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# Perceptions of commercialisation and value-addition of non-timber forest products in forest adjacent communities in Ghana

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**Abstract**
Residents living adjacent to forests commonly gather non-timber forest products (NTFPs) for income, nourishment, ailment treatment, firewood, religious reasons, and artefacts. This study investigates local perceptions of the commercialisation and value addition of non-timber forest products (NTFPs) in forest-adjacent communities in Ghana. NTFPs are integral to food security and cultural practices. However, more is needed to know about local perceptions of these products' commercialisation and value addition. In this study, we collected data using a qualitative research approach through semi-structured interviews and focus group discussions with community members involved in NTFP collection and sales. To determine which NTFPs are collected, we interviewed 732 residents about their perception of value addition to the NTFPs collected and if value addition has impacted the commercialisation and quality of the products obtained from the forest. Descriptive statistics were used to analyse the data for the study. From the survey, frequencies and percentages of responses were analysed for each indicator related to value addition and commercialisation of NTFPs. The study found that 97.5% of those surveyed frequently visited the forest to gather different NTFPs. For example, mushrooms, snails, honey, and others were the most collected. Also, most interviewees do not process or add value to the NTFPs collected from the forest; thus, adding value to these NTFPs could increase incomes in the future. The findings indicate that locals have a variety of perceptions and understandings about commercialisation and value-addition processes. The study emphasises the importance of understanding local perceptions to develop effective strategies for the commercialisation and value addition of NTFPs. By incorporating the perceptions and insights of locals, interventions can be tailored to meet the needs and aspirations of forest-adjacent communities and promote sustainable resource management and equitable distribution of benefits. Future research should focus on educating locals about the value addition to NTFPs, and processes for increasing the price of NTFPs by adding value and commercialising these products. Proper commercialising of NTFPs may well help improve the lives of the locals.

**Keywords** Value addition · None-timber forest products · Poverty reduction · Alternative livelihoods

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## 1 Introduction

Forest products other than timber from natural or altered forests are referred to as non-timber forest products (NTFPs) [1, 2]. Seeds, fruits, nuts, vegetables, medicinal plants, gums, resins, bamboo, rattan and palm, fibres, grasses, leaves, mushrooms, honey, game, and syrups, are examples of NTFPs [3, 4]. NTFPs are all products or commodities derived from forests used at home or for sale [5]. These products have social, cultural, and religious benefits [1, 5, 6].

Millions of people in the globe, households, and communities use NTFPs for a wide range of purposes [7, 8]. Rural and urban households in third-world countries rely heavily on NTFPs for nutrition, health, home construction, and other needs [9]. There is an increasing demand for essential resources in rural households, such as food, fuel, feed, health products, and fibre. To meet these diverse demands, NTFPs play an indispensable role in the process [10]. In addition to ensuring food security and nutrition, NTFPs significantly contribute to the development of agriculture [11, 12] in local communities. Most rural households rely on NTFPs as a nutritious food source, especially in areas with limited access to conventional agricultural products [13, 14]. In addition to providing vitamins, minerals, proteins, and other essential nutrients, non-traditional food products serve as a diverse and locally available food source [15, 16]. For rural communities, NTFPs are not only a valuable source of food but also a valuable source of fuel [17]. Fuels such as wood, leaves, and other biomass derived from forests are used for cooking, heating, and generating energy [18]. Using NTFPs for fuel relieves the pressure on other energy sources and contributes to sustainable forest management [19, 20]. On a large scale, NTFPs contribute to economic profit and employment. NTFPs are of significant economic importance, particularly in rural areas where formal employment opportunities may be limited [20, 21]. As a result of the collection, processing, and trade of NTFPs, local communities can generate income and provide employment opportunities [22, 23]. In addition to contributing to the local economy, this reduces poverty and improves the local population's living conditions [24]. With fibres and handicrafts, NTFPs are used to manufacture other products with added value [25, 26]. An NTFP-based industry creates market opportunities and contributes to economic development, particularly in regions with abundant biodiversity and traditional knowledge [27]. In forests, various plant species have medicinal properties that treat ailments, promote well-being, and support conventional healing practices [28]. In remote and marginalised communities, using NTFPs in healthcare contributes to the availability of affordable and accessible remedies [29]. A growing body of evidence demonstrates how NTFPs can improve the livelihoods of rural communities, thereby attracting worldwide attention [30, 31]. The importance of non-timber forest products in rural livelihoods is widely recognised in developing countries [32].

### 1.1 NTFPs for direct household provisioning in Ghana

Ghana's economic development is partially dependent on NTFPs to sustain rural living. Ghanaian rural households benefit significantly from NTFPs regarding income and food security [33]. As a result of NTFPs, households can maintain a healthy diet, maintain their health, and generate additional revenue during lean seasons [34]. Non-Timber Forest Products (NTFPs) are essential in directly feeding Ghana households and contributing to food security, livelihoods, and cultural practices [35]. NTFPs are collected and utilised by local communities for various purposes in Ghana's rich forest ecosystems [20]. The most significant contribution of NTFPs to household provisioning is through the production and consumption of food [8, 9]. Fruit, nuts, seeds, leaves, snails, game and mushrooms are among the edible NTFPs found in Ghana's forests [36]. As a result of these resources, rural households can supplement their diet with essential nutrients, vitamins, and minerals [37]. In traditional recipes and cultural dishes, NTFPs reflect the local culinary heritage and promote different dietary habits [38, 39]. Ghanaian communities possess deep knowledge of the medicinal properties of various forest plant species [40, 41]. In addition to treating common ailments, managing diseases, and promoting overall health, NTFPs promote wellness. Natural remedies are vital in providing primary healthcare in rural areas with limited access to modern medical facilities [42, 43]. Again, NTFPs are a source of shelter, clothing, and crafts that contribute to household provisioning [44, 45]. Traditionally, timber, rattan, bamboo, fibres, and dyes are used to produce handicrafts, weavings, and construction[46, 47]. Local communities collect and process these materials to generate income and support local craftsmanship [48, 49]. Furthermore, NTFPs are integral to Ghanaian cultural practices and rituals[50, 51]. Certain plants, herbs, and other forest resources have cultural significance and are used in ceremonies, traditional rituals, and spiritual practices [52, 53]. As a result of these practices, cultural heritage is preserved, and social cohesion within communities is maintained [54]. There has been

widespread recognition that NTFPs can improve the livelihoods of forest-dependent communities in Ghana [55]. Rural poor communities in various parts of Ghana, especially women, depend on NTFPs [33]. Marketing and utilising NTFPs can serve as an effective means of income generation in rural communities and food security, nutrition, and sustainable forest management [56, 57]. Studies have shown that forest product activities in Ghana create 6.9% of the country's total employment [58, 59]. NTFPs are estimated to provide income to 20% of Ghana's economically active population, and 38% of households trade them [58, 60]. Studies have shown that a significant proportion of rural households, approximately 68%, engage in the supply of Non-Timber Forest Products (NTFPs) to regional market centres in Ghana [20, 61]. The sales of these NTFPs provide a vital source of income for local communities, which allows them to generate income and support their families [62]. In households surveyed in southern Ghana, a significant proportion of individuals, specifically 72%, earn their income from NTFPs [33]. In this regard, NTFPs provide a source of livelihood for local communities in the region. [14, 63]. Forests offer a diverse range of non-timber forest products (NTFPs) that are important for meeting the food and medicinal requirements of both urban and forest communities [1, 3]. Rural households have traditionally relied heavily on traditional medicines from NTFPs to treat a wide range of ailments and maintain their health [64].

### 1.2 Commercialization to improve local household income and health

NTFPs are promoted in rural areas as a possible solution to poor health, malnutrition, and poverty intensification [65]. NTFP commercialisation helps meet rural communities' food and income needs, reducing poverty and promoting sustainable forest management and livelihood improvement [66, 67]. Forests provide food, nutrition, medicine and income for about 350 million people worldwide [68]. For rural people worldwide, household income and sustenance are traditionally derived from commercialising NTFPs. Ghana's rural poor, particularly women, rely heavily on NTFPs, especially in rural areas [57, 69]. Studies have shown that NTFP markets are strong, particularly in urban areas, with no signs of decline [57]. Many people sell NTFPs in Ghana, including mushrooms, snails, game, honey, medicinal plants, food wrapping leaves, and chewing sticks. Various traders are involved in the NTFP's commercialisation, including local collectors and hunters, village traders, road-head traders, and large urban traders [56]. District and urban markets are the most common markets for NTFP traders. However, some locals sell directly to locals, urban centres, bypassers, and third parties.

### 1.3 Value chain and value addition to NTFPs

Non-Timber Forest Products (NTFPs) in Ghana are subject to a value chain before they reach urban consumers. Value chains refer to the series of activities and processes involved in the production, processing, marketing, and distribution of a product, from its initial collection to its final use [33, 56, 70, 71]. The value chains for NTFPs in Ghana generally follow a generic structure, with several actors and stages involved. Typically, the value chain consists of the following stages (Fig. 1). The activities in the value chain are production, collection, processing, packaging, labelling, transportation, marketing, and consumption. The collection or extraction stage involves the collection or extraction of NTFPs from forests or other natural habitats [1, 72, 73]. Typically, these products are gathered by local communities with traditional knowledge and skills. Primary processing: After collection, NTFPs undergo primary processing, which may include cleaning, sorting, drying, or other basic procedures to prepare them for further use or transportation [27, 74]. NTFPs are packaged and aggregated into more significant quantities to enable storage, transportation, and market access. Proper packaging, labelling, and quality control measures may be required at this stage. In the marketing and distribution stage, NTFPs are promoted, sold, and transported to various markets. According to the scale and demand for the products, wholesalers, retailers, local markets, or export markets may be included [61, 75]. However, adding value to NTFP products is often overlooked in Ghana's value chains [76, 77]. Adding value to a product means enhancing its quality, functionality, or appeal by adding processing, branding, packaging, or differentiating it from competitors' products [78, 79]. In most cases, NTFPs do not undergo significant value additions [76, 80], and only a few have entered high-end markets. Additional value to NTFPs can increase its easy commercialisation, which might increase its prices hence increasing the income generation of players of NTFPs. Thus, it is crucial to understand how participants in NTFPs and commercialisation perceive the value addition of NTFPs.

Producing, collecting, processing, storing, transporting, marketing, and selling are some activities comprising NTFP value chains. Depending on the product, each of these is of varying importance. At every stage of the value chain, farmers, collectors, traders, processors, retailers, and consumers will generate more value the more they cooperate. As a product or service progresses through the different stages of production, the value chain describes the whole process

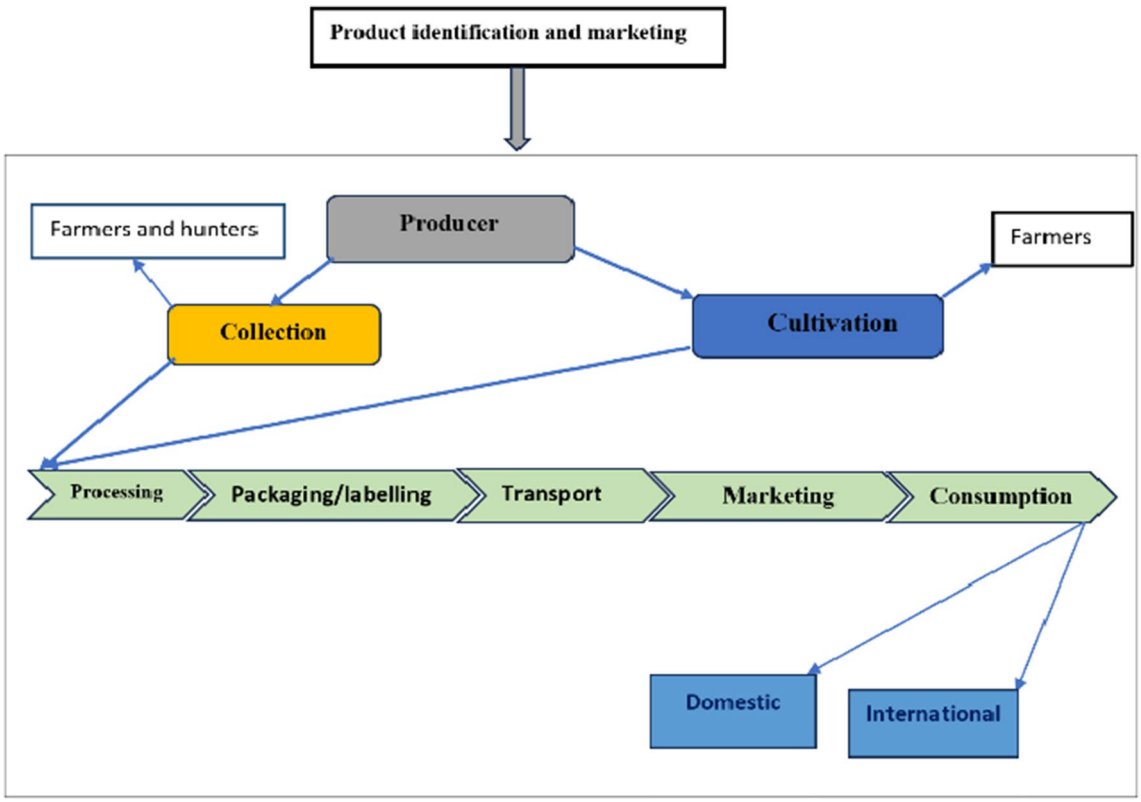


**Fig. 1** Chart showing NTFPS collection to consumption

from conception to market (involving a combination of physical transformation and the input of various producer services), delivery to final consumers and final disposal after use is standard for NTFPs commercialisation in Ghana to follow the generic structure of the NTFP value chain. The value chain contains the following activities: production, collection, processing, packaging/labelling, transport, marketing and consumption.

### 1.4 Aim of the study

In Ghana, there is a need to put more emphasis on value addition in NTFPs value chains, which can potentially enhance economic opportunities and profitability for local communities [81, 82]. The products may be sold in raw or minimally processed forms without value addition, fetching lower prices and losing out on potential markets. To address this issue, value-addition strategies must be promoted in NTFP value chains. It is essential to know how the locals understand value addition to help introduce processing techniques to improve product quality, develop innovative packaging and branding, explore opportunities for diversifying the product line, and establish market connections with buyers interested in NTFPs with added value. This study aims to explore and understand the perceptions and opinions of locals regarding the commercialisation and value addition of NTFPs in forest-adjacent communities in Ghana. As part of the study, insights are gathered about these communities' perceptions of the commercialisation potential of NTFPs, their current practices of value addition, and their perspectives on the opportunities, challenges, and benefits associated with promoting value-added NTFPs in their communities [33, 56].

## 2 Methodology

### 2.1 Study area

The study was conducted in five regions (Western North, Ahafo, Bono, Ashanti, and Eastern) in Ghana (Fig. 2). It is well known locally that these regions offer various NTFPs. The main economic activities in the study areas are agriculture

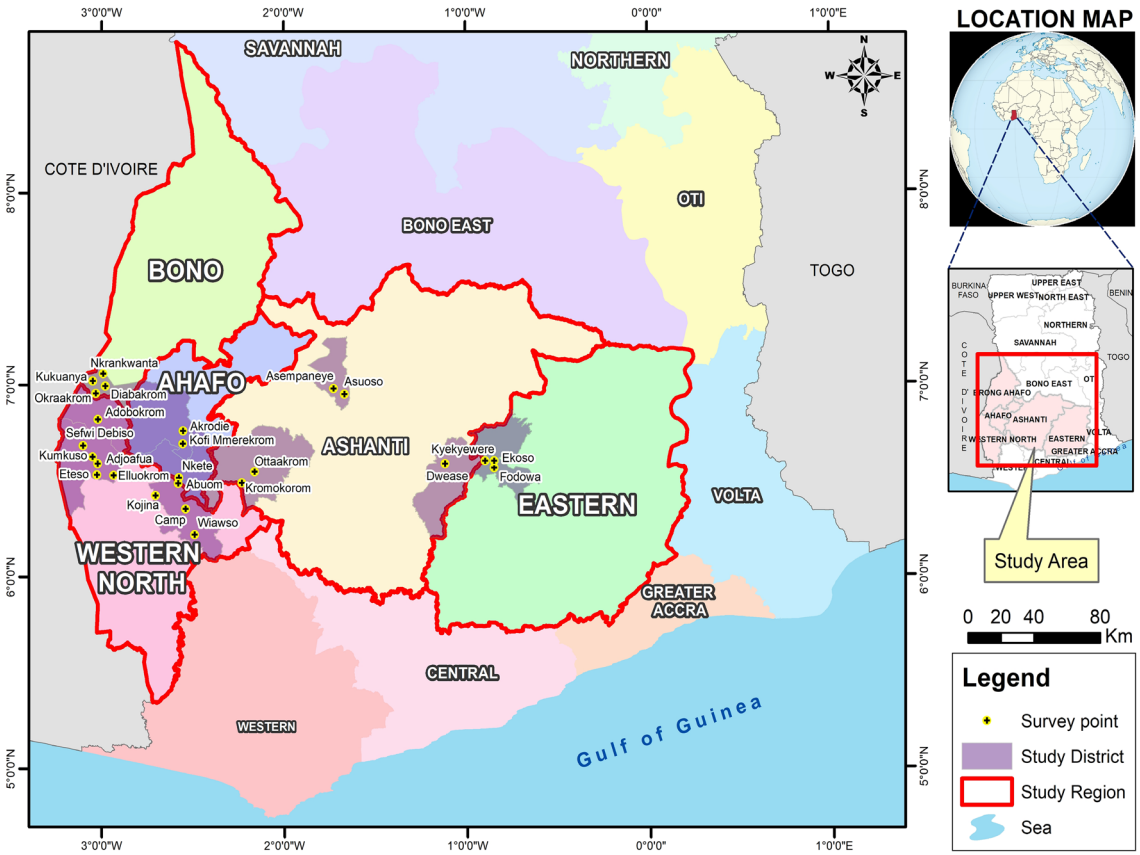


**Fig. 2** Map of Ghana showing the regions of the study area in Ghana

(farming), trade and commerce, and services (hotels, auto mechanics, sawmills, banking, etc.). The study areas are characterised by dense and diverse vegetation, which includes tall canopy trees, understory plants, and a wide range of plant and animal species. Some trees can reach 50–60 m in height in moist semi-deciduous forests. In the study area, we found *Trilochiton scleroxylon* (wawa), *Antaris Africana* (Kyenkyen), *Milicia excelsa* (Odum) and *Ceiba pentandra* (Onyina), as well as other plants native to the moist rainforest and semi-deciduous forest zones. This study area has substantial precipitation in a wet semi-equatorial climate zone. This vegetation type receives an annual rainfall of between 1250 and 1750 mm a year. On average, temperatures range between 24 °C and 28 °C, with relatively few seasonal variations. A wide range of endemic and rare species can be found in the tropical rainforest, including tree species, mammals, birds, reptiles, and insects.

## 2.2 Method of survey and study approach

To explore the locals' perceptions of the commercialisation and value addition of NTFPs in rural communities, we conducted 732 interviews with a team of interviewers in five (5) regions (Ahafo, Ashanti, Bono, Eastern, and Western-North) of Ghana. We developed a draft questionnaire in March 2022 after discussing it with a group of economists, market players, locals and the forest commission of Ghana. The survey was reviewed in Ghana by three lecturers, one from the School of forest science at the University of Eastern Finland (Forest Health and Biodiversity Management, Tropical Forest Ecology, Environmental Science and Biotechnology), the other from the University of Cape Coast Ghana, in the Department of Geography and Regional Planning (Forest Ecology and Ecosystem, Forest Conservation, Natural Resource Management, Ecosystem Functioning), and one from the Forest Research Institute of Ghana, Head of CSIR College of Science and Technology (CCST), Ghana (Forest Management, Forest Conservation, Forest products, Natural Resource Management). These faculty members helped formulate and adjust the wording to ensure language and conceptual clarity. A well-defined timetable was developed to collect data from the selected regions, districts and local communities where the survey occurred. In June 2022, a focus group discussion was conducted near the study areas with NTFP collectors, marketers, and farmers. This discussion provided feedback on the

question phrasing and potential policy implications. In May and June 2022, in-person interviews were carried out in selected communities in Ghana. Verbal and formal consent was made before starting the interview.

### 2.3 Sample design and data collection

We selected respondents using a simple random sampling method and a mixed-methods approach. As part of the simple random sampling method, each member of the population has an equal chance of being selected as a sample member. In this manner, every individual in the population has an equal opportunity to be included in the study, which reduces the possibility of bias and ensures that the sample is representative. It is easier for researchers to generalise their findings from the sample to a larger population when they use random selection [83, 84]. The simple random sampling method ensures that a member of the population is chosen equally as part of the sample. Simple random sampling eliminates bias in the selection process, ensuring that the sample is representative of the population [85, 86]. Every member of the population has an equal chance of being included in the sample, which reduces the possibility of systematic bias [87, 88]. The results of simple random sampling have demonstrated that they are representative of the population and eliminate bias in the selection process [89–91]. Regions and districts in the study area were selected based on their proximity to forest reserves. Also, communities in the districts were selected based on the number of reserves and how close they were to the forest (reserved and off-reserve). An integrated qualitative and quantitative approach was employed in the study. Qualitative research seeks individual opinions, interpretations, and expressions about the research problem.

On the other hand, the quantitative approach uses numbers to describe data or variables, establish relationships among variables, and determine whether two or more variables are significantly different. In this case, combining both approaches achieve a successful outcome. The study's sample size was arrived at considering the sample size estimator proposed by [92]. The sample size of the study arrived at 732 respondents, taking into account their age, gender, educational level, occupation, Years of residence in the community, the kind of NTFPs they collect, whether they add value to the NTFPs they gather, and their perception of adding value to the NTFPs.

We surveyed respondents whose livelihoods depend on NTFPs. A combination of primary and secondary sources was used to collect data. A structured questionnaire and interview guide were used to collect primary data. Marketing and utilisation of NTFPs were conducted by distributing and administering the questionnaire to the relevant individuals.

### 2.4 Ethics statement

In this study, we obtained verbal consent from locals who participated in both group discussions and answered questions for the survey.

### 2.5 Data analysis

Our objective was to investigate local perceptions regarding the commercialisation and value addition of NTFPs. To arrive at our objective, we categorised interviewees according to the actors involved (collectors, buyers, and consumers) in the value chain of NTFPs. We used SPSS Statistics 20.0 (IBM, New York, USA) to analyse the descriptive statistics for the study. Based on the survey results, frequencies and percentages of responses were analysed for each indicator related to value addition, the effects of value addition on commercialisation, and the quality of NTFPs. Through this analysis, a comprehensive understanding of the distribution of responses among the surveyed population was gained. In addition, the survey included frequencies and percentages of responses for each indicator (value addition, its effects on commercialisation and quality of NTFPs) and bivariate relationships between socio-demographic factors and household income from NTFPs. Bivariate relationships helped examine sociodemographic factors (such as age, gender and education level) derived from the NTFPs survey. To arrive at these, dummy variables were created using SPSS for (value addition, Value addition and price increment, Value addition affecting the quality, and Value Addition Improving commercialisation of NTFPs). Since the responses were "Yes and No" in creating the dummy variables, "1 = Yes and 0 = No" was created before the analysis was performed in SPSS.

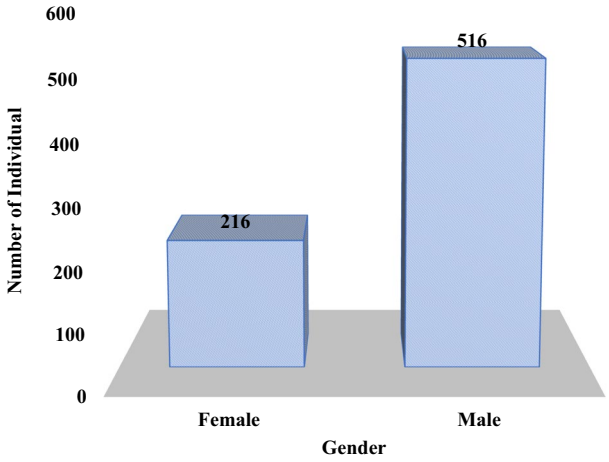


**Fig. 3** Gender distribution in the study

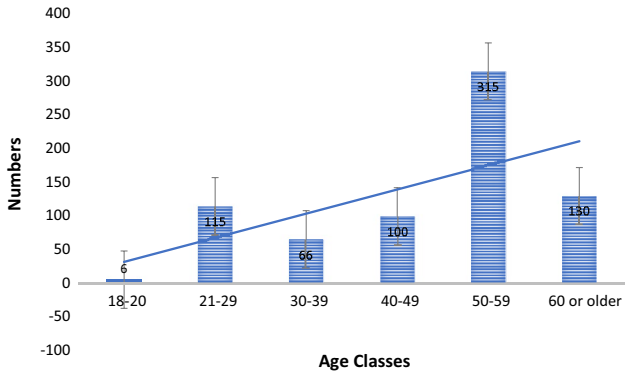


**Fig. 4** Age distribution of the respondents

## 3 Results

Study findings were analysed using descriptive statistics, including local perceptions of value addition, its effects on commercialisation, and the quality of NTFPs. Participant observation, quantitative survey results, and data collected from respondents were used to conduct this analysis. All the respondents surveyed were originally locals. Children under 18 years of age and individuals who were not Ghanaians were excluded from the study; individuals who were not Ghanaians and had not lived in the district for an extended period (2 years or more) were also excluded.

During the study, a higher proportion of males responded to the interviews because men are the heads of families and are responsible for most of the activities involved in gathering and hunting NFPs. Most women were also observed to be shy when answering most of the questions. Of the respondent, 218 female respondents and 516 male respondents participated in the survey (Fig. 3). It is presumed that the high number of males involved in the collection of NTFPs is because they are the ones who usually go hunting and gathering NTFPs in the forest.

The age group with the highest number in the survey were 50–59 (Fig. 4**)**. This constituted (315) of the respondents, whiles ages between 18 and 20, 4 respondents were the least, and this was the reason that the time of the data collection was school section time, so most of the age class were in school.

It was observed that a high number of the locals only had primary education (Fig. 5), with few who had some graduate courses. Of the total respondent, 368 (52.1%) had only primary education, while only 41 (5.1%) completed the graduate level. This high primary level could be attributed to financial constraints in sponsoring their education since poverty prevails in these adjacent forest communities.

Variables studied are Value Addition, Value Addition Improving commercialisation, Value addition and price increment and Value Addition Improving commercialisation.

The study asked the interviewees to mention which NTFPs they usually collect from the forest. Collections of mushrooms and snails were the most common responses (34.0%), and game (30.8). The last mentioned were Chewing

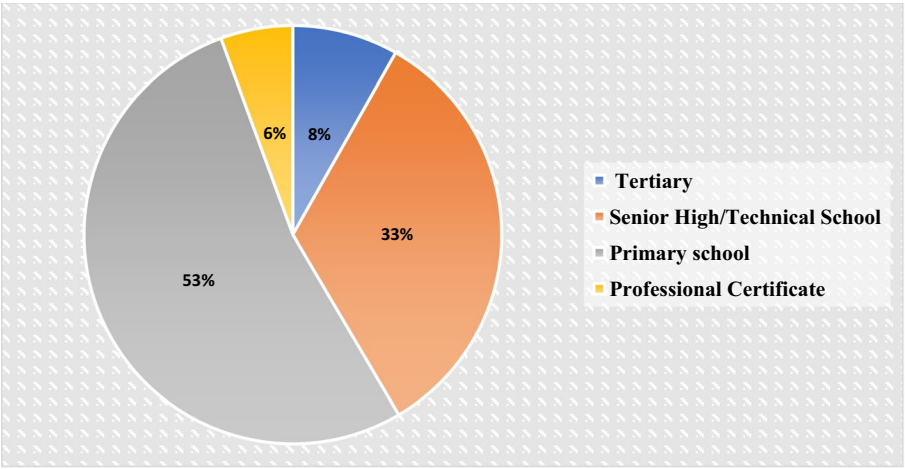


**Fig. 5** Level of education of the respondents

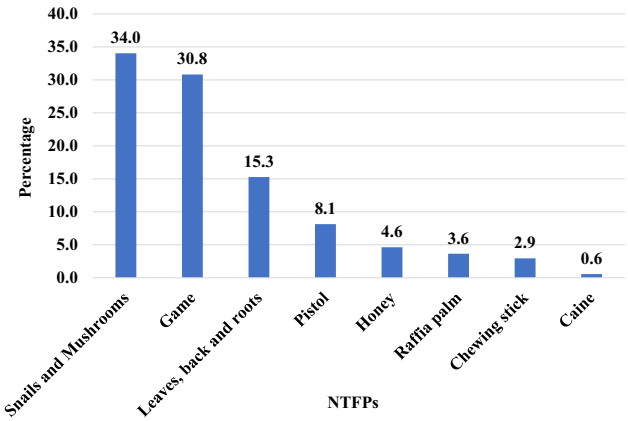


**Fig. 6** NTFPs collected by locals in study areas and their responses

**Table 1** The respondent's perception of value addition on NTFPs

| Variable | Response | Frequency | Per cent | Valid per cent | Cumulative per cent |
|---|---|---|---|---|---|
| Value addition | Yes | 582 | 79.5 | 79.5 | 75.5 |
| | No | 150 | 20.5 | 20.5 | 100.0 |
| | Total | 732 | 100.0 | 100.0 | |
| Value addition and price increments | Yes | 664 | 90.7 | 90.7 | 9.3 |
| | No | 68 | 9.3 | 9.3 | 100.0 |
| | Total | 732 | 100.0 | 100.0 | |
| Value addition affects the quality | Yes | 144 | 19.7 | 19.7 | 19.7 |
| | No | 588 | 80.3 | 80.3 | 100.0 |
| | Total | 732 | 100.0 | 100.0 | |
| Value addition improving commercialisation | Yes | 667 | 91.1 | 91.1 | 9.1 |
| | No | 65 | 8.9 | 8.9 | 100.0 |
| | Total | 732 | 100.0 | 100.0 | |

sticks and Caine (ratan), with 2.9 and 0.6, respectively There was a list of NTFPs mentioned by the locals interviewed, and the long list was streamlined for the popular NTFPs in the study area (Fig. 6).

The interviewees were asked if they understand or know what the "value addition" of NTFPs means; 19.7% of the respondent answered "No," and 80.3 responded "Yes", indicating that most of the locals understand value addition to

NTFPs. Of the respondent, 582 (79%) made it clear that they do not add value to the NTFPs they collect from the forest despite their knowledge of adding value to the products, while 150 (20%) add value to their NTFPs. 664 (90.7%) locals believed that value addition could increase the price of NTFPs, while 68 (9.3) believed that value addition could not increase it. It was stated by 588 (80.3%) of the respondents that value addition does not affect the quality of NTFPs, and 144 (19.7%) of the respondents stated that value addition could affect their quality (Table 1). Of the respondents, 667 (91.1%) said that value addition could improve the commercialisation of NTFPs, while 65 (44.3%) declared that value addition could not improve the commercialisation of NTFPs.

This was made known that value addition has effects on the pricing since most of the NTFPs are seasonally collected [93], and it is difficult to get some NTFPs when the collection season is over, which could reduce the supply, increasing the demand, which positively increases the price of the of NTFPs. Most locals do not add value to their forest products but perceive that value addition can raise their prices and improve their commercialisation (Table 1). Our study found that the collection of NTFPs is seasonal; locals mostly consumed raw NTFPs without processing them for value-added products. Similarly [94]. A study of Cambodian NTFPs found that most of the products were sold locally by road passers and intermediaries without processing or adding value to them [94].

## 4 Discussion

### 4.1 Perception of locals on value addition to NTFPs

The perception of locals on the value addition of NTFPs in Ghana varies depending on the product type and the region. In general, many locals see value addition as a way to increase the income and economic benefits of NTFPs. However, some challenges and barriers hinder value-addition activities and prevent locals from adding value to NTFPs. Several factors can influence locals to add value to NTFPs [95, 96]: The lack of resources, such as processing equipment, skills, and knowledge, can influence locals' willingness to add value to NTFPs [25, 26]. If these resources are readily available and accessible, locals may be more likely to engage in value-adding activities [97]. Cultural and social factors, such as traditional knowledge and practices, can influence locals' willingness to add value to NTFPs. If value-adding activities are part of the local culture or tradition, locals may be more likely to engage in these activities. In this study, most locals needed more skills and resources to add value to NTFPs. In the study, the locals sell honey directly without adding value, packaging or labelling [33, 56]. The paper points out that honey value chains in Ghana include collectors, processors, wholesalers, retailers, and consumers. The value addition in the chain needs to be fully operational. For example, honey is sold in the market to the locals in raw form, with little or no processing, additional value, and packaging; almost all the locals sell their products in bottles without any labelling. There is less potential for this to increase the prices of honey locals sell in local markets and in general. For example [98], accessed how the incomes of the locals adjacent to the forest are affected by NTFPs in southern Asia.

### 4.2 Perception of locals on value addition to influence commercialisation of NTFPs

Many locals generally recognise the potential economic benefits of value addition and the importance of commercialising NTFPs to improve their livelihoods [26, 99]. The perception of locals on value addition can play a significant role in influencing the commercialisation of NTFPs. In many rural communities, NTFPs are an essential source of income and livelihood, and the local perception of value addition can determine whether or not NTFPs can be commercialised successfully [100]. If the local community understands the importance of adding value to NTFPs, they may be more willing to invest time, effort, and resources into processing and marketing these products. However, challenges and barriers exist to the value addition and commercialisation of NTFPs in the local communities [101, 102]. These include limited access to processing facilities and equipment, lack of skills and knowledge in processing and marketing, and limited market access and distribution channels. In addition, some locals may be hesitant to engage in value-added activities due to a lack of awareness of the potential benefits or fear of taking risks [2, 103]. If the value is not added to NTFPs, their price may be lower than comparable products that have undergone value addition. This is because the product is less differentiated and may not meet the needs of certain consumers. In addition, if the raw material is readily available, the supply may be high, which can further depress prices.

It was observed that 95% of the locals got some income from the sales of NTFPs, and almost all the locals sell the NTFPS in the raw state at low cost since no values are added. Several factors need to be improved in the ability of Ghanaians in

the forest-adjacent communities to exploit the full potential of the commercialisation of NTFPs. According to [56] lack of packaging, processing, and value addition of NTFPs has negatively impacted the pricing of NTFP in Ghana, thereby affecting local household income. NTFPs can reduce rural unemployment and increase rural income generation when value is added [104].

### 4.3 Perception of value addition and its potential to increase the price of NTFPs

Value addition can increase the price of NTFPs in several ways. Firstly, by adding value through processing, NTFPs can be transformed into products with higher value and demand in local and international markets. For example, wild fruits can be processed into jams, jellies, and juices with a longer shelf life and command higher prices than fresh fruit. In addition, value addition can improve the quality of NTFPs, making them more attractive to buyers. For example, grading and sorting wild mushrooms can result in better quality products, which can attract higher prices from buyers. Furthermore, value addition can enable producers to access new markets and increase their bargaining power. By branding and packaging their products, producers can differentiate them from competitors and create a loyal customer base, leading to higher prices and increased demand.

From the study, 90.7% of the respondents clarified that value addition potentially increases the price of NTFPs. They understand that value additions can increase the price of NTFPs, improving their financial status. The sale of Non-Timber Forest Products (NTFPs) can significantly impact the living standards of local communities that rely on forest resources for their livelihoods [20, 105, 106]. NTFPs provide a means of generating income for these communities, improving their economic well-being and reducing poverty [100, 107, 108]. The sale of NTFPs can help to promote the conservation of forests and other natural resources. When communities benefit economically from the sustainable use of forest resources, they are more likely to become stewards of the forest and adopt sustainable practices to ensure the continued availability of these resources.

Unemployment in forest-adjacent communities is a severe problem, and it is not easy for the government and public sectors to provide jobs for all educated youths [109]. There are presently locals unemployed and severely under-employed persons in the local communities in Ghana. In this context, preparing quality products from NTFPs by educated, uneducated and unemployed youths in these communities will improve the value chain and commercialisation of NTFPs, which will serve as a vital source of income for community members. Present studies in other countries have shown that most of the value-added products prepared from fruits, leaves, bark, roots other plant parts collected from the forest have a promising economic potential in an economic generation because of the total output, as well as the net return, is very high for all the value-added products [109]. This indicates that value addition to forest products has an excellent potential to increase the price of NTFPs hence improving the lives of the locals in the forest communities in Ghana.

## 5 Conclusion

NTFPs remain crucial to socio-economic development in food security, nutrition, health, and sustainable and alternative timber sources of forest adjacent Ghana communities [110]. The study highlights the importance of NTFPs as a valuable resource for local communities. The findings emphasise the significant role that NTFPs play in providing income and livelihood opportunities for households in forest-adjacent communities. A large percentage of rural households in Ghana collect and sell NTFPs, which serve as a source of income. In this regard, NTFPs are of considerable economic significance and contribute significantly to the livelihoods of local people. However, the study also identified a gap in the and value addition of NTFPs in communities adjacent to forests. Although NTFPs are supplied to regional market centres, there needs to be more emphasis placed on adding value to these products to increase their commercialisation potential. There is an opportunity for interventions and strategies promoting value addition, thus increasing the economic benefits of NTFPs. The results from our research strongly support the findings of [56, 94] that locals sell NTFPs without adding value to the products, which affects the pricing and commercialisation of the NTFPs. As suggested by [111], sustained extraction, value addition and processing of non-timber forest products by local people can enhance their income and provide an option to improve rural livelihood.

Adding value to NTFPs can create new economic opportunities for communities near forests. By processing, packaging, and marketing NTFPs in new and innovative ways, local people can earn more money from the resources they collect. This can help to reduce poverty and create more sustainable livelihoods. When NTFPs are more valuable, communities have a greater incentive to protect the forests that produce them. This can help to reduce deforestation and other negative

impacts on forest ecosystems. It can also encourage the sustainable use of resources, which can help to maintain biodiversity and other critical ecological processes. Many NTFPs have essential medicinal properties that can be used to treat a range of health conditions. Adding value to these products can make them more accessible to people who need them. This can help improve health outcomes, particularly in areas with limited access to conventional healthcare. NTFPs are often deeply embedded in local cultures and traditions. By adding value to these products, we can help to preserve and celebrate these cultural practices. This can help to strengthen local identities and promote cultural diversity. Overall, adding value to NTFPs can have a range of positive impacts for both people and the environment. By creating economic opportunities, encouraging conservation, improving health outcomes, and preserving cultural traditions, we can help to build more sustainable and resilient communities.

It is essential to understand the perceptions of local communities regarding the commercialisation and value addition of NTFPs to develop sustainable strategies that support local livelihoods and enhance the conservation and management of forest resources. Forest-adjacent communities in Ghana can maximise the economic and social benefits of NTFPs by addressing the identified gap and promoting value addition. The result would be improved livelihoods and forest management practices for these communities. The purpose of this study was to add to the body of knowledge related to perceptions and practices regarding NTFPs in forest-adjacent communities in Ghana. In addition to providing valuable insights for policymakers, practitioners, and researchers, this study also identifies strategies for promoting sustainable commercialisation, value addition, and equitable distribution of NTFP benefits, which will positively impact local communities and forest ecosystems. Based on our research results, we suggest that future research focus on proper education to the locals on the additional values of NTFP, which stands to increase the price NTFPs. The government make affordable loan facilities available to locals willing to process and add value to NTFPs and measure harvest amounts. Considering the provisioning service that NTFPs provide, within the scheme of payments for ecosystem services may also warrant future research.

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**Data availiability** The datasets generated during and/or analysed during the current study are not publicly available due locals names and location, but are available from the corresponding author on reasonable request.

## Declarations

**Ethics approval and consent to participate** The study did not involve experiments or procedures that involved animal or human experiments. Local communities, respondents, and key informants were informed that verbal consent was made before involving them in the survey

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