

Tiger Nut (*Cyperus Esculentus Lativum*) as a Cash Crop: Assessing its Economic Impact on Smallholder Farmers in Nadowli-Kaleo District of Ghana

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ABSTRACT

Tiger nut (*Cyperus esculentus Lativum*) is an emerging cash crop with significant economic potential for smallholder farmers in Ghana. Despite its nutritional and medicinal benefits, research on its impact on household welfare and the challenges affecting its production and marketability remains limited. This study examines the economic contributions of tiger nut cultivation to farmers' livelihoods in the Nadowli-Kaleo District, employing a mixed-method approach with data from 310 farmers through surveys, interviews, and focus group discussions, the findings revealed a strong positive relationship between tiger nut farming and household income, with 88% of respondents reporting earnings from cultivation. Increased income enables farmers to invest in food crop production, enhancing household food security while also creating employment opportunities and diversifying local economies. However, challenges such as poor market access, high input costs, and climate variability hinder productivity. The study concludes that tiger nut farming significantly improves livelihoods and recommends policy interventions for sustainable growth in the sector.

Keywords: Tiger nut farming, livelihood, Nadowli-Kaleo, economic impact, smallholder farmers

INTRODUCTION

Over the past decade, the agricultural sector in Ghana has witnessed a gradual shift towards the commercialization of non-traditional cash crops, with tiger nut (*Cyperus esculentus lativum*) emerging as a promising option for smallholder farmers (Ayambila et al., 2023; Novor, & Donkor, 2024). Tiger nut farming, primarily concentrated in northern Ghana, including the Nadowli-Kaleo District, has gained attention due to its adaptability to semi-arid conditions and low fertile soil (Timon et al, 2019), high nutritional value, and expanding market demand both domestically and internationally (Munialo et al., 2024). The crop, known for its resilience to drought and minimal input requirements, has the potential to significantly enhance rural livelihoods and contribute to economic diversification (Wongnaa et al., 2019). However, despite its increasing importance, the economic viability and impact of tiger nut farming remain underexplored, particularly in the context of smallholder farmers in the district.

The discourse on sustainable agricultural development highlights the need for smallholder farmers to transition from subsistence farming to commercial crop production as a means of improving income levels and economic resilience (Mekonnen et al, 2024). Previous studies have examined the nutritional and medicinal benefits of tiger nuts (e.g., Bazine & Arslanoğlu, 2020; Nwosu et al., 2022; Edo et al., 2024.), but there is limited research assessing its economic impact and market prospects as a cash crop. Key challenges such as limited access to finance, inadequate storage facilities, and market inefficiencies continue to hinder the full realization of its economic potential (Akabassi et al., 2022). Therefore, understanding the profitability, production constraints, and marketing dynamics of tiger nut farming is essential to inform policies that support its commercialization and integration into Ghana's agribusiness sector.

The relationship between cash crop production and rural economic development has been well-documented in agricultural literature. The tiger nut trade presents a significant economic opportunity for countries like Ghana, which exported 63,462 tons of tiger nuts valued at US\$25,130.82 to Europe in 2020 (Donkor et al., 2019). Studies have shown that smallholder farmers engaged in high-value cash crop farming often experience increased household income (Boadi et al., 2025), improved food security (Oluwole et al., 2020), and better access to essential services such as healthcare and education (Eyasu et al., 2025). However, the extent to which tiger nut farming can deliver these economic benefits remains uncertain. Market fluctuations, price volatility, and inadequate value chain integration pose significant risks to farmers seeking to scale up production (Acheampong et al., 2023). Examining these factors in the context of Nadowli-Kaleo District will provide critical insights into whether tiger nut farming is a viable cash crop option for improving the livelihoods of smallholder farmers. This study therefore seeks to bridge the knowledge gap by evaluating the economic impact of tiger nut farming in the Nadowli-Kaleo District, focusing on profitability, market access, and production challenges.

This study makes two key contributions. First, it focus on smallholder farmers in the Nadowli-Kaleo District, a region where the potential of tiger nut farming has not been systematically analyzed. By examining production costs, revenue streams, and market accessibility, this study will offer valuable insights into whether tiger nut cultivation can serve as a viable source of income for rural farmers. The findings will provide evidence-based recommendations for policymakers and agricultural extension services seeking to enhance the profitability of non-traditional cash crops in Ghana. Secondly, while previous studies have discussed general challenges in Ghana's agricultural sector (e.g., Awuni et al., 2023), this research provides specific, localized insights into the structural barriers affecting tiger nut farmers, such as inadequate storage facilities, lack of organized marketing channels, and price instability. By addressing these issues, this study contributes to the broader discourse on sustainable agricultural development and rural economic transformation and diversification.

Employing a mixed-method approach, this research provides empirical evidence on the financial sustainability of tiger nut farming and offers policy recommendations to enhance its commercialization. The findings will be valuable for policymakers, agribusiness stakeholders, and development organizations working to promote sustainable agricultural practices and improve rural livelihoods in Ghana. The rest of this paper is organized as follows. The literature review is presented in Section 2. Section 3 describes the data and empirical approach in the study. Section 4 presents the main findings, and Section 5 concludes with policy implications.

LITERATURE REVIEW

2.1 Economic Importance of Tiger Nut Farming

Tiger nut cultivation has emerged as a significant agricultural activity contributing to the livelihoods of farmers, particularly in rural communities. Studies have highlighted its role in income generation, food security, and social well-being, making it a valuable cash crop in various regions.

Tiger nut cultivation plays a significant role in the economic and social fabric of many communities, particularly in regions where it is a major agricultural product. A study by Novor & Donkor (2024), found that tiger nut farming contributes substantially to household incomes, providing an essential source of livelihood for smallholder farmers. The crop's resilience to harsh environmental conditions makes it a viable option for farmers in arid and semi-arid regions, where other crops may fail (Wang et al., 2022). This adaptability reduces the risk of income loss due to climate variability, thereby enhancing economic stability for farming households.

Beyond individual economic benefits, tiger nut cultivation contributes to local and national economies. The commercialization of tiger nuts has led to the establishment of small and medium-sized enterprises (SMEs) that process the tubers into products such as milk, flour, and oil, fostering economic growth and development. This expansion has also stimulated investments in agro-processing industries, creating employment opportunities, particularly for rural youth. (Novor & Donkor 2024).

Socially, tiger nut farming has been found to enhance community cohesion and development. A study by Agyeman et al. (2022) observed that cooperative farming models centered around tiger nut production facilitate knowledge sharing and resource pooling among farmers. Such collaborations improve farming techniques,

increase productivity, and strengthen social networks. Additionally, the income generated from tiger nut sales enables families to afford better healthcare, education, and improved living conditions, thus contributing to overall societal well-being (Obeng-Koranteng et al., 2017).

Health benefits associated with tiger nut consumption also play a role in its increasing demand. Studies have found that tiger nuts are rich in fiber, vitamins, and essential minerals, making them a nutritious dietary option. Their consumption has been linked to improved digestion, cardiovascular health, and diabetes management. The growing awareness of these health benefits has driven demand for tiger nut-based products, further stimulating economic activities in the agricultural and food sectors (Yu et al., 2024; Llorens et al., 2025).

Tiger nut cultivation contributes to household food security by enhancing the availability and accessibility of food. Studies have affirmed that tiger nut farming plays a crucial role in sustaining household food supplies (FAO, 2019; Odubo et al., 2024). The crop is often consumed as a snack, providing essential nutrients and energy for household activities (Maduka & Ire, 2018). Beyond household consumption, tiger nut farming contributes to food security by supporting intercropping practices. Farmers often cultivate tiger nuts alongside maize, cassava, and yams, ensuring a diversified food supply for their families (Edo et al., 2024). This practice strengthens food availability, especially during lean seasons when staple food supplies diminish.

Overall, tiger nut cultivation contributes significantly to economic and social development by providing income, employment, and health benefits. Studies suggest that with better investment in processing technology, improved storage facilities, and supportive policies, the tiger nut industry has the potential to further strengthen rural economies and improve livelihoods on a broader scale.

2.2 Challenges faced by farmers in Tiger Nut Cultivation

Despite its economic potential, tiger nut cultivation is hindered by several challenges that affect productivity. The labor-intensive nature of farming, requiring significant human effort for land preparation, sowing, and harvesting, is a major obstacle. High labor costs and physically demanding harvesting methods further strain farmers (Tetteh & Ofori, 1998). Additionally, pre-planting hazards such as cutlass injuries, snake bites, and fatigue add to the difficulties (Maikasuwa et al., 2019). The high cost of inputs, particularly fertilizers, remains another key challenge. Many farmers struggle to afford quality fertilizers, leading to reduced yields (FAO, 2021). The reliance on traditional farming methods due to limited access to modern agricultural inputs and government support exacerbates the problem (Devlet, 2021).

Climate variability poses further risks, as erratic rainfall patterns and droughts negatively impact tiger nut production (Bamishaiye & Bamishaiye, 2011). Insufficient water availability reduces productivity, and fluctuating moisture levels contribute to post-harvest losses due to aflatoxin contamination (FAO, 2021). Post-harvest storage issues are another significant challenge. Inadequate storage and processing facilities lead to high losses, reducing the market value of tiger nuts (Odubo et al., 2024). Poor storage practices further contribute to product deterioration, affecting profitability (Maikasuwa et al., 2019).

Market access difficulties and price fluctuations also affect farmers. The absence of structured marketing channels forces farmers to rely on middlemen, who often exploit them by offering low prices (Odubo et al., 2024). The lack of price regulation further limits farmers' ability to secure fair returns (FAO, 2021). To address these challenges, targeted interventions such as improved access to modern farming inputs, better storage facilities, structured market linkages, and supportive agricultural policies are needed. Implementing these measures can enhance productivity and economic sustainability for smallholder farmers.

STUDY AREA AND METHODOLOGY

3.1 Description of study area

The scope of the study was in the Nadowli-Kaleo District, located in the central part of Ghana's Upper West Region. Established in 1988 under LI 1437, the district has Nadowli as its administrative capital and covers a land area of 2,742.50 km². It lies between latitude 11° 30' and 10° 20' North and longitude 3° 10' and 2° 10'

West, bordered by Jirapa Municipal to the North, Wa Municipal to the south, Daffiama Bussie Issa District to the East, and Burkina Faso to the West (MOFEP, 2020; GSS, 2021). The study focused on tiger nut cultivation, which is widespread in the southeastern part of the district, particularly in the Sankana, Sombo, Takpo, and Nator operational areas. The sandy-loamy soil in these areas supports tiger nut farming, while the less dense vegetation, resulting from deforestation, overgrazing, and bush burning, creates suitable conditions for crop growth and productivity. **Figure 1** below shows the map of the study area.

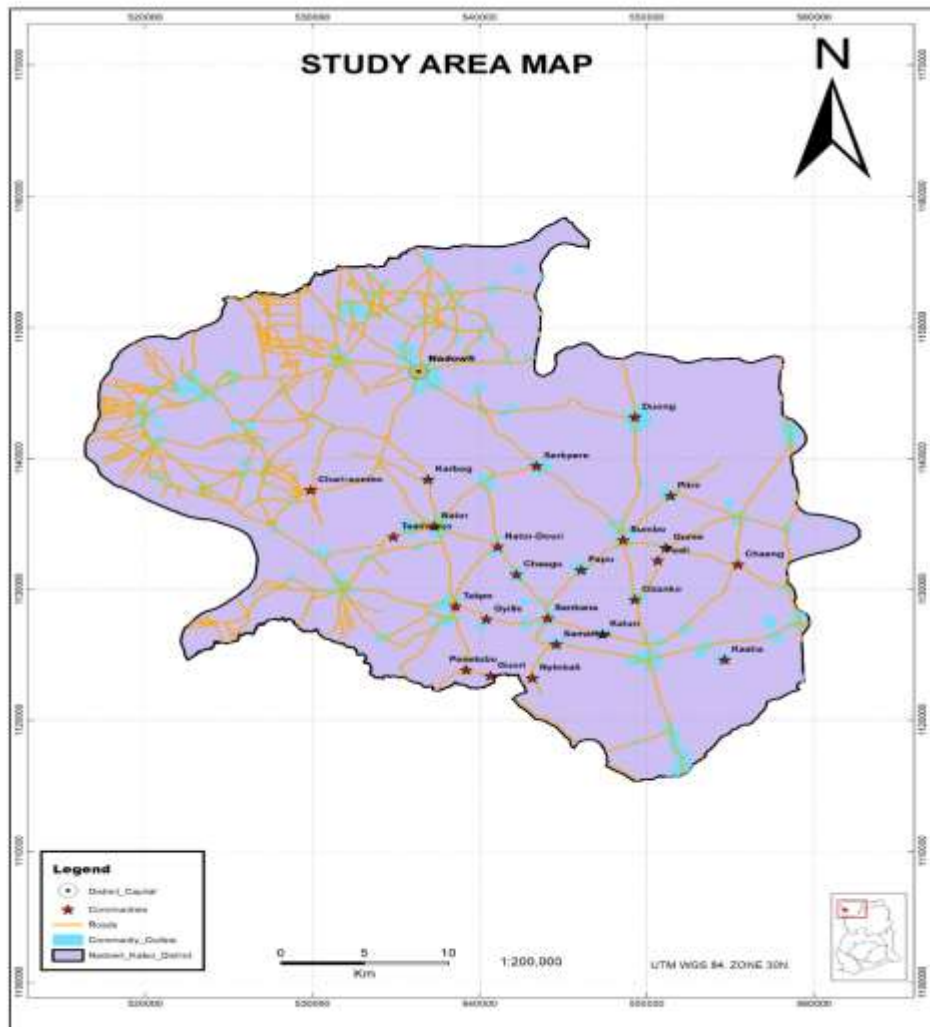


Figure 1: Map of the Study Area in the Nadowli-Kaleo District

Source: www.gog.gss data manipulated by the Author (2024)

3.2 Sampling technique

The study employed both probability and non-probability sampling techniques. The Nadowli-Kaleo District was purposively selected due to its prominence in tiger nut production and marketing in the Upper West Region. Based on simple random sampling, the lottery method was applied in selecting farmers from identified tiger nut farming communities, ensuring fair representation and minimizing bias. Additionally, purposive sampling was used to select key informants and focus group discussion participants, enriching the study with qualitative insights while reducing the margin of error.

3.3 Methods of data collection

The study primarily relied on a structured questionnaire for data collection (Appendix 1). A survey questionnaire was administered face-to-face to 310 smallholder tiger nut farmers using a non-probability sampling approach.

Conducting interviews in person allowed for deeper probing of responses. The questionnaire targeted household heads, as designated by their respective households, and covered key areas such as household demographics, resources, assets, labor and farming activities, crop cultivation, agricultural innovations, factors influencing innovation adoption, crop marketing, challenges in tiger nut cultivation, and its impact on farmers' livelihoods.

Key informants were selected from diverse demographic backgrounds and professional fields, including agricultural extension officers, researchers, tiger nut farmers, community leaders, women traders, and administrative officers (chiefs). To explore cultural management practices in tiger nut farming, four Focus Group Discussions (FGDs) were conducted. These discussions provided deeper insights into people's experiences, perceptions, and knowledge regarding tiger nut production and marketing in the district, and obtained detailed information about tiger nuts production and marketing in the District.

3.4 Data Analysis

Qualitative data were collected through Focus Group Discussions (FGDs) and Key Informant Interviews, translated into English where necessary, and transcribed to identify key themes, patterns, and features for analysis. Quantitative data underwent manual editing and coding before being processed using SPSS version 23 and analyzed. The results were presented using tables and charts to illustrate statistical relationships among variables. A chi-square analysis was conducted to examine the main drivers of innovation, while a one-sample t-test was performed to assess factors influencing innovation adoption, challenges faced by farmers in tiger nut production, and household expenditure of income generated from cultivation. In summary, qualitative data was analyzed through content analysis and presented descriptively, whereas quantitative data was processed using SPSS and analyzed using descriptive statistics.

RESULTS

4.1 Economic importance of tiger nut farming

Tiger nut cultivation contributes significantly to household income and livelihood diversification. About **85% of respondents reinvest earnings** into other crops, particularly groundnuts, maize, and beans, while a smaller share invest in yams, millet, sorghum, or cashew plantations. Off-farm diversification is also common, with farmers channeling income into petty trading (52%), livestock (29%), and food processing (17%). The study found that out of the 310 respondents, 185 were into off-farm activities, as represented in Table 1.

Table 1: Off-farm activities that tiger nut income supports

Businesses diverted	Freq.	Percent
into from tiger nut farming	<i>F</i>	%
Petty trading	97	52.43
Processing of food and drinks	31	16.76
Livestock	54	29.18
Wielding	3	1.62
Total	185	100

Source: Field Survey, (2024)

The analysis of businesses diverted from tiger nut farming shows that petty trading is the most common alternative, with 97 respondents (52.43%) engaging in it. This suggests that many farmers find small-scale trading a viable way to supplement their income. Livestock farming follows as the second most common choice, with 54 respondents (29.18%) investing in animal rearing, indicating its significance in household income

diversification. A smaller proportion, 31 respondents (16.76%), have ventured into food and drink processing, likely due to the additional skills and resources required for such enterprises only 3 respondents (1.62%) have gone into welding, making it the least common option, possibly due to the specialized skills and equipment needed.

4.2 Impact of tiger nut cultivation on the livelihood of farmers

A vast majority (88%) confirmed that tiger nut farming generates income, averaging **GH¢7,260 per household** annually. This income supports household needs and long-term investments. Nearly half of respondents also consume tiger nuts at home, mostly as snacks, citing energy and nutritional benefits. Tiger nut cultivation contributes strongly to food security: **91%** of respondents affirmed improved household food supply, often through reinvestment into staple crops. Reported livelihood improvements include increased production (95%), additional income (95%), and enhanced food availability (94%). A discussant acknowledged, *“We cultivate tiger nuts in the household to generate income to help fund the family expenses”* (FGD, Takpo).

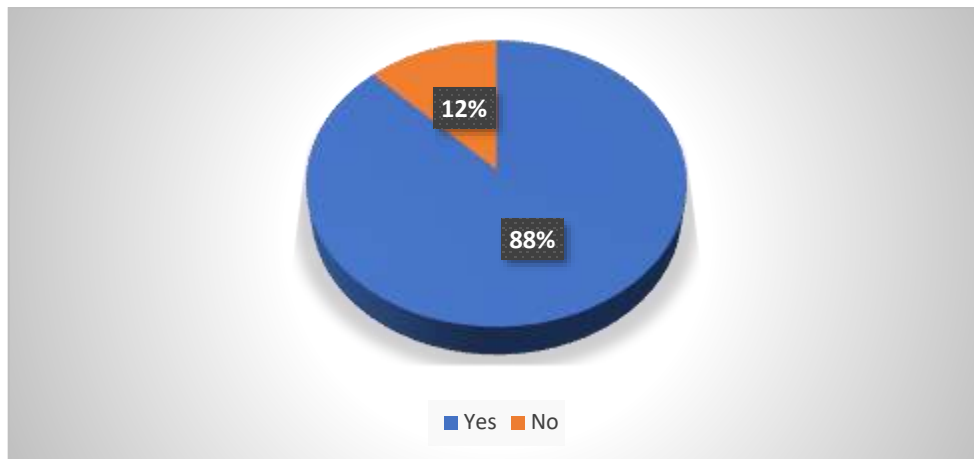


Figure 2: Income generation from tiger nut cultivation by respondents

Source: Field Survey, (2024)

The generation of income from tiger nut cultivation is very vital to the survival of the household. The study revealed that out of the 272 respondents who noted the generation of income from tiger nut cultivation, a mean amount of GH¢ 7,260 ($n = 272$, $SD = 5,744$, minimum = 200, maximum = 26,250) is generated by a household. Our findings support previous studies by Novor and Donkor (2024), which found that tiger nut farming significantly contributes to household incomes, serving as a vital source of livelihood for smallholder farmers

4.2.2 Consumption and sale of tiger nut by households

The consumption of tiger nut is well noted for its nutritional and medicinal values. Tiger nut is mostly eaten as a snack in the household and by many other people. It is noted that tiger nut consumption provides people with high energy levels to sustain the body and to undertake their daily activities. From the data, 47% of the respondents stated that they consume tiger nuts in their household as a snack or a meal. Farmers revealed that tiger nut is consumed as a snack in households. A discussant noted that *“We soak tiger nut and eat it as a snack during the lean season, it provides us with a lot of energy to do our work”* (FGD, Sankana). These findings corroborate with the previous study by Maduka & Ire (2018), which concludes that tiger nut is often consumed as a snack, providing essential nutrients and energy for household activities.

4.2.3 Contribution of tiger nut cultivation to household livelihood outcomes

Food is vital to the survival of the household as it provides nutrients for growth and energy to undertake livelihood activities. The study interrogated the contribution of tiger nut cultivation to food security in the household, and it was revealed that a significant majority (91%) of the respondents affirmed the contribution of tiger nut cultivation to household food security. It was also observed that only 9% of the respondents stated that

tiger nut cultivation does not contribute to food security in the household. Our findings are supported by Odubo et al. (2024). Additionally, Tetteh and Ofori (1998) also revealed that tiger nut farms are intercropped with maize, cassava, and yam to produce more food for farming households.

4.2.3 Changes in livelihood outcomes upon tiger nut cultivation

The cultivation of tiger nut has occurred in many households over the years. It is a cultural management practice that has been undertaken across many generations in several communities within the District. **Table 2** shows the distribution of changes in livelihood outcomes upon tiger nut cultivation

Table 2: Distribution of changes in livelihood outcomes upon tiger nut cultivation by respondents

Livelihood outcomes	Frequency	Percent (%)
Increase in production	294	94.84
Extra Income	295	95.16
More food for the household	292	94.19

Source: Field Survey, (2024)

Table 2 shows a summary of enhancement in livelihood outcomes upon the cultivation of tiger nut in households. The study revealed that about 94.84% of respondents recorded increase in production, while 95.16% of the respondents experienced extra income on tiger nut cultivation. It is also noted that about 94.19% of the respondents recorded the generation of more food for the household.

4.2.4 The effect of tiger nut cultivation on the wellbeing of household members

The general well-being of household members is the ultimate aim of investing households' assets in tiger nut production. The study revealed in Figure 9.5 that, majority (53%) of the respondents assessed the effect of tiger nut cultivation to improve the wellbeing of household members as medium, while 35% of the respondents assessed tiger nut cultivation to improve the wellbeing of household members as high. It is also noted that only 12% of the respondents assessed tiger nut cultivation to improve the well-being of household members as low.

The study found that income generated from tiger nut cultivation is spent on the provision of basic household needs such as water, food, shelter and health care expenses. These household basic needs promotes peace, love, freedom of choice, harmony, unity as well as happiness among household members. Farmers revealed that income generated from tiger nut cultivation has enhanced much dignity and prestige among household members. Our finding is supported by the literature and findings of (Obeng-Koranteng et al., 2017; Eyasu et al., 2025).

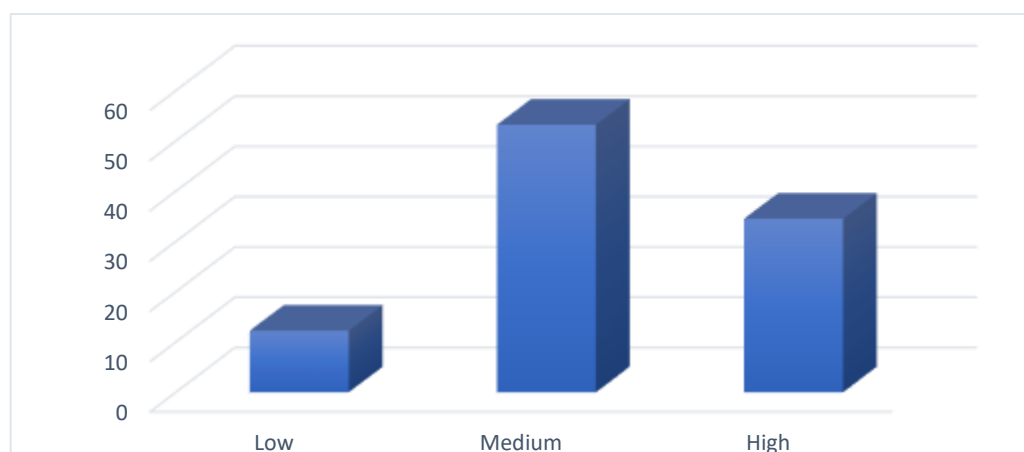


Figure 3: The effect of tiger nut cultivation on the well-being of household members

Source: Field Survey, (2024)

The main objective of tiger nut cultivation is to improve the living conditions of the farming household. According to Muminov et al. (2020), living conditions are defined as the immediate objective conditions of the living which include employment, wages and income, the family welfare forms of migration, the nature of housing, the development of the social welfare system and the social sector. The quality of life of an individual is manifested in the subject's social life and human needs, and it is a reflection of living conditions and comforts.

The nexus between lifestyle, quality, level and well-being can be summarized as follows: "if the standard of living reflects the complexity and character of human activities in the consumer sector, then the lifestyle is the human activity in all areas; and the well-being of the population is a synthesis of these concepts (FAO, 2019). Therefore, the well-being of the population is manifested in the application of human needs, the development of which is used in the main spheres of life: labour, culture, consumption, social and political life (Muminov et al., 2020).

4.2 Challenges in tiger nut production

Despite these benefits, farmers face substantial constraints (Table 3). Nearly all respondents cited **labour intensity (99%)** and **high input costs (89%)** as major challenges, alongside erratic rainfall (31%), poor yields (2%), and weak markets (1%). Farmers emphasized that these factors reduce profitability and discourage expansion. A discussant stated that "Last three (3) years I sold two (2) cattle and invested it in my tiger nut farm, but because of poor yield I could not recoup my investment". This was complemented by another discussant who noted, "I also sold my three (3) pigs to invest in my tiger nut farm, and I could not recoup my investment because of poor rainfall" (FGD, Sankana).

Table 3: Summary of challenges in tiger nut production provided by respondents

Challenges	Frequency	Percent
Labour intensive	306	98.71
High cost of inputs	278	89.39
Poor rainfall pattern	95	30.65
Lack of innovation	14	4.52
Poor crop yield	7	2.26
Low prices in the market	4	1.29

Source: Field Survey, (2024)

The production of tiger nut involves stages in which various livelihood activities are undertaken. Different cultural management practices are performed at various stages of tiger nut production. These stages of tiger nut production are associated with different challenges. The study found that about 23% of the respondents stated that they encounter challenges in the pre-planting activity stage, while the majority (62%) of the respondents noted that they encounter challenges in the post-planting activity stage. It was further observed that only 15% of the respondents encounter challenges in the post-harvesting activity stage. The above challenges are not different from findings of previous studies (Maikasuwa et al., 2019; Akabassi et al., 2022; Odubo et al., 2024).

DISCUSSION

This study contributes to the existing literature by assessing the economic impact of tiger nut cultivation on the livelihoods of farmers in the Nadowli-Kaleo District of Ghana. The findings indicate that both men and women engage in tiger nut farming as a means of sustaining their families. However, the study revealed a gender disparity, with males constituting the majority (80%) of respondents involved in tiger nut cultivation, while females accounted for the remaining 20%. The study identified two primary varieties of tiger nuts cultivated in the district: the yellow and black varieties. Among the 310 respondents, the yellow variety was the most

commonly cultivated (83%). Farmers attributed their preference for the yellow variety to its attractive appearance, high yield, ease of harvesting, strong market demand, and wide availability.

This study confirms that tiger nut farming is an important livelihood activity in Nadowli-Kaleo District, providing income, food security, and social stability. The average annual income of **GHC7,260** underscores its potential as a commercial cash crop, complementing evidence from earlier studies (Novor & Donkor, 2024; Tetteh & Ofori, 1998). Diversification into both on-farm and off-farm activities further enhances household resilience. Although tiger nuts are widely cultivated, household consumption remains secondary, with most production sold commercially. This reflects its increasing role as a cash crop rather than a subsistence food, aligning with findings from Maduka & Ire (2018). Food security benefits are significant: income from tiger nut sales enables farmers to invest in staple food crops, thereby strengthening household nutrition and stability. This dual role—as both an income source and a contributor to food security—illustrates its importance in sustainable rural development.

However, production is constrained by high labour requirements, costly inputs, and climate variability. These challenges echo earlier studies (Akabassi et al., 2022; Tetteh & Ofori, 1998) and highlight the need for interventions such as mechanization, affordable fertilizers, and irrigation. Market inefficiencies further limit profitability, suggesting that value chain development and structured market linkages are essential.

In summary, tiger nut farming holds strong potential as a rural cash crop, but realizing its full benefits will depend on targeted policy support, improved access to technology, and integration into broader agribusiness value chains.

CONCLUSION

This study has examined the economic significance of tiger nut cultivation on smallholder farmers in the Nadowli-Kaleo District. The findings reveal that tiger nut farming plays a crucial role in improving household livelihoods by generating income, supporting food security, and promoting diversification into both on-farm and off-farm activities. Farmers reinvest their earnings from tiger nut farming into other crops such as groundnuts, maize, and beans, as well as into off-farm businesses like petty trading, food processing, and livestock rearing. These economic activities contribute to household stability and resilience against financial uncertainties. Furthermore, the study highlights the vital role of tiger nut cultivation in enhancing the well-being of farming households. The majority of respondents indicated that their quality of life improved through increased production, extra income, and better food availability. Tiger nut cultivation enables households to meet essential needs, including education, healthcare, and housing, thereby improving overall living conditions. Additionally, the nutritional and medicinal benefits of tiger nuts contribute to household food security, reinforcing their significance in local diets.

Despite its benefits, tiger nut farming is not without challenges. The study identified key constraints such as labor intensiveness, high cost of inputs, unpredictable rainfall patterns, and poor crop yields. These challenges affect profitability and sustainability, discouraging some farmers from expanding their production. Farmers also expressed concerns about market fluctuations and limited innovation in tiger nut farming, which could hinder long-term productivity and economic returns.

Therefore, while tiger nut cultivation presents a viable livelihood option for smallholder farmers in the Nadowli-Kaleo District, addressing existing challenges is essential for maximizing its benefits. To enhance tiger nut cultivation, policymakers and stakeholders should consider interventions such as improved access to farm inputs, irrigation support, and market linkages to enhance productivity and sustainability. Future research should explore innovative farming techniques and value addition strategies to further strengthen the economic prospects of tiger nut farming in Ghana.

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