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# TRADITIONAL METHODS OF BEEKEEPING AND HONEY PRODUCTION AMONG SMALL HOLDER FAMERS IN NASARAWA STATE NIGERIA

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**ABSTRACT**

Beekeeping is the art of rearing, breeding and managing honeybee colonies in artificial hives for economic gains leading to the production of valuable materials such as honey, bee wax, bee pollen, bee venom and royal jelly. Unfortunately, these enormous potentials are bedeviled with complicated constraints including the use of traditional bee hives, fire as a traditional practice in honey collection (harvesting) technique which reduces the quality and the quantity of honey and its products. This study assessed the traditional beekeeping methods in Nasarawa State, Nigeria, focusing on socio-economic characteristics, practices, constraints, and productivity. A survey of 150 beekeepers across five Local Government Areas (LGAs)—Nasarawa Eggon, Doma, Lafia, Kokona, and Wamba—revealed that beekeeping is predominantly male-dominated, with most practitioners aged 21–30 years. Log hive was dominant in Wamba, 90%, followed by Kokona, 80% and 56.7% in Doma while skep was higher in Lafia, 56.7%. The findings further indicate that Wamba produced the highest honey yields (21–25 litters/hive). Major constraints included theft, diseases, deforestation, and capital limitations, while government policies were perceived to be neutral. Beekeeping significantly enhanced livelihoods, with 76.7–86.7% of respondents reporting improved living standards. The study concludes that there is considerable potential to enhance beekeeping productivity and sustainability through interventions such as the introduction of improved beehive technologies, access to credit, training in modern apiculture practices, and stronger institutional support. Such measures could strengthen beekeeping as a viable and sustainable income source for rural communities in Nasarawa State and similar regions in Nigeria.

**Keywords**: Traditional beekeeping, Honey production, Smallholder farmers, Constraints, Livelihood, Nasarawa State, Nigeria

## INTRODUCTION

Beekeeping is the art of rearing, breeding and managing honeybee colonies in artificial hives for economic gains (Shu'aib *et al.*, 2009), which leads to the production of valuable materials such as honey, bee wax, propolis, bee pollen, bee venom and royal jelly (Oladimeji 2018). Agriculture is one of the oldest profession in the world, from creation to date the profession has undergone various metamorphosis from food gathering to organizing of agricultural practices which require man to select crops and animal for domestication and rearing. Collecting honey from the wild is one of the early agricultural activities (Ibrahim *et al*., 2022).

Beekeeping plays a significant role in Nigeria and it is a possible alternative to smallholder farmers in livelihood sustainability (Chigbo *et al.,* 2020). It is practiced by households at low scale of production using mainly traditional hives, making use of traditional methods of harvesting and processing resulting in low output and poor quality of honey (Abdullahi *et al.,* 2014).

Nigeria has a high potential for producing honey and other hive products (both for local consumption and export) due to its varied ecological conditions, climatic conditions and rich plant diversity (Ahaotu and Nwachukwu, 2014). But unfortunately, this enormous potential is bedevilled with complicated constraints (Chigbo *et al.*, 2020). Although, Ayelew (2001) has posited that the aggressive nature of bees is an aversion to participation in beekeeping, several social economic factors has also been identified (Babatunde *et al.*, 2007; Otim *et al.*, 2018; Oladimeji, 2018; Chemwok *et al.*, 2019) as influences to beekeeping and productivity of honey and other hive products (bee wax, royal jelly, bee venom and propolis extract).

In most rural communities in Nasarawa state for instance, bee keeping is practiced by farmers who do not have any form of formal training and as a result the farmers encounter some challenges in their production activities resulting in low hive productivity (Ukanyirioha *et al*., 2022). A study to identify these constraints and socio economic determinants of bee keeping in Nasarawa state is therefore necessary. Knowledge of socioeconomic determinants of beekeeping as an enterprise could be valuable to policy makers in designing effective strategies and making feasible policies (Ottim *et al.,* 2018) that can increase participation in honey production, increase production scale and innovation thereby increasing the household income and contribution to national GDP.

## MATERIALS AND METHODS

### Study Area

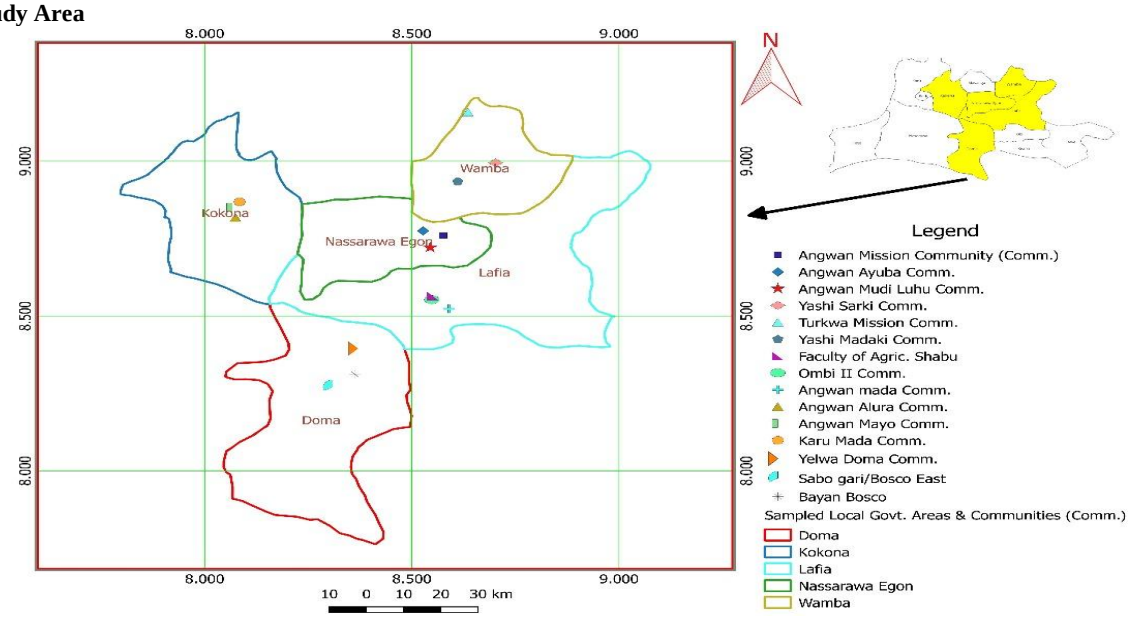


Figure 1: Map of Nasarawa State Showing the Study Area

### Experimental Design

A multistage sampling technique was used to select the study location and the respondents. In the first stage, five (5) Local Government Areas (Nasarawa Eggon, Doma, Lafia, Kokona and Wamba Local Government Areas) were selected. In each Local Government Area, three (3) communities were selected and from each community, ten (10) beekeepers were selected as respondents. Therefore the population of respondents was 150.

### Data Collection

Using a structured questionnaire, information on socioeconomic characteristic of the respondent which includes age, gender, years involved in beekeeping, occupation, marital status, educational background, income and others were gathered. Also information on traditional knowledge of beekeeping and honey production in Nasarawa State were obtained. The number of days taken for each hive to start colonizing; number of days taken for each hive to be fully colonized and matured for harvest and the quantity (Litre) of honey obtained from each hive after harvest. The data obtained from the survey was collated and subjected to descriptive statistics using frequencies and percentages and represented in tables.

## RESULTS AND DISCUSSION

### Socio-economic Characteristic of the Respondents

The results of the socio-economic characteristics in table 1 show a male dominance in beekeeping across all LGAs, with percentages above 70 % in Doma and above 90 % Faculty of Agriculture. This aligns with studies by Adgaba *et al.,* (2022), who found that beekeeping is predominantly male-dominated in sub-Saharan Africa due to cultural and labor-intensive factors. Female participation was minimal, suggesting a need for gender-inclusive interventions to empower women in apiculture. Furthermore, the pronounced gender disparity observed (76.7–96.7% male dominance) aligns with global patterns where cultural norms restrict women's access to land-based enterprises (Njoroge *et al.,* 2017). The exception in Nassarawa Eggon (56.7% male) may reflect evolving gender dynamics or niche cultural acceptance, warranting ethnographic study. The predominance of the 21–30 age cohort (20–66.7%) signals youth engagement potential, contrasting with aging farmer populations in African agriculture (FAO, 2022). However, the significant >50 representation in Doma (20%) indicates intergenerational knowledge transfer—a critical asset for traditional apiculture (Gebretinsae *et al.,* 2021).

Age distribution showed that most beekeepers (21–30 years) are in their productive years, which is consistent with findings by Ajao *et al*., (2021) who noted that younger farmers are more likely to adopt modern beekeeping techniques while (Sa'aondo *et al.,* 2024) found out that 21 – 30 years are the most productive age group within the study area. However, older beekeepers (>50 years) were also active, particularly in Lafia LGA, indicating intergenerational knowledge transfer.

Marital status revealed that most respondents were married, which could imply household stability and family labor support in beekeeping activities. Religion and language varied by LGA, with Islam and Hausa being predominant in some areas, while Christianity and English/Pidgin were more common in others. This diversity reflects the cultural heterogeneity of the study area. Religious affiliation patterns (e.g., 90% Islam in Doma and 96.7% Christianity in Kokona) correlate with method adoption: Muslim-majority LGAs showed higher traditional method use (76.7–96.7%), possibly reflecting adherence to traditional practices. This echoes findings in Northern Ethiopia where religious identity influenced beekeeping technology choices (Gidey and Mekonen, 2020). Linguistic diversity, particularly Lafia's 36.7% other languages, suggests ethnic heterogeneity potentially impacting extension service design, as language barriers hinder knowledge adoption (Mwangi *et al.,* 2021).

**Table 1: Socio-Economic Characteristic of the Respondents**

| | Doma | | Kokona | | Lafia | | Nas. Eggon | | Wamba | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Indices** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| **Gender** | | | | | | | | | | |
| Male | 23 | 76.7 | 28 | 93.3 | 29 | 96.67 | 17 | 56.7 | 28 | 93.3 |
| Female | 7 | 23.3 | 2 | 6.7 | 1 | 3.33 | 13 | 43.3 | 2 | 6.7 |
| **Total** | **30** | **100** | **30** | | **30** | **100.00** | **30** | **100** | **30** | **100** |
| **Age** | | | | | | | | | | |
| <20 | 7 | 23.3 | 2 | 6.7 | 6 | 20.00 | 9 | 30 | 6 | 20 |
| 21-30 | 13 | 43.3 | 20 | 66.7 | 11 | 36.67 | 8 | 26.70 | 15 | 50 |
| 31-40 | 2 | 6.7 | 6 | 20 | 5 | 16.67 | 5 | 16.70 | 5 | 16.7 |
| 41-50 | 2 | 6.7 | 1 | 3.3 | 4 | 13.33 | 8 | 26.70 | 2 | 6.7 |
| >50 | 6 | 20 | 1 | 3.3 | 4 | 13.33 | | | 2 | 6.7 |
| **Total** | **30** | **100** | **30** | **100** | **30** | **100.00** | **30** | **100** | **30** | **100** |
| **Marital Status** | | | | | | | | | | |
| Single | 1 | 3.3 | 28 | 93.3 | 10 | 33.33 | 15 | 50.0 | 26 | 86.7 |
| Married | 29 | 96.7 | 2 | 6.7 | 20 | 66.67 | 15 | 50.0 | 4 | 13.3 |
| Total | 30 | 100 | 30 | 100 | 30 | 100.00 | 30 | 100.0 | 30 | 100 |
| **Religion** | | | | | | | | | | |
| Christianity | 3 | 10 | 29 | 96.7 | 3 | 11.11 | 15 | 50.0 | 29 | 96.7 |
| Islam | 27 | 90 | 1 | 3.3 | 27 | 88.89 | 15 | 50.0 | 1 | 3.3 |
| Total | 30 | 100 | 30 | 100 | 30 | 100.00 | 30 | 100.0 | 30 | 100 |
| **Language Spoken** | | | | | | | | | | |
| Hausa | 28 | 93.3 | 2 | 6.7 | 15 | 50.00 | 8 | 26.70 | 2 | 6.7 |
| English | 2 | 6.7 | 14 | 46.7 | 1 | 3.33 | 11 | 36.70 | 16 | 53.3 |
| Pidgin | | | 14 | 46.7 | 3 | 10.00 | 10 | 33.30 | 12 | 40 |
| Others | | | | | 11 | 36.67 | 1 | 3.30 | | |
| **Total** | **30** | **100** | **30** | **100** | **30** | **100.0** | **30** | **100.0** | **30** | **100** |

Table 2 indicates a significant proportion of beekeepers; 70% in Doma, 60% in Lafia had over 20 years of experience, suggesting long-term engagement in the trade. This finding is supported by Gebretsadik and Negash (2023), who highlighted that experienced beekeepers tend to achieve higher productivity due to accumulated knowledge. Beekeeping was largely inherited (e.g., 96.7% in Kokona and Wamba), emphasizing its traditional roots. However, Lafia had a lower inheritance rate (23.3%), possibly due to newer entrants into the practice. The dominance of traditional methods as shown in Figure 2 aligns with Muli *et al*., (2022), who found that traditional beekeeping remains widespread in rural areas due to cost constraints, though modern methods improve yield and efficiency. In addition, the inverse relationship between experience (>20 years: Doma 70%, Lafia 60%) and modern method adoption (Doma 10%, Lafia 63.3%) reveals a paradox. Lafia's outlier status suggests exposure to external interventions, possibly through its urban character. The dominance of log hives (Wamba 90%) and skeps (Lafia 56.7%) confirms the persistence of Intermediate Technology in African apiculture (Muli *et al.*, 2018), though colony destruction during harvest remains a constraint (Bradbear, 2020).

Honey yields varied, with Wamba producing the highest quantities (21–25 liters/hive) which verify Wamba as a long time hotspot for honey production in Nasarawa state, this correlates with studies by Nuru *et al*., (2021). Most beekeepers sold honey at mid-range prices (e.g., 76.7% in Doma at price range N6,000), indicating stable market demand. However, Lafia had a higher proportion of premium-priced sales (66.7% at price range N5, 000), possibly due to better market access and higher demand. Initial capital requirements varied, with Doma requiring moderate investments while Wamba had higher thresholds. This reflects disparities in resource availability and scale of operations, as noted by Otieno *et al*., (2023). Beekeeping significantly improved living standards, corroborating the findings by Kasina *et al*., (2021) in Kenya. However, spoilage was a minor issue with most beekeepers reporting no spoilage, likely due to effective preservation techniques.

**Table 2: Status of Bee Keeping in Nasarawa State**

| **Indices** | **Doma** | | **Kokona** | | **Lafia** | | **Nas. Eggon** | | **Wamba** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| **How long you practicing honey? (in years)** | | | | | | | | | | |
| 1-5 | 2 | 6.7 | 4 | 13.3 | 3 | 10 | 1 | 3.3 | 5 | 16.7 |
| 6-10 | 1 | 3.3 | 2 | 6.7 | 1 | 3.3 | 3 | 10.0 | 4 | 13.3 |
| 11 - 15 | 2 | 7.4 | 3 | 10.3 | 1 | 8.3 | 4 | 15.4 | 2 | 6.9 |
| 16-20 | 4 | 14.8 | 5 | 17.2 | 7 | 58.3 | 18 | 69.2 | 6 | 20.7 |
| > 20 | 21 | 70.0 | 16 | 53.3 | 18 | 60 | 4 | 13.3 | 13 | 43.3 |
| **Total** | **30** | **100.0** | **30** | **100.0** | **30** | **100** | **30** | **100.0** | **30** | **100.0** |
| **Do you inherit honey?** | | | | | | | | | | |
| yes | 27 | 90 | 29 | 96.7 | 12 | 40 | 26 | 86.7 | 29 | 96.7 |

| Indices | Doma | | Kokona | | Lafia | | Nas. Eggon | | Wamba | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| no | 3 | 10 | 1 | 3.3 | 18 | 60 | 4 | 13.3 | 1 | 3.3 |
| **Total** | **30** | **100** | **30** | **100** | **30** | **100** | **30** | **100** | **30** | **100.0** |
| **Full time or part time?** | | | | | | | | | | |
| Full Time | 27 | 96.7 | 29 | 96.7 | 27 | 90 | 30 | 100 | 29 | 96.7 |
| Part Time | 3 | 3.3 | 1 | 3.3 | 3 | 10 | | | 1 | 3.3 |
| **Total** | **30** | **100.0** | **30** | **100.0** | **30** | **100** | **30** | **100** | **30** | **100.0** |
| **Local method of bee keeping?** | | | | | | | | | | |
| Clay Pot | 1 | 3.3 | 1 | 3.3 | 12 | 40 | | | 1 | 3.3 |
| Logs | 17 | 56.7 | 24 | 80 | 1 | 3.3 | 14 | 46.7 | 27 | 90.0 |
| Skep | 12 | 40 | 5 | 16.7 | 17 | 56.7 | 16 | 53.3 | 2 | 6.7 |
| **Total** | **30** | **100** | **30** | **100** | **30** | **100** | **30** | **100** | **30** | **100.0** |


Figure 2: Showing Traditional Bee Hives in the Study Area

Colonization timelines (7–8 weeks: Wamba 66.7%) exceed the 4–6 week global optimum as earlier reported by (Human *et al.,* 2023), indicating ecological stressors. The peak setup in May–June (Wamba 63.3%) coincides with nectar flows from Acacia spp., aligning with phenological studies in Nigerian savannas (Oyerinde and Adekola, 2021). Yield differentials (21–25L/hive: Wamba 63.3% vs. Lafia 23.3%) correlate with method modernity—a trend documented in Kenya where modern hives increased yields by 300% as earlier reported by Chemurot *et al.,* (2022). However, the minimal spoilage reported in Lafia (96.7 % "no") challenges perceptions of African honey perishability, suggesting endogenous preservation knowledge as indicated in table 3.

**Table 3: Periods and Duration of Bee Keeping Activities**

| Indices | Doma | | Kokona | | Lafia | | Nas. Eggon | | Wamba | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Set up time of the year | | | | | | | | | | |
| Jan - Feb | 2 | 6.7 | 2 | 6.7 | 6 | 20.0 | 4 | 13.3 | 1 | 3.3 |
| Mar - April | 15 | 50.0 | 6 | 20.0 | 4 | 13.3 | 9 | 30.0 | 4 | 13.3 |
| May - June | 10 | 33.3 | 17 | 56.7 | 5 | 16.7 | 8 | 26.7 | 19 | 63.3 |
| July -Aug | 3 | 10.0 | 4 | 13.3 | 9 | 30.0 | 4 | 13.3 | 4 | 13.3 |
| Nov - Dec | | 0.0 | 1 | 3.3 | 6 | 20.0 | 5 | 16.7 | 2 | 6.7 |
| **Total** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** |
| Fully colonize hive takes how long? (weeks) | | | | | | | | | | |
| 1-2 | 1 | 3.3 | 1 | 3.3 | 7 | 23.3 | | 0.0 | 2 | 6.7 |
| 3-4 | 2 | 6.7 | 3 | 10.0 | 16 | 53.3 | 5 | 16.7 | | 0.0 |
| 5-6 | 13 | 43.3 | 7 | 23.3 | 6 | 20.0 | 14 | 46.7 | 6 | 20.0 |
| 7-8 | 11 | 36.7 | 16 | 53.3 | 1 | 3.3 | 7 | 23.3 | 20 | 66.7 |
| 9-10 | 3 | 10.0 | 3 | 10.0 | | 0.0 | 4 | 13.3 | 2 | 6.7 |
| **Total** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** |
| How long before first harvest after set up? (months) | | | | | | | | | | |
| 1-2 | 3 | 10.0 | 4 | 13.3 | 6 | 20.0 | | 0.0 | 1 | 3.3 |
| 3-4 | | 0.0 | | 0.0 | | 0.0 | 1 | 3.3 | | 0.0 |
| 5-6 | 16 | 53.3 | 7 | 23.3 | 18 | 60.0 | 18 | 60.0 | 10 | 33.3 |
| 7-8 | 10 | 33.3 | 16 | 53.3 | 5 | 16.7 | 7 | 23.3 | 17 | 56.7 |
| 9-10 | 1 | 3.3 | 3 | 10.0 | 1 | 3.3 | 4 | 13.3 | 2 | 6.7 |
| **Total** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** |

Table 4 shows that in Wamba, a striking 63.3% of beekeepers get between 21 to 25 liters of honey from each hive. This is a strong yield, suggesting that conditions in Wamba—whether due to flora, climate, or beekeeping methods—are particularly favorable. However, in Doma, the story is different: 43.3% of beekeepers harvest only 1-5 liters per hive. This low yield points to potential challenges, such as less productive forage, older traditional hive types that are harder to manage, or higher pest pressure. These findings align with broader patterns in Nigeria, where honey yield per colony varies drastically based on ecology and technology, often ranging from as low as 3 kg to over 20 kg per hive annually as earlier reported by (Faleye *et al.*, 2021).

The annual production totals reveal the scale of these beekeeping operations. Wamba still stood out, with all surveyed beekeepers producing more than 200 liters of honey per year. This indicates that beekeepers in Wamba aren't just getting good yields per hive; they are also managing multiple hives, treating it as a more substantial commercial activity. On the other end in Nasarawa Eggon, 80% of beekeepers produce between 51-100 liters annually, and in Doma, 46.7% produce less than 50 liters. This suggests that in these areas, beekeeping is often a smaller-scale, supplementary livelihood rather than a primary business. This variation mirrors findings from Kenya, where the scale of production is a key determinant of whether beekeeping significantly contributes to household income, with small-scale producers often remaining in subsistence mode as reported by (Munyuli, 2016).

On how much honey beekeepers have in storage (quantity at hand), Kokona and Wamba, had majority of beekeepers (60% and 63.3%, respectively) reported having 51-100 liters in stock. This could mean they are producing consistently and may store honey to sell in larger batches or during off-seasons for better prices. Conversely, in Doma and Lafia, over half of the beekeepers have less than 50 liters stored, which might indicate they sell their honey quickly after harvest, possibly due to immediate cash needs or limited storage facilities. Effective post-harvest handling and storage are critical constraints in many African apiculture systems, as improper storage can lead to spoilage and lost income in line with the findings of (Mazorodze and Mwanyambo, 2022).

**Table 4: Honey Harvesting Indices**

| | Doma | | Kokona | | Lafia | | Nas eggon | | Wamba | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Indices** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** |
| **What honey quantity per hive (litters)** | | | | | | | | | | |
| 1-5 | 13 | 43.3 | 1 | 3.3 | 3 | 10.0 | 4 | 13.3 | 1 | 3.3 |
| 6-10 | 2 | 6.7 | 8 | 26.7 | 4 | 13.3 | 3 | 10.0 | 2 | 6.7 |
| 11-20 | 8 | 26.7 | 16 | 53.3 | 5 | 16.7 | 7 | 23.3 | 5 | 16.7 |
| 21-25 | 7 | 23.3 | 5 | 16.7 | 7 | 23.3 | 7 | 23.3 | 19 | 63.3 |
| 26-30 | | 0.0 | | 0.0 | 8 | 26.7 | 9 | 30.0 | 3 | 10.0 |
| >40 | | 0.0 | | 0.0 | 3 | 10.0 | | 0.0 | | 0.0 |
| **Total** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** |
| **Quantity of honey produced (litters) per year** | | | | | | | | | | |
| <50 | 14 | 46.7 | 2 | 6.7 | 13 | 43.3 | 6 | 20.0 | 2 | 6.7 |
| 51-100 | 7 | 23.3 | 6 | 20.0 | 11 | 36.7 | 24 | 80.0 | 6 | 20.0 |
| 101-150 | 5 | 16.7 | 10 | 33.3 | 3 | 10.0 | | 0.0 | 12 | 40.0 |

| | Doma | | Kokona | | Lafia | | Nas eggon | | Wamba | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Indices** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** |
| 151-200 | 2 | 6.7 | 12 | 40.0 | 2 | 6.7 | | 0.0 | 10 | 33.3 |
| >200 | 2 | 6.7 | | 0.0 | 1 | 3.3 | | 0.0 | 30 | 100.0 |
| **Total** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | | **0.0** |
| **Quantity at hand now (litters)** | | | | | | | | | | |
| <50 | 17 | 56.7 | 5 | 16.7 | 17 | 56.7 | 16 | 53.3 | 7 | 23.3 |
| 51-100 | 3 | 10.0 | 18 | 60.0 | 8 | 26.7 | 12 | 40.0 | 19 | 63.3 |
| 100-150 | 7 | 23.3 | 5 | 16.7 | 4 | 13.3 | 1 | 3.3 | 4 | 13.3 |
| 151 - 200 | 1 | 3.3 | 1 | 3.3 | 1 | 3.3 | | 0.0 | | 0.0 |
| **>200** | 2 | 6.7 | 1 | 3.3 | | 0.0 | 1 | 3.3 | | 0.0 |
| **Total** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** |

Table 5 shows that the selling price per liter of honey shows a clear market hierarchy. In Lafia, the state capital, 66.7% of beekeepers sell their honey at ₦5,000 per liter, and another 20% sell for more than ₦6,000. This premium pricing is likely due to better access to urban consumers, government offices, and a more formal market where honey is valued for its purity and medicinal qualities. In contrast, in Doma, a whopping 76.7% sell at ₦6,000 per liter, which might reflect a different local market structure or perhaps sales in larger, wholesale-like quantities. Kokona and Wamba show a split between ₦5,000 and ₦6,000. This variation in price is common in Nigeria, where honey value chains are informal and prices are heavily influenced by local demand, buyer relationships, and perceived quality rather than a standardized market rate in line with the findings of (Oguntoyinbo *et al.,* 2021).

On startup costs, 36.7% of beekeepers in Wamba, reported needing more than ₦1,000,000 to start their business, and another 30% needed between ₦301,000 and ₦750,000. Similarly, in Doma and Kokona, significant portions of beekeepers cited costs in the hundreds of thousands. These are not trivial sums for smallholder farmers. This high barrier to entry is a major constraint documented across Africa. The cost of modern hives (like Langstroth), protective gear, extractors, and initial colonies is often the single biggest hurdle, keeping many potential beekeepers using less productive traditional methods (Aidoo *et al.*, 2023), this can lead small older farmers to using only their traditional bee hives, however, the results suggests that in areas like Wamba, beekeeping has evolved into a more capital-intensive venture. Interestingly, there's a potential link between the high startup costs in Wamba and its high yields. This aligns with findings from Kenya, where the adoption of modern beehives was directly linked to a 2-3 fold increase in honey yield compared to traditional log hives, but adoption was limited by the initial investment required as reported by (Muli *et al.*, 2018).

**Table 5: Economic Aspects of Beekeeping**

| | Doma | | Kokona | | Lafia | | Nas eggon | | Wamba | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Indices** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** |
| How much do you sell per litter (Naira) | | | | | | | | | | |
| 3000 | - | - | - | - | 1 | 3.3 | - | - | - | 0.0 |
| 4000 | 2 | 6.7 | 2 | 6.7 | 1 | 3.3 | 2 | 6.7 | 2 | 6.7 |
| 5000 | 4 | 13.3 | 12 | 40.0 | 20 | 66.7 | 17 | 56.7 | 14 | 46.7 |
| 6000 | 23 | 76.7 | 16 | 53.3 | 2 | 6.7 | 10 | 33.3 | 14 | 46.7 |
| >6000 | 1 | 3.3 | - | - | 6 | 20.0 | 1 | 3.3 | - | 0.0 |
| **Total** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** |
| **How much does it require to start honey business (Naira)** | | | | | | | | | | |
| <100,000 | - | - | 2 | 6.7 | - | - | 7 | 23.3 | 1 | 3.3 |
| 101000-200000 | - | - | - | - | - | - | 4 | 13.3 | - | 0.0 |
| 201000-300000 | - | - | - | - | - | - | 2 | 6.7 | - | 0.0 |
| 301000-4000000 | 18 | 60.0 | 7 | 23.3 | - | - | 12 | 40.0 | 5 | 16.7 |
| 401,000-500,000 | 4 | 13.3 | 4 | 13.3 | 19 | 63.3 | 5 | 16.7 | 5 | 16.7 |
| 501000-750000 | 2 | 6.7 | 4 | 13.3 | 8 | 26.7 | - | - | 4 | 13.3 |
| 751,000-1000000 | 3 | 10.0 | 3 | 10.0 | 3 | 10.0 | - | - | 5 | 16.7 |
| >1,000,000 | 3 | 10.0 | 10 | 33.3 | - | - | - | - | 11 | 36.7 |
| **Total** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **30** | **100.0** | **31** | **103.3** |

Respondents identified theft, diseases, deforestation, and vandalism as major constraints as indicated in table 6. These findings are consistent with Alhassan *et al.,* (2022), who reported similar challenges in Northern Ghana. Also, theft and vandalism reflect tenure insecurity, necessitating apiary governance models like Kenya's community conservancies (Mbuvi and Boon, 2023). Deforestation's negative perception corroborates studies on nectar source depletion in West Africa (Kugbe *et al.,* 2022). Neutral attitudes toward bush burning and insufficient equipment suggest these are moderate concerns, while lack of modern methods and other factors were perceived positively, indicating lesser impacts. However, the neutral rating of the bush burning contradicts ecological impacts, suggesting cognitive dissonance about fire management. Storage facilities and capital constraints were negatively rated highlighting infrastructural and financial barriers. Government policies were viewed neutrally, suggesting the need for improved support, this neutral perception of government policy (mean 3.3) critiques institutional neglect, consistent with apiculture's

marginalization in agricultural budgets (Aidoo *et al.,* 2023). Low patronage was a concern, though low supply and price were positive, indicating market stability meaning a large market for anyone who will be willing to venture into bee keeping.

**Table 6: Perception of the Respondents on Constraints to Bee Keeping**

| Questions | Doma | Kokona | Lafia | Nas. Eggon | Wamba | Mean | Attitude |
|---|---|---|---|---|---|---|---|
| Theft | 1.0 | 1.1 | 1.0 | 1.0 | 1.2 | 1.1 | Negative |
| Diseases | 1.0 | 1.3 | 1.0 | 1.0 | 1.3 | 1.1 | Negative |
| Deforestation | 1.2 | 1.9 | 1.0 | 1.2 | 1.8 | 1.4 | Negative |
| Vandalization | 1.3 | 2.1 | 1.1 | 1.4 | 2.0 | 1.6 | Negative |
| Bush Burning | 2.8 | 3.1 | 3.2 | 1.8 | 3.2 | 2.8 | Neutral |
| Insufficient Equipment | 2.9 | 3.5 | 3.6 | 3.4 | 3.6 | 3.4 | Neutral |
| Lack of Modern Methods | 3.2 | 4.0 | 4.2 | 3.8 | 4.2 | 3.9 | Positive |
| Others | 3.9 | 4.3 | 3.9 | 4.7 | 4.2 | 4.2 | Positive |

Scale: 1.0-2.4(Negative), 2.5-3.4(Neutral), 3.5-5.0(Positive), Alhassan *et al.,* 2022)

## CONCLUSION

Beekeeping remains a vital, though under-optimized, livelihood activity in the state, predominantly carried out by men using inherited, traditional methods such as log hives and skeps. While this practice provides important income and improves living standards for many households, its productivity is limited by significant constraints. These include ecological pressures like deforestation and bush burning, economic barriers such as high startup costs and limited capital, and operational challenges like hive theft, vandalism, and disease. The study reveals notable local variations, with Wamba emerging as a high-yield zone compare to Doma and Nasarawa Eggon who operate at a smaller, more subsistence-oriented scale. Market dynamics also differ, with beekeepers in Lafia accessing premium urban prices, whereas others rely on more localized or wholesale markets. It is therefore recommended that promoting affordable, improved beehive technologies and implementing policies that support apiculture within broader agricultural and environmental programs will bring a transition from a supplementary activity to a robust, productive, and sustainable enterprise for rural communities in Nasarawa State and similar regions across Nigeria.

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