Available online at www.asric.org
ASRIC Journal on Agricultural Sciences 1 (2022) 9-16

Empirical Analysis of Honey Productivity among Local Beekeepers in Sanga, Kaduna State Nigeria

Onuwa G.C[1*].

[1]Department of Agricultural Extension and Management, Federal College of Forestry, Jos, Nigeria.

*Corresponding author: Onuwa G.C.; Email: onuwag@gmail.com; Tel: 08035606473

Received 9 July 2022; revised 31 July 2022; accepted 13 August 2022

Abstract

Beekeeping is a sustainable form of agriculture that supplements rural income and nutrition requirements; however, gross underutilization and inadequate exploitation of bee keeping potentials persists. Productivity analysis is an important consideration in measuring firm efficiency or performance. This study therefore estimates profitability and honey productivity among local beekeepers in Sanga, Kaduna state, Nigeria. Primary data collected via random sampling were evaluated using descriptive statistics, farm budget model and Total Factor Productivity (TFP) index. The study revealed that net farm income of honey production was ₦19,900/hive; percentage profit margin and benefit-cost ratio were 48.5% and 0.94 respectively. Furthermore, 66% of the beekeepers were sub-optimally productive as their TFP indices were below the optimal scale; attributable to sub-efficient input mix and cost of production inputs. The major constraints of honey production in the study area were cost of modern technology (92%), inadequate capital (74%), inadequate extension support (66%), poor access to credit (50%), climate factors (42%), shortage of forage plants (38%) and lack of incentives /training (26%). Forage improvement, input supply and subsidy, improved funding, incentives, interventions, extension support and access to agricultural credit for local beekeepers are strongly recommended.

Keywords: Apiculture, beekeepers, constraints, honey, profitability, total factor productivity

1.0 INTRODUCTION

Apiculture (Honey production) presents an untapped natural resource that will help diversify farm household income and alleviate rural poverty. Apiculture can also be referred to as the art and science of beekeeping; it comprises collection and bee management, bee forage and crop pollination, wax and honey production) in either small or large scale. Beekeeping for honey production is a profitable agricultural enterprise. It is an important foreign exchange earner for those that export honey and bee wax. Following the production trends, China is the number one honey exporter in the world, selling $246,550,000 (12% of total natural honey exports in the world) closely followed by Argentina with $212,637,000 (10.3%) and New Zealand at third with $139,316,000 accounting for 6.8% of total natural honey exports in the world (Ayansola, 2012). The experiences of apiculturist in developed economies show that commercial apiculture is a money spinner. However, beekeeping as a commercial venture is still largely unexplored in Nigeria, and the country meets most of its domestic demand for honey by importation from producer countries and locally from small scale beekeepers (Ayansola, 2012). There is a growing consumption of honey and other bee products because of its high nutritional and medicinal value (https://www.fao.org/3/w0076E/w0076e10.htm). With the current growth in domestic consumption of honey in most part of the country; apicultural enterprise and demand for its products is bound to increase. It could provide food, nutritional, and livelihood security for smallholders in ecologically sustainable systems. Apiculture can be practiced as a hobby, a part time or fulltime occupation. At times depending on how it is practiced, it could be seen

as an art, a science, a technology or a vocation and can be practiced by those who are not conventional farmers. Bees, the main player in bee-farming are four-winged flower feeding insects found in natural habitats. The bee specie, *Apis mellifera* commonly known as the honey bee is the most widely-spread and abundant insect on earth (Goulson, 2003); *Apis mellifera* is an extremely useful specie (Gallai, *et al.,* 2009). Bees are social insects that live in colonies and are divided into three groups namely the queen, the drones and the worker bees. Honey bees are important and beneficial economic insects; they produce honey and pollinate crops. Honey is a natural food produced by bees from nectar or secretion of flowers. Honey content include 82% carbohydrate, 16% water, 0.3% proteins, 0.2% ashes, and minor quantities of amino-acids, vitamins as well as other components in low level concentration. These properties and its medicinal value make it an essential economic commodity (Ajao, 2012).

Bee farming is relatively cheap to manage, as the major production is undertaken by the bees, while the beekeeper harvests; with relatively low investment capital requirement. Beekeeping offers opportunities for empowering and developing the rural population; through the various benefits derivable from beekeeping. 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 an alternative income stream and nutrition for farm households in agrarian communities (Babatunde *et al.,* 2007). Honey, bee wax and other by-products are in high demand by households, hospitals, commercial outlets, pharmaceuticals and cosmetic industries as a good supplement, medicinal or complement in the production of other products. Apart from the medicinal value, honey can provide a cheap and readily available source of energy to man; they are also used as dietary or nutritional supplement in foods due to its high medicinal and nutritional properties. Honey can be eaten or used in any type of cooking or to sweeten beverage. It can be used to make jams and marmalades (Adrain and Claire, 2006). Honey can be used alone and sometimes in combination with herbs for the treatment of wounds, burns and sores, cataracts, common colds, cough, gastric ulcer, restlessness, hypertension, skin ulcer and scabies (Eddy, 2007). Bee wax is used in the production of cosmetics, candles, polishes, etc. The wax is used as a water proof agent for wood and leather, production of candles, ointments, soaps, polishes, battery cells, transformers, clothes (*adire*) and used by dentists as an artificial denture, and used by shoe makers for strengthening shoemaker's threads. The waxy substance, propolis contains enzymes which are believed to contain immunity factors; that stimulate certain body hormones and give it natural resistance to diseases. The propolis is used to prepare cough syrups, toothpastes, lotions, skin soaps, skin oils (Ubeh, 2011). Health care products and medical ointments containing propolis are used for wounds, scares, infections, muscle ailments, eczema, warts nail cuticle (Nicolas, 2004). The bee venom has useful medicinal properties; it can be used to cure ailments such as arthritis and for treatment of nervous system disorder (Ubeh *et al.,* 2005). Pollen from the flowers is sold to perfume industries.

This Agro Forestry System can be integrated into many farming systems (Atala, 2005). Commercial beekeepers around the world, using modern techniques harvest an average of about 30 – 40 liters of honey annually depending on the size of hive, and the international market price per liter of honey is about U.S $7.00 (an average of ₦2,000) amounting to a total sum of ₦60, 000.00 to ₦80, 000.00 per hive. It also gives a profitable and healthy form of livelihood to a large number of people; it is of considerable importance in the economies of both developed and developing countries (Onuwa *et al*., 2017; Mohammed and Abdurrahman, 2004). Bee keeping is an activity that needs to be developed, as there is a great scope in broadening its base in Nigeria. Nigeria posses' enormous potential to transform bee keeping into a productive industry. As it can play a very vital role in increasing rural income as well as contributing to increased export earning, its role in bio-diversity conservation, the usefulness of its hive products as raw materials for local industries such as bakery and confectionary, tanning, cosmetics, pharmaceuticals etc. which are presently importing such material as bee wax and propolis. In this way, bee keeping could also save our scarce foreign exchange earnings. The rate of expansion of apiculture industry is relatively low compared to other fields of agro-forestry in Nigeria. This low expansion rate could be related to gross unawareness of the use and value of honey and other hive products, poor and ineffective collection, processing and preservation method as well as poor handling which results to product quality deterioration. Non-commercialization of bee keeping practice can be attributed to gross underutilization and inadequate exploitation of bee keeping potential in the country. Apiculture is one of the most widespread agro-forestry activities that are practiced all over the world (FAO, 2007). Forests provide adequate bee-forage in terms of both quality and quantity of nectar and pollen grains (Tzob, 2006). For this reason, bee-keeping also has the potential to increase opportunities for forest conservation (CIFOR, 2008). When promoted among forest adjacent communities, beekeeping provides reliable livelihood diversification options

(Sanford, 2009). Despite of the importance of non-timber forest product (NTFPs), their contributions to rural livelihoods in many developing countries are yet to be acknowledged (Shackleton and Shena, 2004). Timber was perceived as the dominant reason for forest management and hence no attention was paid to non-timber forest product (NTFPs). In Nigeria particularly, there is no clear-cut policy directed at non timber forest product (NTFPs) at all levels. Non-timber forest product (NTFP) has long been considered minor or secondary forest products. There is general lack of appreciation of the value and roles of non-timber forest product (NTFPs) in the livelihood of rural dwellers (Oyun, 2009).

Modern beekeeping technology and practices, though not quite popular among the rural farmers; can serve as an alternative income generating activity. Due to ignorance of the profitability bee-keeping and fear of bee sting most farmers are deterred from venturing into this enterprise. Bee keeping for wealth creation has practically remained untapped in the country. Those already involved in beekeeping in the rural communities are not utilizing all the bee products but are mostly interested only in honey and bee wax extraction. Another set of problem for bee keeping is the incidence of pest attack, bush burning, indiscriminate pesticide use, abscondment of bees, non-colonization, vandalization/theft of apiary equipment and inadequate enterprise information adversely affects the productivity of beekeepers (Gutierrez, 1999). Local beekeepers do not keep records of their activities making it difficult to determine the level of progress they make. This study will create awareness on the profitability of beekeeping and encourage non-beekeepers to venture into it as means of wealth creation. Bee-keeping does not require a large piece of land or compete with crops or livestock for land space. Bee products provide farmers with an alternative income steam and can be sold at both local and international markets. Beekeeping can be used as a means of poverty alleviation, hunger reduction and job creation especially in the rural areas of the country where there is a high level of unemployment and prevalence of subsistent agricultural production (Nlemchi, 2003; Nicolas, 2004). Beekeeping can be undertaken by anyone who has the ability, determination and requisite skills (Mbah, 2012). Honey was previously harvested from the wild; however, modern management practices through adoption of hive technology has made beekeeping more convenient; this innovative technology has the potential to increase adoption of beekeeping practices among rural farmers and create diversified rural livelihoods (Udah, 2006).

This study therefore estimates the profitability and level of honey productivity among local beekeepers in the study area and will attempt to find answers to the following research questions;

a. Is honey production profitable?
b. What is the level of honey productivity?
c. What are the constraints of honey production in the study area?

2.0 METHODOLOGY

Study Area

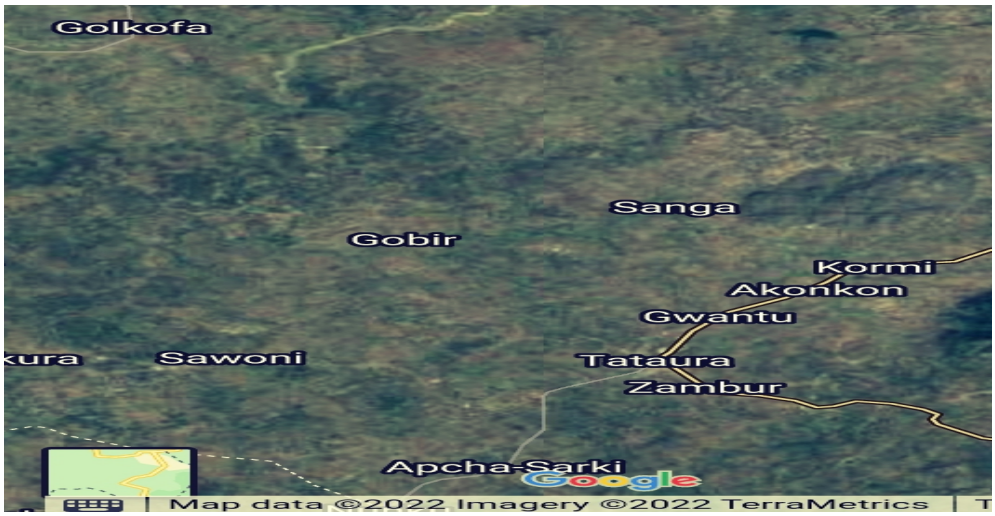

Fig.1. Sanga LGA: Google Map Data (2022)

This study was carried out in Sanga Local Government Area (LGA), Kaduna state, Nigeria. Its headquarters is in the town of Gwantu, with geographical coordinates of latitude 9° 19' 0" N and longitude 8° 27' 0" E (NBS, 2010). It has an estimated population of 149,333 as at 2006 census, with an area of 781 km². The postal code of the area is 801. The study area is rural based and the population comprises smallholder farmers. The LGA is predominantly an agrarian community (NBS, 2010).

Sampling Procedure

Simple random sampling techniques were used to select the respondents for this study, at constant proportionality of 0.3 (30%); which is the constant ratio or fraction of variable quantity to another to which it is proportional, fifty (50) respondents were selected for the study from a sample frame of 169 beekeepers; and validated using raosoft sample size calculator at 90% confidence level and 10% margin error. This sampling method was used because beekeepers in the study area are not well enumerated. The respondent population in the study area constitutes household heads that were predominantly male; especially those that adopted the beekeeping enterprise.

Method of Data Collection

Primary data for this study was collected using a structured questionnaire.

Analytical Techniques

Primary data collected were evaluated using descriptive statistics, farm budget model and Total Factor Productivity (TFP) technique. The farm budget technique (costs and returns analysis) was used to determine the costs, returns and profitability of honey production in the area. The Total Factor Productivity (TFP) technique was used to estimate agricultural productivity by comparing an index of agricultural inputs to an index of outputs.

Farm Budget model

The farm budget model adopted for this study was the costs and return analysis adapted by (Akinpele and Ogbonna, 2005). Indicators such as net farm income, percentage profit margin and benefit-cost ratio per hive were analyzed.

The budgetary model is presented in equation (1);

$$Net\ farm\ income\ (N.F.I) = GFI - TC \quad \ldots (1)$$

Where;
GFI = gross farm income; TC = Total cost; expressed mathematically in equation (2)

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

Where:
TVC = Total variable cost (₦; Nigerian naira) (bait, labour, etc.)
TFC = Total fixed cost (₦) (depreciation cost of hives and hive tools, e.g. scrappers, smokers, etc.).

The straight-line method of evaluating depreciation cost (₦) will be used to estimate the depreciation of farm assets (hive tools and equipment). The straight-line method of depreciation is specified in equation (3);

$$D = P - S/N \quad \ldots (3)$$

Where;
D = Depreciation; P = Purchase price of the assets; S = Salvage value of the assets; and N = Number of years of life of the assets

To further substantiate the profitability of this enterprise, profitability ratios such as: percentage (%) profit margin and benefit-cost ratio (BCR) were estimated and specified in equations (4) and (5) respectively;

$$Percentage\ Profit\ margin\ (\%P.M)\ =\ (Net\ farm\ income\ \div\ Total\ revenue)\ 100\% \quad \ldots (4)$$

$$Benefit-cost\ ratio\ (BCR)\ =\ Net\ farm\ income\ \div\ Total\ cost \quad \ldots (5)$$

Where:

Total Factor Productivity

Total factor productivity (TFP) is a method of calculating agricultural productivity by comparing an index of agricultural inputs to an index of outputs (Fakayode *et al*., 2008). This can be computed following Key and McBridge (2005) as the ratio of the output to the total variable cost (TVC), specified implicitly in equation (6):

$$\frac{\text{TFP}}{\text{TVC}} = \frac{Y}{TVC} = \frac{Y}{\sum PiXi} \quad \ldots (6)$$

Where:

Y = quantity of output; TFP = Total Factor Productivity; TVC = total variable cost; P*i* = unit price of the i^{th} variable input; and X*i* = quantity of i^{th} variable input.

This methodology ignores the role of total fixed cost (TFC) as it does not affect either the profit maximization or the resource-use efficiency conditions (Fakayode *et al*., 2008), expressed mathematically in equation (7);

$$TFP = \frac{Y}{AVC} \quad \ldots (7)$$

The interpretations of TFP index are given as follows;

(< 0.1) = Sub-optimal; (1.0 – 1.09) = Optimal; and (≥ 1.10) Super-optimal.

3.0 RESULTS AND DISCUSSION

Costs and Return Analysis of Beekeeping Enterprise

Table 1: Profitability Analysis of Honey Production per Hive

Variables	Amount(₦/hive)	%
A. Farm income		
i. Honey(18litres) per hive	27,000	
ii. Bee wax (7kg) per hive	14,000	
iii. Total Revenue	41,000	
B. Variable Cost		
iv. Labour (inspection/harvest)	3,500	16.6
v. Plastic containers/bottles	2,500	11.8
vi. Packaging	1,000	4.7
vii. Total variable cost (TVC)	7,000	33.2
C. Fixed Cost		
viii. Beehive construction with stand (Clay hive)	7,000	33.2
ix. Apiary kits (hand gloves, boots, etc.)	5,800	27.5
x. Hive tools (smoker scraper/knives, etc.)		
xi. Manual press	1,300	6.2
xii. Total fixed cost	14,100	66.8
D. Total cost (B+C)	21,100	100

E. Gross margin (A-B)	34,000	
F. Net farm income (E-C)	19,900	
I. Profitability ratios:		
xiii. Benefit cost ratio (BCR)	0.94	
xiv. Percentage Profit Margin		48.5

Table 1 revealed that the net farm income of honey production in the study area was ₦19,900/hive, suggesting that honey production is a relatively profitable venture with prospects for improved economic potentials. The estimated total variable and total fixed costs were ₦7000/hive and ₦14,100/hive respectively; the average total cost for honey production was ₦21,100/hive. The total variable and fixed costs constituted 33.2% and 66.8% of the total production cost respectively. This result suggests that a significant proportion of the gross farm income (total revenue) was expended on production cost. Hive construction (33.2%) and apiary kits (27.5%) constituted the most significant components of production cost. The estimated percentage profit margin was 48.5%, which suggests the percentage net margin accruable to the farmer from the estimated gross margin. The benefit-cost ratio was 0.94, which is indicative that for every naira (₦1) invested in honey production ₦0.94 can be accruable in return. These ratios are indicative of the profitability index of honey production in the study area. This corroborates with the findings of Onuwa *et al*., 2017; Bhatta, *et al*. (2020) who also reported similar result on the profitability of honey production.

Total Factor Productivity

Table 2: Distribution Based on Total Factor Productivity Index of the Beekeepers

Productivity index	Frequency	%
Sub-optima (<1.00)	33	66.0
Optima (1.00 -1.09)	12	24.0
Super-optima (>1.10)	5	10.0

The summary statistics of the total factor productivity result in Table 2 revealed that most (66%) of beekeepers were sub-optimally productive as their TFP indices were below the optimal scale, which indicated sub-optimal input mix allocation in the production process; 24% were found to be optimally productive as indicated by their TFP indices and 10% were super-optimally productive as their TFP indices were above the optimal scale. The low productivity could be attributed to sub-efficient input mix and cost of production inputs, which yielded low output in respective apicultures in the study area. This corroborates with the findings of Fakayode *et al*., 2008; Chain *et al*., 2017; Farrel, 2005; Fadare, *et al*., 2008; CTA, 20O5 who also reported similar results in their study on Agricultural Productivity Profiles.

Constraints of Honey Production

Table 3: Constraints Confronting Honey Production among Beekeepers

Constraints	Frequency*	%
i. Shortage of forage plants	19	38
ii. Cost of modern technology	46	92
iii. Inadequate capital	37	74
iv. lack of incentives/training	28	56
v. Climate factors (rainfall)	21	42
vi. Inadequate extension support	33	66
vii. Poor access to credit	25	50

Table 3 revealed the constraints affecting honey production among beekeepers in the study area. The critical factors identified include cost of modern technology (92%); adoption of modern hives and technology can constitute

a major cost component in apiculture; hence, modern hives and technology are well suited for optimal honey production. Inadequate capital (74%); capital is a very significant factor in apiculture, all procurements of apiary equipment's, kits and technology adoption are correlated to the availability and adequacy of farm capital. Inadequate extension support (66%); extension services will facilitate exchanges required for capacity building among local beekeepers in the area. Poor access to credit (50%); absence of financial services in most rural and agrarian communities are very prevalent; hence smallholders lack access to microcredit required for the expansion and intensification of farm activities. Climate factors (42%); these factors particularly the amount of rainfall and temperature can exert a great influence on the life and work output of the honeybee, this can significantly constrain the gross output of honey produced. Shortage of forage plants (38%); forage materials are required to enhance colonization of honey bees in the hive; hence to attract bees. Lack of incentives /training (26%); incentives and interventions can serve as pull factors for investments in apiculture. These findings corroborates with the work of Shrestha (2017) who also reported similar results on Production economics and production problems of honey in Bardiya District, Nepal. Furthermore, this result corroborates with the findings of Bhatta, *et al*. (2020) who posited similar results in their work on Economic Analysis of Honey Production in Chitwan District, Nepal.

4.0 CONCLUSION AND RECOMMENDATIONS

This study analyzed honey productivity among local beekeepers in Sanga, Kaduna State, Nigeria. The results revealed that honey production was relatively profitable in the study area; with possibilities for further increase in output and farm income. Furthermore, the result revealed that most of the beekeepers were sub-optimally productive as their TFP indices were below the optimal scale; attributable to sub-efficient input mix and high cost of production inputs. All the constraints identified by the beekeepers were economically important and significantly affected beekeeping enterprise in the study area. Improving beekeeping enterprise therefore requires channeling efforts towards ameliorating these constraints. All stakeholders are encouraged to play their part in ensuring the survival and sustainability of honey production in the study area. Based on the findings of this study, the following recommendations are made for policy actions to improve firm efficiency and productivity:

1. Improvement and modification of forage plants;
2. Adequate supply and subsidization of modern production technology (e.g., automated centrifugal press, Kenya top bar langstroth hive, etc.);
3. Policy formulation and implementation to increase funding for apicultural activities;
4. Provision of incentives and interventions for beekeepers;
5. Increased extension supports for beekeeping activities; and
6. Improved access to agricultural credit and production inputs; particularly for local beekeepers.

REFERENCES

Adrain, W and Claire, W. (2006). *Teach yourself Beekeeping*. Pp. 133-240. Graw Hill Publishing Company, New Delhi, India.

Ajao, A. M. (2012): *Comparative Studies on Ecology and Morphometric of Reared and Feral Honeybees in Geological Zones of Kwara State, Nigeria*. Ph.D. Thesis. Federal University of Agriculture, Abeokuta. Pp 58-70

Akinpele, A. A and Ogbonna, C. (2005). Economics of Egg Plantsolanum (spp) production in south-east Agro-ecological zone, Nigeria. *Proceedings of the 39th conference of the agriculture society of Nigeria University of Benin October 9th – 13 2005*, p 143-145.

Atala, A.A. (2005). *Bee keeping among the TIV in the tropics and Trade on Honey and Bee wax*, Common wealth secretariat, London, pp. 63-69.

Ayansola, A.A (2012): An Appraisal of Apicultural Practices in Southwestern Nigeria. *Journal Agricultural Science*. 3(2): 79-84.

Babatunde, R.O., Olorunsanya, E.O., Omotesho, O.A., Alao, B.I. (2007). Economics of Honey Production in Nigeria: Implications for Poverty Reduction and Rural Development. *GAEP*.3 (2): 23-29.

Bhatta, S., Baral, S. and Datta, J. P. (2020). Economic Analysis of Honey Production in Chitwan District, Nepal. *American Journal of Agricultural and Biological Sciences, 15*(1): 132-137. https://doi.org/10.3844/ajabssp.2020.132.137

Centre for International Forestry Research (CIFOR). (2008). CIFOR's Strategy 2008-2018: *Making a Difference for Forests and people*. Bogor, Indonesia. CIFOR Report.

Chain, J.R., Ritten, E.J. Peck, D.E., Elmke, M and Patalee, B. (2018). Firm Efficiency and Returns-to-Scale in the Honey Bee Pollination Services Industry. *Journal of Economic Entomology*, 111(3):1014–1022doi: 10.1093/jee/toy075

Eddy, J. (2007). *Tropical Honey as a Treatment of Diabetic Ulcers*. University of Wisconsin Study Test, University of Wisconsin, Madison.

Fadare, S.O., Ojo, S.O and Imoudu, P.B. (2008). Analysis of production performance of Beekeepers in the Niger-Delta area of Nigeria. *APIACATA*, 43(2): 37-48.

Fakayode, BS, Omotesho, OA, Tsoho, AB, Ajayi, PD. (2008). An Economic Survey of Rural Infrastructures and Agricultural Productivity Profiles in Nigeria. *European Journal of Social Sciences. 7(2):158-171*.

Farrel, MJ. (2005). The Measurement of Productive Efficiency. *Journal of Royal Statistical Society Series*, 120(3):253-290.

Food and Agricultural Organization (FAO) (2007): *Beekeeping and sustainable Livelihoods*. The urban Producer's resource book, Rome, 67pp. Retrieved 30th November, 2020.

Gallai, N, Michael, S., and Bernard, F. V. (2009). *Economic Evaluation of the Vulnerability of World Agriculture* (unpublished M.Sc. Thesis).

Goulson, D. (2003). Effects of Introduced Bees on Natural Ecosystem. *Annual Reviews of Ecology and Evolution System,* 34 (2): 1-26.

Gutierrez, E.G. (1999). *Guide to Natural Remedies for Health and Well Being*. Orvil Publishing, Mexico, Pp.263-283.

https://www.fao.org/3/w0076E/w0076e10.htm. Retrieved on the 26th August, 2022.

Key N, McBride W. 2003. Production Contracts and Productivity in the U.S. Hog Sector. *American Journal of Agricultural Economics. 85(1):121-133*.

Mbah, S. O (2012): Profitability of Honey Production Enterprise in Umuahia Agricultural Zone of Abia State, Nigeria. *Int'l Journal of Agric. and Rural Dev.* 15(3):126-138.

Mohammed, R.J.S. and Abdurrahman, Y.H.E. (2004). *A comparative Analysis of Beekeeping and crop production in Nigeria*. Available at: www.apiservice.com/apimandia/2revisedbeekeepingcrops2006.doc. Accessed 19th November, 2011).

National Bureau of Statistics (NBS). 2010. *The review of the Nigerian economy 2010*. NBS Bulletin.

Nicolas, B (2004): *Beekeeping and sustainable Livelihood*. IBRA U.K. Pp 96-115

Nlemchi, R. (2003). *Beekeeping Managements*. Lecture Delivered to Imo ADP Staff. Pre-season Training, April, 2003. Technical Paper

Onuwa, G. C., Ukanyirioha, C. J., Yitnoe, G. S., and Mbah, A. (2017). Analysis of Honey Production under the Apiary Unit, Federal College of Forestry, Jos, Plateau State, Nigeria. *Proceedings of the 31st Annual conference of the Farm Management Association of Nigeria (FAMAN), Bauchi*, 917-922. Published by FAMAN.

Oyun, N. B. (2009). The Role of Non-Timber Forest Products on the Livelihood of Fringe Communities of Idanre Forest Reserve, Nigeria. *Journal of Forest and Forest Products*, 3(5): 43-57.

Sanford, T. M (2009): *Basic beekeeping manual*, Florida 4-H Youth Development

Shackleton, C. and Shena, S. (2004). *The Importance of Non- Timber Products in Rural community Livelihood-Security Program, Florida Cooperative Extension Service*. Institute of Food and agricultural Sciences, University of Florida. 122pp.

Shrestha, A (2017): Study of Production economics and production problems of honey in Bardiya District, Nepal. *Sarhad Journal of Agriculture*, 34(2): 240-245.DOI. http://dx.doi.org/10.17582/journal.sja/2018/34.2.240.245

Technical Center for Agriculture (CTA) (2005). *Beekeeping in the tropics*, Wageningen, Netherlands. Agrodok, 32pp.

TZOB (2006). *Zirai ve İktisadi Rapor*. TZOB. Ankara. Turkey.

Ubeh, E. 0. (2011). *Beekeeping*. Lecture Delivered at Federal University Technology, Owerri (FUTO). Technical Paper.

Ubeh, E. O. and Nwjiuba, C. U (2005): *Economics of Apiculture. A Case Study of Federal University of Technology, Owerri (FUTO), Apiary*. In: Ekenyem, B. U. and Madubuike, F. N. (2005). *Issues in Tropical Animal Science for Rural Development*, Fegro Press.Pp164-169.

Udah, C. A. (2006*). Overview of Forestry and Agro Forestry Systems with Adaptable Technologies for Extension to Imo Farmers*. Technical paper presented at the Intensive Training Workshop for Newly Employed Local Government Agricultural Officers in Imo State. 6th April, 2006.