

*Full Length Research Paper*

## Socioeconomic analysis of beekeeping in Swaziland: A case study of the Manzini Region, Swaziland

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Swaziland has substantial potential in beekeeping with her rich flora, proper ecological conditions and existence of colonies. However, the Swaziland beekeeping sector has not yet efficiently utilized the rich natural resources. The apiculture sector in Swaziland is still faced with challenges in respect to marketing and importation as a result of the quality of honey and competition from South African honey. The objectives of the study were to describe the socioeconomic characteristics of beekeeping farmers and determine the factors affecting honey production among smallholder beekeepers. Primary data was collected from 37 randomly selected respondents from a population of 63 beekeepers. The results revealed that 62.2% of the respondents were married, 32.4% were above the age of 55, and mostly 86.5% used the Swazi top-bar types of hives. The results further showed that honey production was explained by the farmer's experience and colony size, implying that an increase in the farmer's experience by 1% would result in 0.41% increase in the amount of honey produced, while a 1% increase in colony size would result in 0.57% increase in honey production. The study has shown that there are plenty opportunities to improve the livelihoods of smallholder farmers by engaging in beekeeping. In order for farmers to improve their honey production, they need to increase the colony size and also use langstroth beehives because of their high productivity.

**Key words:** Beekeeping, honey production, socioeconomic analysis.

### INTRODUCTION

#### Agriculture and the economy in Swaziland

Agriculture is the backbone of Swaziland's economy and a major source of livelihood for rural households with about three quarters (70%) of the population relying on this sector for a living (Thompson, 2010). Some of the agricultural activities that take place in this country include sugarcane, citrus fruits, maize with other cereal crops and pulp production to name a few. The country has always benefited from the European Union (EU) markets which offered a higher price for sugar. However, such an arrangement was phased out and as a result the

price showed a decline. This development has caused the need to diversify the agricultural sector in order to enhance its contribution to the economic growth of the country. The identification of commodities with the opportunity for value adding is a priority for the country (Total Transformation Agribusiness (PTY) LTD, 2008). Thompson (2010), also state that agriculture contributes about 12.7% to the country's gross domestic product (GDP).

Swaziland is mostly covered by natural and man-made forests and the major parts of the country that are covered by forests are the highlands of Hhohho and

Shiselweni regions. Honey production has a positive effect to the vegetation, hence, the promotion of bee farming in the country has a significant potential.

### Importance of beekeeping in rural development

Beekeeping also known as apiculture, is the act, science and or business of managing honey bees for the purpose of producing honey, beeswax and other bee products for personal consumption and industrial use. The most important component in the beekeeping industry is the bee as it is involved in the primary production of bee products. There are four well-known honeybee species in the world namely: *Apis mellifera*, *Apis dorsta*, *Apis cerana* and *Apis florae*, according to Admassu (2003). *A. mellifera* is native to Europe and Africa, while the rest are native to the Asian continent.

The honeybee *A. mellifera* is one of the most successful species in the animal kingdom judged by its ability to adapt to a wide climatic range. It is believed to have evolved in the tropics. It is highly productive and can adapt well in different climatic conditions. Although they are known as vicious and aggressive bees, they are good producers (Matavele, 2007). Beekeeping is an enterprise that offers great potential for development in Swaziland since it is easy and cheap to manage. For farmers to practise beekeeping they require little land and its quality is less important since the beehives are placed on trees (Oluwole, 1999). This enterprise serves as a means of empowering small-scale farmers who have low capital investments (Farinde et al., 2005).

According to Carruthers and Rodriguez (1992), beekeeping provide local people with an economic incentive for preservation of natural habitat enhancing environmental quality thus, labour in rural areas can be utilized especially during dry seasons. Beekeeping is an activity that fits well with the concept of small-scale agricultural development. It is a labour-intensive undertaking, which can be easily integrated into larger agricultural or forestry projects. Bees not only aid in the pollination of some crops used in such projects, but also makes use of otherwise unused resources such as nectar and pollen. Previous studies indicates that the beekeeping activity provide benefits in terms of employment, pollination of crops and conservation of biodiversity (Didas, 2005); generates income through hive products (Jones, 2004) and renting bee colonies to pollinate crops (Gates, 2000). Ecological conditions and the floral composition, queen quality and resource management were found to be influencing profitability of beekeeping enterprises (Tucak et al., 2004; Cobey, 2001; Jong, 2000). Beekeeping potential was reported to be great in Swaziland given the economically valuable bee races, varied geography and rich floral resources in the country (Güler and Demir, 2005).

Beekeeping is of vital importance in starting and

rebuilding of economic activities that would address socio-economic problems such as HIV and AIDS, poverty and unemployment. A range of products produced in beekeeping not only are rich in nutrients but also have medicinal properties, which people may benefit from. In arable farming, bees also improve crop yields through increased efficiency in pollination and also beekeeping diversifies agriculture as it can be integrated with other agricultural activities as well as agroforestry (Total Transformation Agribusiness (PTY) LTD, 2008).

In the context of agriculture-based major employment and economy of Swaziland, beekeeping has substantial contribution to income generation. In a family-based activity, it is very easy and less expensive to operate than any other income generating activity because a family, keeping 1-5 colonies does not require much land. Most of the time there will be no need to purchase raw materials as honey bees collect nectar and pollen from the available source of existing natural bee plants.

Swaziland has considerable potential in beekeeping with her rich flora, good ecological conditions and existence of colony. However, the beekeeping sector in Swaziland has not yet sufficiently utilized the rich natural resources. Beekeeping can play an important role in the urban and rural areas as small-scale farmers may produce products such as honey, beeswax, propolis to name a few, and selling them in order to generate income.

However, beekeepers encounter different challenges when in the course of the practice. The low yield of honey and other beekeeping products such as honey, beeswax, propolis may result from insufficient management practices and lack of adequate training. On the other hand, honey production is affected by climatic conditions and some bee diseases such as Varroa mites and the American Foulbrood.

### Objectives of the study

The main objective of this study was to evaluate the problems that affect the economic performance of beekeeping farmers in Swaziland. The specific objectives were to describe the socio-economic characteristics of beekeeping farmers and determine the factors affecting honey production among smallholder beekeepers.

## LITERATURE REVIEW

### Status of honey production in Swaziland

Honey, which is one of the products of honeybees. It has been in use since time immemorial. Honey has been found to comprise mostly plant sugars that are readily absorbed by the human body. It is composed of water, protein, fat, carbohydrate, ash, calcium, phosphorus,

iron, sodium, potassium, Vitamin A, thiamine, riboflavin and vitamin C (ascorbic acid). All these substances give honey its nutritional and healing properties. The nutritional and healing properties of honey have been given much accolade through the ages. Honey contains a diversity of substances, which are indispensable to all living things (Olarinde et al., 2008).

Apart from honey, other bee products such as beeswax, bee pollen, propolis and royal jelly among others can be obtained from beekeeping, which are also enormous income generating products. Although, honey and other beekeeping products are very important (economically and socially), humans have not fully utilized the benefits of these products. Beekeeping is regarded as a vocation. It is yet to be practised as a paying occupation. It is obvious that the practice improves the ecology of an environment and helps in plant reproduction, which largely improves the living standard of the people and the nation's economy at large. Despite its numerous benefits and uses to humans and its importance in the society, very few people are engaged in bee keeping. Consequently, the few people who engage in beekeeping as a business are not only skeptical but are also not totally committed to it.

Another source of concern is that, because of the associated bee-keeping problems, especially the seemingly lack of technical know-how, only little or nothing is known about the level of technical efficiency of the few who practise it. This means that the sustainability of bee keeping for honey and the production of other products may not be ascertained. This stems from the fact that the ability to produce maximum output from a given set of inputs (technical efficiency), given the available bee-keeping technology has not been fully understood.

From the data that were obtained by WK Kellogg Foundation (2005) in a survey conducted in all four administrative regions of Swaziland, it was discovered that about 83 tonnes of honey were harvested of which approximately 30 tonnes were obtained from small-holder beekeepers. However, data were not readily available for some areas in the Hhohho, Manzini and Shiselweni regions but it was found that Hhohho had the highest yields of honey among the four regions with Lubombo lagging behind in production due to the fact that the region lacks a wide diversity of the vegetation that can sustain the bees throughout the year. Interviews indicated that these areas had large man-made trees and the natural vegetation receiving good rainfall as they are in the Highveld. The average harvest per hive was around 13 kg and as a result it was established that the beekeepers on average did not harvest more than two times in a year (WK Kellogg Foundation, 2005).

A study by Senger (2001) shows that in most high producing countries such as China, USA and Mexico, production rate is averaged between 50 to 150 kg per hive. However, the local data indicate that it is possible to achieve average production of 50 kg per hive in the

Highveld. Improved hive management, selection and development of appropriate species are most of the critical issues that need to be addressed for honey production increment in the country. Currently, African bees are trapped in to catch boxes and transported to hives to produce honey. Vigorous efforts are needed to improve the technology to make the local industry more viable and competitive (WK Kellogg Foundation, 2005).

### **Factors affecting honey production**

Honeybees have a lot to offer in terms of agricultural products and ecosystem services. However, bees are exposed to a number of threats such as climate change, reduced biodiversity, and invasive species that reduce their quality of health and longevity (UNEP, 2010). The cost of dealing with these problems is increasing for apiarists, thus making the beekeeping business less profitable. According to Pokhrel (2008), predators, parasites and diseases are some of other factors that affect beekeeping, thus reducing honey production. Since limitations of beekeeping may affect honey production in a way that these may feed on the honeybees, thus decreasing the population hence lowering production.

Parasites and diseases also affect beekeeping and this will eventually lower production due to the fact that honeybees will be engulfed by a lot of diseases, limiting the status of bees making honey. This is attributed to lack of adequate knowledge of management practices needed in beekeeping. Honeybees can also be affected when using plants for their nectar that had been treated with a high concentration of pesticides because the use of this treated nectar kills the bees and in that case lowers production in terms of output. Beekeepers therefore should control damage on vegetation planted close to the project area, by making use of less concentrated pesticides on such plants or crops (Pokhrel, 2008).

On the other hand, age can be a factor in beekeeping, during harvest times or hard operations you may find that only young adults are able to do all operations requiring man-power. Some literature depicts that only those individuals who are still at average ages of 20-40 years can be able to harvest honey from trees other than those above 50 years who are not able to do so. Gender is another factor that affects honey production in a country. Take for instance, a lot of women find it difficult harvesting their produce due to bees stings; and may be the division of labour that exist may limit the participation of women in beekeeping (Yahaya and Usman, 2008).

Lack of technical know-how can be another factor in honey production in the sense that beekeeping is mainly practised in rural areas. These areas have people who are less educated in agricultural practices due to the fact that they are unable to get funds for their education thus limiting the harvested honey yields (Yahaya and Usman, 2008).

According to Gamez et al. (2004), poor feeding

especially during winter affects honey production. When the colony is not well fed, it will leave the area at the same time affect the yield. Beekeepers therefore, introduce sugar syrup in their feeds at least 6 weeks prior to the onset of the first major nectar flow and this may encourage the production of bees that will be at the appropriate age for foraging by the time of the main nectar flow (Gamez et al., 2004). Further literature states that for honey to be increased, it is essential that there should be a well populated colony in areas where there is abundant nectarous flora.

## METHODOLOGY

### Research design

A descriptive cross-sectional research design was employed in the study with the aim of describing the farmers' characteristics and identifying factors influencing honey production.

### Sampling procedure and data collection

The target population was 63 beekeepers in the Manzini region and this was based on a sample frame that was obtained from the Ministry of Agriculture, apiculture section. The study engaged 37 randomly selected beekeepers and random sampling technique was preferred because it is able to eliminate bias, both consciously and unconsciously. This helps in such a way that every member of the population has an equal probability of being chosen in the study (Key, 1997). The data were collected in December 2011 through the use of personal interviews with the aid of a structured questionnaire.

### Data analysis

Descriptive and inferential statistics were used to analyze the data. These included mean, standard deviation and frequencies; whilst the inferential statistics included regression analyses to determine the factors affecting honey yields among small-scale beekeepers.

### Analytical model

The analytical framework used in the study was based on the production function. The regression analysis was used to determine the relationship between beekeepers' socioeconomic characteristics and honey production. A Cobb-Douglas production function was used to determine the factors that influence honey production among beekeepers.

The regression model was specified as:

$$Y = \beta_0 X_1^{\beta_1} X_2^{\beta_2} X_3^{\beta_3} X_4^{\beta_4} X_5^{\beta_5} X_6^{\beta_6} e^u \quad (1)$$

Equation 1 was then linearized by taking the natural logarithm, which then yielded the following model:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + u \quad (2)$$

Where; Y = total honey yield (kg); X<sub>1</sub> = Experience of beekeeper (years); X<sub>2</sub> = labour measured in man hours; X<sub>3</sub> = size of the colony; X<sub>4</sub> = Age of beekeeper; X<sub>5</sub> = Gender of beekeeper; X<sub>6</sub> = Inputs

costs;  $\beta_0$  = constant term;  $\beta_i$  = coefficients of the regression model; Ln = natural logarithm, and U = error term variable.

Table 1 presents the description of the variables used in the regression.

## RESULTS AND DISCUSSION

### Socio-economic characteristics of beekeepers

Table 2 presents the descriptive statistics of beekeepers. Most beekeepers were between the age of 15 to 40 years, which shows that beekeeping in the two areas studied (Ludzeludze and Mahlangatsha), was mostly done by the youth. Grown up farmers above the age of 40 years had low participation and this could be due to the fact that the operations that are done in beekeeping demand more man-power, which these old people do not have, so it becomes more difficult for them to conduct most of the beekeeping operations. The results in Table 2 show that about 54.1% of beekeepers had the age range of 15-40 years and 45.9% had more than 40 years old.

The results further show that there were 23 beekeepers that were married (62.2%). Fourteen (32.4%) of the farmers were above 50 years old. About 86.5% of the beekeepers used the Swazi top-bar hive, and they preferred it the most, whilst 13.5% of them preferred the Langstroth hive. Most farmers preferred the Swazi top-bar hive because it is cheap, easy to make and manage. According to the results most (56.8%) of the farmers had primary level of education, while 43.2% had secondary and high school levels of education. The number of beehives a farmer keeps influences the amount of honey produced. Farmers either use Swazi top-bar hive or langstroth hive. When asked about which one they prefer, the majority (86.5%) preferred Swazi top-bar because they are easy to harvest. However, they claimed that the langstroth allow for high yields.

As can be observed from Table 3, the amount of honey harvested by the beekeepers was between 10 to 100 kg per year (43.2%). Only one (2.7%) farmer had output above 700 kg. The results in Table 4 reveal that 78.8% of the variation in honey production is explained by the variables in the model. The results further revealed that honey production was positively and significantly influenced by the experience of the beekeepers in honey production ( $p < 0.05$ ) and the size of the colony ( $p < 0.05$ ).

The findings suggest that an increase in the beekeeper's experience by 1% would result in an improvement in honey production by 0.41%, while an increase by colony size by 1% would result in an improvement honey production by 0.57%. The more experienced farmers tend to have better management skills of bee farming. Experience helps farmers to master complex practices in bee keeping. The more bee colonies, the higher the production of honey. Hauser and Lensky (1994), also found significant influence of

**Table 1.** Description of variables used in the study.

Variable	Unit	Description	Apriori
Y	Kg	Honey output	+
X <sub>1</sub>	Years	Experience of beekeeper	+ or -
X <sub>2</sub>	Man-hours	Family labour	+
X <sub>3</sub>	Number of bees group (hives)	Colony size	+
X <sub>4</sub>	Years	Age of farmer	
X <sub>5</sub>	Dummy(1= male; 0 = female)	Gender of beekeeper	+ or -
X <sub>6</sub>	Emalangeneni (E)	Inputs costs	

1US\$ = E8.6

**Table 2.** Characteristics of beekeepers.

Item	Frequency	Percentage
<b>Marital status</b>		
Married	23	62.2
Single	14	37.8
<b>Age</b>		
15-20	9	24.3
21-30	5	13.5
31-40	6	16.2
41-50	5	13.5
Above 50	12	32.4
<b>Education level</b>		
Primary	21	56.8
Secondary	8	21.6
High School	8	21.6
<b>Number of beehives</b>		
1-5	18	48.6
6-15	15	40.5
Above 15	4	10.8
<b>Preferred hive</b>		
Swazi top-bar	32	86.5
Langstroth	5	13.5
Don't know	0	0.0

**Table 3.** Amount of honey harvested.

Harvest (kg)	Number of beekeepers	Percentage
10-100	16	43.2
101-200	8	21.6
201-300	3	8.1
301-400	2	5.4
401-500	1	2.7
501-600	4	10.8
601-700	2	5.4
Above 700	1	2.7

**Table 4.** Factors affecting honey production.

Variable	B	t- statistics	p- value
Constant	3.100	3.918**	0.000
Experience	0.410	2.548*	0.016
Family size (labour)	0.248	1.351	0.187
Age of beekeeper	0.054	0.268	0.790
Gender of beekeeper	0.058	0.199	0.843
Colony size	0.568	5.766**	0.000
Production costs	0.031	0.689	0.496

\*\*p<0.01 and \*p<0.05 respectively. R<sup>2</sup> = 0.824, Adjusted R<sup>2</sup> = 0.788, F- statistics = 23.354\*

colony size on honey yield

## CONCLUSION AND RECOMMENDATIONS

Although the involvement of small-scale beekeepers in beekeeping is still at an infant stage, the enterprise shows a great potential in improving the livelihoods of the farmers. The favourable natural environment and low disease incidence makes the farmers to be competitive in honey production. Most farmers in the study area use the local (Swazi) topbar hives and further enhance honey production by using langstroth because of their high productivity.

There are opportunities to improve the livelihoods of the smallholder farmers through beekeeping. Farmers need to gain experience in beekeeping in order to improve their honey production. This could be done through special trainings by government extension officers. Farmers also need to increase the colony size of their beekeeping enterprise. And use more of langstroth beehives because they are highly productive.

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