes** **2. No**

3.1.1. **If yes, please specify below:**

	2 >times/week	1 per week	1 per 2 weeks	Other
External				
Internal				
Both				

3.2. **When do the following major activities occur in your locality?**

No	Major activities	Season(s) of occurrence			
		Sept.- Nov.	Dec.- Feb.	March- May	June- Aug.
1	Brood rearing period				
2	Dearth period				
3	Colony migration				
4	Absconding				

3.3.**Where do you keep your bee colonies?**

No	Site or placement of hive	Movable-frame boxes
1	Back yard	
2	Under the eaves of the house	
3	Inside the house	
4	Hanging on trees near homestead	
5	Hanging on trees in forests	
6	Other	

3.4.**For how many years your colony remains or stays in the hive?**

Minimum _________year(s) Maximum ____________year(s)

3.5.**What is the major honey bee plant species found in your area (rank in order)?**

No	Plant type	Local name	Flowering period	Colour of honey
1				
2				
3				
4				
5				

3.6.**The honey from which plant species are more preferred among consumers?**

____

3.7. **Do you feed honey bee colonies? 1. Yes 2. No**

3.8. **If yes, when do you feed your honey bee colonies (months)? ------------------**

3.9.**What kind of feed do you offer to your honey bees?**

No	Type of feed	Amount of offered/season/colony	Costs per kg (R)
1			
2			
3			
4			
5			

3.10. **Is there beekeeping cooperatives around your area? a. Yes b. No**

3.11. **If yes, are you the member of the cooperative? a, Yes b. No**

3.12. **If No, why not?____**

4. TOTAL NUMBER OF COLONIES OR BEEHIVES OWNED

4.1.**How many bee boxes (movable frames) you owned?**

a. 2009	b. 2010	c. 2011	d. 2012	c. 2013 to date

4.2.**How many honey bee colonies (boxes with bees) you own?**

No	years	Movable-frame boxes		Total production
		No	Product(kg)	
1	2009			
2	2010			
3	2011			
4	2012			
5	2013			

4.3. **Is there a gap between the number of boxes owned and the bee hives owned? If yes, why?**

____

SECTION B

1. PRODUCTION OF HONEY AND HONEY PRODUCTS

1.1.**What is the total honey production per hive/year?**

Type of hive	No.	unit	Total	Lowest/hive	Highest/hive
		Kg			
		Kg			
		Kg			

1.2. **What type of other bee products do you obtain per year? E.g. Beeswax, propolis, royal jelly, bee venom, pollen, bee brood.**

Type of hive	No.	unit	Total	Lowest/hive	Highest/hive
		Kg			
		Kg			
		Kg			
		Kg			
		Kg			
		Kg			
		Kg			

1.3.**How many times honey is harvested /year?**

	a. Once	b. Twice	Three times	Four times	More than four
Frequency					
	a. July – Sept	b. Jan- march	Oct- Dec	Apr- June	Other specify
Season					

1.4. **Is there any fluctuation of the honey harvesting period?**

a. Yes b. No

1.5. **If yes, what is the possible reason?**

c. Drought	d. High temperature	High rainfall	Other

2. THE COST AND RETURN STRUCTURE OF BEEKEEPING

2.1.**What are the sources and costs of the bee hives you used?**

No	Items	Movable-frame boxes
1	Constructed by himself/herself	
2	Constructed locally & bought	
3	Bought from market	
4	Supplied by governments	
	-On credit bases	
	-Free of charge	
5	Supplied by NGOs	
	-On credit bases	
	-Free of charges	
6	Price of one hive	
7	Service years	

2.2. **What is the total number of people employed and the rates per hour, day and month?**

	a. Permanent	b. Casual	c. Family	Total
Number				
Cost per month				
Cost per day				
Cost per hour				

2.3. **What are the beekeeping tools used in production of honey and honey products? Include material, producer, place and price.**

No.	**Name**	**Access**	**Place**	**Price/unit**	**Note**
	Knife				
	Frame/box				
	Extractor				
	Bee suit				
	Smoker				
	Ladder				

2.4. **When and how frequently do you transport your inputs and products?**

	Type	**Transport mode**	**Cost per month**	**Cost per year**
Products	**e.g. Honey**			
Inputs	**e.g. Tools and feed**			

2.5.**What other costs incurred in beekeeping per month? E.g. rent, fuel, etc.**

No.	Item	Unit	Cost price
A			
B			
C			
D			
E			
F			
G			
H			
I			
J			

2.6.**What is the annual income from the sale of hive products and bee colonies?**

No	Type of product	Quantity (kg)	Unit price/unit	Total	Market
a	Honey				
b	Beeswax				
c	Proplies				
d	Bee colonies				
e	Bee venom				
f					
g					
h					
i					
j					

SECTION C

1. CONSTRAINTS AND CHALLENGES

1.1. **If there is a decrease in trend in the number of bee colonies and honey yields over the year, what are the causes in order of importance?**

No	Causes	Rank	Season of occurrence	Measures taken
1	Lack of bee forage			
2	Drought (lack of rainfall)			
3	Absconding and migration			
4	Pest and predator			
5	Disease			
6	Pesticides & herbicides application			
7	Death of colony			
8	Decrease in price of honey			
9	Increased cost of production			
10	Others (specify)			

1.2. **What are the major pests & predators found in the area that threaten your colonies? List in order of importance (rank 1 – 5)?**

No	Pest/predator	Rank	Local control methods
1	Insects e.g. ants, wasps, moth		
2	Spiders		
3	Lizard		
4	Snake		
5	Monkey		
6	Birds		
7	Honey badger		
8	Others(specify)		

1.3.**What are the major constraints affecting your beekeeping business (rank 1-5)?**

No	Constraint	Rank	Local control methods
1	**Drought**		
2	**Theft and vandalism**		
3	**Pests and diseases**		
4	**Lack of forage**		
5	**Lack of swam**		
6	**Lack of equipment**		
7	**Diseases**		
8	**Marketing**		
9	**Lack of knowledge**		
10	**Marketing problems**		
11	**Others (specify)**		

1.4. **Is there any other thing that you would like us to talk about? a. yes____ b. no ___**

____

____

____

____

____

Compiler's name ___________________________ Signature _________________

Date __________Time _______Duration: Starting time __________Ending time

APPENDIX 2:
THE VARIABLE CORRELATIONS

		PRODUC	GENDER	AGE	MARITAL	HHINCM	EDUCA	EXTSION	COLON	CREDIT	LABOR	PRICE	MACC	DSTMAK
PRODUC	Pearson Correlation	1	.294*	-.055	.029	-.071	.243*	.454**	.881**	.601**	.559**	-.633**	.431**	.449**
	Sig. (1-tailed)		.013	.341	.415	.298	.033	.000	.000	.000	.000	.000	.000	.000
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
GENDER	Pearson Correlation	.294*	1	-.110	-.265*	.051	.076	.022	.280*	.153	-.016	-.004	.101	.294*
	Sig. (1-tailed)	.013		.206	.022	.352	.285	.435	.017	.126	.453	.487	.225	.013
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
AGE	Pearson Correlation	-.055	-.110	1	.510**	.134	-.014	.042	-.109	.126	-.078	-.021	-.130	-.323**
	Sig. (1-tailed)	.341	.206		.000	.157	.458	.376	.209	.173	.280	.438	.165	.007
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
MARITAL	Pearson Correlation	.029	-.265*	.510**	1	.059	.123	.100	-.018	.145	.050	-.091	.026	-.055
	Sig. (1-tailed)	.415	.022	.000		.329	.178	.229	.446	.139	.354	.248	.425	.341
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
HHINCM	Pearson Correlation	-.071	.051	.134	.059	1	.346**	.010	-.091	.032	-.186	.149	.070	-.108
	Sig. (1-tailed)	.298	.352	.157	.329		.004	.469	.248	.407	.081	.132	.300	.210
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
EDUCA	Pearson Correlation	.243*	.076	-.014	.123	.346**	1	.208	.247*	.333**	.083	-.100	.376**	.131
	Sig. (1-tailed)	.033	.285	.458	.178	.004		.058	.031	.005	.269	.228	.002	.164
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
EXTSION	Pearson Correlation	.454**	.022	.042	.100	.010	.208	1	.385**	.756**	.186	-.325**	.460**	.267*
	Sig. (1-tailed)	.000	.435	.376	.229	.469	.058		.001	.000	.081	.006	.000	.021
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
COLON	Pearson Correlation	.881**	.280*	-.109	-.018	-.091	.247*	.385**	1	.521**	.451**	-.547**	.385**	.588**
	Sig. (1-tailed)	.000	.017	.209	.446	.248	.031	.001		.000	.000	.000	.001	.000
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
CREDIT	Pearson Correlation	.601**	.153	.126	.145	.032	.333**	.756**	.521**	1	.321**	-.241*	.512**	.353**
	Sig. (1-tailed)	.000	.126	.173	.139	.407	.005	.000	.000		.007	.034	.000	.003
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
LABOR	Pearson Correlation	.559**	-.016	-.078	.050	-.186	.083	.186	.451**	.321**	1	-.435**	.377**	.285*
	Sig. (1-tailed)	.000	.453	.280	.354	.081	.269	.081	.000	.007		.000	.002	.015
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
PRICE	Pearson Correlation	-.633**	-.004	-.021	-.091	.149	-.100	-.325**	-.547**	-.241*	-.435**	1	-.255*	-.253*
	Sig. (1-tailed)	.000	.487	.438	.248	.132	.228	.006	.000	.034	.000		.026	.028
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
MACC	Pearson Correlation	.431**	.101	-.130	.026	.070	.376**	.460**	.385**	.512**	.377**	-.255*	1	.267*
	Sig. (1-tailed)	.000	.225	.165	.425	.300	.002	.000	.001	.000	.002	.026		.021
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
DSTMAK	Pearson Correlation	.449**	.294*	-.323**	-.055	-.108	.131	.267*	.588**	.353**	.285*	-.253*	.267*	1
	Sig. (1-tailed)	.000	.013	.007	.341	.210	.164	.021	.000	.003	.015	.028	.021	
	N	58	58	58	58	58	58	58	58	58	58	58	58	58

APPENDIX 3:

University of Fort Hare
Together in Excellence

ETHICAL CLEARANCE CERTIFICATE
REC-270710-028-RA Level 01

Certificate Reference Number:	BES061SPET01
Project title:	**The Income contribution of Agriculture to the Rural Household Economy of the Eastern Cape Province.**
Nature of Project:	Masters
Principal Researcher:	Luntulwandile Peter
Supervisor:	Prof B Bester
Co-supervisor:	

On behalf of the University of Fort Hare's Research Ethics Committee (UREC) I hereby give ethical approval in respect of the undertakings contained in the above-mentioned project and research instrument(s). Should any other instruments be used, these require separate authorization. The Researcher may therefore commence with the research as from the date of this certificate, using the reference number indicated above.

Please note that the UREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the document
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research

ETHICAL CLEARANCE CERTIFICATE

The Principal Researcher must report to the UREC in the prescribed format, where applicable, annually, and at the end of the project, in respect of ethical compliance.

Special conditions: Research that includes children as per the official regulations of the act must take the following into account:

Note: The UREC is aware of the provisions of s71 of the National Health Act 61 of 2003 and that matters pertaining to obtaining the Minister's consent are under discussion and remain unresolved. Nonetheless, as was decided at a meeting between the National Health Research Ethics Committee and stakeholders on 6 June 2013, university ethics committees may continue to grant ethical clearance for research involving children without the Minister's consent, provided that the prescripts of the previous rules have been met. This certificate is granted in terms of this agreement.

The UREC retains the right to

- Withdraw or amend this Ethical Clearance Certificate if
    - Any unethical principal or practices are revealed or suspected
    - Relevant information has been withheld or misrepresented
    - Regulatory changes of whatsoever nature so require
    - The conditions contained in the Certificate have not been adhered to
- Request access to any information or data at any time during the course or after completion of the project.
- In addition to the need to comply with the highest level of ethical conduct principle investigators must report back annually as an evaluation and monitoring mechanism on the progress being made by the research. Such a report must be sent to the Dean of Research's office

The Ethics Committee wished you well in your research.

Yours sincerely

Professor Gideon de Wet
Dean of Research

27 October 2014