

## **ANALYSIS OF PRODUCTION PERFORMANCE OF BEEKEEPING IN THE NIGER DELTA AREA OF NIGERIA**

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### **ABSTRACT**

Beekeeping in the Niger Delta Area (NDA) of Nigeria is a sideline economic activity most especially in the rural and semi-urban communities. The production performance revealed that the average honey yield was found to be higher for the users of modern technology than for users of traditional technology. The overall average honey yield per colony was 12.35kg for users of modern technology and 6.72kg for users of traditional technology during the period of years 2002 to 2004. These figures were under World average honey yield of 20kg because modern beekeeping was still at an infant stage in the study area. The production cost for users of traditional technology (₦ 9,710.79) was about 42% of users of modern technology cost (₦ 23,357.71). The net returns of users of traditional technology (₦ 5,964.97) were about 15% of the users of modern technology (₦ 39,319.22). For the beekeeping to have meaningful impact on the well-being of the NDA there is need for the users of traditional technology to embrace and adopt modern beekeeping technology in totality.

Analysis of costs and returns revealed that fixed cost accounted for 23.15% of the total cost while the operating expenses accounted for 76.85%. The net return per beekeeper was ₦ 31,981.29 (\$290.74) per annum which was even slightly above Nigerian average per capital income of \$280.00 during the period under review. The average rate of returns of this enterprise was as well better than some agricultural enterprises in the NDA with the value of 163%. In short, the production performance of the beekeeping in the Niger Delta Area of Nigeria

was economically viable and should be boosted through formulation of a good policy by government at all levels.

**KEY WORDS:** Beekeeping, Technology, Honey, Production, Nigeria

## INTRODUCTION

Beekeeping is an applied science of rearing honeybees for man's economic benefits [1]. The common African honeybee in Nigeria (*Apis mellifera adansonni*), live throughout the year in colonies consisting of a queen or mother bee, which is a fertile egg-laying female, 10,000 to 20,000 worker bees, which are infertile females and the male bees called drones that may be present in the colony only during the reproductive season [2]. Honeybees naturally build their nests in a hole of a tree, inside a cave and under the roof of buildings, but traditionally, people also keep bee colonies. Beekeeping has been in practice in many part of the world where the honey has been used for many purposes. Apart from direct consumption of the honey, it is used for dressing of wounds, as anti-diarrhea drug, in alcoholic drink, tobacco curing, bakery and confectionery and in manufacturing of cosmetics [3]. In addition, other honey products like bee wax, propolis, bee venom, and royal jelly are foreign exchange earning commodities for some countries while the crop pollinating role of the bees is of tremendous importance [4].

Successful beekeeping starts with the right choice of apiary. The following elements are critical for locating apiaries:

- (a) Abundant food resources for the bees, that is, nectar and pollen. With the evergreen forest and diverse indigenous fruit trees, the bees could easily forage throughout the year.
- (b) Nearby source of water all the year round.
- (c) Abundant vegetation to provide shade for the hives.

In view of this and couple with the Shell Petroleum Development Company's effort at supporting agricultural production especially beekeeping technology in the Niger Delta area, the enterprise has been accepted with great enthusiasm.

Beekeeping generally is a complementary enterprise to virtually all-farming enterprises in the study area. This provides insurance against risk and uncertainty that could result due to inclement weather and pest attacks. For honey production to increase in a sustainable manner, the present level of modern beekeeping technology must be improved upon. The extra-remarkable aspect of beekeeping is that it ensures the continuation of natural assets by the pollination of wild and cultivated plants. Honey is a delicacy that is widely consumed with many medicinal values, and beeswax has a number of industrial uses. Trade in bee products has the potential for earning significant foreign exchange for Nigeria as the industry gains grounds. However, despite this enormous potential, not enough has been done to harness it yet.

The broad objective of this study is to determine the production performance of beekeeping in the NDA of Nigeria. The specific objectives are to examine the socio-economic characteristics of the honey production in the study area and to examine the honey production technology being used there and to determine the profitability of honey production.

## **MATERIALS AND METHODS**

### **Study Area**

The study was conducted in three states within the NDA. The states were Delta, Edo and Ondo. Delta is made-up of 25 local Government Area (L.G.As) with Asaba as its capital and has a population of 4.1 million. Edo state is made-up of 18 L.G.As with Benin City as its capital and has a population of 3.2 million. Ondo State also has 18 L.G.As with Akure as its capital and has a population of 3.4 million [5]. The area lies between latitudes  $5^{\circ}\text{N}$  and  $7^{\circ}\text{N}$  of the equator and approximately between  $3^{\circ}\text{E}$  and  $6^{\circ}\text{E}$  longitude. The area has three distinct ecological zones: the mangrove forest to the south, the rain forest in the middle and the savanna to the north. The area is agrarian and melliferous flora are common in the area under study.

### **Sampling Techniques and Data collection**

Non-probability and probability sampling techniques were used in selecting the samples. The non-probability method used was the purposive sampling, which for the purpose of accurate and detailed comparative analysis selected those towns and villages where apiaries are located. The probability sampling method used was the multi stage method, which based the selection of the sample on a combination of two or more sampling methods. Three states namely Delta, Edo & Ondo were purposively selected on the basis of the vegetation cover spanned across Mangrove, Rainforest, & Guinea savanna ecological zones. Modern beekeepers were located in the area, and there is tradition of beekeeping/honey hunting in the area too.

The beekeepers sampled were stratified on the basis of technology used whether modern or traditional. The stratification of beekeepers was necessary because variables such as hive types and harvesting/processing equipment have important contribution on honey output. In line with Agricultural Development Programme (ADP) delineation there are 2 ADP zones in each state. One area was purposively selected from each zone, and 25 beekeepers were randomly sampled in each area by a lottery method. Hence, constituting the primary data in each state were 50 beekeepers irrespective of technology. In all 150 beekeepers were sampled. A structured questionnaire supplemented with an interview schedule was used to elicit information from the beekeepers with the help of trained enumerators under close supervision. The enumerators employed were those that are familiar with the localities.

### **Data analysis**

For this study, the following tools were employed in order to achieve the already stated objectives of the study, that is, a descriptive and budgeting technique.

### **Descriptive statistics**

Simple descriptive statistics were employed in order to have a summary description of the data collected. This involved the use of percentages, means, frequency distributions, and standard deviations to describe parameters as socio-economic characteristics, honey output, resource use, proportion of fixed cost and variable cost and so on. The tool would aid the achievement of objectives one and two of the study.

### **Farm Budget Model:**

A farm budget is a detailed physical and financial plan for the operation of a farm for a certain period [6]. It has been used in a number of economic studies for analyzing the profitability of farm production practice. The farm budget model would be used to achieve objective three of the study.

The Gross margin and Net-returns analysis were carried out to determine the profitability of honey production in the study area.

- a) Gross Margin Analysis (GM): This is the difference between the Total Revenue (TR) and Total Variable Cost (TVC).  $GM = TR - TVC$ . A GM greater than zero indicates the enterprise is profitable.
- b) Net-Returns Analysis (NR): It is the difference between the Total Revenue (TR) and Total Cost (TC), that is,  $NR = TR - TC$

The total revenue represents the honey sales and other hive products receipts, and the total costs (TVC+TFC) represent direct purchases for the beekeeping project. Total costs include fixed costs (e.g. rent on land, interest on borrowed fund, costs of hives, smokers, bee kits, honey press & centrifuge and depreciation, etc) and variable costs (labour, storage bottles, sieve cloth, soft brush, straw hat, detergent, torchlight, etc).

## **RESULTS**

Table 1: **Socio-economic characteristics of the respondents**

Socio-economic characteristics	Means
Household size	7.00

Years of experience	3.40years
Age of beekeepers	45.00 years
Gender	87% male, 13% female
Marital status	86% married, 14% single
Technology	78% modern, 22% traditional
Literacy level	60% with secondary education & above
Mode of land acquisition	75% by inheritance

Table 2: HONEY OUTPUT LEVEL

Category	Delta	Edo	Ondo
	Honey output	Honey output	Honey output
Modern Beekeepers	2,523.00kg	4,946.45kg	2,358.50kg
Traditional Beekeepers	322.00kg	415.00kg	364.50kg
Average/colony (Modern Tech.)	$2523 \div 193 = 13.07$	$4946.45 \div 393 = 12.59$	$2,358.5 \div 207 = 11.39$
Average/Colony (Traditional Tech)	$322 \div 48 = 6.71$	$415 \div 62 = 6.69$	$364.5 \div 54 = 6.75$

Table 3 BEESWAX OUTPUT LEVEL

Category	Delta	Edo	Ondo
Modern Beekeepers	145.70kg	321.90kg	131.53kg
Traditional Beekeepers	-	8.80kg	3.70kg
Average/colony (Modern Tech.)	$145.7 \div 193 = 0.75$	$321.9 \div 393 = 0.82$	$131.53 \div 207 = 0.64$
Average/Colony (Traditional Tech)	-	$8.8 \div 62 = 0.14$	$3.7 \div 54 = 0.07$

Table 4: Summary of Production Performance Analysis

Category	Traditional Beekeepers			Modern Beekeepers		
	N	Total	Mean	N	Total	Mean

Colonized hive	33	164.00	4.97	117	793.00	6.78
Honey Output (kg)	33	1,101.50	33.38	117	9,827.95	84.00
Beeswax (kg)	33	12.50	0.38	117	599.13	5.12

Table 5: Average Yearly Labour Input per Colony in Man-days

Activities	Modern Technology			Traditional Technology		
	Family	Hired	Total	Family	Hired	Total
Hive installation & hiving	0.15	0.15	0.30	0.25	0.25	0.50
Periodic management	1.00	1.00	2.00	1.05	-	1.05
Honeycombs harvesting	0.10	0.10	0.20	0.21	0.21	0.42
Honey processing	0.15	0.15	0.30	0.05	-	0.05
Bees wax preparation	0.09	-	0.09	-	-	-
Total	1.49	1.40	2.89	1.56	0.46	2.02

Table 6 Costs and Returns per Beekeeper according to Technology used

	Traditional Technology			Modern Technology		
	Min	Max	Mean	Min	Max	Mean
- Total cost(N)	3,925.00	23,000.00	9,710.79	3,232.00	359,650.00	22,357.71
- Total value of output (i.e. Revenue)(N)	5,450.00	35,000.00	15,675.76	6,850.00	1,175,000.00	61,676.93
-Net returns(N)	1,525.00	12,000.00	5,964.97	3,618.00	815,350.00	39,319.22

Table 7: Overall Costs and Returns per bee keeper

	Minimum	Maximum	Mean	Standard derivation
- Annual cost of	265.00	108,750.00	4,530.89	10,009.43

implements (i.e. depreciation cost)( <del>₦</del> )				
- Operating expenses	2,487.00	248,700.00	15,044.49	23,588.98
- Total cost	2,952.00	357,450.00	19,575.39	33,408.66
- Total value of output (i.e. Revenue)( <del>₦</del> )	5,060.00	1,175,000.00	51,556.67	106,412.46
-Net returns( <del>₦</del> )	2,108.00	817,550.00	31,981.29	73,452.55

N.B: Mean value (Beeswax) = ₦1,834.89

Mean value (Honey) = ₦49,721.78

Hence, Total value of output = ~~₦~~ 51,556.67

## DISCUSSION

The socio-economic characteristics of the respondents, especially gender, was analyzed and the results showed that men participated more in beekeeping and honey production in the study area than women (Table 1). This might be partly due to psychological fear exhibited by women towards the profession and coupled with periods of major activities, which are either late evening or early morning hours, which are not convenient for women due to essential domestic chores. The study showed that the level of education of the respondents is higher when compared to national adult illiteracy level of 30% and 48% for male and female in Nigeria respectively [7]. The higher level of education with 60% having secondary school education and above will enable respondents to access relevant information that will stimulate honey production.

The respondent's large household size with an average of seven is relevant to honey production because family constitutes the bulk of labour supply in this enterprise in Nigeria. The overall average total cost of production was ₦19,575.39 out which 76.85% were operating expenses. The annual average profit of ₦ 31,981.29 (\$290.74) which was higher than per capita income of \$280.00 in Nigeria [8]. This is partly due to the fact that this enterprise in the study area was a recent innovation with years of experience of respondents averaging 3.40. An aptitude that is one of the factors of successful beekeeping is directly related to experience. Modern beekeeping technology is gradually



gaining ground in the study area with 78% adopting one aspect or the other of modern beekeeping. Nevertheless, the level of innovation adoption among the beekeepers is still low because of low contact with extension agents who are skillful in the field, coupled with non-availability of adequate credit to procure modern beekeeping equipment. The modern beekeeping technology comprises a package of management practices/equipment, which includes:

- Construction of moveable combs hives especially Top-bar hives,
- Hiving methods such as baiting, capturing of swarm, dividing established colonies and transfer of wild colonies.
- Four period of management: Dearth, Build-up, Honey-flow, and Harvest periods.
- Use of honey extractors such as Honey-press, Centrifuge and Gravity method.
- Use of Bee garments and Smoker during hive inspection and harvesting of ripe honeycombs.

The honey output is the total quantity of honey processed from ripe honeycombs harvested from a given number of colonies on yearly basis. Any comb whether honey comb or brood comb is attached/built along each top-bar of Kenya Top-bar hives or hung on the roof of hive as in the case of traditional hives. For this study, the various honey output levels were converted to yearly average yield per colony for both groups of beekeepers.

According to Table 2, the modern technology was producing an annual average of honey per colony as follows: Delta state – 13.07kg; Edo state – 12.59kg; Ondo state - 11.39kg. The yield difference was dependent upon the average size of modern hive in term of top-bar number per hive since Delta had an average of 20 top bars per hive, Edo with 18 top bars per hive, and Ondo with 15 top bars per hive. The overall modern beekeepers average yield per colony was 12.35kg. This is 61.75% of the World average honey yield of 20kg [9]. The reason is that modern beekeeping is still young in the Niger Delta Area and average age of sampled colonies was for 2 years. Even from productivity analysis, the yield per colony is still at stage 1 of the production function. The

traditional beekeeping is age long sideline economic activity in the three states, consequently, all the beekeepers had about 7kg yield per colony annually.

In a similar vein, Table 3 revealed beeswax production according to technology as thus:

- The average beeswax production per colony for modern beekeepers on a state basis was 0.75kg, 0.82kg and 0.64kg for Delta, Edo and Ondo respectively. This showed that the beeswax rendering technique is yet to be perfected since the ratios of beeswax to honey in all the states are greater than 1:12 which is acceptable standard from top bar hives [4].
- The average beeswax production by the users of traditional technology is highly negligible with Edo state leading with 0.14kg, followed by Ondo with 0.07kg while none in Delta state.

Similarly, Table 4 revealed the summary of Production Performance Analysis in line with technology used. The honey outputs per beekeeper per annual were 33.38kg and 84.00kg for traditional and modern technologies respectively. In like manner the beeswax outputs per beekeeper per annual were 0.38kg and 5.12kg for traditional and modern technologies respectively. From the study area, one can conclude that only the modern beekeepers carried out beeswax preparation by rendering pressed honeycombs with aid of rush bag. 90% of sampled traditional beekeepers threw away squeezed honeycombs after honey extraction with bare hands. Even the ratio of about 16kg honey output from honey press to 1 kg beeswax from pressed combs, after rendering showed that the technology of beeswax preparation had not been mastered by modern beekeepers thereby reducing expected income.

The overall means of the two major products of beekeeping per beekeeper were 72.86 kg honey and 4.08 kg beeswax annually.

According to Table 5, the average man-days per hive in the study area for honey production were 2.89 for modern beekeepers and 2.02 for traditional beekeepers. All the beekeepers interviewed revealed that beekeeping required very low labour input and most of the labour was in the evening during the

relaxed period of other farming enterprises/livelihood systems. The users of traditional technology for honey production used more of family labour (77.3%) than the users of modern technology (51.7%), in all family labour was more prominent than hired labour. According to Table 6, the production cost of users of traditional technology (₦ 9,710.79) was about 42% of users of modern technology cost (₦ 23,357.71). The net returns of users of traditional technology (₦ 5,964.97) were about 15% of the users of modern technology (₦ 39,319.22). These data justified the need for total adoption of modern beekeeping technology in the study area. In the same manner, Table 7 revealed the mean fixed cost represented by annual cost of implements as ₦ 4,530.89 while the study revealed that fixed cost accounted for 23.15% of the total cost and operating expenses accounted for 76.85% of the total cost. The operating expenses variability as measured by the standard deviation was also higher than that of fixed cost. The total costs were made up of annual cost of implements and operating expenses. The beekeepers derived their revenue from two major products namely honey and beeswax. The total value of output (honey and beeswax) per beekeeper was the mean value of ₦ 51,556.67 (Beeswax revenue was ₦ 1,834.89 while honey revenue was ₦ 49,721.78), and the net returns per beekeeper was ₦ 31,981.29 per annum. In this case, the net returns represent return from beekeeper's labour, management and capital. The variability as measured by standard deviation which was ₦ 106,412.46. The values of the variables varied among the beekeepers as depicted by the large standard deviation.

On the other hand, the net returns per colony represent the difference between the total value of all output per colony (gross revenue) and the total cost per colony. In this case the gross revenue would be  $\text{₦ } 51,556.67 / 6.3467 = \text{₦ } 8,123.38$ . The total cost was  $\text{₦ } 19,575.39 / 6.3467 = \text{₦ } 3,084.34$ . Therefore, the net return to the total investment (net return / total cost) was 163%. This implies that on the average a profit of ₦ 1.63 was realized on every Naira invested in beekeeping. Thus this figure indicated that honey production was a profitable enterprise. As long as there is interest and right attitude to this

enterprise, alleviating rural poverty in the Niger Delta Area would be achieved sooner than later.

### **ACKNOWLEDGEMENT:**

My warmest regards to the ADP staffs in the affected states of study for their roles in the data gathering for this study.

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