APPLIED ENTOMOLOGY AND INNOVATION (AEI)

VOLUME 1 ISSUE 1 (2024)

PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

Applied Entomology and Innovation (AEI)

Volume 1 Issue 1, Year 2024
https://journals.e-palli.com/home/index.php/aei

The Role of Edible Insects in Enhancing Food Security and Livelihood in Nigeria: A Case Study of Konshisha LGA of Benue State

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Article Information

Received: September 16, 2024
Accepted: October 22, 2024
Published: November 23, 2024

Keywords

Edible Insects, Entomophagy, Food Security, Insect Biodiversity, Non-Wood Forest Products, Nutritional Value

ABSTRACT

Insects serve as crucial non-wood forest products, particularly in impoverished communities, where they are gathered primarily by women and children for both food and income. Globally, over 1,400 insect species are consumed, providing essential nutrients comparable to those found in meat. In Africa, insects form a regular part of the diet, contributing significantly to food security. Despite their nutritional value and ecological sustainability, edible insects remain under-researched, particularly in regions like sub-Saharan Africa, where they hold potential for addressing hunger and poverty. This study focuses on assessing edible insects in selected areas of Konshisha Local Government Area (LGA) in Benue State, Nigeria. Using multistage sampling, the study identified major edible insects, including crickets (*Brachytrupes membranaceus*), termites (*Macrotermes spp.*), and Cirina forda, and explored local consumption preferences, collection methods, and availability. Findings reveal that crickets are the most consumed insect, with higher consumption observed among males, particularly married adults aged 41-50 years. These insects are typically collected through trapping, handpicking, and buying, and are consumed primarily during the rainy season. The study concludes that edible insects play a vital role in improving livelihoods in Konshisha LGA by providing both nutrition and income. Recommendations include the establishment of insect farming centers to boost large-scale production and the promotion of public awareness on the health benefits of entomophagy. Sustainable management of insect habitats is also advised to ensure continued availability.

INTRODUCTION

Insects are vital non-wood forest products that play a significant role in the lives of impoverished communities, particularly women and children who gather them (FAO, 1995). Across many cultures worldwide, insects are a common food source, consumed either as an occasional delicacy or as a substitute during periods of scarcity, such as droughts, floods, or wars. Insects provide the same nutritional benefits as meat, with over 1,400 species reportedly eaten globally. Among these, about 14 insect orders contain edible species, and Africa stands out as one of the leading continents in insect consumption, alongside Australia, Asia, and the Americas.

In Africa, insects are an integral part of the traditional diet for millions of people and are also used as feed for farm animals. Some of the popular edible insects include winged termites, grasshoppers, caterpillars, beetle grubs, and a variety of aquatic insects. Unlike emergency foods, these insects are consumed as a regular part of the diet when they are seasonally available. Despite their widespread consumption, insects remain the least studied of all forest fauna, even though they account for the greatest amount of biodiversity in forests. Edible insects offer more than just protein; they are also rich in vitamins, minerals, and fats, with many species containing lysine, an amino acid often lacking in grain-based diets. Insects generally have higher food conversion efficiency than traditional meats and reproduce faster, making their production more sustainable and ecological than vertebrate meat. This has led to growing scientific interest in entomophagy, the practice of eating insects, particularly for its potential in food security and poverty alleviation strategies in sub-Saharan Africa (De Foliart, 1992).

Insects are widely consumed around the world, appreciated not only for their nutritional value but also for their organoleptic characteristics. When accepted by consumers, insects can significantly improve human nutrition and livelihoods, especially in developing countries where they are easily gathered, cultivated, and sold, providing both dietary benefits and income (Mollins, 2014). Transforming insects into more acceptable products could further enhance their role in addressing global hunger and nutritional deficiencies. This study aims to assess the edible insects in selected areas of Konshisha Local Government Area of Benue State, Nigeria, focusing on identifying major edible insects, determining consumption preferences, collection methods, availability, and their benefits to the local

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populace. Given the challenges associated with the distribution, seasonal availability, and over-exploitation of edible insects, this research is timely and essential for ensuring sustainable use of these vital resources.

LITERATURE REVIEW

Entomophagy, according to the Oxford Dictionaries Online, refers to the practice of eating insects, particularly by people. The term is derived from the Greek words "éntomon," meaning "insect," and "phagein," meaning "to eat." Entomophagy encompasses the consumption of insects in various life stages, including eggs, larvae, pupae, and adults. Insects have historically played a significant role in human nutrition across Africa, Australia, Asia, and the Americas, with hundreds of species being consumed as food. Commonly consumed insects include grasshoppers, caterpillars, beetles, winged termites, ants, cicadas, and various aquatic insects. Not merely an emergency food source, insects are often a regular part of diets, especially when seasonally available.

Global Practices and Evolution of Entomophagy

Entomophagy is a global practice, though it is less common in developed countries, particularly in Europe and North America. According to Megido *et al.* (2014), over 2 billion people from more than 3,000 ethnic groups in 130 countries consume over 2,000 identified insect species (Ramos-Elorduy, 2009; Rumpold & Schlüter, 2015; Niassy & Ekesi, 2016; Tang *et al.*, 2019). In Africa alone, approximately 500 insect species are consumed (Kelemu *et al.*, 2015), while India accounts for about 255 edible species (Chakravorty, 2014). Insects are usually harvested from natural forests, yet despite their biodiversity, they are among the least studied fauna.

The evolution of entomophagy dates back to ancient times, with evidence of insect consumption found in many organisms, particularly among primates, including our ancestors (Van Huis, 2003). Insect consumption is nutritionally significant across primate species (Raubenheimer & Rothman, 2013), and it is suggested that edible insects may have played a crucial role in human evolution (McGrew, 2001). Historical records also indicate that entomophagy was practiced in the Middle East as early as the 8th century BC, with locusts served at royal banquets. In ancient Greece, cicadas were considered a delicacy. The Bible also mentions the consumption of insects, with locusts, crickets, and grasshoppers being deemed edible (Leviticus 11:20-23; Matthew 3:1-4).

Entomophagy Around the Globe

The increasing global demand for animal-based food, driven by a growing population, has led to a renewed interest in insects as a food source due to their diversity, abundance, and lower ecological footprint (FAO, 2013; Van Huis *et al.*, 2013). However, attitudes towards entomophagy vary by region, influenced by cultural and health considerations.

Entomophagy in Asia Pacific Regions

In Asia and the Pacific, the consumption of insects as food or animal feed has a long history. Insects were consumed in China as far back as 3,200 years ago (Yi *et al.*, 2010). Unlike Western attitudes, which often view insects negatively, many Asian and Pacific cultures accept insects as a normal part of the diet (De Foliart, 1999). In Thailand, for example, Weaver ants (Oecophylla smaragdina) are highly popular, with consumer demand exceeding the natural supply (Hanboonsong *et al.*, 2013).

Entomophagy in Australia

In Australia, Aboriginal people traditionally lived as nomadic hunter-gatherers, consuming a varied diet in which animal foods, including insects, predominated (O'Dea, 1991). Bogong moths, honey ants, and Witchetty grubs were commonly eaten. Modern Australian entrepreneurs have introduced these insects to the commercial food market, recognizing them as delicacies.

Entomophagy in Africa

Africa has the richest diversity of edible insects, with over 500 species consumed, including caterpillars, termites, locusts, and beetles. Insects form a significant part of the traditional diet in many African countries, such as the Democratic Republic of Congo, Cameroon, and Nigeria. In these regions, insects are also used as animal feed, contributing to food security and economic livelihoods.

Entomophagy in Nigeria

In Nigeria, edible insects are consumed in various forms depending on species, life stages, and local traditions. Locusts and crickets, for example, are popular snacks, often deep-fried or preserved for later consumption (Adeoye *et al.*, 2014; Van Huis, 2003). The appearance of locusts is often met with joy among certain ethnic groups, such as the Babies of Borno State (Alamu *et al.*, 2013). Common edible insects in Nigeria include Cirina forda, Brychytrupes membranaceous (crickets), *Macrotermes spp.* (termites), and Zonocerus variegatus (grasshoppers).

Benefits of Edible Insects

The relationship between humans and insects is not solely antagonistic. Insects are vital to ecosystems and offer significant benefits to humans, particularly in terms of food security and environmental sustainability. The rapid growth of the global population presents challenges related to food production, availability, and environmental impact. Entomophagy offers a potential solution, particularly in regions where insects are already part of the culinary tradition (Cappelli *et al.*, 2020). Insects provide a highly efficient source of protein with a lower environmental footprint compared to traditional livestock (Huang *et al.*, 2020). In many cultures, insects are considered a delicacy, valued for their rich protein content and unique flavors. However, in Western countries, psychological barriers such as disgust and neophobia often hinder the acceptance of edible insects (Payne *et*

al., 2016; Verneau *et al.*, 2016). Despite this, entomophagy is recognized and practiced by over 2 billion people worldwide, with over 2,000 insect species consumed by various ethnic groups (Baiano, 2020).

Environmental Impact

Insects are poikilothermic, meaning their internal temperature varies with the environment, leading to a more efficient conversion of feed into protein compared to homeothermic animals. This makes insect farming a more sustainable option with a lower ecological impact, particularly in terms of greenhouse gas emissions (McMichael *et al.*, 2007).

Challenges and Risks Associated with Entomophagy

Despite its benefits, entomophagy is not without challenges. Some insects are toxic and require special preparation to make them safe for consumption. For instance, Zonocerus variegatus in Nigeria and Cameroon must be repeatedly cooked to neutralize toxins (Bodenheimer, 1951; Faure, 1944). Moreover, spoilage and bacterial contamination are potential risks, as highlighted by researchers from Wageningen University and FAO (Klunder *et al.*, 2012). Certain insects, such as the Tessaratomid species, excrete fluids that can cause severe pain or blindness if not properly handled (Scholtz, 1984). Additionally, the consumption of caterpillars with toxic hairs requires careful preparation to avoid harm (Tango Muyay, 1981). Consuming whole insects, such as grasshoppers and locusts, without removing certain parts like legs, can lead to health issues such as intestinal blockages (Bouvier, 1945). These risks necessitate careful handling and preparation to ensure safety. While insects are beneficial as a food source, they are also pests that can cause significant damage to crops and forests (Alarcon *et al.*, 2024). In the United States, insects destroy more timber annually than any other factor, including forest fires (F.S. Agbidye: Personal Communication).

In Western cultures, entomophagy is often viewed as a taboo. This aversion coexists with the consumption of other invertebrates like mollusks, highlighting the cultural specificity of food preferences and the challenges of introducing entomophagy into new regions. Entomophagy offers a promising alternative to traditional animal protein sources, providing numerous benefits in terms of food security and environmental sustainability. However, its widespread adoption faces significant challenges, including cultural barriers, health risks, and the need for proper handling and preparation. As global interest in sustainable food sources grows, entomophagy may play an increasingly important role in addressing the challenges of feeding a growing population while minimizing environmental impact.

MATERIALS AND METHODS

The study area for this research is Konshisha Local Government Area (LGA) in Benue State, Nigeria. Konshisha LGA is situated on leveled land in the northeastern part of Benue State, between longitudes 8°30' E and 8°50' E and latitudes 7°00' N and 7°20' N. It shares boundaries with Gboko LGA to the north, Gwer LGA to the west, Ushongo LGA and Vandeikya LGA to the east, and Cross River State to the south. Konshisha LGA was originally created out of the former Vandeikya LGA on February 28, 1983. It was temporarily scrapped by the military government in 1984 but was

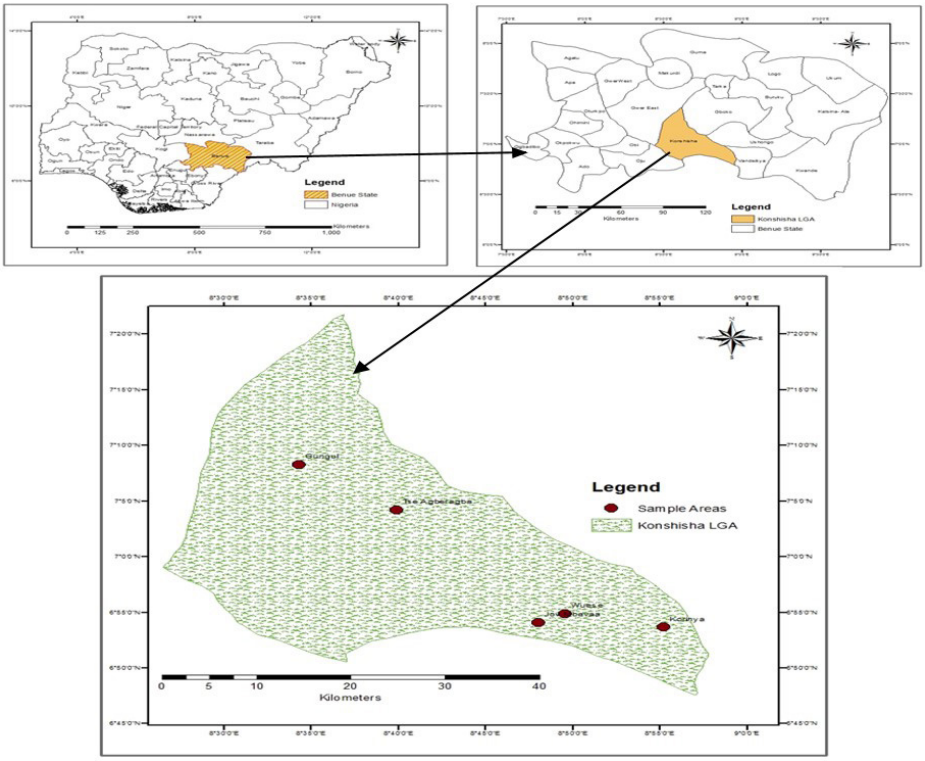

Figure 1: Map of the Study Area
Source: Produced from GADM Shape file

re-established on February 4, 1989, by General Ibrahim Babangida. The LGA is named after the River Konshisha, which originates in Gboko LGA. The headquarters of Konshisha LGA is located in Tse Agberagba. The area covers a land mass of 10,089 square kilometers, making it one of the largest LGAs in Benue State. Konshisha LGA is divided into eleven council wards: Mbaikyase, Mbatem, Ikyurav/Mbatwer, Mbayegh/Mbaikyer, Mbatem, Iwar/Nyam, Mbavaa, Mbanor, Mbatser/Mbagusa, Mbake, and Mbawar. The inhabitants are predominantly farmers, producing a variety of crops such as yams, cassava, rice, soybeans, guinea corn, maize, groundnuts, and oranges. The population is mainly of the Tiv ethnic group, with a census figure of 225,672 as of 2006 (Source: Tsee, 2013; NPC, 2009). The map of the study area, indicating its boundaries and the sampled areas, is presented in Figure 1. The study employed a multistage sampling technique, along with purposive and random sampling methods. Multistage sampling was used to divide the LGA into council wards, districts, and households as strata. Out of the eleven council wards in Konshisha LGA, five wards—Mbaikyase, Mbagen, Mbawar, Mbavaa, and Mbayegh/Mbaikyer—were selected purposively. Within these selected wards, five districts—Gungul, Tse Agberagba, Jov Mbavaa, Wuese, and Korinya—were also purposively chosen. From these districts, 25 households were randomly selected, and a total of 100 questionnaires were distributed, with four questionnaires per household. Data were collected using a semi-structured questionnaire administered to respondents in the selected households. Additional data were gathered through interviews with household heads and personal observations conducted in Gungul, Tse Agberagba, Jov Mbavaa, Wuese, and Korinya markets. The data collected from the five selected areas (Gungul, Tse Agberagba, Jov Mbavaa, Wuese, and Korinya) were analyzed using simple descriptive statistics, including frequencies and percentages. The results were used to describe the characteristics and responses of the sampled population.

RESULTS AND DISCUSSION

Results

Table 1: Demographic characteristics of the respondents

Variable	Frequency	Percentage (%)
Sex		
Male	66	66%
Female	34	34%
Total	**100**	**100**
Age Class		
<20	2	2%
20-30	11	11%
31-40	26	26%
41-50	61	61%
>50	0	0%
Total	**100**	**100%**
Marital Status		
Single	24	24%
Married	72	72%
Divorced	2	2%
Widowed	2	2%
Total	**100**	**100%**

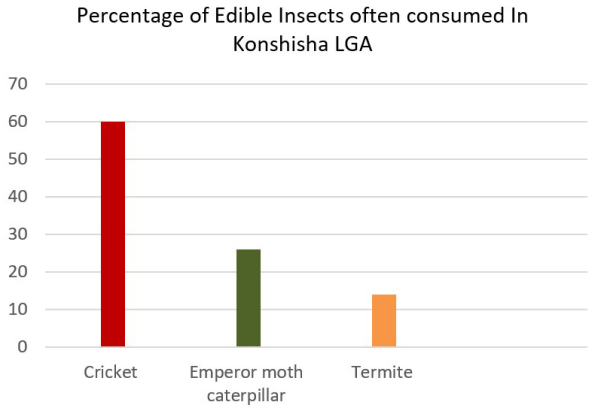

Figure 2: Percentage of Edible Insects often consumed In Konshisha LGA
Source: Field Survey, 2021

Table 2: Methods of obtaining edible insects in Konshisha Local Government Area

Method	Frequency	Percentage (%)
Trapping	11	11
Digging	54	54
Hand Picking	3	3
Buying	32	32
Total	**100**	**100%**

Source: Field Survey, 2021

Table 3: Various methods of processing edible insects in Konshisha Local Government Area

S/N	Method	Frequency	Percentage (%)
1	Frying	53	53
2	Boiling	47	47
3	Drying	0	0
Total		**100**	**100**

Source: Field Survey, 2021

Table 4: Abundant edible insects in Konshisha Local Government Area

Common Name	Scientific Name	Frequency	Percentage (%)
Crickets	Brachytrupes membraneceus	62	62%
Emperor Moth Caterpillar	Cirina forda	18	18%
Termites	Macrotermes subhylinus	20	20%
Total		**100**	**100%**

Source: Field Survey, 2021

Table 5: Seasonal Availability of Edible Insects in Konshisha Local Government Area

S/N	Season	Frequency	Percentage (%)
1	Dry season	0	0%
2	Raining season	100	100%
Total		**100**	**100%**

Source: Field Survey, 2021

Table 6: Benefits of Edible Insects in Konshisha Local Government Area

Benefits	Frequency	Percentage (%)
Condiment	0	0%
Income.	18	18%
Food	82	82%
Total	**100**	**100%**

Source: Field Survey, 2021

Figure 3: Brychytrupes membranaceous sold at Gungul market

Figure 4: Macrotermes subhylinus sold at Wuese market

Figure 5: Dried Cirina forda sold at Tse Agberagba market

Discussion

The study revealed a higher proportion of male respondents compared to females. This gender disparity was attributed to the easier access and greater willingness of males to participate in the study. Interestingly, this finding contrasts with the report by the FAO (1995), which highlighted that women are typically more involved in gathering edible insects. The age category with the highest frequency of respondents was 41–50 years. This older group exhibited a stronger preference for insect consumption compared to younger respondents, who showed a greater interest in more conventional meats like beef and pork. This finding aligns with the research by Nkiru and Onoja (2018) on the determinants of edible insect consumption in Kogi State, which also reported a similar age-related trend. Regarding marital status, married respondents had the highest participation rate in the study, surpassing singles, divorced, and widowed individuals. This predominance of married individuals in the study area is consistent with Nkiru and Onoja's (2018) findings, where married people also showed the highest frequency in edible insect consumption in Kogi State.

The study identified the major edible insects in Konshisha Local Government Area of Benue State as termites (*Macrotermes spp.*), crickets (*Brachytrupes membranaceus*), and Cirina forda. These species are consistent with those reported by Agbidye *et al.* (2009) as being widely consumed in various parts of Benue State. In Konshisha Local Government Area, crickets emerged as the most preferred, abundant, and consumed insect, differing from Agbidye *et al.*'s (2009) findings in Makurdi metropolis, where termites were reported as the most preferred. The methods of obtaining and processing these insects, such as handpicking, buying, trapping, boiling, and frying, are similar to those described by Agbidye and Nonga (2009) in their study on the harvesting and processing techniques for the larva of the pallid emperor moth among the Tiv people of Benue State.

Edible insects like crickets, termites, and Cirina forda are available throughout the rainy season in Konshisha Local Government Area, but their availability is limited to a short period. This observation is consistent with the reports of Adedutan and Bada (2004) and Ashiru (1998), who noted that while some insects are available year-round, others are only accessible during specific seasons, depending on weather conditions and other natural factors. The consumption of edible insects in Konshisha Local Government Area has significantly contributed to improving the livelihoods of the local population, serving as both a source of nutrition and income. This finding aligns with the research of Mollins (2015), which emphasized that edible insects enhance the diets and livelihoods of up to two billion people globally.

CONCLUSION

This research concludes that edible insects are prevalent in Konshisha Local Government Area of Benue State. It highlights the influence of the socio-economic characteristics of the respondents on the consumption of these insects. Notably, males consume edible insects more frequently than females, with the highest consumption observed among adults aged 41-50 years, particularly those who are married. The study identifies crickets, termites, and Cirina forda as the major edible insects in the area, with crickets being the most consumed and abundant. These insects are typically obtained through methods such as trapping, digging, handpicking, and buying, and are prepared for consumption by frying or boiling. They are predominantly available during the rainy season and serve as both a vital food source and a means of income for the people of Konshisha Local Government Area. Based on the findings of this study, the following recommendations are made: The state government should establish insect farming centers to encourage farmers to engage in large-scale production of edible insects, thereby increasing availability and meeting consumer demand. Public awareness and education campaigns should be intensified to highlight the health and nutritional benefits of edible insects. The habitats of these beneficial insects should be managed sustainably to ensure their continued availability.

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