PROFITABILITY OF HONEY PRODUCTION ENTERPRISE IN UMUAHIA AGRICULTURAL ZONE OF ABIA STATE, NIGERIA

S. O. MBAH

**Federal College of Agriculture, Ishiagu P.M.B. 7008, Umuahia, Abia State
E-mail: sam.uche@yahoo.com Mobile Phone: 08134090420**

ABSTRACT

The study was carried out in Umuahia Agricultural Zone of Abia State to examine the profitability of honey production. Information were elicited from 60 respondents randomly selected from a sample frame of 80 registered Beekeepers in the zone by means of structured questionnaire from where input and output data were obtained. The data collected were analyzed using descriptive statistics, gross margin analysis, profitability ratio analysis and multiple regression analysis. The result of the socio-economic variables showed that 93.3% of respondents were within the highly productive age-range of 20 – 50 years. It further revealed that there was no gender discrimination (between male and female) in beekeeping.

The result of the multiple regression analysis showed that number of hives(x_6), Fixed and Variable assets (x_7) Labour (x_8), Baiting materials (x_9) and Availability of credit (x_{10}) were all positively related to productivity. The coefficient for age (x_1) was negative, but significant at 10% level of productivity. The coefficients for Household size (x_2) and Gender (x_5) were negative, but significant at 1% level of probability, while the coefficients for Number of hives (x_6), Labour (x_8), baiting materials (x_9) and Availability of credit (x_{10}) were positive and significant at 1% level of probability respectively. Honey production in the area is profitable as a beekeeper on the average realizes 255 litres of honey per season and a net farm income of ₦151,440.00. Also a return on investment per naira was ₦1.46. The identified problems include; high cost of production inputs (especially labour), paucity of hives, inadequate capital, theft of hives and honey, environmental problems, predators and bush fire. As honey production attracts the attention of a greater percentage of the populace these days because of its profitability and a viable complementary activity/quick returns, efforts should be made by relevant authorities towards ameliorating these problems of bee farmers in the study area.

INTRODUCTION

In recent years, the production of honey through beekeeping is becoming popular among the small-scale farmers. This is due to the fact that the farmers have resorted to the need for income in diverse ways; thereby reducing the risk involved in depending on conventional crop and animal production as the only source of income (Olarinde, *et al*, 2008).

Apiculture is an aspect of the agricultural sector that has not been given much attention particularly at the commercial level in the country (ICTA, 2004). Modern beekeeping is undertaken because it serves as a source of food, employment and income (Olagunju and Ajetomobi, 2003). Beekeeping for honey production has been identified as one of the most lucrative enterprises in many parts of the world. In United States of America, about 109,799,366.60kg of honey worth $24,200,000.00 is produced each year; the same goes to the former USSR. Australia produces 18,375,000.51kg of honey and exports 5,898,313.08kg of it worth 900,000 pounds, and Tanzania about 750,000 pounds worth of honey is produced annually (Canadian Statistics, 2003).

Presently in Nigeria, honey production is still at its developmental stage, though its awareness was created far back as early 1950s. This could be attributed to inefficient and inadequate information on the enterprise and the belief that swarms of bees are a taboo and signifies that a terrible mayhem is about to befall the individual whom it visits (Onyekuru, 2004).

Honey is a natural resource that has received priority attention from farmers in the study area because of its economic importance to the people (Onyekuru, 2004). Generally, honey production enterprise attracts the attention of a greater percentage of the populace these days because of its profitability and it is a viable complementary activity for rural people and requires

very little investment and in addition, produces quick returns (Onyekuru, 2004).

The demand for bee honey in Nigeria is on the increase, but organized beekeeping as an enterprise is low (Eluagu and Nwali, 1999). Beekeeping as an enterprise has a lot of potentials for the development of farm households in Nigeria (Anyaegbunam, *et al*, 2006). Honey and beewax are highly demanded by households, hospitals, commercial outlays, pharmaceuticals and cosmetic industries as a good supplement, medicinal or complement in the production of other products. Honey can be used for the treatment of wounds, burns, cataracts, skin ulcer and scabies (Ayeni, 2003). If food security situation and the vision 2020 is to be fully realized, it will be necessary to plan for the possibility to increase production in apiculture, among other things, but we cannot plan effectively without adequate facts about the existing systems of production.

Although there has been increase in local production of honey in the study area, the demand for honey still far exceed the supply. Irrespective of this high production of honey to meet with the increasing demand, they hardly produce enough to march with the seeming quest for honey within and outside the study area. Improvement on honey production will be a sure way to adding value to agricultural production, not only in the study area, but in Nigeria as a whole. Honey production should be promoted as a component of integrated rural development approach and its effectiveness should be elevated with a well organized extension service to act as a link between apiculture specialists and the rural beekeepers (Onyekuru, 2004). The adoption of improved beekeeping technology by bee farmers as an aspect of agricultural enterprise is an option available to meet the culinary and industrial demands for bee honey and its products (Anyaegbunam, *et al*, 2006). The objectives of the study are to: describe the socio-economic characteristics of the honey bee farmers in the study area; estimate the costs and returns associated with honey production in the study area; examine the factors that influence the output of honey using improved method in the study area; and identify the problems associated with beekeeping in the study area.

MATERIALS AND METHODS

The study was carried out in Umuahia Agricultural Zone of Abia State from February to December, 2011. This is because the zone occupies a major position in the agricultural sub-sector economy of the State. The zone is made up of five Local Government Areas. These include; Umuahia North, Umuahia South, Ikwuano, Isiala Ngwa North and Isiala Ngwa South Local Government Areas; all of which fall within the Abia Central Senatorial District. The zone has a land area of 2032.570 square kilometres and with a population of 563,380, out of which 271,194 or 48% are females; while 292,186 or 52% are males (FRN, 2006). It has a relatively high population density of 277.176 persons per square kilometre. Its minimum and maximum temperatures are $20^{o}C$ and $32^{o}C$ respectively; while its annual rainfall lies between 1700mm – 2000mm.

The zone has a generally undulating terrain with a tropical rain forest vegetation. It is noted for her vast agricultural activities and crafts. Being agrarian in nature; cash crops grown are oil palm , Rafia palm, Cocoa, Citrus (oranges), Kolanuts, Banana/Plantain and Pineapple; while the food crops grown include; Cassava, Yam, Maize, Rice, Okro, Cocoyam, Cucumber and Sweet potatoes; but on a small-scale basis.

In the study, a simple random sampling technique was adopted. A list of Registered Beekeepers was collected from Abia State ADP office from where the sample frame for the zone was extracted. Of the eighty (80) Beekeepers from the zone, sixty were randomly selected.

In the first instance, three (3) villages were purposively selected from each local government area in the zone because of their adoption of apiary technology and proximity too. Thereafter, four (4) beekeepers were randomly chosen from the fifteen (15) villages (already chosen above) thereby giving a total sample size of sixty (60) respondents that were reached and administered with structured questionnaire. Data collected were on volume of honey produced, Age of the farmers, Beekeeping experience, Educational level, gender, Household size, Number of hives, fixed and variable assets, Labour requirements, Baiting materials and Access to credit. Input – output prices were also taken based on the prevailing market prices in the study area from March – December, 2011 production year.

Analytical techniques:

Data collected were analyzed using descriptive statistics, Gross margin analysis and Profitability Ratio Analysis. In addition, multiple regression analysis involving the use of Ordinary Least Squares (OLS) estimation techniques was used to determine the factors affecting the output of honey in the study area.

Model specification:
Gross margin analysis:

Gross margin as defined by Olukosi and Ogungbile (1989) is a detailed physical and financial plan for the operation of a farm enterprise for a certain period. In computing the costs and returns,

the Gross margin method was adopted and specified thus:

$$\pi = TVP - TVC - TFC$$

$$\pi = \sum_{j=1}^{m} P_j Q_j - \sum_{i=1}^{n} P_i X_i - \sum_{K=1}^{r} PKCK$$

Where:

π = Net Farm Profit; TVP = Total Value of Production;

TVC = Total Variable Cost; TFC = Total Fixed Cost;

Q_j = Quantity of $_j$th Output; P_j = Unit Price of $_j$th Output;

X_i = Quantity of $_i$th Variable input; ($_i$ = 1,2,3,….n)

P_i = Unit price of $_i$th Variable input;

m = Number of Enterprises; r = Number of fixed inputs;

n = Number of inputs used in production;

PK = Unit Price of Kth fixed inputs; (K = 1,2,3,…n)

CK = Quantity of Kth fixed input; $\sum$ = Summation

Profitability ratio model:

The profitability ratio analysis was used to determine the economic performance of the honey production enterprise.

Where:

$\dfrac{N1}{TR}$ = Profitability index or Return on sales

$\dfrac{N1}{TC} \times \dfrac{100}{1}$ = Rate of Return on Investment (%)

$\dfrac{TR - TFC}{TVC} \times \dfrac{100}{1}$ = Rate of Return on Variable cost (%)

$\dfrac{TR - TVC}{TFC} \times \dfrac{100}{1}$ = Rate of Return on Fixed cost (%)

$\dfrac{TVC}{TR}$ = Operating Ratio

Multiple regression model:

This was used to express the technical relationship between inputs and output of the production cycle. Linear, Semi-log, Exponential and Double-log functional forms were employed, fitted and tried; and on the basis of economic theory, statistical and econometric criteria; Double-log function form was chosen as the lead equation. The explicit form of the model is presented below:

$lnY = lnb_O + b_1 lnX_1 + b_2 lnX_2 + b_3 lnX_3 + b_4 lnX_4 + b_5 lnX_5 + b_6 lnX_6 +$
$b_7 lnX_7 + b_8 lnX_8 + b_9 lnX_9 + b_{10} lnX_{10} + …. bnlnX_n + e_t$

Where:

Y = Output of honey (litres)

X_1 = Age of the farmer (years)

X_2 = Household size (No of people that live and eat together)

X_3 = Beekeeping experience (years)

X_4 = Educational level (years)

X_5 = Gender (dummy variable; male = 1, female = 0)

X_6 = Number of hives

X_7 = Fixed & variable assets (₦)

X_8 = Labour (man-days)

X_9 = Baiting materials(Kg)

X_{10} = Availability of credit (Available = 1, unavailable = 0)

b_o = Constant term

$b_1 – b_{12}$ = Coefficients to be estimated

e_t = Error term

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents:

Analysis of the socio-economic variables of respondents (Table 1) indicated that majority (93.3%) of them are within the age-range of 20 – 50 years. This means that they are still in their active productive ages, which signifies increase in the output of honey. The study also revealed that 75 percent of married couples were involved in beekeeping business n the area. This emphasizes the importance of honey as a source of food and income to the beekeepers. However, for the 25 percent of those that were not married, yet they practice beekeeping, it is certain that they want to remain in it, since it is a lucrative business. Similarly, 70 percent of the sampled farmers were males, while 30 percent were females. This shows that bee beekeeping is done by both males and females in the study area, even though males dominated in this case. It is to be noted that women farmers contribute immensely towards agricultural development, while ensuring food security for the home.

The result further showed that all beekeepers in the study area are literate. This therefore shows the importance of formal education. Acquisition of formal education enhances the ability to read and interpret improved technological packages developed by the research institutes so as to know how to apply them. This is in line with the finding of Abubakar (2000) who opined that the ability and readiness with which a particular producer accepts or rejects an innovation depends on ones educational background. The beekeepers in the area have a household size of between 4 – 20 members with a mean size of 12. This is so because the beekeepers rely so much on household labour for beekeeping activities. However, it is to be noted that under subsistence agriculture, much reliance is often placed on the strength of household to supply the

much need farm labour in the absence of mechanical equipment. Thus, the larger the household size, the higher the supply of household labour.

Of the four functional forms that were fitted and tried with the production function models, the double-logarithmic functional form gave the best fit as it satisfied the economic, statistical and econometric criteria and therefore chosen as the lead equation which was then used for discussion as presented in table 2.

The results showed that 73.2 percent (R^2) of the variation in Output of honey is jointly explained by those explanatory variables which had direct relationship with it. However, age of the farmers (x_1), household size (x_2), beekeeping experience (x_3), educational level (x_4) and gender (x_5) had an indirect relationship with Output of honey.

This means that those with positive signs would lead to increase in the output of honey, while those with negative signs would not. The age of the farmers (x_1), has negative relationship with output, but its effect was significant at 10% level of profitability. This implies that productivity declines with advancement in age; however, it was significant because majority (93.3%) of the respondents were within the highly productive age-range of 20 – 50 years. The negative coefficient of age also indicates that the younger people who are agile and stronger are more productive than the older ones. Nwaru (2004) found out that the ability of a farmer to bear risk and be innovative decreases with age. The Coefficient for household size (x_2) was negative implying an inverse relationship with the yield of honey, but its effect was highly significant at 1% level of probability. In practical terms, it means that honey production decreases with increasing age and household size. However, it is to be noted that the household size negative impact on the yield of honey was as a result of pressure imposed on the finances of the beekeeper by the bloated household responsibilities. This therefore reduce the capital meant for the expansion of the honey production enterprise.

The Coefficient for the number of hives (x_6) was positive and have direct relationship with the output of honey. It was highly significant at 1% level of probability. This holds true on the premise that the greater the number of hives, the higher the output which was confirmed by the findings of Sekumade *et al*, (2004) who had a similar result in a related study. The Coefficients for Labour (x8) and Baiting materials (x_{10}) had positive signs and were highly significant at 1% level of probability. The use of household labour is a cash saving measure and would add to both output and profitability of the enterprise. Similarly, large quantity of baiting materials will boost the attraction of more bees which will invariably enhance the output of honey.

Olarinde *et al* (2008) also obtained a similar result with baiting materials in their study on the determinants of technical efficiency in beekeeping farms in Oyo State, Nigeria. The Coefficient for Availability of Credit (x_{10}) had a positive sign and as such has a direct relationship with the yield of honey, but was highly significant at 1% level of probability. From the result, it could be deduced that output increased by 1% with 0.081% increase in access to credit.

This interpretation is plausible given the fact that the lead equation is a double-log and as such the coefficients can be interpreted as elasticities.

Costs and Returns Analysis

The result of the costs and returns analysis (Table 3) showed that honey production enterprise is a lucrative business; as an average of 255 litres of honey was produced per farmer per season, or a gross farm income of ₦255,000.00; with a total cost amounting to ₦103,560.00; thereby giving a net farm income of ₦151,440.00 and a benefit-cost-ratio of 2.46. This implies that for every naira invested in honey production in the study area, there is a profit of ₦1.46. Farmers should therefore be encouraged to expand production by increasing the number of hives they have so as to improve on their income and standard of living.

Profitability ratio analysis

The profitability ratios on honey production were calculated to establish the profitability level of the enterprise. Table 4 reveals that the profitability index was 0.59 indicating that out of every ₦1 earned, about ₦0.59 returned to the beekeeper as a net income. Also a beekeeper earns ₦1.46 profit on every ₦1 spent on honey production. The Rate of return on variable **cost was estimated as 478.98% that is on production basis, every ₦1 cost incurred on inputs generates about ₦4.79; which can be deduced that improving profitability in honey production in the** study area will require that more efforts be put into increasing the efficiency of use of variable inputs. Operating ratio that is less than one indicates a good, efficient and profitable business; therefore, an operating ratio of 0.16 as in this honey production enterprise portends larger gross income over total variable cost which is good for the enterprise.

CONCLUSION

The result showed that most (93.3%) of the beekeepers in the area fall within the highly productive age-range of 20 – 50 years. Half of the estimated coefficients had direct relationship with the output of honey, while the other half had inverse relationship with output of honey. Labour constituted 56.3% of total variable cost and this means that it is the most expensive resource in

honey production. Nevertheless, beekeeping and honey production in particular, is a very rewarding and profitable enterprise if well managed. The identified constraints include; high cost of production inputs (especially labour), paucity of hives, inadequate capital, theft of hives and honey, Environmental problems, Predators and bush fire.

Recommendations and Policy implications

To overcome the production constraints identified, it is recommended that:

1. The Government should assist interested honey bee producers with soft loans and provide the necessary inputs at subsidized rates.
2. In the case of predators like wax moth, wall gecko, lizards and termites; salt solution or spent engine oil should be spread or applied around the hives.
3. In the case of environmental problems like the weather being too hot, the hives should be relocated or provided with shades; while if the weather is too cold, the trees around the hives should be cut or the hives relocated.
4. Bush fire particularly during the dry season should be averted by clearing the surrounding bushes before the onset of harmattan.
5. Theft of beehives and honey should be checked by placing security guards around the hives sites.

The first implication of the study is that since land is not a limiting factor in the area, rural dwellers should be encouraged in beekeeping through the provision of incentives so as to be able to produce more to reduce poverty and foster rural development. In addition, it would be a source of revenue not only to the beekeeper, but also to the country at large by boosting the nation's foreign exchange earnings and level of employment.

REFERENCES

Abubakar, H (2000). "Economic analysis of Egg Production in Birnin Gwari, Jama'a and Igbai Local Government Areas of Kaduna State" Unpublished M.Sc. Dissertation, (2004) Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria, Nigeria.

Anyaegbunam, H.N; C.O. Emereole and G.O. Chukwu (2006) *Economics of Bee Honey Production in Abia State, Nigeria. Journal of Sustainable Tropical Agricultural Research* (JOSTAR), University of Uyo. Vol. 20; pp. 27 – 30.

Ayeni, S.A. (2003). "Modern Beekeeping in the Tropics. Paper delivered at the training the trainers sensitisation workshop on beekeeping; 11th – 14th March, 2003 at the Federal College of Forestry Mechanisation, Afaka, Kaduna, pp. 4-6

Canadian Statistics (2003) "*Honey Production*, 2003. Canadian bee journal, Vol. 35, No. 4, pp 67-72

Eluagu, L.S. and L.N. Nwali (1999). *An Economic Appraisal of an improved method of Beekeeping in Nigeria. A case study of Apiculture Unit, Federal College of Agriculture, Umudike. The Nigerian Agricultural Journal*; Vol. 6, No. 2; pp. 90 – 105.

ICTA (2004). The Prospects of Beekeeping in the modern world. Paper delivered at Training the trainers state organized workshop for officials of L.G.As, held between 11th – 14th March, 2003, at the Federal College of Forestry Mechanization, Afaka, Kaduna, P4. International Centre for Tropical Apiculture, 2004.

FRN (2006). Federal Republic of Nigeria: National Population Commission; National Census, 2006.

Nwaru, J.C. (2004). "Rural Credit Markets and Arable Crop Production in Imo State of Nigeria. Unpublished PhD Dissertation (2004); Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike, Nigeria.

Olagunju, F.I. and J.O. Ajetomobi (2003).*Profitability of honey production under improved method of beekeeping in Oyo State*, Nigeria. *International Journal of Economics and Development*. Vol. 3, No. 1; pp. 148 – 151.

Olarinde, L.O; Ajao, O.A. and Okunola, S.O. (2008). *Determinants of technical efficiency in beekeeping farms in Oyo State, Nigeria. A stochastic production frontier function. Research Journal of Agricultural and Biological Sciences*; Vol. 4, No. 1; PP. 65 – 69.

Olukosi, J.O. and Ogungbile, A.O. (1989). Introduction to Agricultural Production Economics: Principles and Applications; AG/TAB Publishers Ltd, Samaru, Zaria, Nigeria p 97.

Onyekuru, N.A. (2004). "Economic Analysis of Honey Production in Nsukka, L.G.A. of Enugu State. Unpublished B.Sc. degree thesis (2004). Department of Agricultural Economics, University of Nigeria, Nsukka.

Sekuniade, A.B; S.O. Akinleye and G.O. Olayode (2004). "Economic Analysis of Honey Production in Osun State, Nigeria. Unpublished B.Sc. thesis (2004) Department of Agricultural Economics, Ado-Ekiti State University, Ado-Ekiti.

Table 1: **Socio-economic characteristics of Respondents**

Variables	Frequency	Percentage
Age in years		
0 – 20	3	5.0
20 – 30	19	13.7
30 – 40	29	48.3
40 – 50	8	13.3
50 – 60	1	1.7
Total	60	100.00
Household Size		
1 – 4	3	5.0
5 – 8	19	31.7
9 – 12	29	48.3
13 – 16	6	10.0
17 – 20	3	5.0
Total	60	100.00
Beekeeping Experience		
1 – 5	10	16.7
6 – 10	12	20.0
11 – 15	7	11.7
16 – 20	16	26.6
21 – 25	15	25.0
Total	60	100.00
Educational Status		
No formal education	0	0
Primary education	1	1.7
Secondary education	10	16.7
National Diploma/NCE	19	31.6
Higher National Diploma/B.Sc	30	50.0
Total	60	100.00
Marital Status		
Married	45	75
Single	6	10
Widow	6	10
Divorced	3	5
Total	60	100.00
Gender		
Male	42	70.0
Female	18	30.0
Total	60	100.00

Source: Field Survey data, 2011

Table 2: Result of multiple regression estimates of bee honey Production in Umuahia Agricultural Zone of Abia State

Variables	Coefficients	Standard Errors	T-Values
Constant	2.740	0.771	3.558***
X_1 – Age	-0.675	0.352	-1.918*
X_2 – Household size	-0.730	0.212	-3.443***
X_3 – Farming experience	-0.089	0.085	-1.051NS
X_4 – Educational level	-0.115	0.281	-0.410NS
X_5 – Gender	-0.797	0.147	-5.422***
X_6 – No of hives	0.529	0.159	3.335***
X_7 –Fixed & Variable assets	0.126	0.172	0.732NS
X_8 – Labour	0.496	0.146	3.397***
X_9 – Baiting materials	0.662	0.223	2.969***
X_{10} – Availability of credit	0.081	0.014	5.786***
R^2		0.732	
F-ratio		11.959***	

Source: Field Survey data, 2011
Note: *** implies significant at 1% level; ** implies at 5% level and * implies significant at 10% level. NS implies not significant at all.

Table 3: Average costs and Returns of Beekeeping in Umuahia Agricultural Zone of Abia State

Item	Unit	Quantity	Price/Unit	Value (₦)
Output/Gross Income	Litre	255	1,000	255,000
Variable Costs				
A) Operating inputs:				
Baiting materials	Kg	6	300	1,800
Packaging can	Litre	100	50	5,000
Rubber Sac.	Vol.	20	200	4,000
Total Operating inputs				**10,800.00**
B) Hired labour inputs (M/days)				
Harvesting	MD	15	750	11,250.00
Processing	MD	15	750	11,250.00
Total Labour Cost				**22,500.00**
Opportunity cost of variable capital at 20%				**6,600.00**
Total Variable Cost				**39,960.00**
Gross margin (GM) = (GFI – TVC)				**215,040.00**
Fixed Costs:				
Depreciation of fixed assets; (excluding land)				2,000.00
Land rent				3,000.00
Salary of a Permanent Staff				48,000.00
Opportunity Cost of Fixed Capital at 20%				10,600.00
Total Fixed Costs (TFC)				**63,600.00**
Total Costs (TC) = (TVC + TFC)				**103,560.00**
Net Farm Income (NFI) = (GM – TFC)				**151,440.00**
Benefit – Cost – Ratio (BCR) = $\frac{GFI}{TC}$				**2.46**
Return on investment/₦ = $\frac{NFI}{TC}$				**1.46**

Source: Computed from field survey data, 2011

Table 4: Profitability ratio analysis of bee honey Production Enterprise in Umuahia Agricultural Zone of Abia State

1. **Profitability Index** $\quad = \quad \dfrac{NFI}{GFI} = \dfrac{151,440}{255,000} = \quad 0.594$

2. **Rate of Returns on investment (%)** $\quad = \dfrac{NFI}{TC} \times \dfrac{100}{1} = \dfrac{151,440}{103,560} \times \dfrac{100}{1} = 146.29\%$

3. **Rate of Returns on Variables cost (%)** $= \dfrac{GFI - TFC}{TVC} \times \dfrac{100}{1} = \dfrac{255,000-63,600}{39,960} \times \dfrac{100}{1} = 478.97\%$

4. **Rate of Returns on Fixed Cost (%)** $= \dfrac{GFI - TVC}{TFC} \times \dfrac{100}{1} = \dfrac{255,000-39,960}{63,600} \times \dfrac{100}{1} = 338.11\%$

5. **Operating Ratio** $= \dfrac{TVC}{GFI} = \dfrac{39,960}{255,000} = 0.1567$

Source: computed from field survey data, 2011