

Costs and Returns in Modern Beekeeping for Honey Production in Nigeria

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Abstract: The study investigated the costs and returns on modern beekeeping for honey production in Ekiti State, Nigeria. Also, the problems affecting the production of honey under the modern systems were examined. One hundred respondents were randomly selected from four Local Government Areas (LGAs) of the state. With the aid of structured questionnaire, data were collected. Descriptive statistics and budgetary analysis were used to analyse the data collected. Descriptive analyses revealed that majority (60%) of the respondents were young apiculturists. They were in the age bracket 40 years and below. All the randomly selected respondents were men and educated with about 46% of them graduates of tertiary institutions. Most of them did not have experience, with just 5 years or less, in beekeeping. Seventy five percent of the respondents were members of Beekeepers Association of Nigeria. The major sources of information on beekeeping in the study area were fellow beekeepers, (80%), Beekeepers Association of Nigeria (BAN) (35%), textbooks/journal (25%) and extension agents (10%). Eighty seven percent operated the business on part time and 83% used TopBar hives to rear honey bees. The beekeepers were faced with problems such as, bush burning, lack of capital, lack of technical assistance and so on. Budgetary analysis revealed that the variable costs were responsible for about 70% of the total costs. Net revenues realised per hive per harvest were ₦11279.21 and ₦5393.25 for Langstroth and ToBar hives, respectively. Langstroth method of beekeeping is more profitable and the use should be encouraged. Also, recommendations were made to encourage other potential beekeepers.

Key words: Costs and returns, beekeeper, langstroth and topbar hive, honey production, Nigeria

INTRODUCTION

Agricultural sector remains the largest contributor to the Nigerian economy, accounting for over 39% of the non-oil foreign exchange earnings and employing about 70% of the active labour force of the populace. Although, the sector has suffered much neglect by the government since the discovery of petroleum, but its importance cannot be over-emphasised in the Nigerian economy. With this in mind, the Nigerian government is currently focusing attention on how to increase agricultural production with a view to providing employment opportunities for the people (Anyanwu, 1996). Over the years emphases have been laid on promotion of various type of small-scale income generating activities such as beekeeping (apiculture).

Bees are insects in the order Hymenoptera. They make up as super family known as the Apoidea. There are eleven families of bees. The honeybees belong to the family called Apidae. Apini and Meliponini represent this family in Nigeria. The stingless honey bee (meliponini) has nine species while the true honey bee (Apini) has one species known as *Apis mellifera adansonii*. Honeybees

are found throughout the world except on some small oceanic Island and at the highest altitudes in Polar Regions. Honey bees' range in size. Many of them are black or grey, but others are yellow, red or blue. Large quantities of honey are hoarded by honeybees. This characteristic is exploited by beekeepers, who harvest the honey for human use (Morse, 2006).

Honey is a supersaturated sugar solution manufactured by bees to feed their larvae and for subsistence in winter. Workers bees that collect nectar from flowers and regurgitate it into empty cells in the hive make honey. Other bees add enzymes to the nectar, which changes to honey as the water in it evaporates. Bee honey is composed of glucose, water and fructose in varying proportions. Also, several enzymes and oil are found in honey. The flavour and colour depend on the source of the nectar and the age of the honey (Adejare, 1990). It has been observed that light coloured honeys are usually of higher quality than darker honeys.

Honeybees are important in pollination of most of the agricultural crops. Beeswax which serves as an ingredient in cosmetics, candles and water proofing compounds is produced by honeybees. They also produce propolis a

gummy substance made from tree sap that has anti-bacterial properties. Honeybee venom is extracted for the production of anti-bodies. Honey that serves as food for man, used to produce alcoholic beverages (mead), part of feed for livestock, ingredient in drugs and cosmetics is produced by honey bees (Corby, 1994).

Beekeeping is referred to as management of honey and other products and for the pollination of crops. Groups of hives are called apiaries and a beekeeper may also be called an apiarist or apiculturist. Until 1851, beekeepers harvested honey and beeswax by killing the colonies inhabiting the hives (Obi, 1967). Honey could be produced through both traditional and modern methods. The traditional method includes the use of the followings as hive, gourds, pots and baskets. Under this system, the beekeepers hardly protect themselves from bees and the quality of honey produced is poor. Modern methods are much more labour saving and high quality honey is produced. Types of modern hive include, Langstroth and TopBar. The latter is commonly used by apiculturist in Nigeria and is cheaper.

In this study, honey production includes all activities involved in the art of modern beekeeping. Over the years, shortage of quality honey has been reported. In order to meet the ever-increasing demand for honey, there is need to educate the society about the profitability of the modern beekeeping method. Thus this study is aimed at determining the costs of establishing and servicing the modern hive for honey production and drawing comparison between costs and an estimated stream of returns accruing from it. This is essential because it is generally believed that human beings are rational and will be interested in such innovations whose adoption will improve their welfare. More specifically, the study has three major objectives. These are:

- To examine the socio-economic and demographic characteristics of modern beekeepers.
- To derive the costs and returns from modern beekeeping method for honey production.
- To examine the constraints that militate against modern beekeeping for honey production.

MATERIALS AND METHODS

Study area: This study was carried out in Ekiti State, Nigeria. The state is situated entirely within the tropics with two distinct seasons (dry and rainy seasons). There are 16 Local Government Areas (LGAs) in the state. By the 1991 census, the population of the state was 1.65

million. The estimated population on creation, on October 1, 1996, was put at 1.75 million but that for 2006 was 2.34 million. The state is mainly an upland zone, rising about 250 m above the sea level. Guinea savannah exists in the north, while Tropical forest occupies the southern peripheries. Agriculture is the main occupation of the people, which provides income and employment for more than 75% of the populace. In the state, the main cash crops are cocoa, kolanut and oil palm. It also boasts of various species of timbers that provide raw materials for wood-based industries. Among the food crops are yam, maize, cassava, rice and cocoyam.

Sources and method of data collection: The study used both primary and secondary data. Primary data were collected through the use of well-structured questionnaire from a sample of 100 respondents randomly selected from four Local Government Areas (LGAs). For the purpose of the survey and according to Beekeepers Association's classification, areas where bees are kept in the state were sub-divided into two zones: Ikere-Ikole zone and Ido/Osi-Irepodun/Ifelodun zone.

In each zone, villages were randomly selected from the lists of towns and villages. Finally, 50 beekeepers were randomly selected from each zone. Data collected on demographic and socio-economic characteristics of the beekeepers include, sex, age, household size, educational level, beekeeping experience, other occupation and so on. Also, information was sought on the quantity and cost of the inputs used. These include, bait, labour, smoking materials, bee suit, head shield, rubber gloves, smokers, rain boot, cutlass, knife, sieve, wax extractor, etc. In addition, outputs data were collected on honey and other products from beekeeping. Secondary data were obtained from publications of the State Ministry of Agriculture, FAO production yearbook and magazines.

Analytical techniques: Descriptive statistics and budgetary analysis were employed as tools of analysis. Descriptive statistics such as table, frequency counts and percentages were used to analyse socio-economic and demographic characteristics of the respondents. In addition, a budgetary technique was used to analyse returns to the factors of production as measures of efficiency and allows comparison between alternative systems of honey production. The technique has been found useful by various researchers in the economic analysis of farming business. Farm budget is defined as a physical and financial plan for the operation of the farm enterprises over a given period of time. There could be a

total or partial budget. The total farm budget is used to organise the entire farm enterprise while the partial farm budget helps to assess the profitability of part of the farm business. The procedure used in assessing the costs and returns of modern beekeeping for honey production.

Costs

Variable Cost (VC): This cost changes with the variation in the output level. In honey production, the costs include cost of labour, transport, maintenance, smoking materials, bottles and bait.

Fixed Cost (FC): This involves depreciation of the set of tools and equipment used. Straight line method was used and the useful life was estimated using the average life span (year) obtained during the study. Therefore, the FC involves the current service flow of hive, protective suit and head shield or veil, smoker, sieve, boots, rubber gloves, knives, cutlasses and wax extractor.

Income

Gross Revenue (GR): This is the total value of the entire beekeeping enterprise outputs if they dispose off all their products at the farm gate prices. The outputs considered in this study are: honey, beeswax and propolis.

Gross Margin (GM): This is the difference between the gross revenue and variable costs.

$$G.M = \sum_{i=1}^n P_i q_i - \sum_{j=1}^m C_j X_j \tag{1}$$

Where,

- GM = Farm Gross Margin.
- P_i = Market unit price of output i .
- q_i = Quantity of output i .
- C_j = Unit cost of the variable input j .
- X_j = Quantity of variable input j .
- m = Number of input used.
- n = Number of output produced.

Net Returns/profit (NR): This is the difference between gross revenue and total cost.

$$NR = TR - TC \tag{2}$$

Where,

- NR = Net Returns
- TR = Total Revenue
- TC = Total Cost

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents: One hundred respondents of diverse socio-economic characteristics were interviewed. Therefore, an analysis of the socio-economic characteristics of these beekeepers for honey production in terms of their age structure, sex distribution, religion, educational background, experience, membership of beekeepers Association, source of information on beekeeping, mode of operation, type of hive, income and constraints in beekeeping is presented in this study.

Table 1 shows that the modal age group was 31-40 years with frequency of about 50%. Specifically, 12% were aged 30 years or less; 33% were in the age range group 41-50 years and 5% were above 50 years. This reveals that about 62% of the respondents fall within the age group 40 years or less. This conforms to a priori expectation that young farmers tend to show interest in new innovation. Also, all the respondents were men. Women might be scared away from this business because of the age long fear of being stung by bees. In terms of religions affiliation, 88% of the beekeepers were Christians and 12% practised Islam. This indicates a predominance of Christians among the beekeepers in Ekiti State, Nigeria.

In addition, Table 1 shows that all the respondents had not less than primary school education. This will enhance the ability of the beekeepers to understand easily various technical operations involved in the use of modern hive. Also, 75% of the respondents had 1-5 years experience and 25% had 6-10 years. This shows that the beekeepers were relatively new in the business. It has been argued that a more experienced farmer could predict the future outcome of production with some probability by considering performance of past years. Seventy five percent (majority) of respondents were members of Beekeepers Association of Nigeria while 25% were not members. There is, therefore, a need to increase the awareness and participation of beekeepers in this organisation. This will enhance the availability of inputs needed in modern method of honey production. Moreover, on sources of information on modern bee management, multiple responses were allowed. Table 1 shows that about 80% (majority) claimed to get information from other modern beekeepers, 10% from extension agents, 25-35% got their information from textbook/journal and Beekeepers Association, respectively. This shows that information was obtained by the beekeepers from one source or the other. Also, from Table 1, 87% (majority) of the beekeepers were engaged in other farming or non-farming businesses while just 13% had no secondary occupation. On the types of

Table 1: Socio-economic characteristics of respondents

Variable	Frequency	(%)
Age group (years)		
≤ 30	12	12
31-40	50	50
41-50	33	33
> 50	5	5
Sex distribution		
Male	100	100
Female	-	-
Religion		
Christianity	88	88
Islam	12	12
Education		
Primary	17	17
Secondary	37	37
Tertiary	46	46
Experience (years)		
1-5	75	75
6-10	25	25
> 10	-	-
Membership of BAN		
Yes	75	75
No	25	25
Source of information		
Fellow beekeepers	80	80
Extension agents	10	10
Textbooks/journals	25	25
Beekeepers association	35	35
Mode of operation		
Part-time	87	87
Full-time	13	13
Types of hive		
Langstroth	17	17
Topbar	83	83
Income/hive/harvest (₦)		
5000-6000	50	50
7000-8000	25	25
9000-10,000	15	15
> 10,000	10	10

Source: Field survey, 2006

Table 2: Factors militating against beekeeping for honey production in Ekiti State

Constraints	Frequency*	(%)
Inadequate equipment	75	75
Lack of capital	91	91
Pest and diseases	10	10
Theft	25	25
Lack of technical assistance	82	82
Bees aggressiveness	38	38
Absconding of bees	10	10
Inadequate marketing		
Facilities	25	25
Bush burning	78	78

Source: Field survey, 2006, *Multiple responses were allowed

hive used, 83% used TopBar hives while only 17% made use of Langstroth hives. This might not be unconnected with high cost of Langstroth hive. Seventy three percent of the honey producers earned between ₦5000 and ₦8000 while just 25% generated ₦9000 and above as income per hive per harvest. This shows that the respondents were low-income earners in reference to beekeeping. This occurs because majority of the respondents used TopBar hives and were part-time beekeepers.

Table 2 shows the constraints in beekeeping for honey production. Apiculturists all over the world are faced with problems, which militate against the honey production. Respondents were asked to state all the possible problems facing them in beekeeping. Ninety one percent claimed that lack of funds to purchase the necessary inputs was problem. Another 82% said that they were faced with lack of technical assistance while 78% claimed that bush burning was one of the major constraints militating against beekeeping and honey production. Bush burning should be a serious problem because majority of the beekeepers in the study area were not land cultivators. They did not own land but kept their hives at suitable locations on other people's farms mostly with the consent of landowners. In addition, according to Table 2, 75% of the beekeepers indicated that inadequate equipment such as extractor, bee uniform, etc was one of their problems. The aggressiveness of bees was a problem to about 38% of the respondents while 10, 25 and 10% complained of bees absconding, theft and pests and diseases problems, respectively.

Analysis of costs and returns

Analysis of cost: The costs concept can be viewed from many perspectives. The incurred cost items were grouped as either variable or fixed costs. The variable cost items considered included, expenses on labour, bait, smoking materials and transport. The fixed cost items were, depreciation on the equipment used such as, bee suit, head shield, rubber gloves, hive, smoker, rain boot, cutlass, knives, sieve and wax extractor. Straight-line depreciation method was used. The average cost composition per hive per harvest for modern beekeeping for honey production is presented in Table 3. It could be noticed that the variable cost made up the bulk of the total cost of production for both types of hives. This high level of the variable cost shows the flexibility of the business. According to Table 3, the labour cost accounted for about 64 and 70% of the variable costs for Langstroth and Top Bar hive, respectively. This is followed by expenditure on bait. In addition, for respondents using Langstroth hive, the average total cost was about ₦1311 per harvest per hive while for TopBar hive, it was ₦1108.

Gross revenue: The gross revenue that accrued to individual honey producer during the survey year was calculated by multiplying their, respective honey output in litres with the price per litre. On the average, the selling price was ₦550 per kg or ₦733.33 per litre. Also revenue from the other products such as beeswax and propolis was added to the honey's revenue. Table 4 shows the average honey output and revenue per hive per harvest

Table 3: The average costs composition per hive per harvest

Cost of items	Langstroth hive (22×26 cm)		Topbar hive (12×15 cm)	
	Amount (₦)	% in cost class	Amount (₦)	% in cost class
A. Variable costs				
Labour	590.00	64.40	570.14	70.35
Bait	157.02	17.14	90.00	11.10
Smoking materials	78.11	8.53	70.13	8.65
Transport	91.00	9.93	80.20	9.90
Sub total	916.13	100.00	810.47	100.00
B. Fixed cost (Depreciation on equipment)				
Bee suit	74.69	18.93	70.64	23.74
Head shield	12.17	3.08	10.13	3.40
Rubber gloves	15.01	3.80	15.21	5.11
Hive	170.40	43.18	95.02	31.94
Smoker	20.80	5.27	15.20	5.11
Rain boot	21.58	5.47	18.58	6.24
Cutlass	10.53	2.66	9.53	3.20
Knives	8.59	2.18	8.20	2.76
Sieve	12.02	3.05	9.13	3.07
Wax extractor	48.87	12.38	45.90	15.43
Sub total	394.54	100.00	297.54	100.00
Total (A + B)	1310.79		1108.01	

Source: Field survey, 2006

Table 4: The average output per hive, price per unit and revenue from honey production

Type of hive	Average output /hive (litres)	Average price /unit (₦)	Revenue (₦)
Langstroth	13	733.33	9533.29
Top bar	7	733.33	5133.31

Source: Field survey, 2006

for both systems of modern beekeeping. The revenue from the sales of honey varies from ₦9533-₦5133 for Langstroth and TopBar system, respectively. The average outputs of honey per hive per harvest were 13 litres and 7 litres for Langstroth and TopBar system, respectively.

Table 5 shows that an average Langstroth user realised ₦3056.71 while ₦1367.93 was generated by an average TopBar user from the sales of other products such as beeswax and propolis. In addition, the study reveals that average gross revenue of ₦12590 per hive per harvest was realised by the Langstroth hive user while TopBar hive user averagely realised gross revenue of ₦6501 per hive per harvest.

Gross margin and net returns: The gross margin for each type of hive was calculated using Eq. 1. This was calculated as the difference between the gross revenue and variable costs. For Langstroth hive, average gross margin per hive per harvest was ₦11673.87 (12590-916.13) while that of TopBar was ₦5690.79 (6501.26-810.47).

The net return is the difference between the gross revenue and total costs. The average net returns on beekeeping enterprise for honey production per hive per harvest were ₦11279.21 (12590-1310.79) and ₦5393.25 (6501.26-1108.01) for Langstroth and Top Bar hive,

Table 5: The average income per hive per harvest of other products

Type of hive	Average income (₦)
Lang stroth	3,056.71
Top bar	1,367.93

Sources: Field survey, 2006

respectively. The net returns were positively signed for both systems. This is an indication that beekeeping enterprise is lucrative and profitable. The study reveals that Langstroth hive gives more profit than TopBar hive.

CONCLUSION

The main objective of this study, was to evaluate the costs and returns on modern beekeeping for honey production. Four LGAs of Ekiti State were sampled. Data were collected randomly with the aid of structured questionnaire from 100 modern beekeepers in the study area. Multi-stage sampling technique was used and data were sought on inputs and outputs. Two types of hive (Langstroth and TopBar hives) were used by respondents to keep honey bees. Descriptive statistical tools and budgetary analysis were used to analyse the data collected. Apart from honey, beeswax and propolis were other products harvested.

The analysis of socio-economic characteristics of the honey producers showed that the majority (62%) of respondents were 40 years and below while the modal age bracket was 31-40 years. This shows that young people enjoy keeping bees for honey production. The study also showed that women had not shown interest in the enterprise. All the respondents in the study areas were men. Women should be encouraged in beekeeping. Also 88% of the respondents were Christian while all (100%) were literates. This level of education will assist the beekeeper in record keeping which is very important in any farming business. In addition, the modern beekeeping practice is new in the study area as majority (75%) of the Beekeepers had just 1-5 years experience and 75% belong to Beekeepers Association of Nigeria (BAN).

Moreover, 80% of respondents got information on beekeeping from their fellow beekeepers. Other sources include extension agents, textbook/journal and Beekeepers Association. Eighty seven percent were into beekeeping on part-time basis. This had effect on their incomes. TopBar hive was popular in the study area. About 83% of the respondents used this type of hive to produce honey while few used Langstroth hive type which is more efficient. Fifty percent of the beekeepers had their income per hive per harvest ranging between ₦5000 and ₦6000 because TopBar type of hive was common among them. The major problems faced by the respondents were lack of capital, bush burning, aggressiveness of bees, theft, pest and diseases, lack of technical assistance and inadequate marketing facilities.

Furthermore, the costs and returns analysis revealed that on the average, variable costs constituted about 70% of the total costs. The low level of the fixed cost component has implication on the flexibility of the enterprise. The study also pointed out that it is more profitable to produce with Langstroth hive than TopBar hive. The average net revenues realised from the sales of honey, beeswax and propolis per hive per harvest were ₦11279.21 and ₦5393.25 for Langstroth and TopBar hive users, respectively.

RECOMMENDATIONS

In order to increase the production of honey through the modern methods, the following recommendations will be useful.

- More extension agents should be trained and equipped on modern beekeeping methods and encouraged to disseminate information to members of the public or farmers that are interested in the enterprise.
- Financial institutions should be enlightened to consider modern beekeepers as farmers when loans are granted.

- The use of Langstroth hive should be encouraged by the government. This could be done by subsidizing the cost of producing the hive.
- Women should be encouraged into the enterprise by providing the modern equipment needed to harvest honey.
- Finally, farmers should be discouraged from bush burning in order to preserve the nature.

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