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Comparative Analysis of Honey Production Yield between Modern and Traditional Bee Hives in Igabi Local Government Area of Kaduna State, Nigeria

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ABSTRACT

Honey production in Nigeria continues to face challenges of low yield and inconsistent quality, largely due to the dominance of traditional beekeeping practices. In Igabi Local Government Area of Kaduna State, both modern and traditional hive technologies are in use; however, empirical comparisons of their performance remain limited. This study therefore examined differences in honey yield and profitability between modern and traditional bee hives, with the goal of identifying the more productive and economically viable system for enhancing apiculture in the area. A three-stage sampling procedure was used to select 120 beekeepers across five purposively chosen wards. One community was selected from each ward, followed by random selection of 24 respondents per community. Primary data were collected using semi-structured questionnaires and analyzed using descriptive statistics and budgetary techniques. Results indicated that beekeeping is predominantly practiced by males (70.83%), with most respondents aged 30–50 years (45%) and an average age of 41 years. The majority were married (69.17%), had household sizes of 5–8 persons (57.50%), and possessed primary education (50%). Beekeepers relied mainly on personal savings (71.67%) for financing, managed an average of 10 colonies, and had 14 years of experience. Modern hives produced higher quantities and better-quality honey than traditional hives. Budgetary analysis showed that honey production is profitable, with an average net income of ₦66,363.06 per respondent per colony annually. Major constraints included inadequate credit, theft, insecurity, declining forage resources, and bush burning. The study recommends cooperative formation, improved access to credit, strengthened security, and environmental conservation measures to enhance honey production.

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1.0 Introduction

According to Olagunju (2000) and Ayansola (2003), cited in Komolafe and Oseni (2007), beekeeping is the art of raising bees to produce all bee products that are useful to man in quantum: honey, beeswax, propolis, pollens, royal jelly, broods and venom. Apiculture does not depend directly on soil, and it can be a single means of living for families with very little or no soil. Beekeeping has made a significant contribution to the livelihood security of the poor and vulnerable communities, even without access to land (Sawtee, 2015). Bee farming is relatively cheap to manage, as the major production is undertaken by the bees, while the beekeeper harvests with a 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 decentralised 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). Apart from providing regular income to the family in terms of honey production, it offers a complementary source of income for farmers from crop pollination by increasing yield and quality (Sawtee, 2015). The potential benefits of honey are manifold.

Beekeeping has been identified as an important activity in the welfare of mankind (Ayeni *et al*., 2020). This is because of its significance not only in food production through its pollinating activities but also because of numerous economic products derived from it. Beekeeping can contribute to household livelihood through the provision of food and medicine and to national income when properly harnessed. In Nigeria, high social and economic importance is attached to honey, especially because of its dietary and medicinal value as well as it being a good substitute for sugar (Ajao *et a*l., 2014). The products from beekeeping are good foreign exchange earnings and are in high demand globally and, when carefully exploited, have contributed to the socio-economic uplift of impoverished farm families in the developing world (Wilson, 2006). Initially, local farmers harvested the honey from the wild, but today apiculture is a growing industry in many parts of the country (Adebiyi *et al*. 2004). The potential contributions of honeybee enterprise to poverty reduction and sustainable livelihoods, as well as meaningful contributions to the attainment of the Millennium Development Goals (MDGs), have been reported by several authors (Babatunde *et al*., 2007; Livestock and Wealth Creation, 2005).

Moreover, recent studies show that beekeeping remains one of the most affordable agricultural enterprises, requiring minimal capital while providing accessible livelihood and employment opportunities for rural households (Ejikeme and Ugwu, 2023a; Ijigbade et *al*., 2026).

Consequently, beekeeping is often promoted as being a pro-poor income-generating activity because it is accessible to marginalised members of local communities. However, recent studies confirm that beekeepers in developing tropical countries continue to face major constraints, particularly limited access to capital and inadequate technical assistance, which hinder productivity and adoption of improved practices (Tadele*et al*., 2025; Kashumba, 2025; Ali *et al*., 2024).

Other constraints facing beekeepers in African countries are inadequate information on suitable internal or external markets and relevant processing technologies for product diversification. Under these circumstances, development partners continue to play a central role in supporting beekeeping by funding projects that modernise traditional practices, provide training, and introduce apiculture into new areas (FAO, 2024; RMRDC, 2026; NAP-Nigeria, 2025).

The importance of beekeeping to society is enormous. For instance, Ojo (2004) describes the enterprise as a means of empowering youth economically because of its many advantages over other types of agricultural enterprises. The enterprise requires relatively low start-up capital, and most of the equipment used in both traditional and modern systems can be produced or sourced locally (FAO, 2020; Ejikeme and Ugwu, 2023b; Umaru and Ronald, 2024). Beekeeping requires very little land since hives can be placed on trees or simple stands and does not compete with other agricultural enterprises, as bees depend on naturally occurring nectar and pollen from surrounding vegetation (da Silva and Vic, 2024; Ngansou et *al*., 2025). Honey is not only priced as food but also as medicine for

healing many ailments (Shu'aibet et *al.,* 2009). The experiences of apiculturists in Europe and North America demonstrate that commercial apiculture is highly profitable, with strong markets for honey, hive products, and pollination services (Dimitrov *et al*., 2025; Berton et *al*., 2025; Oyerinde and Omara-Achong, 2021). 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). Nigeria has not evidently taken beekeeping as a great economic resource (Olagunju, 2000). Against this backdrop, the research was conceived with the objectives of examining the socio-economic characteristics of bee honey producers in the study area, comparing honey production from modern and traditional beehives, estimating the profitability of honey production and identifying the problems facing bee honey production in the study area.

2.0 Materials and Methods

2.1 Study Area

The study was carried out in the Igabi Local Government Area (LGA) of Kaduna State. It has its headquarters in Turunku. The local government is bounded in the east by the Kaduna North local government area, in the south by the Chikun local government area, and in the west by the Kaduna South local government area. Igabi LGA covers an area of about 1,864 km² and lies between the latitudes and longitudes 10^0 N and 48´N and 7^0 42´E. The climate is marked by a rainy season and a dry season. The climatic condition of the area reflects a typical tropical savanna (Aw) pattern, characterised by a hot wet season and a dry harmattan period occurring between November and January. Recent climate records indicate that Igabi receives an average annual rainfall of about 881 mm, while temperatures generally range from 22 °C to 30 °C, with extremes dropping to around 11 °C during harmattan and rising to nearly 40 °C in the hottest months (Climate-Data.org, 2024; Copernicus Climate Change Service, 2024). Igabi LGA comprises several administrative wards, including Hayin Rigasa, Rigachikun, Barakallahu, Hayin Mallam Bello, Mando, Birnin Yero, Sabon Birni, Turunku, Afaka, Jaji, and Igabi town. The area is ethnically diverse, with Hausa, Fulani, and Gbagyi forming the dominant population groups, alongside smaller minority communities (Kaduna State Bureau of Statistics, 2023). Economic activities in the LGA are varied, with residents engaged primarily in agriculture, trading, transportation services, military and paramilitary employment, and civil service occupations. Educational infrastructure in the area includes both government-owned and privately operated primary and secondary schools, reflecting the area's expanding population and urban influence. Agriculturally, the people cultivate major staple crops such as maize, beans, groundnut, rice, millet, sorghum, yam, and cassava, while livestock production includes sheep, goats, cattle, poultry, rams, and swine (Suleiman and Olukotun, 2019; Idris and Dahiru, 2023). These agricultural activities remain central to livelihoods and are supported by the region's savanna ecology and expanding agricultural land use.

2.2 Methods of Data Collection

Three-stage sampling techniques were used to select respondents for the study. The first stage entailed purposive selection of five wards that have a history of honey production in the LGA. One community was selected from each of the wards due to the large number of honey producers; this formed the second stage of sampling. The third stage involved random selection of 24 respondents from each community to make a total sample size of 120 respondents used for the study. Data were collected from the respondents with the aid of a semi-structured questionnaire designed to capture the objectives of the study. The questionnaires were administered to the respondents by the personal interview method. More information was collected from the respondents by probing. Data were collected on socio-economic variables such as sex, age, occupation, marital status, education level and experience, and also on inputs and outputs of honeybee production.

2.3 Data Analysis

The primary data collected were subjected to budgetary analysis in order to estimate the profitability of honey production. Data involving socio economic variables were presented with descriptive statistics namely mean, frequency distribution, table and percentages.

The budgeting technique is presented below:

$TC = \text{TVC} + \text{TFC}$..... equation 1

Where TC = Total cost of production (₦), TVC = Total variable cost (₦), TFC = Total fixed cost (₦). Fixed assets such as cutlasses, knives, rain boots, smoker, extractor buckets etc were depreciated with straight line method of depreciation.

$D = \text{Oc} - \text{Sv}/\text{N}$ (2)

Where D= Annual depreciation, Oc= Original cost of fixed assets (₦), Sv= Salvage or Scrap value (₦) and N = Life expectancy of the asset in years

The net income of honey production was obtained by removing the total cost from gross revenue:

$NI = \text{GR} - \text{TC}$ (3)

Where NI = Net Income (₦), GR = Gross Revenue (₦) which was obtained by:

$GR = \text{QHPM} * \text{PL} + \text{QHPT} * \text{P}$ (4)

Where Q_{HPM} = Quantity of honey produced in liters from modern bee hives

Q_{HPT} = Quantity of honey produced in liters from traditional bee hives,

P_L = Price per liter of honey (₦).

3.0 Results and Discussion

3.1 Socioeconomic Characteristics of the Respondents

Table 1

Socio-Economic Characteristics of the Respondents

Variable	Frequency	Percentage (%)	Mean
Gender			
Male	85	70.83	
Female	35	29.17	
Age			
10-30	33	27.50	
30-50	54	45.00	
50-70	25	20.83	
70-90	8	6.67	
Mean			**41**
Marital status			
Single	29	24.17	
Married	83	69.17	
Divorced	3	2.50	
Widow	3	2.50	
Widower	2	1.67	
Family size			
1-4	37	30.83	
5-8	69	57.50	
9-12	14	11.67	
Mean			**6**
Educational level			
Primary	60	50.00	
Secondary	30	25.00	
Tertiary	5	4.17	
Qur'anic	25	20.83	
Number of Hives			
1-5	18	15.00	
6-10	55	45.83	
11-15	39	32.50	
16-20	8	6.67	
Mean			**10**
Sources of Finance			
Personal savings	86	71.67	
Bank loan	6	5.00	
Family and friends	28	23.33	
Years of experience			
1-10	46	38.33	
11-20	56	46.67	
21-30	18	15.00	
Mean			**13**

Source: Computed from Field Survey Data, 2023

The socio-economic variables of the respondents presented in Table 1 showed that 70.83% of the honey producers are males and 29.17% are females. This indicated that males are more into honey production than females in the study area. This agreed with the findings of Tijani *et al.* (2011), who found that 90% of the beekeepers were male and 10% female. The low participation of the female gender in beekeeping could be attributed to fear of being stung by the bees. A similar report was made by Amadi et *al.* (2019). This result opposed the finding of Okoye and Agwu (2008) and Ukanyirioha et al. (2024) in Plateau State that beekeeping is traditionally gender-specific, involving only male members of the household. The age distribution revealed that 45% of the honey producers are within 30-50 years, 27.50% and 20.83% are within 10-30 and 50-70 years, respectively, and only 6.67% are found between 70 and 90 years. The average age of the respondents was 41 years; this figure shows that most of the beekeepers were in their active and productive ages. The marital status showed that 69.17% were married and 24.17% were single. 2.50% each are divorced and widowed, while only 1.67% are widowers.

The highest family size of 57.50% was found between 5 and 8 family members. 30.83% and 11.67% had family sizes between 1-4 and 9-12, respectively. The average family size among the respondents was 6. This revealed that the respondents have moderate family sizes, which could be a source of labour for the beekeeping business. In terms of educational level, more than half (79.17%) of the respondents were educated at primary (50%), secondary (25%), and tertiary (4.17%), respectively. Only 20.83% have Qur'anic education. According to Adedapo et *al.* (2010) in

Southwest Nigeria, more than half (60%) of beekeepers had tertiary education, while Onyekuru et *al*. (2010) in the Nsukka Local Government Area of Enugu State, Nigeria, reported that the majority of beekeepers had secondary education. The level of educational attainments by the beekeepers determines to a large extent the level of adoption of innovation in beekeeping and efficient use of resources for better income (Amaza, 2000; Amaza and Maurice, 2005). The number of hives owned by the beekeepers showed that 45.83% had 6-10 hives, 32.50% had 11-15 hives, and 15% had 1-5 hives, respectively. Only 6.67% had between 16 and 20 beehives. The average number of bee hives owned per beekeeper was 10. The number of colonies owned by the beekeepers will determine the profit generated from the business, assuming all other factors remain constant.

Personal savings accounted for the highest sources of finance (71.67%) for the beekeeping business. 23.33% of the beekeepers obtained their finances from friends and family; only 5.00% obtained their finances through a bank loan. The data shows that personal saving is the major source of finance for the beekeepers; this will reduce the scale of operation of the business and constrain the beekeepers to operate at a small scale. The highest years of experience acquired by 46.67% of the respondents in beekeeping fall within 11-20 years. 38.33% of the respondents have between 1 and 10 years of experience, while 15.00% have between 21 and 30 years of experience. The average years of experience were 13 years. This indicates that a significant number of beekeepers possess extensive experience in the beekeeping industry. The report is contrary to the findings of Bifarin*et al*. (2008), which stated that 75% of the beekeepers sampled had fewer than 5 years of experience. However, the higher the number of years spent in beekeeping, the more the skills and experience gathered and the more the awareness of new techniques in bee farming, thereby increasing the level of productivity.

3.2 Comparison of Honey Production Yields from Modern and Traditional Bee Hives

Figure 1

Picture of Mounted Traditional Bee Hive

Figure 2

Picture of Mounted Modern Bee Hive

According to the respondents, the Traditional Bee Hives (TBH) (Fig. 1) produce less honey than Modern Bee Hives (MBH) (Fig. 2) and have a life span of one to two years if properly handled. The MBH, under proper management, has an average life span of 4–8 years and produces more honey for a longer period (2–3 litres of honey every three months for Kenyan hives and up to 10 litres for Langstroth hives if a queen excluder is provided in the hive). The honey produced by TBH is usually of low quality because of the method of harvesting. Fire is used to harvest, killing most bees, reducing their population, and causing the queen to flee. Also, other by-products, like propolis, royal jelly, and bee venom, cannot be obtained from TBH. Honey from traditional beehives is usually a mixture of ripe and unripe honeycombs (i.e., broods with high water content), beeswax, dead bees, and other debris (Bradbear, 2009). However, such practices may affect the quality when compared with honey from MBH. According to MAAIF (2012), good-quality honey must be clean and clear—no dirt, dead bees, wax, dust, splinters of wood, or ashes; it must also have a good colour, taste, smell, and low water content. Smoke is used to calm the bees down during the inspection of hives, management and harvesting of honey from MBH; this technique preserves the lives of the bees and the quality of the honey produced and other by-products. However, the honey produced from MBH has high viscosity and is purer than honey obtained from TBH. According to Babarinde et *al.* (2011), honey harvested from MBH was better in terms of physical attributes, physicochemical composition, microbial activities, and bacterial and yeast counts as compared with honey from TBH. However, TBH and MBH honey are sold at the same price because customers often can't tell the difference. The result in Table 2 showed that an average of 14 litres of honey per colony was produced from traditional beehives (TBH) in a year, as compared to an average of 22 litres of honey produced per colony from modern beehives over the same period of time. This confirmed the claims of the respondents above that modern beehives produce more honey than traditional beehives.

3.3 Budgetary Technique of Bee Honey Production

Table 2
Budgetary Analysis of Bee Honey Production

Variables	**Quantity of honey produced/ litters**	**Price per litter of honey (₦)**	**Revenue**
Modern bee hives	22	3,500	77,000
Traditional or local bee hives	14	3,500	49,000
Total quantity of honey produced	36	3,500	126,000
A. Total revenue			126,000
B. Variable inputs	**Cost (₦)**	**Percentage (%)**	
Transportation cost	8,000	33.33	
Labour cost	12,000	50.00	
Cost of baiting	1,200	5.00	
Matches	200	0.83	
Processing cost	2,600	10.83	% of TC
C. Total variable cost (TVC)	**24,000**		**40.24**
D. Fixed Inputs			
Modern bee hive	14,950.05	41.95	
Traditional or local bee hive	7,845.25	22.01	
Bee suit	1,500	4.21	
Hive openers	225	0.63	
Cutlass	1,166.66	3.27	
Knife	666.66	1.87	
Rain boot	833.33	2.34	
Smoker	1,500	4.21	
Extractor	5,000	14.03	
Bucket	750.00	2.10	
Sieve	600	1.68	
Funnel	133.33	0.37	
Muslin cloth	166.66	0.47	
Bee Brush	300	0.84	
E. Total Fixed Cost (TFC)	**35,636.94**		
F. Total Cost (TC= TVC+ TFC (C+E)	**59,636.94**		**59.76**
Net Profit (TR-TC) (A-F)	66363.06		

Source: Computed from Field Survey Data, 2023

The budgetary technique of bee honey production in Table 2 shows the various cost items, both variable and fixed, including the total cost, the quantity of honey produced, and the return generated. The total variable cost and total fixed cost of production recorded ₦ 24,000 and ₦ 35,636.94, this sums up to ₦ 59,636.94

the total cost of production. The cost of labour is the most important variable; it represents half (50%) of the total variable cost. This evidence corroborates the findings of Tijani *et al*. (2011), which stated that labour costs accounted for the largest proportion of the total variable costs. Transportation and the cost of baiting formed 33.33% and 5% of the total variable costs, respectively. The cost of processing constituted 10.83%; this cost formed the cost of materials used in the processing of honey. The cost of matches constituted the smallest portion, at 0.83%, of the total variable cost. In terms of the fixed cost, the cost of a modern and a traditional or local beehive constituted the highest fixed cost of 41.95% and 22.01%. The results indicated that the cost of the beehive consumed the largest proportion of the total fixed cost; a similar report was given by Tijani *et al*. (2011). The beehive cost was followed by the cost of the extractor (14.03%); the bee suit and smoker had an equal value of 4.21%. Fixed assets, such as cutlasses, rain boots, buckets, knives, and sieves, formed 3.27%, 2.34%, 2.10%, 1.87%, and 1.68%, respectively, of the fixed cost. Others, like bee brushes, hive openers, muslin cloths, and funnels, comprised 0.84%, 0.63%, 0.47%, and 0.37%, respectively. The total fixed cost and total variable cost accounted for 40.24% and 59.76% of the total cost of honey production. To boost honey production, we should concentrate more on enhancing the variable inputs, particularly the number of bee hives. A total revenue of ₦ 126,000 was obtained by selling 14 litters and 22 litters of honey from traditional and modern bee hives at a unit price of ₦ 3,500. The results indicated that the bee honey production was profitable, with a net value of ₦ 66,363.06 per respondent, per colony, per annum. With 10 average numbers of colonies per beekeeper, it means that the beekeeper will be gaining ₦ 663,630.60, which translates to ₦ 55,302.55 per month. The results agreed with the findings of Babatunde *et al*. (2007), Tijani *et al*. (2011), Onyekuru et *al*. (2010) and Aiyeloja et *al*. (2010) that honey production is a profitable business. The income obtained by the beekeepers will increase with an increased number of hives/colonies. It should be noted that the honey production from a modern beehive is more profitable because it produces more honey (22 litres) within a year than a traditional beehive, which produces 14 litres over the same period of time.

3.4 Problem of Bee Honey Production

Table 3
Problems of Bee Honey Production

Problems	*Frequency	Percentage
Decreasing bee forage area	60	11.28
High cost of bee keeping equipment	45	8.46
Pest, predator and pesticide threat	15	2.82
Lack of trained man power	20	3.76
Inadequate credit facilities	77	14.47
Theft	70	13.16
Absconding of bee	35	6.58
Insecurity	68	12.78
Inadequate improved technologies	27	5.08
Bee aggressiveness	55	10.34
Bush burning/ deforestation	60	11.28
Total	**532**	**100**

Source: Computed from Field Survey Data, 2023
*Multiple responses

Problems facing honey production were identified on Table 3. Eleven problems were listed; the most prominent among the problems was inadequate credit facilities, which limit the ability of beekeepers to purchase modern inputs to increase the level of production. These findings confirmed the study of Tijani *et al*. (2011), which opined that inadequate credit to purchase the necessary inputs for beekeeping was a major problem. Inadequate credit is a prominent problem affecting the use of improved technologies by farmers because adoption requires extra resource commitment that can only be met through the acquisition of credit facilities (Ouma et *al*. 2006). The next issue is theft, which accounts for 13.16% of the problems reported. Respondents reported that thieves often harvest their honey, and in many cases, they take away the entire colony. The problem of insecurity, which occupied 12.78%, could be a result of banditry, kidnappings, and insurgencies, which have become general problems, especially in the northern part of Nigeria. This problem of insecurity also limits the

activities of beekeepers in accessing their colony. The issue of decreasing bee forage area, which may result from bush burning and/or deforestation, accounts for 11.28%. Bees' aggressiveness and ability to sting accounted for 10.34% of the problems, according to the respondents. The high cost of beekeeping equipment, the absconding of bees from hives, inadequate access to improved technologies, and the lack of trained manpower accounted for 8.46%, 6.58%, 5.08%, and 3.76% of the problems, respectively. The problem of pests, predators, and pesticides has a minimum value of 2.85%.

4.0 Conclusion

From the results observed, it can be concluded that the majority of beekeepers in the study area were males, married, with an average age of 41 years and a moderate family size of 5-8 members. They have a primary school education, personal savings as a major source of finance, an average of 10 hives and an average of 13 years of experience. The modern beehives produce more quantity and quality honey within a year than traditional beehives. Beekeeping was found to be profitable in the study area, allowing the beekeeper to obtain a reasonable income with possibilities of a further increase in output and farm income. The problems facing honey production are inadequate credit facilities, theft, insecurity, a declining bee forage area, bush burning, and bee aggression—defensive behaviour aimed at protecting their colony, not typically an unprovoked attack. Additional challenges include the high cost of beekeeping equipment, the tendency of bees to abscond, insufficient access to improved technologies, a shortage of trained manpower, and threats from pests, predators, and pesticides.

5.0 Recommendations

Based on the outcome of the study, it is recommended that beekeepers should come together and form cooperative societies to enable them to pool their resources together and also to obtain credits from government and financial institutions for better funding of the business. The government should address the issue of insecurity to create a safe environment for beekeepers to operate. Bush burning and deforestation should be discouraged, and afforestation encourages providing more forage resources and enabling environments for the bees to thrive. The government and non-governmental organisations should provide subsidised, accessible modern beekeeping equipment to ensure affordability for beekeepers. The extension agents should be well trained on the modern practice of beekeeping and equipped with the necessary innovations and methods required to teach and guide beekeepers to be more efficient in beekeeping and honey production.

6.0 Declaration of Conflicting Interests

The authors declare no conflict of interest.

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