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ASSESSMENT OF CONTRIBUTION OF APICULTURAL PRACTICES TO HOUSEHOLD INCOME AND POVERTY ALLEVIATION IN KWARA STATE, NIGERIA

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ABSTRACT
Agriculture and biotechnology including beekeeping offers an unexploited succor capable of salvaging the people from abject hunger and poverty. Honey bee and its products are frequently used in diverse ways and contribute to agricultural development through crop pollination and income to farmers. The study examined contribution of apiculture practices to household income and poverty alleviation in Patigi and Irepodun areas of kwara State, Nigeria. A random sampling technique was used to select 120 bee farmers for the study. Primary data were obtained with the aid of structured questionnaire and interview schedule. Descriptive statistics, gross margin and OLS model were employed in data analysis. The results revealed that bee farmers were at productive age with mean age of 45 years. The literacy rate was very low while the bulk of the bee farmers had subsidiary occupations to supplement their income. Average net return per litre of honey produced ranges from ₦1200 to ₦1500 while average income per season per colony ranges from ₦7500 to ₦10000.The postulate explanatory variables explained 72.5% in the variation of volume of bee produced. However, all the explanatory variables included in the factors affecting bee farmer income explained 81.4% in the variations in income earned by bee farmer. Given the opportunity and amazing potentials for widening export base for apiculture in Kwara State, it was recommended that the government at all levels should provide social services and ensure that bee farmers are educated to ensure proper understanding of indices of bee production with attendance boost in honey.

KEYWORDS: Apiculture, Poverty alleviation, Net margin, household income, Nigeria.

INTRODUCTION

The current global economic meltdown has had its devastating turn on Nigeria as a nation, biting hard on organizations, businesses, families and homes. The frantic search for alternative resource of national revenue aside oil has become imperative for economic emancipation of the lots of Nigerians. Agriculture and biotechnology including beekeeping offers an unexploited succor capable of salvaging the people from abject hunger and poverty. Creating renewed awareness and practice of beekeeping in the rural setting would go a long way in eradicating global economic challenges. Ayansola, (2012) observed that beekeeping will help to reduce the endemic poverty problem in Nigeria, especially in the rural communities. In order word, beekeeping which is an aspect of agriculture, scientifically called apiculture is a self-reliance enterprise that will help reduce the hardship, unemployment and other social vices associated with it. Beekeeping for honey production is a profitable agricultural enterprise nowadays in all parts of the world including Nigeria. It is an important foreign exchange earner for those that export honey and beeswax. However, beekeeping as a commercial venture is still largely unexplored in Nigeria in large scale production, and the country meets domestic demand for honey mostly by importation from producer countries, and locally by bee hunters (Ja'Afarfuro 2007; Ayansola 2012). Honey, the major apiculture product is produced in nearly all countries of the world. Total world production in 2003 was estimated at 1.2 million MT. However, only about 400 000 MT of the honey is traded in the export market annually, implying a dominance of domestic markets within the producing countries (Gu G et al., 2002; UEPB, 2005).

Bee farming in Nigeria is an important seasonal activity that predominantly remained rudimentary and unexploited, but it has tremendous potential for widening Nigeria export base. There is a growing consumption of honey and other bee products because of its high values in maintaining good health and in treatment of various diseases. With the current growth in domestic consumption of honey in Nigeria coupled with mechanized agriculture in most part of Nigeria, resulting in large crop acreage, the future of apicultural enterprise is very bright as the demand for honey and pollinators is bound to increase?. It could provide food, nutritional, and livelihood security to the rural work force on an ecologically sustainable basis. Apiculture is the art of rearing, breeding and managing honeybee colonies in artificial hives for economic gains (Ikediobi *et al*., 1985; Morse, 1989). 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. Bee-keeping or bee farming is an art, and a science of managing bees in an artificial hive so as to obtain the products of the venture to solve both man's social and economic problems. It could be learnt, practiced as a hobby, a part time or full-time occupation. At times depending on how it is practiced, it could be seen as an art, a science, a technology or a vocation (Adegoke, (2002). In the words of Onwbuya, (2004), bee farming can help alleviate poverty in rural areas as beekeeping can be taken as a hobby, a social booster and can be practiced by those who are not conventional farmers. Honey is a natural food produced by bees from nectar or secretion of flowers. Honey has a content of 80-85 % carbohydrates, 15-17 % water, 0.3 % proteins, 0.2 % ashes, and minor quantities of amino-acids and vitamins as well as other components in low levels of concentration. These properties including using honey for various medications made it an essential and high economic commodity (Ajao, 2012). Bee farming is relatively cheap to manage, as the major production is undertaken by the bees, while man does the harvesting. It is the only agricultural practice that does not need large expanse of land, water, feed and fertilizer to thrive. According to the International Honey Commission and Food and Agriculture Organization of the United Nations, honey contains many minerals in very small quantities, potassium being the most abundant. Dark honeys, particularly honeydew, are the richest in minerals. Other minerals found in honeydew include calcium, zinc, magnesium, copper, manganese, iron, phosphorus, selenium, chromium, and sodium. Honeydew honey contains larger amounts of oligosaccharides (about 5%) than nectar honey (Iniah *et al*., 2006).

Beekeeping offers opportunities for empowering and developing the rural populace by making them self-reliant and depend less on the government. They can be economically empowered through the various benefits derivable from beekeeping (Oluwole, 1999). The importance of beekeeping to the society is enormous. Ojo (2004) describe the enterprise as a means of empowering youth economically because of its many advantages over other types of agricultural enterprises. In beekeeping, the quality of land required is less important because hives are placed either on the trees or on the ground. According to Oluwole (1999), modern bee keeping that entails housing the bees is not difficult to embark upon because investment is low, it does not require large area of land and water and there is no need for daily care. Beekeeping is an agricultural and forest based decentralized industry and does not displace persons from their villages. It is a sustainable form of agriculture that can provide rural people with a source of much needed income and nutrition therefore they have economic reasons to retain the natural habitat or modify it to boost honey product because it has potentials to increase yield such as other agricultural products (Babatunde *et al*., 2007). In general, the focus of rural development strategies has been on agriculture as the solution to rural poverty and on the role of government in delivering services to enhance livelihood (FAO, 2002, 2010). Despite the growing importance of farm and off-farm activities, there is dearth in information about the role they play in the income generation strategies of farm households in developing economies like Nigeria (Korie *et al*., 2011). For most beekeepers in developing countries, beekeeping is a supplementary activity and therefore often only plays a secondary role in development policies by countries and donor agencies (Aburime *et al*., 2006). This leaves its true contribution to the rural economy undervalued and not considered meritoriously. The activity is under-utilized and village beekeepers more often than not receive little or no attention in public policies. Higher visibility and attention to beekeeping as a development tool will bring not only benefits to beekeepers but also to rural populations as a whole, and will contribute directly and indirectly to sustainability and food security. Tradition of beekeeping in Africa dates back almost 5000 years when beehives were first used for producing honey in ancient Egypt. During the course of time it has spread from Egypt to the Middle East, throughout the Mediterranean and south into tropical Africa (Akachukwu, (1993). In tropical Africa, beekeeping practices vary only slightly across the continent, based on good knowledge of botany and ecology, that makes beekeeping possible under very complex circumstances. In the region as a whole, local honeybee races exploit scattered resources by moving from area to area (Inah, *et al*., 2006), This means that some hives remain empty for parts of the year especially under adverse weather conditions. African races of honeybees also have a high rate of swarm production. A beehive is any container provided for honey bees to nest in. The idea is to encourage the bees to build their nest in such a way that it is easy for the beekeeper to manage and exploit them. Emin pasha gives an early description of the use of bark hives when coming across them among the Dinka of east Sudan in 1888 (Adejare, 1991).

Traditional hives as shown in figure 2 and 3 are made from whatever materials available locally: e.g. logs, bark, clay, grass, or cane. Traditional beekeeping includes clay pots, cylindrical log hives, and bark hives, grasses woven into mats and rolled up, leaves of the doum palm "tangels". In Sudan a beehive was designed for usage by natives of the Southern parts of the country, by developing the so called Khartoum and Omdurman hives. Modern low-technology hives like Kenya tops bar hives, Omdurman clay hives, Gufa basket hives and modern hives are used in Sudan (Chukwuemeka, 1999). While in Uganda beehives are traditionally constructed from timber, bamboo boruss palms or woven from forest climbers. Moreover, in Zambia beehives are made by stripping bark off a living tree. The cylindrical hives are about 120 cm long and about 30 cm in diameter. The joint along the length of the hive is secured with seasoned hardwood pegs. The ends are then closed either by circular plaited grass doors made of fine thatching grass, or by another piece of bark. The hives are then left to dry for two months before being hung in trees (Ayodele and Onyekuru, (1999)).

The Honey hunting and traditional beekeeping using clay pots, cylindrical log hives, bark hives, grasses woven and log hives have long been part of the subsistence economy of people inhabiting the Patigi and Ajasse woodlands of North-central Nigeria. Honey-hunting from feral colonies

of bees is done by many people on an opportunistic basis. Beekeeping, on the other hand, is often described as a `specialist enterprise', or a `way-of-life', originally practiced by a minority of people, with the skills passed on from generation to generation within families. Beekeeping utilizes the woodland ecosystem in two main ways: first, through the partial domestication of wild bees by providing them with suitable places in which to establish their colonies and second, hives are made out of bark or wood and other equipment (such as woven grasses, clay pots gourds and calabashes) are also from locally available resources. The bark hive is particularly ideal, since it is light and durable and its construction involves little investment apart from time (Farinde, *et al*., 2005; Jean-Marie Jullienne, 2004).

Management of the hives and colonies is adapted to the seasonal nature of the woodlands and the semi-migratory habit of the bees. The traditional beekeeper works within a framework set by the subsistence needs of the household, the chance to earn supplementary income, and the opportunity of supplying important commodities to the community to the enhancement of social relationships. It has high status and a successful beekeeper can accumulate wealth and establish contacts with the outside world through trading and bartering. Beekeeping and the processing and marketing of its products are almost entirely carried out by men. Although, there is evidence to suggest that women are becoming involved in beekeeping in densely populated agricultural land where the colonies become more stable; and, in parts of Zambia at least, women from female-headed households are increasingly taking to honey-hunting in order to supplement their incomes (Goldenberg, 2004)).

Few literatures have analyzed the practice of beekeeping in underprivileged areas of the globe that have favorable natural resources, especially Africa. These studies demonstrated the economic and social benefits of beekeeping as it is considered to be a means of obliterating poverty and of raising the standard of living (Gug *et al*., 2002; Mickels, 2006; Ogaba, 2007; Lalaka *et al*., 2009). Other studies undertaken had to do with the analysis of the production of beekeeping and honey (Gate, 2001; Babatunde *et al*., 2007; Ebojei *et al*., 2008; Abere *et al.*, 2011 and Chala *et al*., 2013). In spite of the findings of these studies, a number of problems are yet to be addressed, for example, basic information on costs and returns, and overall productivity of resources in small scale beekeeping or honey production enterprises particularly in Kwara State. This stems from the fact that the ability to produce maximum output from a given set of inputs, given the available bee-keeping technology has not been fully understood by bee farmers in Kwara State. In addition, beekeeping is advocated to improve human welfare by alleviating poverty through increases household income, biodiversity conservation, food and nutritional security, raw material for industries and enhance environmental resilience. Despite the significance of beekeeping and abundant resources for honey production in the study area, there is paucity of information on the level of contribution of beekeeping to household income and poverty alleviation in Kwara State.

Bradbear, (1990; 2009) among others identified the following as benefits of beekeeping venture.

Production of honey, bee wax, propolis and bee venom which are useful and valuable commodities. The products are cash-crops that are readily marketable and have long shelf-life.

1. The pollination service rendered by the honeybee from beekeeping results in increased crops production and abundant harvest.
2. Beekeeping does not require expensive equipment, as simple hives and others can be made from local materials by local artesian. This stimulates business for local trades.
3. No serious food is required by bees other than pollen and nectar in flowers which are available all year round
4. Basic beekeeping techniques are easy to learn by both sexes and all age groups
5. Bees do not require daily attention
6. Beekeeping do not take up valuable land or space as hives are placed on trees, waste land or on flat roof tops.

From the foregoing, it is evident that honey and it's by products are crucial to the economy development and health of the nation. It becomes imperative to assess socio-economic characteristics, profitability and resource use efficiency of honey production in Kwara State by bee farming for designing policies to meet the needs and well being of farmers. It is hoped that the result that comes out from this study will help the bee farmers and the policy makers in improving upon the yield of honey production and equally be a guide to other researchers that might be interested in similar studies

The study was conducted to achieve the following objectives:

1. To assess the beekeeping structure in the study area;
2. Examine the socio economic characteristics of bee farmers;
3. Determine the profitability of beekeeping activity in the study area
4. Determine the contribution of beekeeping to household income of the bee farmers

Estimate factors that influence net beekeeping income of the bee farmers in the study area.

MATERIALS & METHODS

The Study Area

The study was conducted in Patigi and Ajasse area of kwara State, Nigeria. The State is located between latitudes 7^0 45'N and 9^0 30'N and longitude 2^0 30'E and 6^0 25'E and a total land area of 3,682,500 hectares and 247,975 farm families with majority living in rural areas. The State has a population of about 2,365,353 people in 2006 according to the National Population Census (NPC, 2006). It has a population of about 2,365,353 people in 2006 according to the National Population Census This is projected in 2013 to be 2,948,858 representing 3.2% annual growth rate in population and an average density of ninety one persons per km^2 (NPC, 2006; Oladimeji and Abdulsalam,(2013). It is bounded in the North by Niger State, to the South by Oyo, Osun and Ekiti States, to the East by Kogi State and to the west by Benin Republic. It

comprises of 16 Administrative Local Government Areas, divided into four agricultural zones by the Kwara State Agricultural Development Project (KWADP) in consonance with ecological characteristics, cultural practices and project administrative. The zones are: zone A; Baruten and Kaima LGAs; Zone B; Edu and Patigi LGAs; Zone C; Asa, Ilorin East, Ilorin South, Ilorin West and Moro LGAs and Zone D; Ekiti, Ifelodun, Irepodun, Offa, Oyun, Isin and Oke Ero LGAs. The climate of the study area is derived/ guinea savannah with two main distinct seasons: the wet and dry season. The annual rainfall ranges from 800mm to 1500mm per annum. The vegetation in the State consists largely of with a great expanse of arable land and rich fertile soil with crops like rice, maize, yam, sweet potatoes, cassava and vegetable grown. Kwara State is essentially agrarian with about 80 percent of the population living in the rural areas and more that 90 percent of the rural population engages in farming (KWADP, 2008). The vegetation is of guinea savannah and characterized by tall grasses intermixed with scattered trees. Economic trees found in the area includes *Citrus sinensi,, Parkia biglobosa Butyrospermum parkii, Azadiracta indica Mangifera indica, Acacia species Delonix regia,* and *Anacardium occidentale.* These species of trees provide forage for the bees. The study area is drained by streams taking their sources from River Niger with ferry facility that takes people across its bank here to adjacent bank with villages at Niger state. The people are predominantly farmers growing rice *(Oriza sativa),* guinea corn*,* maize *(Zea mais);* groundnut *(Arachis hypogea) and* cassava*(Manihot esculenta)*. Due to its proximity to River Niger majority of the indigenes (Nupe) are fishermen and takes part in annual fish caching exhibition termed *'Rigata'.*

The wide climatic and edaphic variability in guinea savannah area have endowed Kwara State with diverse and unique flowering plant that is highly suitable for sustaining a large number of bee colonies and the long established practice of beekeeping. Though, Kwara State has potentials for honey production due to excellent flora and fauna diversity, particularly diverse and unique flowering plants suitable for beekeeping. The bees and the plants like all renewable natural resources are seriously underutilized and constantly under threat from lack of knowledge and appreciation of these endowments.

FIGURE 1: Map of Kwara State Showing the 16 LGAs including the Study Area; Source: (KWADP, 2008)

Data Collection and Sampling Techniques

Primary data were used for this study. Farm level survey provided the basic cross-sectional data from 120 bee farming households in the study area. Data were collected from bee farmers with the aid of structured questionnaire and interview schedule. These include information on number of beehive owned, as well as their socio economic characteristics. A systematic random sampling technique was used to select the representative bee farming households that were used for this study. The first stage was random selection of 4 villages/districts out of the list of bee farming villages/settlements in the Patigi and Ajasse-ipo Areas of the State. The second stage sampling was the random selection of 30 bee farming households per settlement to make a total of 120 bee farming household for this study. The designed questionnaire sought for beekeeping techniques and honey harvesting procedure among others. Data obtained were analyzed using frequency counts, percentages, net margin analysis and regression model.

Analytical Technique

The designed questionnaire sought for beekeeping techniques and honey harvesting procedure among others. Data obtained were analyzed using frequency counts, percentages, net margin and multiple regression analysis.Profitability of any investment is based on comparison of the returns and costs of the investment. Hence, costs and returns analysis is the basis for measurement of profitability of any enterprise. Profitability stimulates farmers to venture into risky business and also drives them to develop ways of cutting cost and adopting new technologies always in an effort to satisfy consumer interest. Profit maximization is the most important goal of farm business.Profit is generally described as the difference between Total Revenue ***(TR)*** and the Total Costs ***(TC)***. The total revenue is the product of output sold and price. Total cost is divided into fixed and variable costs. Gross margin analysis forms an alternative basis for farm profitability analysis. It involves accurate collection of different costs of variable inputs and the gross income obtained from a

particular enterprise in order to obtain the net returns (Bernard, 2003). Farm budgeting technique is one of the simplest and oldest tools of analysis in farm management and production economics studies. According to Olukosi and Ogungbile (2004), net farm income gives an overall level of profitability of an enterprise. It involves the determination of total revenue and total costs. The difference between the two constitutes the net farm income. The Average Net Return per Litre and Net Return per bee farmers were estimated using equations (1) and (2 below:

Gross Margin per Litre was expressed as:

$GM=TR_{ij}-TVC_i$ ……..... (1)

The net farm income per Litre analysis was expressed as:

$NFI = TR_{ij} - TVC_{ij} - TFC_{ij}$ ..... (2)

Where:

GM= Gross margin (₦);

NFI = Net bee farmer income (₦);

TR_{ij} = Total sales revenue accruing to the ith bee farmer in the jth settlement (₦);

TVC_{ij} = Total variable cost incurred by the ith bee farmer in the jth settlement (₦);

TFC = Total fixed cost incurred by the ith bee farmer in the jth settlement (₦);

TCij = Total cost incurred by the ith bee farmer in the jth settlement (₦);

Costs involved in artisanal fisheries operations are made up of total cost. Total cost consists of total variable cost (TVC) and total fixed cost (TFC). Total variable costs in bee farming depend essentially on the number and type of hives and seasonal variation of the available feeds for the bee. For a fishing unit, fishing effort is the number of fishing trips done and fishing power used to harvest fish during a given period of time FAO, 2004; Njifonjou, 1998). Unlike fixed costs, operating costs depend on the volume of production, and they included of hired labour, imputed cost of family labour, fuel and lubricants expenses, food, ice, servicing and maintenance charges while Total fixed cost was made up of the depreciation costs or loss in value on fixed items as a result of their use in one production year. Items of fixed costs identified in the study included canoes, outboard engines, fishing gears , includes cast net, seine net, gill net and traps; tax levies and interest charge on borrowed capital. Depreciation values were estimated using straight line method under the assumption that canoes and engines are used for a period of 5 years before being scrapped without salvage values. Other fixed items such as boot and nets are depreciated base on estimated life span suggested by fishermen. Labour was standardized with adult male member of household having one labour day for working 6 hours while an adult female working for the same period was apportioned 0.75 labour day and grown up child, about 15 years was also assumed to have contributed 0.5 labour day for all kind of fish operations (Oladimeji, 1999).The average revenue (AR) consists of cash receipts from fish caught including the amount give away and consumed by the fishermen's household. The unit of measurement was majorly a standardized basket which, on average, weighs 5kg and 10kg.

Model specification and estimation

Estimation of the factors influencing net income of bee farmer involved the use of ordinary least square regression techniques and specified by equations:

$LogNEY_{ij}=\beta_0+\beta_1 LogFEX_{1ij}+\beta_2 LogNHV_{2ij}+\beta_3 LogCHL_{3ij}+\beta 4LogFHA_{4ij}+\beta_5 LogCFL_{5ij}+\beta_6 LogDEP_{6ij}+\mu_i$…… …….. (3)

Where:

NEY_{ij} = Net income of the bee farmer in the jth settlement (N);

FEX_{1ij} =Farming experience of the ith bee farmer in the jth settlement (years)

NHV_{2ij} = Number of hives owned by the ith bee farmer in the jth settlement

CHL_{3ij} = Cost of hired labour by ith bee farmer in the jth settlement (₦)

FHA_{4ij} =Frequency of harvest by the bee farmer ith in the jth settlement

CFL_{5ij} =Cost of family labour by the ith bee farmer in the jth settlement (N)

DEP_{6i} =Depreciation of fixed inputs and cost of baits used ith bee farmer in the jth Settlement (N)

μ_i =error term associated with data collection from the ith bee farmer in the jth settlement which was assumed to be normally distributed with zero mean and constant variance.

β_0 is a constant

β_1- β_6 are regression parameters that were estimated.

RESULTS & DISCUSSION

Socio-economic characteristic of bee farmers in the study area

Table 1 show the mean age of the bee farmers was 45 years and ranging from 29 to 74 years with a standard deviation of 12.4. This implies that majority of bee farmers were above middle age. *Ceteris paribus*, labour productivity is a function of age because it is believed that old people tends to adhere strictly to traditional methods of production while young people tends to be more willing to adopt new production methods in order to increase their output. In addition, if productive age group is defined as 21−60 years, the mean age of 45 years implies that majority of bee farmers though, in active age, but tends towards the unproductive age and, therefore may not be able to imbibe new ideas and innovations to enhance increased productivity in the bee industry. The finding is similar to Babatude *et al*., 2007; Ebojei *et al*., 2008 and Chale *et al*., 2013. The literacy rate was very low among the bee farmers. The mean years of schooling of bee farmers in the study area was 3.2 years (Table 1). The estimated value fall below 2009−2012 UNDP mean education index of 5 years for Nigeria. This could have affected their chances of shifting from traditional bee keeping to modern apiculture. Most modern apiculuring requires skilled training and reading manuals for proper understanding of their operations. Therefore, bee farmers in the study areas would be receptive to innovations to boost bee production hence, profit level; all other factors remaining unchanged. This is synonymous with Ogaba, 2007; Babatude *et al*., 2007; Ebojei *et al*., 2008; and Chale *et al*., 2013. The mean value for access to credit was ₦15000.00 and ranges from zero to ₦30000.00.

TABLE 1: Socio Economic characteristics of bee farmers in Patigi and Ifelodun Areas, Kwara State

Distribution	Unit	Mean Value	Minimum value	Maximum value	Std dev
Age (Yrs)	Years	45	29	74	12.4
Gender(Sex)	Sex	20	01	120	1.0
Access to credit (₦)	Naira(₦)	15000	0	50000	3500.5
Level of education (Yrs)	Years	3.2	0	12	4.3
Farming experience (Yrs)	Years	19	4	35	7.6
Non-bee farming income (₦)	Naira(₦)	48590	37000	130000	8700.4
Household size (Persons)	persons	7.5	4	17	4.5

Source: Data Analysis, 2012

TABLE 2: Subsidiary Occupations of Traditional Beekeeping in Irepodun and Patigi LGAs, Kwara State, Nigeria

Occupations	Frequency	Relative frequency (%)	Cumulative Frequency
Farming	70	58.3	-
Wood Carving/Carpentry	12	10.0	70
Blacksmith	18	15.0	92
Govt. Employee	07	5.8	110
Trading	03	2.5	120
Total	120	100.0	-

Source: Data Analysis, 2012

However, small scale farmers have largely been by-passed by formal financial lenders because, among other problems, they lack the collateral demanded by financial institutions. This category of farmers is therefore left to their own devices to overcome shortages of capital in farming operations. The result for access to credit shows that bee farmers depend largely on personal saving to purchase farm inputs and adopt farm innovation. A similar result was observed by Oladimeji, 1999; Ebojei *et al*., 2008 and Oladimeji *et al*., 2013 who confirmed that most artisans in Kwara State particularly farmers do not have access to production loan from formal credit institutions. On the household size, the average numbers of persons per bee farmer were approximately 8 with minimum and maximum value of 4 and 17 respectively. The size of the household affects the amount of farm labour, determines the food and nutritional requirements of household and often affects household food security. The result shows that most of the population explosion occurs in rural areas. However, they are important in the supply of family labour after schooling hours particularly in bee production, harvesting, processing and marketing. Result consistency with findings by Ebojei *et al*., 2008; Chala *et al*., 2013. The length of time during which bee farmers had been engaged in bee culturing is a measure of his experience and also a reflection of his skill in bee production. The average value of bee farming experience was approximately 19 years with the standard deviation of 7.6. The proceed from non farm income can assist the farmers to procure the needed inputs such as hive box, boots, security suits, baits and hired labour which are timely required in bee farming activities. The result was similar to finding by Chala *et al*., 2013; Oladimeji *et al*., 2013. Results show that bee farmers used both durable and non-durable capital assets. Durable capital includes hive box as shown in figures 2 and 3, bee suits, boots; hand gloves, and bellow smokers. While non-durable capital inputs employed include baits. The summary of distribution of respondents based on the size of the bee farm holding is shown in Table 3. It shows that the majority of bee farming families in the study area had small farm holdings with mean value of hives less than 19 per bee farming settlement. The size of the bee farm determines the extent to which other resources such as bee hive and baits are used for optimum productivity. According to Alamu in Abdullahi *et al.*, (2012), farmers that had more resources including land area were more likely to take advantage of new technology and innovations. This indicates that bulk of bee farmers in the study area were small holders. This situation, where many bee farmers crop only small plots of land does not promote agricultural production beyond the level of subsistence. This report was similar to findings Ebojei *et al*., 2008.

TABLE 3: Distribution of Respondents based on the Size of the Bee Farm Holding

Districts	Plastic container	Woven grasses	Clay pots	Calabashes	Total	Mean	St.dev
Lantanna	08	35	42	04	89	22.5	19.1
Lade	05	20	35	07	67	16.8	13.9
Amberi	12	14	08	32	66	16.5	10.6
Ajasse	02	12	28	35	77	19.3	15.0
Total	27.0	81.0	113.0	78.0	299.0	74.8	35.6
Mean	6.8	20.3	28.3	19.5	74.8	18.9	8.9
Stdev	4.3	10.4	14.7	16.3	45.6	11.4	5,4

Source: Data Analysis, 2012

The table 3 also presents the types and occurrence of hives as reflected by the respondents in Patigi and Irepodun study area. The table showed that the respondents used more clay pots (37.9%) as bee hive than traditional beekeeper using woven grasses (27.2%), gourds/ calabashes (26.2%) and plastic containers (8.7%). This

showed that most of the traditional beekeepers still depend on local materials as these cost less than materials used for the construction of modern beehives. The modern hives such as langstroth, Kenya-top-bar and Tanzania- top-bar are very costly and not within the reach of the bee farmers. Given the opportunities to employ the modern beehives and new developments techniques, bee farmers in the study area could make the sector highly commercially viable enterprise for export.The total hives in the study area was highest in Lanta Nna district, 89(30%) and lowest in Amberi 66 with 22% hive. The honey produced in the study area ranged from 78 to 170 with average of 84.5 litres of honey per bee farmer from traditional beekeeping enterprise in the area per year. The differences in each of the village could be due to variation in the presence of foraging tree species and differences in densities and nature of such tree species from district to district varying prices of honey in the Patigi and Irepodu area of Kwara state. Honey is harvested in the study area from September to November and April/May. The price of honey is generally low from January to April and varies from N1000 to N1500 per litre. A little appreciable price increase is noticed from May to October when the commodity is sold for between N1500 and N2000 per litre. The variation in price within a year in the same environment is due to the availability of the product which invariably depends on bee foraging activities, honey production and maturation. This study revealed the deer need for the people of the study area to adopt modern beekeeping practices like using box hives, modern bee management procedure, better honey harvest devoid of threatening bee sting, use bee apparels honey processing and storage facilities, which has the potential of raising the quantity and quality of honey which will translate to better prices for the commodity. The finding is synonymous with Babatunde et al., 2007. The bee farmers in the State are characterized by low capital investment and high labour intensive practices. For instance, the LGAs investment in impoverished hives had a ranged of ₦1,200.00 to ₦2,000.00 while that of boots and security suits had a ranged of ₦2500.00 to ₦4000.00 respectively. The State average for the bee equipments are in the main unsophisticated comprising of clay local hive box, bee suits, boots; hand gloves, and bellow smokers. While non-durable capital inputs employed include baits and other similar devices that are manned by 2-5 persons. Result consistent with Chala *et al*., (2013). Results also showed that bee farmers receive various amount of productive credit averaged ₦15000 and ranged from zero naira to ₦30000 from the sources presented in Table 4. This result was similar to findings by Ebojei *et al*., 2008 who identified lack of credit as the most important constraint to Bee keeping in Kaduna State, Nigeria.

TABLE 4: Source of Production Loans for Bee Farming in Ifelodun and Patigi, Kwara State, Nigeria

Source*	Frequency	Relative Frequency	Cumulative Frequency
Self/Friends/Relative	65	57.0	-
Co-operative Societies	34	29.8	99
Agricultural Credit Co-operative Bank	-	-	-
Commercial Banks	-	-	-
Others	15	13.2	114
Total	114	100.00	-

Source: Data Analysis, 2012; * a bee farmer has only option of one major source

FIGURE 2: A traditional woven grass hive used in the study area (Adapted from Ajao, 2012)

FIGURE 3: A typical traditional clay pot hive used in the study area (Adapted from Ajao, 2012)

Estimate Costs and Returns (₦) per Litre of Honey Produced

Net Margin Analysis

The net margin per litre of honey produce and per bee farmer in the study area has shown that bee farming is profitable. These are presented in Table 5 and 6 below. The table shows that AFC per litre (AFC/L) ranged from ₦78.5 Lanta Nna settlement to ₦110.0 in Ajasse settlement with a State average of ₦94.9/litre and a standard deviation of ₦0.0/litre. On the other hand, AVC/litre had a range of ₦190.7 in Lanta Nna to ₦238.2 in Ajasse study area. The State's AVC/litre was ₦216.1 with a standard deviation of ₦15.3/litre. Table 5 also shows that on state wide basis, AFC/litre and AVC/litre accounted for approximately 30.5% % and 69.5% of ATC respectively. The AR per litre (AR/L) from honey produced varied from ₦1640.0 to ₦1848.2 and had a state average of ₦1698.43 with a standard deviation of ₦180.2. Average net return per litre (AN/L) of honey produced was lowest in Lanta Nna (₦1200) couple with fact that it has the lowest AFC/Lt. Similarly, Ajasse settlements recorded the highest NR/L because of their proximity to urban centre which enable them to have higher bargain for their product. A NR/L of ₦1387.5 was obtained for the State with a standard deviation of 143.6. This is synonymous with finding by Babatunde *et al*., 2007; Lalika *et al*., 2009. Average income per season per colony ranges from ₦7500 to ₦10000.

The AFC per bee farmer ranged between ₦4850.5 in Lanta Nna settlement and ₦7650.5 in Ajasse settlement – giving an average of ₦6475.4 per bee farmer for the State as presented in Table 6. The table also shows that AVC per bee farmer had a range of ₦15500.0 in Lanta Nna to ₦18750.5 in Ajasse with a value of ₦17500.1 per bee farmer for the State. The standard deviations for AFC and AVC per bee farmer were ₦5568.7 and ₦0.0 respectively. The standard deviation for the AFC per bee farmer was smaller than that of the AVC because the later depended on the quantity of inputs used within the same season while the former was invariant to the quantity of honey produced. Table 6 also shows that the ANR per bee farmer was highest ₦43150.3 in Lanta Nna and lowest, ₦32099.0 in Ajasse settlement. The ANR per bee farmer for the State was ₦37924.7 with a standard deviation of ₦ 5568.7. The revenue accrued to bee farmer was not only dependent on the litre of honey produced and price per litre, but also dependent on the variable costs. Results are consistent with findings by Babatunde *et al*., 2007; Lalika *et al*., 2009.* US$1= ₦158 at the time of survey

TABLE: 5 Estimated Average Costs and Returns (₦) Per Litre of Honey produced in Kwara State, Nigeria

Bee Village	Average Fixed Cost (AFC)	Average Variable Cost (AVC)	Average Total Cost (ATC)	Average Revenue (AR)	Net Return (NR/Litre)*
Lade	85.4	204.6	290.0	1640.0	1350.0
Lanta Nna	78.5	190.7	269.2	1469.2	1200.0
Amberi	105.5	230.8	336.3	1836.3	1500.0
Ajasse	110.0	238.2	348.2	1848.2	1500.0
Total	379.4	864.3	1243.7	6793.7	5550
Mean	94.85	216.075	310.925	1698.43	1387.5
Std dev	15.3	22.2	37.5	180.2	143.6

Source: Data Analysis, 2012

TABLE6: Estimated Annual Average Costs and Returns (₦) Per bee farmer in Kwara State, Nigeria

Bee Village	Average Fixed Cost (AFC)	Average Variable Cost (AVC)	Average Total Cost (ATC)	Average Revenue (AR)	Net Return (ANR/Farmer)*
Lade	6250.5	17400.0	23650.5	65850.5	42200.0
Lantana	4850.5	15500.0	20350.5	63500.8	43150.3
Amberi	7150.0	18350.5	25500.5	59750.0	34249.5
Ajasse	7650.5	18750.5	26401.0	58500.0	32099.0
Total	25901.5	70001.0	95902.5	247601.3	151698.8
Mean	6475.4	17500.1	23975.6	61900.3	37924.7
Stdev	1228.4	1448.8	2674.3	3383.9	5568.7

NOTE: *Figures in bracket are percentages of ATC per.
Source: Data Analysis, 2012

Estimated Factors Influencing Volume and Net Incomes of Bee Farmers in Patigi and Ifelodun LGAs

Results showed that in Patigi and Ajasse area, the postulated explanatory variables in equation 4 explained about 72.5% in the variations of volume of honey produced by the bee farmer in Patigi and Ajasse farming settlements. The F-test with a value of 41.30 revealed that the model was significant at the 5.0% level. Although all the estimated co-efficient carried the *a-priori* signs, that of man-days of hired labour was not statistically different from zero at the 5.0% level (equation 4). Results also showed that the number of hives per bee farmer was significant 1% while all other variables except man-days of hired labour were significant at 5%. Similar finding was reported by Babatube *et al*., 2007.

$$\underset{}{\text{Log } Q_{i=}} \underset{(0.065)}{3.794^{*}} + \underset{(0.042)}{0.376^{**}}\ \text{LogFEX}_{1ij} + \underset{(0.025)}{0.085}\ \text{LogNHV}^{*}_{2ij} - \underset{(0.021)}{0.075}\ \text{LogMHL}_{3ij}$$

$$+\underset{(0.120)}{0.142^{*}}\ \text{LogFHA}_{4ij} - \underset{(0.046)}{0.164^{*}}\ \text{LogMFL}_{5ij} - \underset{(0.018)}{0.546^{**}}\ \text{LogDEP6ij} \quad \text{…….(4)}$$

$R^{-2} = 0.725$; F=41.30*

* and ** indicates that estimated co-efficient were significant at 1% and 5% level respectively. The standard errors of the co-efficient are in parenthesis.

On the contrary, equation 5 for Patigi and Ifelodun area shows that the coefficients of all the variables included in the factors affecting bee farmer income carried *a priori* signs which supports the hypothesized that cost of family labour, hired labour and cost of depreciation of assets are expected to bear a negative sign with bee farmer income while number of hive per farmer, frequency of harvest and years of experience make positive contribution to the net income of bee farmer. Although, cost of hired labour carried the *a priori* sign, the variable was not statistically different from zero at the 5.0% level. The postulated explanatory variables in equation 5 explained about 81.4% in the variations of income earned by the bee farmer in Patigi and Ajasse-Ipo farming settlements. The F-test also revealed that the model was significant at 5.0%. However, the negative signs on the coefficients of Log CHL, CFL and DEP showed that an increase in the use of this inputs caused net income to declined, *ceteris paribus.* Small scale bee farming is very labour intensive and every activity in the business, from going to the farm through to harvesting and processing as well as marketing of honey required adequate amount of human effort. The result indicates that if cost of labour increases ceteris paribus, net income of honey will reduce. A similar result was documented by Oladimeji, 1999; Adewumi *et al*., 2012.

$$\text{Log } Y_i = \underset{(0.145)}{1.305^{*}} + \underset{(0.065)}{0.0251}\ \text{LogFEX}_{1ij} + \underset{(0.003)}{0.044}\ \text{LogNHV}^{*}_{2ij} - \underset{(0.003)}{0.026}\ \text{LogCHL}_{3ij}$$

$$+\underset{(0.160)}{0.0825}\ _{\text{LogFHA4ij}} - \underset{(0.205)}{0.0924}\ \text{LogCFL5ij} - \underset{(0.145)}{0.214^{**}}\ \text{LogDEP6ij} \quad \text{…… (5)}$$

$R^{-2} = 0.825$; F=26.90*

* and ** Indicates that estimated co-efficient were significant at 1% and 5% level respectively. The standard errors of the co-efficient are in parenthesis.

Estimated Resource-use Efficiency for Bee Farmer in Patigi and Ifelodun Areas

The results of the estimated resource-use efficiency were derived with respect to number of traditional hives owned, family and hired labours and as well as depreciation of fixed assets in table 7. The table shows that Marginal Value Product (MVP) of each production input was less than its acquisition cost implying that each of the input in bee farming was over utilized. The excessive uses of labour resource in rural areas tend to be a common occurrence due to rather low opportunity cost for the input (Oladimeji, 1999). Family labour cannot sensibly be 'laid off'. For instance, in agricultural activities even when it is making a negative contribution because it still has to be catered for whether it is employed or not. Besides, the existence of disguised unemployment and under-employment of labour in rural areas of the country necessarily promote excess labour in agriculture and

fishing enterprises (Oladimeji *et al*., 2013). In addition, small scale bee farming is a rising enterprise in that under the prevailing technology in the country, bee production depend more on chances than on mandays of labour employed. However the MVP of all resources used are positive, hence they all contribute positively to total output. To maximize profit the ratio must equal one. When the ratio is less than one, it is an indication of over-employment of the resources beyond the point of optimum profit. Profit can be increased by reducing the rate of use of the resources. When the ratio is greater than unity, it indicates that the rate of utilization of the resources is too small; increasing the rate of use would increase profit. From the results obtained it was clear that the optimization condition was not attained for the given level of technology in the bee farming. The MVPs obtained are less than unity. Results are consistent with findings Babatunde *et al*., 2007 and Oladimeji *et al*., 2013.

TABLE 7: Estimated Resource-use Efficiency for Bee Farmers in Patigi and Ifelodun Area, Kwara State

Resources	MVP(₦)	Unit price of inputs(₦)	Efficiency ratio MVP/Unit Cost
Number of traditional hives owned	232.6	550.5	0.423
Family labour (imputed)	67.9	250.0	0.272
Hired labour	205.6	400.0	0.514
Depreciation of fixed assets	658.4	1150.5	0.572

Source: Data Analysis, 2012

CONCLUSION

The study examined the socio-economic characteristics and economic returns of rural bee farming in randomly selected two bee farming Areas of Kwara State, Nigeria. Although, the result showed that honey production from honey bee in the State is profitable. The estimated mean years of schooling of bee farmers in the study area was 3.2 years, fall below 2009−2012 UNDP mean education index of 5 years for Nigeria. This could have affected their chances of shifting from traditional bee keeping to modern apiculture.The result for access to credit shows that bee farmers depend largely on personal saving to purchase farm inputs and adopt farm innovation because they lack the collateral demanded by financial institutions.

RECOMMENDATIONS

Based on the findings of this study, it is recommended, therefore,

1. That bee farmer in the study area should be given adequate training on rudiments of traditional bee farming using community based/ informal education. This will ensure proper understanding of modern equipments and adopt technology capable of increasing not only the profitability of the bee enterprise but also make efficient use of bee farming resources.
2. Establishment of bee farmer's co-operative association for annexing financial aids, marketing information and inputs from government and non-government organizations through poverty alleviation Agencies.
3. Creating a market channel that will take care of commensurate price for product of new beekeeping enterprise.
4. Government at all levels should endeavor to stimulate farmers to boost honey production by providing and subsidize if need be, necessary infrastructures and enabling environment which provide impetus that will ease people transition from traditional to modern beekeeping easy.

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