

Indigenous Knowledge and Adoption of Backyard Farming among Rurban Households in Northern Ghana: Implications for Food Security and Livelihood Resilience

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ABSTRACT

This study examined indigenous knowledge and the adoption of backyard farming (BYF) among rurban households in Bunkpurugu, in the Northeast Region of Ghana. The study was guided by the sustainable livelihood framework, socio-ecological systems theory, and a social constructivist paradigm. The study explored local knowledge systems underpinning backyard farming and assessed the extent of adoption across households. This study uses a household survey with 107 household respondents assisted by 10 key informant interviewers selected by purposive sampling. Data were collected through semi-structured interviews, questionnaires, and field observations and analyzed using thematic analysis and descriptive statistics. The study findings revealed that backyard farming is an integral part of the communities' lives and has been a common practice for generations. About 89% of the households have backyard spaces, which are actively used for crop cultivation and livestock production. The respondents possessed excellent indigenous knowledge on planting seasons, climate adaptation, soil fertility management, and crop–livestock integration. Backyard farming was thought to be a possible solution to the problem of food insecurity and to enhance household nutrition, environmental quality, and livelihood resilience. Adoption levels were strikingly high (88.8%) and similar across gender, age, and education groups, suggesting that backyard farming is a socially inclusive and culturally embedded adaptation strategy. But there was little institutional support for backyard farming, which was popular and known to exist. The findings suggest that backyard farming is a traditional community-based system and not an additional farming activity, which plays a significant role in food supply, climate change adaptation, environmental health, and household stability. This approach can further increase its positive impact on sustainable living in the peri-urban areas of Northern Ghana by creating local support networks, open communication among farmers, and grassroots agriculture programs.

Keywords: home gardening, livelihood, food production, food security and stability, rurban communities, northeast region, sustainable development.

Introduction

Population growth and urban sprawl are continuously reconfiguring settlement patterns in Africa, leading

to the formation of sites with mixed rural and urban characteristics. Urbanization is associated with increased demand for utilities such as housing, transport, school and health services, and commercial buildings and increased competition for available land and natural vegetation (Bimenyimana et al., 2022a; Obubu et al., 2022). Urbanization replaces natural environments with artificial ones, which limits the potential for agriculture and causes other issues such as higher surface temperatures and less plant cover (Fan, 2003; Berdegué et al., 2013; Bimenyimana et al., 2022a). Vegetation changes are important for the local climate, especially in sensitive biological zones where land cover directly influences rainfall and temperature (Esseen et al., 2016). Dakurah, 2018). Today's communities who are moving to urbanity are frequently more exposed to food shortages, environmental degradation, and risks to their climate-resistant livelihoods. Agriculture remains an important economic activity in Ghana, particularly in rural and semi-urban areas where the vast majority of the population relies on farming and animal husbandry for a living (Anang et al. 2011; Owusu et al. 2011; Naami & Naami 2019; GSS 2021). The North East Region is one of the least economically secure regions in the country (Anang et al., 2011; Naami & Naami, 2019; Busck et al., 2009). The Northeast region is in the Sudan savanna with only one rainy season per year, hence only one major period of agricultural activity. These climatic realities make households vulnerable to food insecurity and instability, particularly when agricultural success is undermined by erratic rainfall. Bunkpurugu, the capital of the Bunkpurugu-Nakpanduri District, is a typical "rurban" settlement. Rurban areas are transitional zones, displaying both rural and urban characteristics, linking relatively high population densities and continued dependence on agriculture as the main source of livelihood (Busck et al., 2009; Nggili & Soetomo, 2018). The "rurban" areas are defined as settlement areas that are of urban status in terms of population size but are strongly related to agrarian livelihood strategies. The populations of these areas predominantly engage in backyard farming activities, rearing ruminants, and commercial farming projects. Despite the levels of education and employment status in the formal sectors, a majority of the working class still engaged in agriculture-related economic activities.

Backyard farming remains the oldest form of household food and income diversification strategy among both rural and urban communities in the northeast region of Ghana. This practice is the production of crops, fruit trees, vegetables, and medicinal plants and the rearing of livestock within residential compounds to meet household needs (Joseph et al., 2020; FAO/IFAD, 2019). Backyard farming has been recognized as a valid land-use practice and an important livelihood strategy involving millions of households around the world (FAO/IFAD, 2019). The practice helps to address food security, household nutrition, supplementary income generation, and environmental sustainability by improving vegetation cover and dependence on outside food sources (Burgin, 2018; Joseph et al., 2020). The studies have additionally indicated that backyard production also aids in the improvement of the ecology through various ways such as increasing vegetation cover, improving biodiversity, conserving soil, and localized heat effect reduction (Apeanti, 2014; Kalame et al., 2011; Schoene et al., 2007).

In Northern Ghana, backyard farming has emerged as a local livelihood strategy that is rooted in centuries of local ecological knowledge and a response to environmental risks. Backyard farmers have extensive knowledge on rainfall patterns, planting seasons, crop selection, soil fertility management, and livestock integration. Some communities have taken advantage of the early rains to grow early-maturing crops like millet, guinea corn, and maize, thus minimizing the vulnerability of households during the annual hunger season, which is usually experienced between June and July (Kansanga et al., 2020). These are examples of the continued contribution of local knowledge systems in the face of climatic variability to household resilience and food production. The Sustainable Livelihood Framework (SLF) offers a helpful framework

for the importance of backyard farming in rural contexts. The framework illustrates how household assets (natural, human, social, financial, and physical) can be mobilized to conduct livelihood strategies that can enhance their resilience and reduce their vulnerability (Chambers & Conway, 1992; Scoones, 1998). One of these approaches is backyard farming, where households use local resources such as land, labor, local knowledge, and social resources to enhance food availability and livelihood security. In this respect, backyard farming is not just about food production but also an adaptation strategy to livelihoods, providing resilience to households in low-resource settings.

While the socioeconomic, nutritional, and ecological advantages of backyard farming have been documented (Joseph et al., 2020; Wuraola, 2016), few empirical studies have focused on the indigenous knowledge systems that underpin the practice in Northern Ghana. Similarly, little is known about how much backyard farming is being adopted by rural households and how the adoption relates to demographic characteristics (such as gender, age, and educational attainment). Previous studies have been mainly about the economic benefits of backyard farming, legal aspects, and its potential role in food production and environmental management (Bellwood-Howard et al., 2018; Joseph et al., 2020). There are, therefore, important questions to be answered about the local knowledge that supports backyard farming and how widespread it is in the growing urbanizing agricultural population. This study, therefore, aims to fill these gaps through studying the indigenous knowledge and backyard farming among rural households of Bunkpurugu in northern Ghana. In particular, the study will investigate local knowledge of backyard crop farming and determine the extent to which the backyard farming model is adopted by households. The paper suggests that backyard farming is not just an ancillary farming activity but a cultural practice embedded in the indigenous way of life, which is used by the households to satisfy their food security, nutrition, and livelihood resilience. The practice of backyard farming is also widespread among both genders across all age and education groups, indicating that the strategy is a socially inclusive and locally based adaptation strategy that can help build the resilience of household food security amidst food insecurity and climatic uncertainty.

1.2 Problem Statement

Backyard farming (BYF), also known as urban farming, home gardening, or window-box gardening, is one of the oldest agriculture practices, where households grow crops and raise animals in their backyard for food and livelihood support (Eigenbrod & Gruda, 2015; Joseph et al., 2020). Backyard farming is considered a valid method of land use, contributing to the livelihoods of millions of people across the world with the production of food crops, fruits and vegetables, medicinal plants, and small livestock, in accordance with the definition of the Food and Agriculture Organization (FAO/IFAD, 2019). The model is especially relevant for food security, income generation, environmental sustainability, and climate resilience in the household (Joseph et al., 2020).

In the North East Region of Ghana and especially the Bunkpurugu District, climate is critical to the agricultural activities. The rains are generally from the beginning of March to May, but the practice of free-range livestock management makes it difficult for many rural households to benefit from them. Traditional community arrangements involve livestock owners keeping livestock in at the same time as the formally declared farming season (typically from June to October). As a result, rural crop farmers are frequently late in planting, missing out on the opportunity to plant as early as May or to employ double cropping to maximize food production and food security. Evidence from nearby rural communities, however, indicates that there are indigenous knowledge systems that support both early planting and twin planting seasons. Some households use early rains to plant early-maturing crops like millet, maize, and

guinea corn in the backyard gardens of their houses from April to June, which support them in the critical hunger period of June and July (Kansanga et al., 2020). These experiences suggest that there is some local expertise in backyard farming that is present in the ecological zone and can provide lessons to help increase food security and climate resilience in rural communities. Although the importance of backyard farming cannot be underestimated, the existing studies have been mainly on the legal and economic aspects, contribution of the households, and environmental aspects of backyard farming (Skar et al., 2020; Joseph et al., 2020; Wuraola, 2016). There has been a minimal attempt to learn about the local traditional knowledge on backyard farming and how well it was adopted by the households in a rural setting. Little is known about socio-ecological factors that enable or impede adoption, especially in the context of climate variability, livestock management systems, and food security outcomes. Additionally, it is not clear how communities view dialogue and cooperation between crop and livestock farmers as ways to expand backyard farming and to provide early planting opportunities.

Research Objectives

1. The study seeks to identify and describe the indigenous knowledge, skills, and practices that inform backyard crop farming in the rural areas.
2. The study aims to determine the level and patterns of adoption of the backyard farming model among households in the rural areas.

Research Questions

This study seeks to address two key questions:

1. What local knowledge exists about backyard crop farming in the rural areas?
2. What is the extent of local adoption of the backyard farm model in the rural areas?

The Significance of the Research Work

The study helps develop an understanding of the role of indigenous knowledge in backyard farming, as well as how this knowledge could be promoted among rural communities. Specifically, it documents the local knowledge systems that will aid backyard crop farming. It also reveals factors affecting the adoption of the backyard farming model and levels of participation in dialogue with crop and livestock farmers. It provides contextual data, food security and climate resilience measures, and local participation in policy dialogue for sustainable livelihoods and ecological management in rural areas.

2.0 Literature Review

2.1 Indigenous Knowledge and Water Quality

Indigenous knowledge is an important aspect of the sustainability of agricultural production systems, especially in communities that are highly dependent on natural resources and climatic conditions. In African societies, many agricultural practices have been developed from centuries of experience under the conditions of rainfall, fertility of the soil, choice of crops, and environmental management. This knowledge enables households to adjust agricultural activities to their local ecological conditions and to enhance their capacity to manage the environmental uncertainties.

In the northern part of Ghana, indigenous knowledge plays a key role in the food production and livelihood strategies of the households. The area experiences unimodal, variable rainfall, and local coping strategies have been in place for a long time to address the agricultural risks. Another practice is to grow crops that mature early, like millet, guinea corn, and maize, during the early rains before the major farming season so as to get rid of competition. Kansanga et al. (2020) suggest this practice enables households to obtain food supplies early, decreasing their vulnerability to the hunger season.

A backyard farming activity passed down from generation to generation, known as backyard farming. Most households cultivate food crops, rear poultry, and keep ruminants within the backyards of residential compounds using traditional ecological knowledge and local resources. They utilize knowledge gained from prior experiences to determine planting dates, maintain soil fertility, manage moisture, and integrate crop and livestock production systems as alternative livelihood diversification strategies. Households build useful knowledge by constantly engaging with their surroundings and continue to experiment with their environment to discover ways to produce food despite the constraints of climate variability and resource scarcity.

Backyard farming is an important source of indigenous knowledge, not only about crop production. The local knowledge helps make decisions regarding manure application, crop type, planting dates, and adapting to the environment. The practices in this document are examples of how indigenous knowledge systems can contribute to sustained food production and livelihood resilience in resource-poor environments.

2.2 Backyard farming and household food security situation

Backyard farming has been identified as one of the important channels for enhancing food security and livelihood resilience for the households. This practice has a positive impact on food availability, dietary diversity, nutritional improvement, and supplementary income generation, particularly for the low-income people. Backyard farming plays an important role in coping with seasonal food shortages and household food security in northern Ghana, where farming is still the primary economic activity.

Asante et al. (2024) found that the practice of backyard farming in Northern Ghana is often characterized by the cultivation of vegetables, cereals, and other food crops that are adapted to the ecological conditions of the savannah. Maize, tomatoes, peppers, onions, okra, eggplant, millet, and other local varieties are typical backyard crops. These provide fresh food products to households, which in turn contribute to improved food product diversification.

Several studies demonstrated that backyard farming plays a role in improving food security and vegetation cover. The contribution of backyard farming to household food and nutrition security and the generation of income is significant at the household level (Karina and Guevara, 2021). A similar study by Ofosu-Bamfo et al. (2023) indicated that backyard farming promotes local knowledge, enhances household food security, and contributes to environmental sustainability. In addition, Saaka et al. (2021) pointed out that backyard farming provides households with direct access to nutritious food and enhances food security, particularly during economic shocks and food chain disruptions.

Other than food production, backyard farming helps sustain the livelihoods of households through income generation. Surpluses can be sold locally, and household expenditure on food purchases is reduced through home consumption. Joseph and colleagues (2020) state that backyard farming plays a significant role in supplementary income generation and therefore household resilience, as there is less reliance on external markets. Karina and Guevara (2021) further observed that about 70% of households practiced diversified livelihoods through both crops and livestock production.

Another crucial aspect of backyard farming is the incorporation of livestock. Households keep poultry, goats, sheep, pigs, and other domestic animals for a common source of food, income, and wealth accumulation (Wuraola, 2016). The contribution of animal by-products in crop production is mainly an increase in soil fertility and decreasing the reliance on expensive inorganic fertilizers (Agula et al., 2018). Hence, backyard farming is a livelihood system that facilitates food production, income generation, and resource recycling.

2.3. Smallholder Farmers' Adoption of Innovations in Agriculture

Literature shows that several socio-economic, environmental, and institutional factors affect smallholder farmers' adoption of backyard agricultural innovations. In a lot of rural and urban situations, farmers practice those things that fit their lifestyles, local knowledge, and resource utilization. Backyard farming cannot be compared to exotic technologies because it is well rooted in local culture and livelihood systems. Previous studies have revealed that the adoption of the backyard farming model appears widespread because it requires very low capital investment, is compatible with household labor arrangements, and can provide immediate benefits in food production and income generation. Backyard production is appealing to households wanting diversified livelihoods because of relatively low start-up costs, short production time, and low risks (IFAD, 2020). In addition, the authors noted that backyard farming plays a role in household food security and income improvement, which supports farmers in adopting it (Karina & Guevara, 2021).

Access to land and household resources is also a factor determining backyard farming adoption. Urbanization often leads to the loss of agricultural land, yet households continue to use spaces within the backyard for food production, if available. Research has shown that small plots can play an important role in the food security of households when they are well managed (Joseph et al., 2020).

Often educational attainment is associated with the adoption of agricultural innovation. The education level of farmers can influence their willingness and ability to apply better farming practices, as stated by Meijer et al. (2017). Backyard farming adoption would be more a function of livelihood need, cultural values, and household resource availability than formal education as a result of the closer linkage of backyard farming in local traditions and day-to-day household coping strategies.

Landladies also participate in backyard agricultural activities more than males. Likewise, age does not influence the trend of adopting the backyard farming model. The high female involvement in backyard farming can be attributed to the fact that women are mostly engaged in household food provision and small-scale farming activities, as revealed by previous studies (Joseph et al., 2020; Wuraola, 2016). However, in the case of backyard farming, it is usually a family enterprise and therefore not linked to specific demographic groups.

2.4 Framework for Sustainable Development and Livelihoods

This study is guided by the Sustainable Livelihood Framework (SLF) by Chambers and Conway (1992) and extended by Scoones (1998). This framework outlines how households access their assets and capabilities and how they engage in livelihood strategies that enhance well-being and mitigate shocks and stresses.

The SLF identifies five key assets for livelihoods, namely natural, human, social, physical, and financial capital. Households use these assets differently to work out strategies to address environmental, economic, and social issues. Sustainable livelihoods occur when households can sustain or enhance their capacities and assets and cope with external shocks and uncertainties.

Backyard farming is a suitable fit with the assumptions of the Sustainable Livelihood Framework. It is a practice that involves natural capital (land and ecological resources), human capital (indigenous agricultural knowledge and skills and farming methods), social capital (cooperation, sharing knowledge, and community networks), physical capital (backyard farming tools), and financial capital (surplus produce and livestock for sale).

In urban northern Ghana, backyard farming is a way of life in which households make the best of the available spaces within the backyards to enhance food availability, diversify income, and adapt to climatic

variability. This framework can thus be used to understand the importance of indigenous knowledge for the widespread adoption of backyard farming for food security and the resilience of livelihoods' households. The suitable SLF provides an explanation for why backyard farming remains an important adaptation strategy among rural households in spite of land scarcity and the limited institutional support and the variability of rainfall.

Philosophical and Theoretical Foundations

This study is based on three complementary frameworks: Socio-Ecological Systems (SES) Theory and the Sustainable Livelihoods Framework (SLF). The SES theory has proven to be useful as an approach to understanding the dynamic interactions among human livelihoods and ecological systems, including the interlinkages between local knowledge, backyard farming activities, food security, climate variability, and ecological sustainability in rural areas (Berkes & Folke, 1998; Ostrom, 2009). This approach is of special importance in the context of the adoption of indigenous knowledge systems and backyard farming practices.

The Sustainable Livelihoods Framework (SLF) is useful to understand that households employ a combination of assets such as land, labor, social networks, indigenous knowledge, and financial resources to pursue livelihood strategies to enhance their resilience in the face of environmental and economic shocks (Chambers & Conway, 1992; Scoones, 1998). The framework provides an explanation for both the uptake of backyard farming and the role of backyard farming in food security and livelihood resilience. To complement these views, Participatory Action Research (PAR) has been used to highlight the importance of community participation, collaboration, and knowledge co-production, which enables the local people to share their indigenous knowledge and discover practical solutions to enhance backyard farming adoption (Chambers, 1994; Reason & Bradbury, 2008).

The study falls within the paradigm of social constructivism, where reality is socially constructed as a result of social interaction, cultural activities, and shared experience. Therefore, the history, traditions, and local experiences of communities shape the local knowledge of agriculture, adaptation to climate change, and backyard farming. This study employs an interpretivist epistemology and aims to understand backyard farming from the perspectives of rural farming households. This orientation is suitable for qualitative approaches like interviews, focus group discussions, and observation, which would involve understanding the experiences, meanings, and decisions of the participants in relation to livelihood strategies and ecological sustainability.

3. Methods

3.1 Design of the Study

A mixed-method approach was used to evaluate indigenous knowledge and the practice of backyard farming among the rural households of Bunkpurugu in northern Ghana. To achieve local consent and acceptance, participation and co-production of knowledge, community entry, and face-to-face approaches were utilized. The approaches enabled local residents, farmers, and community leaders to have a say in their experiences and perceptions of backyard farming practices, as well as food security and household livelihoods.

The study relied on the social constructivist paradigm and interpretivist epistemology to select the methodology. Social constructivism is based on the idea that reality is socially constructed through experience, cultural activities, and relations within the community. Hence, it explored local understandings of backyard farming, food security, and agricultural adaptation through the lived

experiences and interpretations of the participants. The interpretivist approach helped achieve in-depth understanding of the significance participants gave to backyard farming and its contribution to household livelihoods.

The Sustainable Livelihood Framework (SLF) was used to guide the study and consider backyard farming as a livelihood strategy that seeks to draw on household assets (such as land, labor, indigenous knowledge, and social networks) to improve food security and resilience (Chambers & Conway, 1992; Scoones, 1998).

3.2 Area of Study

The study was carried out in Bunkpurugu, the capital of Bunkpurugu-Nakpanduri District in the North East Region of Ghana. The district is located in the Sudan Savannah ecological zone and has one rainfall regime. Rainfall is annual, between April and October. The average temperature is between 30°C and 40°C, and the plant cover is mostly grassland with some isolated trees and bushes (GSS, 2021).

The overall economic activity of the district is still agriculture. Households utilize the backyards to grow food crops and vegetables, as well as rear livestock as food and income diversification strategies. They grow crops like maize, millet, beans, and rear rabbits, goats, sheep, pigs, and poultry (Laarbik & Fatawu, 2018). The region offers a suitable environment for the study of backyard farming, as agriculture is still important for the livelihoods of the households, despite the increasing urbanization and changing land use patterns.

3.3 Sample and Participants

A purposive sampling technique was used to guarantee that participants had first-hand experience and knowledge of backyard farming practices. Household livelihood groups, gender groups, age groups, and education levels were chosen to reflect different perspectives from the sampling strategy.

The study was conducted among 107 household respondents from 21 suburbs within Bunkpurugu subdistrict. Crop farmers, livestock keepers, mixed livelihood groups, men, women, youths, adults, and elderly residents participated. The sample was deemed sufficient as it covered a wide range of backyard farming experiences in the rural community.

Ten key informants were also purposively selected for in-depth interviews. This comprised local leaders, skilled farmers, farmers, and other stakeholders who have vast knowledge of local farming practices and household living strategies. To increase the depth and credibility of the findings, various qualitative data collection methods were employed, as follows: 3.4 Data Collection Methods Data were collected through the use of multiple qualitative methods to provide depth and credibility to the findings.

3.4.1 The Household Survey in the Face-to-Face Approach

The study started by entering the community, introducing the study, gaining their consent, and familiarizing the researchers with the community's stakeholders and structures. This first contact was vital in establishing relations and motivating the community to join in. It enables the evaluation of the relationship of communities to the environment, which the SES theory promotes.

Then a face-to-face method was used to interpret the items of the questionnaire to ensure that all participants understood the questions. In the end, this approach was successful in bridging the language gap and establishing the trust needed to gather data from the participants, something that ultimately resulted in the collection of quality data. A semi-structured questionnaire was used to gather data from 107 respondents, who were farmers, community leaders, and agricultural extension officers. The questionnaire was structured around the main themes of local knowledge about backyard farming, the condition of food security in the household, adoption practices, and livelihood strategies (SLF). To enrich

data that was collected, open-ended questions were also used to allow the participants to share their views and provide further input (constructivist/interpretivist paradigm).

3.4.2 Key Informant Interviews (semi-structured)

Key informant interviews were conducted with a semi-structured approach based on the paradigm of philosophy. The key informants were local leaders, agricultural extension officers, and experienced farmers who were selected based on their valuable perspectives and expertise. The interviews included open-ended questions based on socio-ecological systems theory and the sustainable livelihoods approach. This enabled a deep dive into selected areas such as local knowledge about backyard farming, adaptation strategies for climate variability, challenges and opportunities for backyard farming, and the opportunities for scaling up the backyard farming (BYF) model in the rural areas of Bunkpurugu. At the end of the study, a total of ten participants were interviewed when saturation of data was reached.

3.4.4 Field Observations

Field observations were done as a complementary qualitative approach to obtain direct evidence of indigenous backyard farming practices. After acquiring permission, researchers observed each selected household in a systematic, non-participant, and non-intrusive way for 10–15 minutes. Observations were made on six dimensions of the farm ecosystem – physical farm characteristics, crop production, soil and water management, livestock management, indigenous agricultural practices, and environmental conditions – using a structured checklist. Field notes were taken in detail to gain context.

3.5 Data Analysis

Data analysis involved a combination of qualitative thematic analysis and descriptive statistical techniques. The transcripts of interviews, field notes, and qualitative responses were coded and analyzed thematically using interpretivist methodology. Indigenous knowledge systems and backyard farming practices were used as themes, perceptions of benefits, and adoption patterns. Analysis was informed by the concepts within the sustainable livelihood framework, including livelihood assets and livelihood strategies and livelihood resilience mechanisms. The analysis of the descriptive statistics of the responses to the questionnaires was carried out using SPSS Version 20, and the results were presented as frequencies and percentages to describe the pattern of the adoption of backyard farming and local perception. Triangulation was achieved by using the results of interviews, questionnaires, and field observation. The data obtained from the observation were analyzed thematically and triangulated with the data obtained from the interviews and the questionnaires to increase the credibility of the study as well as to increase the depth of the study. This process helped establish the credibility and depth of the findings.

3.6 Trustworthiness and Rigor

Several measures were adopted to improve the credibility of the study. Firstly, triangulation was accomplished by adopting several data sources and data collection methods. Secondly, preliminary findings were presented to participants using member-checking processes to verify interpretations and ensure that the findings accurately represented the community's views. The study also provided detailed context of discarded farming practices and local knowledge systems, which contributed to making the results transferable to other rural environments in northern Ghana (and other similar environments in sub-Saharan Africa).

3.7 Ethical Principles in the Study

All participants gave informed consent before data were collected. Participants were told the objective of the study, that they were participating on a voluntary basis, and that they had the right to withdraw themselves from the study at any time. Personal information was omitted from data collection forms and

reports to ensure confidentiality and anonymity. Households were numbered for data handling and follow-up clarification if needed. The study also ensured that the opinions of the participants were solicited in a respectful and appropriate manner throughout the research.

4. Findings and Discussion

The Indigenous Knowledge of Backyard Farming Among Rurban Households

This study quantifies the indigenous knowledge of rurban people about the practices of the backyard farming (BYF) model in Bunkpurugu. The results indicate that BYF is well established and popular: 89.7% of households had backyard space, and 88.8% farmed it. These indicate a very deep indigenous knowledge and application of BYF in the community.

Key informant interviews confirmed the universal awareness of BYF, but some people could not participate due to space and location constraints. However, 89.7% of the respondents identified BYF as an effective measure to mitigate food insecurity. Most people in the area know the benefits of BYF; however, not all can participate in it because of space and location constraints. People generally think that BYF can help reduce food and income stresses, particularly during lean periods” (Field data, 2024).

Although the practice and awareness are widespread, no institutional support is currently evident: Only 0.9% of households report some type of policy or technical assistance. The lack of institutionalization indicates the dependence of the community on its local knowledge and self-sufficiency in maintaining BYF practices.

Table 1: Indigenous Knowledge and Backyard Farming Practices

Variable	Yes (%)	No (%)
Have backyard space	89.7	10.3
Use backyard for farming	88.8	11.2
Local knowledge of BYF as remedy to food shortage	89.7	10.3
Knowledge of appropriate BYF practices	88.8	11.2
Households with backyard spaces use them for farming	86.9	13.1
Access to support for BYF	0.9	99.1

Source: Field Survey (2024), N = 107.

The results have confirmed that BYF is one of the most important livelihood strategies in the household because it is a source of fresh produce, contributes to food security, and increases resilience, which is consistent with the literature that emphasizes the role of BYF in promoting agroecological practices, conserving water and reducing vulnerability (Sibhatu et al., 2017; Hudson et al., 2017). The findings also reinforce the theoretical approach put forward, which highlights the need to build local knowledge, dialogue, and collective action to help to develop the quality and output of BYF practices (Oriola, 2009). A male farmer from Tojing explained:

“This is something we have learned from our parents; when there was scarcity of food, people relied on crops in their homes. Even today the backyard is helping us to survive when the granary is empty.” (Field data, 2024).

Likewise, a female head of household commented:

“Most families know how to use the backyard; they know which crops will grow there and when and how to take care of them.” (Field data, 2024).

The backyard farming activities were observed to be part of the rural household lifestyle. The majority of households had well-defined backyard areas, which varied in size according to the availability of land. These areas were sometimes demarcated by a holistic attitude, and food plants, vegetables, and small livestock animals were sometimes growing in the same compound. Vegetables were mostly planted close to the kitchen, and the rest of the plots were planted with cereals and legumes, or intercropped with cereals. With fruit trees in the compounds for shade and food, poultry or livestock were contained in pens or fenced shelters. Maximizing land use indicates that the primary purpose of backyard farming is to provide food for the household and not for commercial purposes.

The results support that of Kansanga et al. (2020), who noted that traditional agricultural knowledge continues to play a vital role in the adaptation strategies employed by the household in Northern Ghana. They can also be considered a support for the case of Ofosu-Bamfo et al. (2023), who argue that backyard farming also strengthens local knowledge systems and food security outcomes. Overall, backyard farming is not regarded as a new agricultural technology introduced from other countries but as an indigenous and traditional knowledge system that is part of daily livelihoods. Throughout the discussions, participants repeatedly referred to BYF as a “safety valve” that has been passed down and modified from one generation to the next in response to the evolving food security issues they faced. It highlights the importance of indigenous knowledge to develop resilient and sustainable food systems in rural households.

Indigenous Knowledge of Seasons of Planting and Climate Resilience

There was relatively sound knowledge of seasonal rainfall and planting dates. The very first rains in March were received by just 2.8% of the respondents, while the first rains in April were received by 22.4% of the respondents, who were always aware of the possibility of early rains. But nearly all the respondents (99.1%) reported that households were now not eager to plant when the first rains arrived due to the erratic nature of the rains.

Furthermore, 71% of respondents mentioned that rainfall was no longer consistent from one year to the next, reflecting the high level of awareness about climatic variability.

An old farmer said:

Rainfall has changed; sometimes it comes too early and goes too late. (Field data, 2024)

Similarly, the observation approach revealed that there was a high level of crop diversity adoption among those rural households involved in backyard farming. There were several types of cereals, early-maturing maize, guinea corn, and millet; legumes (cowpea and groundnuts); vegetables (okra, tomatoes, pepper, and garden eggs); and tubers (sweet potato) that were cultivated in households. The diversity reflects a conscious approach at reducing climatic risks and having food security round the year, thus indicating that diversifying crops is one of the local strategies to face climatic risks.

The observation also found that the households used adaptive measures to climate variability, like shifting their planting time, intercropping, using drought-tolerant crops, mulching, and conserving water. Trees were planted for shades, and the planting strategies were adjusted flexibly depending on the amount of rainfall received. The adaptive responses are illustrative of the dynamic and reactive character of indigenous knowledge.

This discovery represents indigenous adaptation processes that call for the emergence of local knowledge in the face of climate change. Households do not just follow historical calendars but continuously decode the climatic information and make planting decisions based on that.

Soil Fertility Management and TEK;

Soil use efficiency and traditional ecological knowledge include the traditional agronomic practices, traditional knowledge of soil management, and traditional animal husbandry practices.

The study revealed significant indigenous knowledge of soil fertility management among the participants. An overwhelming 67.3% said that manure had to be applied for successful cultivation, but only 31.8% said the backyard soils were naturally fertile.

Manure is still the most common method of fertility management in livestock. Households often combine crop production and livestock keeping, enabling nutrients to be recycled in the household production system.

One participant explained:

“Everyone uses animal manure. It is too costly to have to buy fertilizer at this time.” (Field data, 2024)

Another respondent remarked:

The animals benefit the crops; their manure enhances soil quality and boosts crop yield.

This observation approach revealed that most people manage soil fertility using locally available organic resources. Livestock manure (mostly goat, sheep, and poultry) was the most used organic manure. In a few households, compost pits were observed, and most households avoided chemical fertilizers. A majority of the people who used agrochemicals for weed and insect control cited cost and unavailability of human labor as well as quality of delivery as motivators. Such practices are not indicative of sustainable nutrient cycling and environmental conservation practices based on traditional knowledge. The results are consistent with Agula et al. (2018), who found that manure application was an ecosystem-based farming practice of importance to small farmers in Ghana. They also highlight the role of indigenous people's knowledge in the sustainable management of resources and the resilience of their livelihoods. 4.2 Local perceptions overwhelmingly support the backyard farming (BYF) model. 95.3% of respondents feel BYF has a positive impact on the ecology of the area, 91.6% believe BYF helps to retain soil moisture and its heat-reducing properties, and 69.2% feel it is improving the rainfall pattern. Almost everyone (99.1%) said they would promote BYF in their community, and 96.3% agreed that farmer dialogues help to improve agricultural production.

There was a significant difference in the majority opinion on multiple planting seasons, with 98.1% of respondents agreeing that BYF allows for more than one planting season, and this was more likely to be the case in rural households (83.2%), suggesting there is potential for increasing seasonal cropping in urban households. The majority of households have only small plots in their backyards (consensus 95%), but BYF is still widely used. The overwhelming majority of all homes with a backyard indicated that they had utilized their space for food production, demonstrating a high level of interest in using all available space for food. Participants stated that planting patterns are crucial in addressing social and ecological problems, noting that the flexible planting times allow the household to increase their produce and food security. Nearly everyone (98%) agrees that BYF allows planting twice a season and that it can greatly boost local food production (98%). The community's consensus is that the BYF model has a positive effect on the environment, as around 92% believe that the "backyard gardening" approach is beneficial for the environment, soil conservation, and reduction of heat. Further, 95% say that BYF is indeed improving the ecology of the region, and 69% say it is helping in cloud formation and rain. These observations were confirmed by interview accounts, which suggested that fields would be greener and cooler if backyard planting were common.

Advancing the BYF concept is welcomed by the communities of Bunkpurugu to a tremendous extent in the rural setting. The overwhelming majority (99%) said they would encourage others to take up home farming, while 96% felt that they could help everyone to improve their results by sharing best practices. In general, there is a strong appreciation for the value of community knowledge and knowledge sharing.

Table 2: Perceived Benefits of Backyard Farming

Proposition	True (%)
BYF enhances local food production	98.1
BYF allows multiple planting seasons	98.1
BYF promotes cloud formation and rainfall	69.2
BYF conserves soil and reduces heat	91.6
BYF improves local ecology	95.3
Will encourage others to practice BYF	99.1
Dialogue improves farming outcomes	96.3

Source: Field Survey (2024), N = 107.

Backyard farming was overwhelmingly identified by participants as a connection to increased food security, nutrition, environmental quality, and livelihood resilience. Almost all respondents (98.1%) agreed that backyard farming contributes to local food production, and 95.3% agreed that backyard farming helps to enhance the ecological conditions of the area.

The information from the interviews shows that backyard farming in the households is seen as a way of minimizing household vulnerability in times of food scarcity.

One participant stated:

“The backyard is where people begin when there is no food in the house; it is helping families to survive difficult months.” (Field data, 2024)

Another respondent explained:

“The main farm doesn't always succeed, but the backyard always provides us with vegetables or something small.” (Field data, 2024)

Field observations identified that there was good integration between crops and livestock in backyard farming systems. Poultry were often observed on, around, and eating in crop fields, and goats were observed eating crop residues. Systematic collection and application of manure to crops and storage of crop residues as feed were considered an efficient circular production system that enhanced the household livelihoods.

Notably, it was seen that the backyard farming also brought about great environmental advantages. The following observations were made: an increase in vegetational cover, a decrease in bare soil surface, reuse of organic waste, better soil protection, and efficient utilization of domestic wastewater. Additionally, the integrated management of crop residues demonstrated another aspect of the importance of backyard farming in terms of ecological sustainability, reinforcing the dual role of backyard farming in both livelihood and environmental well-being.

There were, however, problems as well. Poultry and goats were frequently seen grazing the fields as free-ranging animals, with goats munching on some parts of the crops and the poultry feeding on fruits or vegetables. Losses were apparent in these intrusions, especially at unfenced or poorly protected farms.

While some households implemented proper fencing, others lacked such barriers, contributing to the problem.

This is in line with earlier studies, including those by Agula et al. (2018), Bellwood-Howard et al. (2018), and Derbile et al. (2022) that highlight the importance of backyard farming in boosting food availability and income diversification and improving nutrition security within the household. Likewise, Saaka et al. (2021) state that backyard farming is a pathway towards greater access to fresh, nutritious food and decreased household vulnerability to food insecurity.

Concurrently, the participants had a high association with the benefits of backyard farming to the environment. Over 90% of respondents reported that backyard gardening reduces heat and helps prevent soil erosion, and around 69% felt that more vegetation cover resulted in better rainfall conditions.

A respondent explained:

“Once people grow the backyard, it is greener and cooler as opposed to leaving it in its original state.” (Field data, 2024)

The perceptions also reflect the embedding of ecological knowledge in local livelihoods and corroborate the results of Mensah et al. (2021) on local perceptions of climate adaptation and environmental stewardship.

The backyard farming experience was adopted by 4.3% of the respondents.

The findings revealed that 49 respondents finished or left the basic level, 85.2% of respondents reached the senior high school education level, and there were only 4 who were in the tertiary level. It also revealed that there were higher numbers of respondents in these groups involved in various activities on the sides of their farming operations (see table 3). Table 3 shows that there is no significant difference between the level of educational attainment and the adoption of backyard farming.

Table 3: Adoption of Backyard Farming within Educational Levels

Educational Level	Farming (%)	Not Farming (%)
Basic	91.8	8.2
SHS	85.2	14.8
Tertiary	100.0	0.0

Source: Field Survey (2024), N = 107.

Results showed a very high level of backyard farming in the study area. About 88.8% of respondents stated that they cultivated crops or raised animals in their backyard areas. There was no segregation by education level. The participation ratios for respondents possessing basic, secondary, and tertiary education were still high.

The results contradict the notion that participation in smallholder agriculture decreases with formal schooling. Rather, backyard farming seems to break the education boundaries as it fulfills practical needs for a livelihood.

The respondent, who was a tertiary-educated person, explained:

“Education doesn't stop people from farming; everybody needs food, so we still use the backyard.” (Field data, 2024)

This result is opposite to Meijer et al. (2017), who linked education with agricultural innovation uptake. The needs for a livelihood seem to have more impact than formal education in Bunkpurugu.

This was also confirmed by the analysis of the adoption by the sex categories of the participants (see table 4).

Table 4: Adoption by Gender

Gender	Farming (%)	Not Farming (%)
Male	89.9	10.1
Female	89.5	10.5

Source: Field Survey (2024), N = 107.

There was little difference between girls and boys in terms of adoption. A similar participation rate for males and females was observed, showing backyard farming to be a socially inclusive livelihood strategy. But women often said they were the main managers of the backyard plots.

A woman farmer commented:

“Usually, women take care of the crops in the backyard as they spend more time around the house.” (Field data, 2024)

The results corroborate those of Joseph et al. (2020) and Wuraola (2016), which recorded a high level of participation of women in the backyard farming system.

There is a relationship between age and level of adoption.

In addition, age is not a significant determinant of the decision to farm. In the case of 5 age groups, the farming rate was below 80% for all but the youngest group (≤ 35 years), which had an 87.5% farming rate, followed by the middle-aged group (36–50 years) with a farming rate of 90.4% and age group 51 and above with a farming rate of 84.6%. This is his or her traditional approach to survival that's been passed down from generation to generation. It also illustrates the interactions within the community between locals and the ecological systems, as they are stewards of the systems.

The data in Table 5 shows the number of children in each age group who are adopted.

Table 5: Adoption by Age Category

Farmers within Age Category likely to engage	Frequency	Farming (%)
≤ 35 years	7 out of 8	87.5
36–50 years	66 out of 73	90.4
≥ 51 years	22 out of 26	84.6

Source: Field Survey (2024), N = 107.

The rates of adoption were also fairly high among all age groups. The percentage of participation was over 84% for all age groups, indicating the multi-generational aspect of backyard farming. From the observation, it was established that a wide-spread adoption existed, with almost 9 out of 10 households engaged in some form of backyard agriculture and crop cultivation or livestock rearing, or both. (Field data 2024) The integrated crop-livestock systems were most common, indicative of a community-wide preference for diversified and resilient livelihoods. The results accordingly indicate that backyard farming is a livelihood activity and a means of passing on indigenous knowledge of agriculture from generation to generation. 5. The results indicate that backyard farming is not just an adjunct farming practice but is a means to a livelihood. In accordance with the Sustainable Livelihood Framework (Chambers & Conway,

1992; Scoones, 1998), families utilize their knowledge of the natural world and the physical, social, and human resources of their homes, including indigenous knowledge, to improve food security and resilience. Indigenous knowledge systems have continued to be relevant in current agriculture as the knowledge on planting seasons, soil fertility management, manure application, and climatic adaptation is widely known. The results corroborate the adaptive and contextual aspects of local environmental knowledge (LEK) as emphasized by indigenous knowledge scholarship (Kansanga et al., 2020; Ofosu-Bamfo et al., 2023).

The very high level of adoption rates found in all genders, ages, and education groups also suggests that backyard farming is now integrated into the rural livelihood systems. Backyard farming seems to be entrenched in the survival strategies of households and is not limited by higher education or monetary resources or institutional support, as many other innovations in agricultural production are. The results therefore corroborate previous research (Joseph et al., 2020), which shows that backyard farming is a food security measure, livelihood diversification, and a socially inclusive adaptation practice all at once.

A food security perspective indicates that the evidence aligns with the arguments put forward by Saaka et al. (2021) that backyard farming increases food availability, dietary diversity, and the resilience of households in times of food scarcity during seasons. The consensus that backyard farming is a key factor in enhancing food production implies that households see backyard farming as a key coping mechanism to cyclical food insecurity.

In addition, participants' perceptions of ecological benefits also serve as good evidence of the linkages between livelihood and environmental goals. The perception that backyard farming has positive impacts on environmental policies such as soil conservation, vegetation cover, and environmental improvement in the local community is an example of a coordinated approach to sustainability in line with indigenous ecological worldviews.

The results indicate that backyard farming is a culturally embedded, knowledge- and social-inclusive livelihood approach that helps rural households cope with food insecurity, environmental uncertainty, and livelihood vulnerability. The practice is still an important adaptation tool in the local context that could be further promoted to enhance resilience and sustainable food systems in Northern Ghana.

6. Key Findings

The use of backyard farms is a known indigenous livelihood activity, where almost 90% of all households use backyards for their food production.

Indigenous knowledge in the households about backyard farming practice in terms of farming practice, seasonality of rainfall, selection and planting of appropriate crops, planting calendar, soil fertility management, and integration of crops and livestock is quite high.

Indigenous knowledge is passed on from one generation to the next and plays a crucial role in the livelihoods and food security of households. The knowledge is continually being locally adapted to the new climate conditions, reflecting flexible and dynamic local adaptation, rather than sticking to a traditional farming calendar.

Strong indigenous resource-recycling practices and integration between crop and livestock production systems are reflected in livestock manure being the main soil fertility management strategy.

In general, communities highly value backyard farming as a good way to achieve increased food production, eliminate food shortages, conserve soil, maintain vegetation cover, and promote environmental sustainability. 6. Adoption of backyard farming is very high; 88.8% of households are engaged in backyard farming of crops and/or livelihoods. The adoption rate is high across educational

levels, age groups, and gender categories, and backyard farming is a socially inclusive and intergenerational livelihood strategy. The numbers of boys and girls who take part in services are comparable, but women are likely the main managers of services.

Although backyard farming has a high level of adoption and perceived advantage, support for backyard farming is very limited in the institutions.

7. Conclusions

1. Backyard farming is not a recent innovative agricultural method in Bunkpurugu but rather a part and parcel of the indigenous way of life practiced by the rural households.
2. Indigenous knowledge remains a key factor in the decisions that are made within the household for planting, adaptation to climate change, soil fertility management, and food production.
3. It plays a key role in improving food security, dietary diversity, livelihood resilience, and adaptation to climatic variability at the household level.
4. Backyard farming was observed to be a socially inclusive adaptation strategy, as the adoption of backyard farming did not have any restrictive barriers of gender, age, or education.
5. The mix of crops and livestock illustrates the socio-ecological aspects of backyard farming, where households make the best use of resources and keep their farming systems productive when resources are limited.
6. Despite its prevalence and importance, the existence of backyard farming is not formally institutionalized, and it could be an opportunity to strengthen local food systems and climate resilience.
7. In rural northern Ghana, backyard farming serves as a mechanism to ensure food security, a livelihood diversification strategy, an environmental management practice, and an indigenous adaptation system.

8. Contribution to Knowledge

The findings of this study have five important contributions to knowledge:

1. **Empirical Contribution:** It is one of the first detailed empirical reports of indigenous knowledge systems supporting backyard farming in the rural setting of Northern Ghana (interpretivist paradigm).
2. **Theoretical Contribution:** It builds on the SLF by showing the role of indigenous knowledge as a critical asset of livelihoods, which has implications for food security and food security outcomes.
3. **Conceptual Contribution:** The study is a socio-ecological and culturally integrated approach to backyard farming as a livelihood and not just an additional food production activity.
4. **Methodological Contribution:** The study shows the utility of community-centered approaches to understanding indigenous agricultural systems through participatory approaches and qualitative and descriptive analyses.
5. **Policy Contribution:** The results offer a foundation for backyard farming to be advocated as a locally based solution to the food security, resilience of livelihoods, and environmental sustainability issues in rapidly urbanizing rural areas.

9. Recommendations

1. Policy Recommendations

Backyard farming should be formally acknowledged by district agricultural authorities as a potential part

of the local food security and climate adaptation measures.

To create specific support programs for backyard farmers as part of agricultural extension services, which would involve training them on better agronomic practices, climate-smart farming, and soil management. Backyard farming should be part of the district development, food security, and environmental sustainability policies of local government.

2. Practice-Oriented Recommendations

There is a need to expand the community-based awareness programs on successful backyard farming practices.

Encourage dialogue and cooperation among crop farmers and livestock owners to help resolve issues related to free-range livestock systems and offer planting opportunities sooner.

Households should be encouraged to develop their capacities in the use of manure and reusing nutrients in the crop–livestock system.

Indigenous knowledge-sharing platforms at the community level should be established to provide intergenerational transfer of indigenous agriculture knowledge.

3. Research Recommendations

Research is needed in the future to address the direct effect of backyard farming on the nutrition, income, and climate resilience of the household with mixed-methods approaches.

Comparative studies should be carried out on other rural/urban settlements in Ghana that will enable the wider applicability of the findings.

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