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Economic Analysis of Beekeeping in Chibok Local Government Area of Borno State, Nigeria

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ABSTRACT: The study was carried out to analyze the economics of beekeeping in Chibok Local Government Area of Borno State, Nigeria. Data were obtained using structured questionnaire. Three (3) wards (extension blocks) were purposely selected out of the eleven (11) wards to reflect areas where beekeeping is predominantly found. A total of 100 respondents were randomly and proportionately selected from the three (3) wards and used for the study. Descriptive statistics, budgetary technique and multiple regression were used as analytical tools. The result indicates that majority (90%) were male, most of them (56%) had between 20 – 40 colonies, 44% had primary education and 40% had between 16 – 20 years beekeeping experience in the study area. The results of multiple regression analysis indicate that the coefficients of age, number of colony owned and gender were positive and significant at 5% and 10%, respectively. Costs and returns analysis indicates that gross revenue, total cost and net farm income were ₦14,234.17, ₦5,260.65 and ₦8,973.74 per colony, respectively. Inadequate credit, theft, bush burning, absconding of bees and inadequate improved technologies were some of the major problems militating against beekeeping in the study area. It was recommended that extension agents in the state should be property trained and provided with all the necessary technological packages required to teach and guide farmers on improved beekeeping to reduce cost of production, farmers engaged in beekeeping should form cooperative groups that will enable them obtain credit from government and financial institutions and non-governmental organisations in collaboration with farmers cooperative groups should provide improved beekeeping technologies at subsidized rate to the farmers.
Keywords: Beekeeping, Economic analysis, Borno State

INTRODUCTION

Agriculture provides primary means of employment for Nigerians, accounts for more than one-third of total gross domestic product (GDP), ensures food security, alleviate poverty and reduce labour force wastage (FAO, 2003; World Bank, 2003; Amaza and Maurice, 2005). The agricultural share of the GDP stood at about 90% before independence in 1960, decreased to 56% between 1960 – 1969 and collapsed to about 40% since 1986 (CBN, 2003). Furthermore, the contribution of agriculture to the GDP further declined to 35 percent between 2002 – 2004 (Amaza and Maurice, 2005). The decline in the contribution of agriculture to the country's GDP overtime is due to its dwindling relevance relative to other sectors of economy, especially the commercial exploration of petroleum (CBN, 2003). This condition leads to poor agricultural output in general and consequently, impoverishment of the people that are agriculture dependent. The search for sustainable forms of farming which will be complementary and also improves the biodiversity, therefore, becomes imperative.

Beekeeping, though not widely practiced in the country is another economic enterprise that has over the years improved the living conditions and livelihood of many in the study area. Beekeeping is the art and science of raising honey bee for man's economic benefits is also called apiculture (Chinaka, 1995). It refers to the practice and management of the bees in the hives (Ojeleye, 1999; Shu'aib *et. al.*, 2009), which leads to the production of valuable materials such as honey, beeswax, propolis, bee pollen, bee venom and royal jelly.

The importance of beekeeping to the society is enormous. For instance, Ojo (2004) describe the enterprise as a means of empowering youth economically because of its many advantages over other types of agricultural enterprises. The enterprise needs relativity small investment capital and most of the equipment needed for

both traditional and modern beekeeping can be sourced locally. In beekeeping, the quality of land required is less important because hives are placed either on the trees or on the ground. It is also not competing with other enterprises for resources as the bees use nectar and pollen grains of plants. The Honey is not only priced as food but as medicine for healing many ailments (Shu'aib *et. al.*, 2009). It is against this backdrop that this study was conceptualised to examine the economics of beekeeping in the study area.

METHODOLOGY

Study Area

The study area is Chibok Local Government Area of of Borno State, Nigeria. It lies within latitudes $10^0$30' and $11^0$00'N and longitudes $12^0$00' and $13^0$00'E, occupying a total land mass of 180 square kilometre (Ministry of Land and Survey (MLS), 2008). It shares boundaries with Damboa to the North, Askira to the South and Biu Local Government Area to the West.

The climate of the area is characterised by dry and hot seasons, with average annual temperature of 25^0C. The minimum temperature ranges from 15–20^0C, while the maximum temperature ranges from 26^0C–32^0C. The annual rainfall ranges from 600mm–700mm per annum (Nigeria Metrological Agency (NMA), 2008). The rainy season is usually from May to October with low relative humidity and short wet season. The topography is generally low land plain and the soil is generally clay (dark brown) with gravel and short grasses. Chibok Local Government Area has a projected population of 92,000 thousand people with annual growth rate of 2.83% per annum (NPC, 2006).

Majority of the inhabitants are farmers, traders and civil servants. Major crops grown are sorghum, maize, rice, groundnut, cowpea, sesame seed, bambaranut etc. Dominant livestock species include sheep, cattle, goat, pig, donkey, horses, etc and beekeeping. Chibok Local Government Area is made up of eleven (11) wards. The major ethic groups are Kibaku, Bura and Fulani and many immigrant settlers from within and outside Nigeria (BOSADP, 2005).

Sampling technique and data collection

Three (3) wards were purposively selected out of the existing eleven (11) wards in the area. These are areas where beekeeping is predominantly practised by the farmers. These wards include Mbalala, Kaburmbula and Kautukari. A total of 100 farmers were randomly selected in proportion to the sizes of the three wards and used for the study.

The data for the study were obtained from both primary and secondary sources. The primary data were collected with the aid of a structured questionnaire and personal interview conducted for respondents who could not read and write. The results of the interview were entered in to the questionnaire, while the secondary sources include textbooks, journals, past projects, Internet, etc. Data were collected on socio-economic variables such a gender, farming experience, age, educational status, household size, farm size and income level. Data were also obtained on costs and returns and problems associated with beekeeping in the study area.

Analytical Technique

The analytical tools employed for this study include descriptive statistics, budgetary technique and multiple regression. Descriptive statistics such as percentage, frequency and rank order were used to analyze the socio-economic characteristics of farmers as well as the problems associated with beekeeping. Budgetary technique such as net farm income analysis was used to estimate the costs and returns associated with beekeeping. The model is expressed as follows:

$$NFI = GI - TC \quad (1)$$

$$TC = TVC + TFC \quad (2)$$

Where:

NFI = Net Farm Income (₦)/ Colony.
GI = Gross Income (₦)/ Colony.
TC = Total cost (₦)/ Colony.
TVC = Total variable costs (₦)/ Colony
TFC = Total fixed costs (₦)/ Colony

Multiple regression model was used to determine the relationship between socio-economic variables and income obtained in beekeeping. The implicit form of the model is expressed as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, e) \quad (3)$$

Where:

Y = Income obtained from beekeeping (₦)
X_1 = Age (years)

X_2 = Number of Colony Owned (No.)
X_3 = Household size (No.)
X_4 = Gender (dummy), 1 for male, 0 female.
X_5 = Beekeeping experience (years).
X_6 = Education (years spent in formal education).
e = Error term.

Different functional forms were tried. These include linear, semi-log, double-log and exponential functions, out of which the double-log function was found to be the best fit and therefore, chosen as the lead equation. The choice of the best functional form (lead equation) depends on both statistical and econometric criteria such as the F - statistics, T – ratio, R^2, number of significant variables and the *a priori* expectation of the signs of the regression coefficients. The *a priori* expectation was that coefficients of X_2, X_3, X_5 and X_6 would be positive while those of X_1 and X_4 would be negative.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondents

The socio-economic characteristics of the respondents examined include: age, gender, education, major occupation, number of colony owned, annual income from beekeeping and beekeeping experience. The findings are presented in Table 1

Table 1: Socio-economic characteristics of the respondents

Socio-economic variables	Frequency	Percentage (%)
Age (Years):		
Less than 30	14	14
31 – 35	38	38
36 – 40	30	30
41 and above	18	18
Total	**100**	**100**
Gender:		
Male	90	90
Female	10	10
Total	**100**	**100**
Education Level:		
No formal education	12	12
Primary	44	44
Secondary	20	20
Tertiary	16	16
Adult education	8	8
Total	**100**	**100**
Number Colony Owned (No.):		
Less than 20	12	12
20 – 40	58	58
50 and above	30	30
Total	**100**	**100**
Annual Income From Beekeeping (₦):		
Less than 100,000	14	14
100,000 – 200,000	20	20
201,000 – 300,000	38	38
301,000 – 400,000	16	16
401,000 and above	10	10
Total	**100**	**100**
Beekeeping Experience (Years):		
Less than 10	18	18
10 – 15	30	30
16 – 20	40	40
21 and above	12	12
Total	**100**	**100**

Source: Computed from Field Survey Data, 2009.

Analysis of the finding in Table 1 shows that majority (68%) of beekeepers were within the age group of 31 – 40 years, while 14% had less than30 year's of age in the study area. The finding shows that most of the beekeepers were in their active and productive age group. The reason is obvious; the age of a farmer is a very important factor that can be used to determine the type of agricultural activities engaged by a farmer. For instance, in family labour supply younger farmers spend much time and tend to engage in labour intensive farming activities than older farmers (Tijani *et. al.,* 2010).

The result also indicates that majority (90%) of the respondents were males, while only 10% were females. This might be due to male farmers' great responsibility in the household of having many mouths to feed as heads. Thus, they engage more in beekeeping to supply their households with food and other basic needs. Female are less involved in beekeeping probably because of the high labour requirements and land ownership pattern which favour males. Besides, the purdah system (seclusion) of women in Northern Nigeria may prevent women's active participation in agriculture and specifically beekeeping (Tijani *et. al.,* 2010).

The result indicates further that 44% of the respondents had primary education, while 8% had adult education. Similarly, most of the respondents were found to have undergone one form of education or the other in the study area. The level of education attained by farmers to a large extend determine the farmers level of adoption of new innovation without difficulties and become resource use efficient which in turn increase farm output and subsequently the profit obtain by the farmers (Amaza, 2000; Amaza and Maurice, 2005). Information pertaining to number of colonies owned reveals that Most of the beekeepers (58%) owned between 20 – 40 bee colonies. This shows that majority of the beekeepers in the study area are small scale farmers.

It is also revealing in Table 1 that 38% of the beekeepers earned between ₦201,000 – ₦300,000 annual income from beekeeping and 10% earned ₦401,000 and above annually form the enterprise. This indicates that a reasonable income can be earned from beekeeping in the study area. This supports the findings by Tijani (2007) that annual farm income of a farmer determine the farmers ability to purchase improved technology which may bring about increase in productivity and subsequently leads to higher income. Thus, the higher the annual income of a farmer, the greater the scale of agricultural production he can undertake and the higher the profit in farming.

The finding also reveals that 40% of the respondents had between 16 – 20 years experience in beekeeping, while 12% had 21 years and above in the study area. This implies that most of the farmers have reasonable beekeeping experience in the study area. The higher the numbers of years spend in farming by a farmer, the more he becomes aware of new production techniques (Iheanacho, 2000) there by increasing the level of his productivity.

Costs and Returns Associated with Beekeeping per Colony

Costs refers to the value of inputs used in production or the expenses incurred in the course of production of a particular produce, while return is the gain made at the end of production (Tijani, 2007). The net farm income represents the difference between the gross revenue and the total cost, and serves as a proxy for measuring profitability. The costs and returns in beekeeping are estimated and presented in Table 2.

Table 2 shows that the gross revenue, total cost and net farm income were ₦14, 234.17, ₦5, 260.65 and ₦8, 973.74, respectively per colony. This implies that beekeeping is a profitable venture in the study area. The result also reveals that beehive constitutes 34.56% of the total fixed costs. This suggests that beehives consumed the largest proportion of the total fixed costs followed by ropes. Hired labour is the most important cost item in the case of variable costs accounting for 19.32% of the total variable costs followed by baiting materials which accounts for 18.28% of the total variable costs.

Table 2: Estimated Costs and Returns Associated with Beekeeping per colony

Items	Average Value (₦)	Percentage (%)
Gross revenue:	**14,234.17**	
Fixed input costs:		
Beehives	494.79	34.56
Bucket	246.88	17.56
Torch light	265.63	18.55
Ropes	424.48	29.65
Total	**1,431.78**	**100**
Variable input costs:		
Hired labour	739.58	19.32
Baiting materials	700.00	18.28
Cost incurred due to environmental problems	546.88	14.28
Control of pest and predators	697.92	18.23
Batteries	437.50	11.43
Corn stock	662.50	17.30
Matches	44.27	1.16
Total	**3,828.65**	**100**
Total cost	**5,260.65**	
Net farm income	**8,973.74**	

Source: Computed from Field Survey Data, 2009.

Socio-economic factors influencing income obtained in beekeeping

In order to determine the socio-economic factors influencing income in beekeeping, income obtained by farmers in beekeeping was regressed against age, number of colony owned, household size, gender, beekeeping experiences and years spent in formal education. The result is presented in Table 3, which shows that age (X_1), number of colony owned (X_2), gender (X_4), beekeeping experience (X_5) and years spent in formal education (X_6) had direct relationship with annual income from beekeeping, while household size (X_3) had negative relationship with beekeeping production. The T-values show that three of the variables, that is, age (X_1), number of colony owned (X_2) and gender (X_4) are all significant at 5% and 10% and 5%, respectively. The F-value (74.586) was significant at 1% which means that all the explanatory variables (Xs) taken together have a significant effect on the dependent variable (Y). Also the R^2 value of 0.912 implies that 91.2 percent of the variation in the independent variables has been explained by age (X_1), number of colony owned (X_2) and gender (X_4), while the remaining 8.8 percent was due to random variable e.

Number of colony owned has positive coefficient and is significant at 10%. This suggests that the more the number of colonies the higher the income obtained by beekeepers. This is plausible, because beekeepers who have more colonies obtain higher income than those with small number of colonies.

Table 3: Double-log Multiple Regression Estimates of Socio-economic Factors Influencing Income obtained in Beekeeping

Variables	Estimated parameters	Coefficient	Standard error	T-Value	R^2	F-Value
Constant	X_0	-13348.466	4126.915	-3.234*	0.912	74.586*
Age	X_1	511.377	223.232	2.291**		
Number of colony owned	X_2	3768.526	2103.411	1.792***		
Household size	X_3	-1087.599	779.138	-1.396		
Gender	X_4	0.189	0.084	2.248**		
Beekeeping experience	X_5	69.637	4812.241	0.014		
Years spent in formal education	X_6	972.736	5210.633	0.187		

Source: Computed from Field Survey Data, 2009.
* = Significant at 1% ** = Significant at 5% *** = Significant at 10% n = 100

The age variable also has a positive coefficient and significant at 5% level. The positive coefficient of age variable suggests that income in beekeeping is higher amongst old than young farmers. This is probably because older farmers tend to have more experience in beekeeping than the younger farmers. Consequently, the former are likely to be more efficient in beekeeping than the later.

The coefficient of gender was positive and significant at 5%. The positive Coefficient of gender variable suggests that income in beekeeping is higher among male than female farmers. The reason might be due to male farmers' significant role in the family as household heads who provide food and other basic needs. Thus, male farmers engage more in beekeeping than their female counterparts.

Problems Associated with Beekeeping

Farmers in the study area were asked to rank some of the major problems associated with beekeeping in the area in order of their importance. The results are presented in Table 4 which shows that 28% of the respondents indicated that inadequate credit to purchase the necessary inputs for beekeeping was a major problem. The finding also indicates that 25% of the respondent indicated theft as a problem associated with beekeeping, while 15% of indicated bush burning as a problem militating against beekeeping in the study area. The result reveals that inadequate credit was the most pronounced problem associated with beekeeping followed by theft in the study area. Inadequate credit could be a problem to beekeeping because it would deprive farmers from accessing modern inputs and reduce the intensity of use of technologies. This supports the findings by Ouma *et. al.* (2006), that prominent among problems affecting the use of improved agricultural technologies by farmers is access to credit. Farmers who have access to credit are more likely to adopt improved technology innovations compared with farmers who do not have access to credit. This is because adoption of improved technologies may require extra resource commitment that can only be met through acquisition of credit facilities.

Table 4: Major Problems Associated with Beekeeping

Major problems	Rank order	Frequency	Percentage
Inadequate credit	1	28	28
Theft	2	25	25
Bush burning	3	15	15
Absconding of bees	4	11	11
Inadequate improved	5	8	8
technologies	6	7	7
Lack of technical assistance	7	6	6
Bees aggressiveness			

Source: Computed from Field Survey Data, 2009.

CONCLUSION & RECOMMENDATIONS

From the foregoing, it is concluded that majority of the farmers who engaged in beekeeping in the study area were males, most of them had primary school education and most of them earned reasonable income from beekeeping. Beekeeping has proved to be a profitable venture in the study area allowing those farmers that were engaged in it to obtained good returns. The findings also re-affirmed the claim that socio-economic factors such as age, number of colonies owned by a farmer and gender influence farmers' income in beekeeping. However, inadequate credit and theft were the major problems militating against beekeeping in the study area.

Based on the findings of the study it is recommendations that extension agents in the state should be properly trained and provided with all the necessary technological packages required to teach and guide farmers on improved beekeeping to reduce cost of production. Farmers engaged in beekeeping should form cooperative groups that will enable them obtain credit from government and financial institutions. Non-governmental organisations in collaboration with the farmers' cooperative groups should provide improved beekeeping technologies at subsidized rate to the farmers. There is also the need to form a vigilante group to monitor and check the activities of theft in the area.

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