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Comparative economic analysis of modern and traditional bee-keeping in Lere and Zaria local government areas of Kaduna State, Nigeria

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Abstract

The study examined the comparative economic analysis of modern and traditional bee-keeping business in selected local government areas of Kaduna state, in Northern Nigeria during the 2010 production season using statistical tools such as descriptive statistics, farm budgeting model and Regression analysis. A purposive random sampling technique was employed to sample 80 respondents, from the two local government area selected in Kaduna state. The result revealed that 65.0% of modern beekeeper were male, while for the traditional 62.5% were male. Cost and returns analysis shows that modern beekeeper had the highest mean gross margin of ₦ 5,264.2 per hive/ year compared to ₦1,391.925 per hive/ year for traditional beekeeper. Exponential function was chosen as the lead equation for beekeepers in the study area, with an R^2 value of 0.65. The results showed that feed, labour, and cost of storage were significant at 10%, 1% and 5% respectively. Some of the problems encountered by both categories of farmers in the study areas include; low bee swarm, expensive technology, inadequate market opportunities, inadequate finance, high cost of equipment, and hive vandalization. From the findings it was concluded that modern beekeeping is more profitable in the study area and can serve as an alternative source of income to households. It is recommended that the government should make efforts at provision of good transportation system, affordable credit, good marketing system, adequate extension contact for prompt information on latest development in bee business which are imperative for enhanced productivity and income generation to meet household needs.

Keywords: income; Nigeria; beekeeper; small-scale production; household

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1. Introduction

A strong agricultural base has been described as a key to national development. It provides employment, food security, improved Gross Domestic Product (GDP), foreign exchange and raw material to industries (Atala, 2005). Nigeria despite its great human and natural resources, its economy is still bad and unemployment is increasing rapidly in proportion with yearly manpower turn out at various levels of educational institution and even among farmers who constitute about 75% of the country's population (Akanbi 1999). It is because of this that bee keeping became more relevant and attractive as sideline work and as activity that is ideal to rural development (IBRA, 1997).

Commercial bee keepers around the world, using modern techniques harvest an average of 40 litres of honey annually per hive, and the international market price per litre of honey is about U.S \$7.00 (an average of ₦900.00) amounting to a total sum of ₦ 36, 000.00 per hive. It also gives a profitable and healthy form of livelihood to a large number of people; it is of considerable importance in the economies of both developed and developing countries (Muhammad and Abdulrahman, 2004).

The art of beekeeping for its products, particularly its honey is as old as 1000 years in Africa, which is practiced mostly in the East where it is regarded as a vocation for the aged and it is also associated with witchcraft (Adejare, 1990). Akanbi (1999) added that early man discovered the goodness of honey probably being before written history. The author also affirmed that, honey not only tasted good but also provides important food nutrients, protein-energy and sugar which accounts for 95-99% of honey dry matter. Latham (1997) stated that malnutrition, vitamin A deficiency, Iodine deficiency disorders and nutritional anemia are the common nutritional problems in the developing world. Apart from medicinal value, Honey can provide a cheap and readily available source of energy to man. The general definition of honey is that it "is the natural sweet substance produced by honey bees from the nectar of blossoms or from the secreting of living parts of plants or excretions of plant sucking insects on the living parts of plants, which honey bees collect, transform and combine with specific substances of their own, store and leave in the honey comb to mature" (Codex, 1999).

Bee keeping is an activity that needs to be developed, as there is a great scope in broadening its base in Nigeria. Nigeria possesses enormous potential to transform bee keeping into a productive industry. As it can play a very vital role in increasing rural income as well as contributing to increased export earning, its role in bio-diversity conservation, the usefulness of its hive products as raw materials for local industries which include those of baking, bakers buy large amount of honey to use in crackers, cookies and other baked goods. They are also used for confectionary, training, cosmetics, pharmaceuticals etc which are presently importing such material as bee wax and propolis. In this way, bee keeping could also save our scarce foreign exchange export from crude oil as major products.

Bee products are generally produced on a small scale in the country, this could be attributed to people's attitude of not really taking bee keeping as a form of vocation, which makes them to be naive of its numerous benefits, thus making the rate of expansion of apiculture industry to be relatively low compared to other fields of agriculture in Nigeria. This low expansion rate could be related to gross unawareness of the use and value of honey and other hive products, poor and ineffective collection, processing and preservation method

as well as poor handling which results to product of inferior quality. Nigeria is one of the countries which practice bee keeping but this has not resulted into any commercial marketing. This can be attributed to gross underutilization and inadequate exploitation of bee keeping potential in the country.

It is based on this that, the federal government of Nigeria through forestry Department and other Agencies like BAN and FEPA were established to create awareness through workshops, seminar and conferences, but this has not yielded the expected results. It is against this background that this study attempt to address the following:

- Describe the socio-economic characteristics of bee keepers in the study area.
- determine the cost and returns associated with traditional and modern bee keeping in the area.
- determine factors influencing honey bee production
- Identify the constraints associated with traditional and modern bee-keepers.

2. Methodology

This study was conducted in some selected local government area of Kaduna state. Kaduna state is located in guinea savanna vegetation zone of Nigeria between latitude $9^{\circ} - 11^{\circ}31'N$ and longitude $3^{\circ}20' - 6^{\circ}33'E$. it has population of 6,066,562 and occupies land area of 5100 square kilometers (KSADP, 2010 and NPC, 2006). In order to obtain a representative sample, a total of 80 Beekeepers were sampled from two purposively selected local government areas (LGAs) of Kaduna State, including Lere and Zaria. This is because of high concentration of Beekeepers in these LGAs. From each LGA, two districts prominent for beekeeping were randomly selected for the study. In each of the selected districts, stratified random sampling was used to select five (5) traditional and five (5) modern bee farmers from the villages making to total of 40 traditional and 40 modern bee keepers respectively. Data for the study were obtained from a combination of primary and secondary sources but mainly through the former. The primary data was obtained from a cross sectional survey of respondent involved in beekeeping with the use of structured questionnaire The data were analyzed using descriptive statistics, Farm budgeting model as well as production function analysis.

2.1. Gross Margin Analysis

Gross margin is the difference between gross farm income (GFI) and the total variable cost (TVC). It is a useful planning tool in situation where fixed capital is a negligible portion of the farming enterprise as in the case of small-scale subsistence agriculture (Olukosi And Erhabor, 1988).

The gross margin is given as;

$$GM = GFI - TVC$$

where,

GM = gross margin ₦/hive

GFI = gross farm income

TVC = total variable cost.

The gross margin analysis was used in achieving objective two (2).

2.2. Production Function Analysis

It is the technical relationship between input and output. Various functional forms were tried and a lead equation was chosen based on R² value, F-statistics, t-statistics and signs of the coefficient.

The model in its general form is;

$$Y = F (X_1, X_2, X_3, X_4, X_5, X_6, \mu)$$

where,

Y = output from honey produced (litres)

X₁ = Feed (sugar solution) (litres)

X₃ = Number of hives used

X₄ = Year of experience in bee keeping

X₅ = Storage cost (N)

X₆ = Transportation cost (N)

μ = error term

The explicit form of these functions takes the following forms;

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + \mu \text{ (linear)}$$

$$Y = a + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + b_5\ln X_5 + b_6\ln X_6 + \mu \text{ (semi-log)}$$

$$\ln Y = a + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + b_5\ln X_5 + b_6\ln X_6 + \mu \text{ (cobb-douglas)}$$

$$\ln Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + \mu \text{ (exponential)}$$

3. Results and discussion

3.1. Socio-economic characteristics of the respondents

Table 1. Socio-Economic characteristics of the respondents

Modern beekeepers			Traditional beekeepers	
<i>Variables</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Frequency</i>	<i>Percentage</i>
Age				
21-30 yrs	08	20.00	03	7.50
31-40 yrs	17	42.50	08	20.00
41-50 yrs	09	22.50	15	37.50
51-60 yrs	04	10.00	12	30.00
>60 yrs	02	5.00	02	5.0
Total	40	100.00	40	100.00
Sex				
Male	26	65.00	25	62.50
Female	14	35.00	15	37.50
Total	40	100.00	40	100.00
Household size				
1-5 people	18	45.00	11	27.50
6-10 people	16	40.00	17	42.50
11-15 people	03	7.50	04	10.00
16-20 people	02	5.00	04	10.00
>20 people	01	2.50	04	10.00
Total	40	100.00	40	100.00
Year of Experience				
1-5 yrs	18	45.00	11	27.50
6-10 yrs	15	37.50	08	20.00
11-15 yrs	06	15.00	08	20.00
16-20 yrs	01	2.50	01	2.50
Total	40	100.00	40	100.00

Source: field survey, 2010

Results in Table 1 show that majority of the modern bee-keeper 85% are within the age bracket of 21-50years. This means that they are able-bodied, still economically active and must have profit maximization goal as their objective in bee-keeping. The table also shows that the traditional beekeepers accounted for 65% of the respondents in the same age bracket as the modern bee keepers that is 21-50years. On the other hand only few, aged individuals in the age bracket of 51-60years (15%) are into modern bee keeping while 35% are engaged in traditional bee keeping. This small percentage is an indication of the fact that aged people are not economically active compared to younger farmers. The youths between the age of 21-30years accounted for the smallest percent (7.5%) who engaged in traditional bee keeping. The smallest percentage is perhaps due to the fact that most rural youth tend to migrate to urban centres in search of white collar job, thus affecting their level of participation (Balarabe,1997). It is also shown in the table that 65.0% of modern bee keepers are male while 35.0% modern bee keepers are female on the other hand 62.5% of traditional

bee-keepers are male while 37.5% traditional bee-keepers are female. It is found that female do not actively keep bees in the study area, which means that men dominate the enterprise. Women are not directly involved in field production of honey, but may be engaged in processing and selling of the bee-products, it could also be due to Islamic belief held by the people in the study area. The table revealed that 18 persons or 45% had a household size in the range of 1-5 individuals while 40% or 16 persons had a household size of 6-10 adult individuals for modern bee keepers whereas 27.5% or 11 persons had a household size of 1-5 adult individuals while 42.5% or 17 persons had a household size of 6-10 people. It has been found in a number of studies that large family size is a ready source of cheap and available labour (Ogu,2010). The table also revealed that 82.5% or 33 respondents had between 1-10years experience in modern bee keeping while about 77.5% or 31 persons had 1-10years experience in traditional bee keeping, Experience in the business of bee keeping is crucial for adjustments in the face of changing production demands and conditions. With experience, farmers or beekeepers are able to make and take necessary decisions regarding risk and uncertainty that are inevitable in any business endeavors or enterprises. Beekeepers with long years of experience are able to adjust production to meet market demand and price fluctuation that may occur.

3.2. Costs and returns associated with modern and traditional beekeeping

Analysis of costs and returns revealed that the average variable cost for modern beekeeper was N10,159.10k and Gross Revenue of N56,059.7 yielding a gross margin of N5,264.2 per hives/yr, on the other hand the average variable cost for Traditional beekeeper was N1,568.12k with gross revenue of N9,232.54 and gross margin of N1,391.93 per hive/yr. Among variable cost, the cost of labour and sugar / feed of modern beekeeper accounted for more than 36.8% of the total cost of production, while costs of labour and transportation were the major constituents of the total cost for Traditional beekeeper. This suggests that sugar input for modern beekeeper is the most costly item in honey production in the study area. Although modern beekeeping appears to be more profitable in terms of output and profit from sales, the cost of production for modern beekeeper is higher than the cost for traditional beekeeping business. The net farm income for modern beekeepers and traditional beekeepers were ₦56,154.67 per hive/yr and ₦37,073.95 per hive/yr with the rate of return on investment reaching 250% for modern beekeeping and 329% for traditional beekeeping. The gross ratio, operating ratio and fixed ratio for modern beekeeping were 0.40, 0.18 and 0.22 respectively while that of traditional beekeeping were 0.30, 0.17 and 0.67 respectively. All the ratios were less than 1 indicating that beekeeping farming is profitable and has potential for increasing rural income.

Table 2. Costs and Returns Associated with Modern and Traditional Bee-keepers, per hive/year

Items of cost and returns (₦)	Modern	% of total costs	Traditional	% of total costs
Labour cost	2,323.50	10.35	659.40	23.46
Transportation cost	987.10	4.40	275.58	9.81
Sugar or feed cost	5,936.45	26.45	100.35	3.57
Storage cost	384.45	1.71	478.70	17.03
Honey comb cost	243.95	1.09	- -	
Detergent cost	283.65	1.26	-	-
Animal dung cost	- -		54.10	1.93
Total variable cost	10,159.10	45.26	1,568.13	55.80
Kenyan top bar cost (dep)	1,976.18	8.81	-	-
Lang stroth (dep)	2,022.22	9.01	-	-
Box with removable top (dep)	1,543.70	6.88	-	-
Wooden frame cost (dep)	1,794.74	8.00	-	-
Set brush (dep)	4,828.50	21.51	-	-
Towel (dep)	55.26	0.25	-	-
Scraping knife (dep)	63.18	0.28	-	-
Calabash cost (dep)	-	-	231.84	8.25
Wooden reed (dep)	-	-	10.27	0.37
Earthen pot (dep)	-	-	180.66	6.43
Gourd hive (dep)	-	-	186.42	6.63
Clay hive (dep)	-	-	248.26	8.84
Straw hive (dep)			384.38	13.68
Total fixed cost	12,283.78	54.74	1,241.83	44.20
Total cost	22,442.87	100	2,809.95	100
Gross Revenue	56,059.7		9,232.54	
Gross margin	5,264.2		1,391.93	
Net farm income	56,154.67		37,073.95	
Gross Ratio	0.40		0.30	
Operation Ratio	0.18		0.17	
Fixed Ratio	0.22		0.67	
Return on Capital Investment	2.50		3.29	

Source: field survey, 2010

Table 3. Estimated exponential regression function (lead equation)

Variable	Regression coefficients	Standard error	t-value
Feed (x_1)	0.010	0.006	1.852*
Labour (x_2)	0.021	0.005	4.516***
Number of hive (x_3)	0.001	0.008	0.171 ^{N.S}
Experience (x_4)	0.012	0.010	1.169 ^{N.S}
Storage cost (x_5)	8.24E-006	0.000	1.989**
Transportation cost (x_6)	-0.003	0.002	-1.670*
Constant	4.823	1.564	3.084***
$R^2 = 0.652$	F-ratio = 22.820***		

Source: field survey, 2010

*** Significant at 1% level of probability

** Significant 5% level of probability

* Significant at 10% level probability

N.S not significant

3.3. Problems associated with modern and traditional beekeepers

The distribution of respondents according to the problems they encountered in the study area is presented in Table 4.

Problems encountered	Modern beekeeper		Traditional beekeeper	
	Frequency*	Percentage	Frequency*	Percentage
Inadequate finance	27	67.5	26	65.0
Lack of extension contact	23	57.5	25	62.5
Lack of good storage facilities	25	62.5	26	65.0
Inadequate market opportunities	27	67.5	27	67.5
Transportation problem	26	65.0	28	70.0
High cost of equipment	23	57.5	28	70.0
Low yield	22	55.0	25	62.5
Low bee swarm	30	75.0	25	62.5
Low literacy level	23	57.5	28	70.0
Technology too expensive	29	72.5	25	62.5
Hive vandalization by cattle rearers	27	67.5	30	75.0

Note: * Implies that multiple responses were recorded / Source: field survey, 2010

Results presented in table 4 indicated that for modern beekeepers, the most pressing problem they encountered is low bee swarm; the implication is that it could affect the quantity of honey that could be realized and can also reduce the profit margin of the beekeepers. While for traditional beekeepers the most pressing problem they encountered is hive vandalization by cattle rearers, the implication is that once these hives are destroyed, the beekeepers find it difficult to replace most of the hives due to inadequate finance. This is in line with the findings of Usman (2004) where he stated that low adoption of modern technology is attributed to low capital base of most of the beekeepers which hinders technology adoption especially by the traditional beekeepers.

4. Conclusion

It was concluded from the findings of this study that modern bee-keeping is more profitable (viable economically) with an estimated gross margin of ₦5,264.2 while traditional beekeeping is more technically feasible with an estimated gross margin of ₦1,391.925 and the net farm income of modern bee keeping is ₦56,154.67 while the traditional beekeepers has ₦37, 73.95 their difference in gross margin were attributed to the difference in quality price of the two methods. It was revealed from the production analysis that feed (X_1), labour input (X_2) and storage cost (X_5) were the significant factors influencing output level of beekeeping production at 10%, 1% and 5% level of probability respectively. The study identified constraints which if resolved would further improve the performance of modern bee-keeping. Most prominent among these problems are inadequate finance, low bee swarm, technology too expensive, high cost of equipment, inadequate market opportunities etc. Therefore effort should be made towards improving the traditional for the purpose of introducing modern method there is a scope for improvement in raising profit levels and improving the livelihood of the bee keepers.

5. Recommendations

Based on the findings of this study, the following recommendations were made;

- Output of hive products can be increased by a gradual shift from traditional production from hunter gathering and fixed bar hives to intermediate technology top bar hives and better processing.
- There are substantial market opportunities for honey, bee wax and other hive products and financial returns can be increased through various methods of adding value and through marketing of minor products.
- Provision of government assisted transportation could aid in ameliorating transportation problem and enhance the earning capacity of the bee-keepers by increasing their profit margin. Also bad roads should be repaired to ease the movement of vehicles from village's, towns and cities.
- There is need for the bee keepers to form association/cooperation where non-existing or join the association where it exists. Cooperatives helps pool the resources of the bee keepers thereby enabling them derive benefits.

- There is need to form local vigilante groups and patrol team in the study areas to check hive vandalization by cattle rearers in order to avoid conflict between the cattle rearers and the bee-keepers in the study area.
- Adequate extension personnel in beekeeping should be provided to educate beekeepers on the use and management practices.
- Private and financial institutions should be encouraged to invest in bee keeping farming to give it the needed popularity.
- Government should ensure that modern technology transferred to traditional beekeepers should be at a minimized price towards improving the traditional method for introducing modern method.

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