Assessing the Impact of Deforestation on Community Livelihood

A Case Study of Bibiani-Anhwiaso-Bekwai Municipality, Ghana

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Assessing the Impact of Deforestation on Community Livelihood: A Case Study of Bibiani-Anhwiaso-Bekwai Municipality, Ghana

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DECLARATION

I declare that this thesis is my work. It and its contents have not been published anywhere except where that material is duly acknowledged in the text. In addition, it has not been submitted for the award of a degree at another university or institution.

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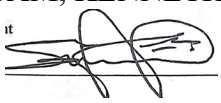

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ABSTRACT

Background: Forest resources contribute significantly to household incomes, energy, and food security, providing sustenance and revenue for about 2.5 million people in Ghana. However, deforestation has been a long-standing issue that has affected forests and biodiversity conservation. Little attention has been drawn to deforestation and its associated implications on forest-based livelihoods, though two-thirds of Ghana's population depends on forests and forest resources for their livelihoods.

Method: The study employed quantitative and qualitative methods. Primary data was collected from 80 respondents in the Bibiani-Awhiaso-Bekwai communities through a field survey. A chi-square test was conducted to analyze quantitative data, and content analysis was adopted for qualitative data.

Results: Farming, NTFPs picking, wood harvesting, hunting, and gathering firewood were the forest-based livelihoods identified. Most participants described the forest's condition as highly degraded and very highly degraded. Deforestation negatively affects the participants' livelihood activities, reducing crop yield due to drought, scarce NTFPs, bush animals, and wood species. Furthermore, the participants lamented that deforestation reduced their income from forest-based livelihood activities. They described their economic well-being as the same, little affected, and worse by various social groups. The concepts of support for current consumption, safety net, and the theory of sustainable livelihood framework further discussed these results.

Conclusion: Deforestation adversely affects forest-based livelihood activities, which rural people depend on for sustenance. Hence, a sustainable and all-inclusive management system should be adopted, measures of accountability and regulation of powerful actors instituted, and power decentralized to the local people to sustainably manage the forest resources and achieve the concept of rural development.

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LIST OF ABBREVIATIONS

UN - United Nations

FAO - Food and Agriculture Organization

FRA - Forest Replacement Association

SLF - Sustainable Livelihood Framework

MLNR - Ministry of Lands and Natural Resources

ITTO - International Tropical Timber Organization

SDR - Sustainable Development Report

UNEP - United Nations Environmental Program

1.0 Introduction

1.1 Background

The essence of forests and forest resources cannot be underestimated because of their vital role in human life. Forests and trees have enormously supported the survival of human life, biodiversity, and ecosystem services. Over the years, forest resources have served as a source of food, medicine, recreation centers, and carbon sinks for billions of the world's populations.

According to UN FAO (2014) in Miller & Hajjar (2020), approximately 1.3 billion people rely on forests and forest products for their livelihoods globally. However, as Newton et al. (2016) noted in Miller & Hajjar (2020), this number is even higher, with about 1.6 billion people living within 5km of a forest depending on forests and forest products for their livelihoods. This trend indicates a growing global reliance on forests and their resources. Furthermore, forests cover about 31 percent of the world's land surface, storing 296 gigatons of carbon, and are home to most of the world's terrestrial biodiversity. Unfortunately, human and non-human activities have significantly reduced the Earth's Forest cover. The 2018 Sustainable Development Report provides evidence that from 2000 to 2015, the Earth's Forest areas decreased by 100 million hectares. The UN Food and Agriculture Organization (UN FAO) Forest Resource Assessment survey estimates a net loss of 4.7 million hectares of forests globally yearly since 2010, with deforestation rates considered even higher. Between 2015 and 2020, deforestation was at an alarming rate of 10 million hectares per year, and the area of primary forest worldwide has decreased by over 80 million hectares since 1990 (FAO, 2021).

In Africa, the challenges of bad governance, weak policy implementation, and corruption have led to the rapid exploitation of forests and increased pressure on the remaining tropical forests and arid woodlands (Schmitt, 2009). However, it is crucial to recognize that immediate action is needed. According to the United Nations Environmental Programme, UNEP (2004), and FAO (2010a), Africa's forests and forest resources are the second most depleted of all the tropical regions globally. Approximately 30 percent of the historical stands remain, but concerted efforts can improve this figure. It has been argued that more than two-thirds of Africa's population depend directly and indirectly on forests for survival (Olufunso, 2010). According to FAO (2004), about 37,000 km2 of forested areas in tropical Africa are cleared per annum.

According to the UN FAO (2022), from 2002 to 2022, Ghana lost 130kha of its humid primary forest, making up 8.7% of its total tree cover loss in the same period. This loss directly affects the local community, as the total area of humid primary forest was reduced by 12% in the same period. Information gathered from the Ministry of Lands and Natural Resources (MLNR, 2012) shows that the country's forest resources are being depleted at an unprecedented rate. At the start of the 20th century, Ghana had a forest cover of 8.2 million hectares. However, only 1.6 million hectares of Ghana's forest cover remain (MLNR, 2012: IV). With a deforestation rate of 2.0 percent, Ghana's annual loss of forest cover is estimated at 135,000 ha (MLNR, 2012). This implies that forests and woodlands in Ghana are on a sedate decline because of over-exploitation, which cannot meet the growing socio-economic needs of the rapidly growing population (Environmental Protection Agency [EPA], 2005). The unsustainable depletion of these resources could lead to the defunctness of many trees and other ecological species used for timber, fuel, and fodder. This will have tremendous consequences on the forests and woodland ecosystems, microclimates, local hydrological cycles, and the local population's livelihood. Therefore, this research focuses on deforestation's impact on the Bibiani-Anhwiaso-Bekwai municipality's livelihoods, a matter of personal relevance to the local communities.

1.2 Problem Statement

Forest resources contribute significantly to household incomes, energy, food security, sustenance, and revenue for about 2.5 million people in Ghana. However, rapid deforestation has been identified as a critical environmental issue that needs serious and urgent attention (MLNR, 2012). Ghana has lost over 33.7 percent, equivalent to 2,500,000 hectares of forest cover within two decades since the 1990s (FAO, 2010b). Between 2005 and 2010, Ghana had the sixth-highest deforestation rate globally (FAO, 2010). This implies that Ghana is among the world's top six most deforested countries, which poses a significant concern to address. At the current rate of deforestation, the country's forests could completely disappear in less than 25 years (Boafo, 2012). As a result, it is crucial for policymakers and environmentally conscious scholars, including the audience, to assert their role in promoting sustainable development. The government of Ghana and other stakeholders have implemented some interventions to halt this situation, but these interventions have proved futile. Also, attempts by scholars to suggest workable recommendations for the circumstance have been unsuccessful. Furthermore, little attention has been drawn to the deforestation menace and its associated implications on forest-based

livelihoods. However, two-thirds of Ghana's population, including many of our fellow citizens, depend on forest and forest resources for their livelihoods. Also, the Western Region is one of Ghana's forested zones with a high deforestation rate. Against this background, the study is proposed to close the existing gap. Therefore, this study seeks to assess the impact of deforestation on forest-based livelihoods in the Bibiani-Anhwiaso-Bekwai Municipality, Western North region, Ghana.

1.3 General Objective of the Study

This study's main objective is to assess deforestation's impact on the community's forest-based livelihoods in the Bibiani-Anhwiaso-Bekwai municipality of Ghana. To achieve this broad objective, the study is specifically designed to answer the following questions:

1.4 Research Questions

The following research questions were formulated based on the study's objectives.

1. What forest-based livelihood activities are practiced in the community, and by which stakeholders?

2. How do local people perceive forest cover change in the area over the past two decades?

3. How has this forest cover change affected locals' forest-based livelihood activities and household economic (financial/income) well-being, and how does this vary across different segments of society?

1.5 Significance of the Study

This study provides a clear insight into forest-related livelihoods in Ghana, particularly among the Bibiani-Anhwiaso-Bekwai municipality. Other related articles explored the effects of deforestation on forest-fringed communities in Ghana and the implications on the general livelihoods of these communities. However, deforestation and its implications on forest-based livelihoods in the Bibiani-Anhwiaso-Bekwai municipality, one of Ghana's high-deforested zones, has little been explored. It is expected that findings from this study will inform the actions of stakeholders and policy-makers to create sustainable livelihoods for forest-dependent communities in Ghana, specifically Bibiani-Anhwiaso-Bekwai municipality. Also, to academicians, scholars, and researchers, this study opens up a new area that has not been studied. Hence, it will provoke further study to create more profound

knowledge in this field, especially for those interested in conducting further research. This study is a significant reference point for literature and research gaps. In addition to those above, it is expected that this evidence-based study will demonstrate commitment to the actualization of Sustainable Development Goal 15, which aims to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" and Goal 1 (No Poverty) of Sustainable Development Goals.

1.6 Scope of Study

This study primarily focuses on the forest-based livelihood activities practiced in Ghana, precisely in the Bibiani-Anhwiaso-Bekwai municipality, by various stakeholders. It also examines the pattern of deforestation and its implications for the livelihood activities and well-being of the local people, particularly in the "Aboduabo, Abesinsuom, Hwenampori, Chine, and Merewa forests" in the Bibiani-Anhwiaso-Bekwai Municipal located within the Western North region.

1.7 Organization of the Study

This study will be organized into five main chapters. The first chapter will introduce the study. This will consist of the background of the study, the problem statement, the objectives, the research questions, the significance of the study, the scope and limitations, and the organization of the study. The second chapter will review relevant theoretical and empirical literature on how deforestation and livelihoods are related. Chapter three concentrates on the methodology used, which is comprised of the study population, data sources, definition of variables, and analysis techniques. Chapter four presents the results, their analyses, interpretation, and discussion. Chapter Five summarizes the outcome and also provides the conclusion and recommendations made.

2.0 Literature Review

This section is dedicated to a comprehensive review of the literature related to the topic. The primary goal of this chapter is to establish the study within the appropriate context and to identify the existing research conducted in Ghana and other regions.

2.1 Overview of Forest, Deforestation, and Livelihoods

Defining what comprises a forest is challenging because forest types vary greatly. It is important to note that different definitions are needed for various purposes and scales. A forest is an ecosystem composed primarily of trees and other woody vegetation. The Food and Agriculture Organization (FAO) offers a more complete definition.

FAO (2010) defines a forest as land covering more than 0.5 hectares with trees taller than 5 meters and a canopy cover of more than 10% or trees capable of reaching these naturally uninterrupted and unbroken thresholds. Boafo (2013) notes that forest resources significantly influence household food security and income creation in Ghana. Approximately 2.5 million people in the country rely on forestry products for income and sustenance. It is widely recognized that Ghana's socioeconomic development is closely tied to forests and forest products, particularly in rural areas. A study conducted in three forest regions by Appiah et al. (2009) found that household income from forest products contributes around 38% more than other sources.

Even though forest products support livelihoods in Ghana, there is still enormous deforestation. The International Tropical Timber Organization (ITTO, 2005) estimates that Ghana's significant forest cover could vanish entirely in 25 years due to the country's yearly rate of deforestation, which is approximately 65,000 hectares. However, there have been some forest restoration projects like the REDD+ and the Forest Replacement Association (FRA). This dire forecast explains why deforestation is currently not just a major national issue but also a threat to the livelihood of communities that depend on forests. These people, primarily rural populations, heavily depend on forest resources for their basic livelihoods. This makes them specifically susceptible to the negative consequences of deforestation, such as reduced income, food insecurity, and displacement (Wunder, 2001). Deforestation, a multifaceted phenomenon with far-reaching environmental, social, and economic repercussions, has emerged as a critical global issue. Deforestation can provide immediate financial benefits by extracting timber, expanding agriculture, and developing infrastructure. However, these advantages frequently come at the cost of long-term sustainability and resilience challenges (Nepstad et al., 2006). To comprehend the social aspects of deforestation, one must analyze the complex network of individuals and groups, the distribution of power, and the organizations responsible for forest governance and resource management.

2.2 Definition and Causes of Deforestation

Deforestation can be defined as the permanent removal of trees from a forest. This can include clearing the land for mining, farming, or livestock or using the timber for fuel, construction, and manufacturing (Derouin, 2023). The causes of deforestation arise from several sectors and perspectives (Mahapatra & Kant, 2003), leading to widespread repercussions at the local, national, and global levels. Deforestation can be attributed to both anthropogenic and natural sources. Anthropogenic sources are consistently acknowledged due to the escalating human activities in forest and earth systems (McCarthy, 2009). Deforestation encompasses various aspects, including economic, governance, demographic, social, and scientific and technological factors (UNEP, 2006). Nonetheless, anthropogenic activities have been the primary cause of deforestation in Africa and, for that matter, Ghana. These activities include mining, hunting, bushfires, timber harvesting, and agricultural expansion (commercial farming).

Also, deforestation may be referred to as the permanent loss of canopy cover or the conversion of forested land to other land uses. This phenomenon has recently drawn more attention worldwide (FAO, 2004). Most of the world's yearly deforestation, almost 13 million hectares, occurs in emerging (developing) nations. However, the loss of forests in Africa is especially worrying since 90% of Africans rely on fuel wood and charcoal as energy sources and two-thirds of the continent's population depend on forest resources for income and food supplementation and replenishment. According to estimates, deforestation in Africa occurs annually across 3.4 million hectares due to or despite the high dependence on forest resources and non-timber forest products - NTFPs (FAO, 2010; CIFOR, 2005). Based on arguments from Acheampong and Marfo (2011) in Boafo (2013), the issue of forest cover loss is especially acute in Ghana, where NTFPs are essential for subsistence and provide income for 2.5 million people living in or near forest communities.

Many of the population in these surviving woodland or forested areas depends on the accessibility, availability, and use of forest products (Asamoah et al., 2007; Appiah, 2009). Forest communities exploit their environment for various purposes, such as legal and illegal logging, harvesting chewing sticks and medicinal herbs, hunting, collecting snails and mushrooms, and producing firewood (Boafo, 2013). According to Ahenkan and Boon (2008), the goods produced by these operations are acknowledged as resources that directly

improve the well-being of communities, particularly in times of agricultural adversity or lean times.

Deforestation occurs in Ghana due to several economic activities, including mining, fuel wood extraction, legal and illegal logging, and tree removal to create more arable land (agricultural expansion). However, these causes vary depending on which of the country's forest zones you are in. Unsustainable charcoal and firewood production, forest fires, and agricultural expansion are the leading causes in the north. In contrast, mining, logging, and agriculture expansion have been identified as the leading causes in the south (Boafo, 2012). As a result of the exponential population growth, farmers face increased pressure to enhance their production to meet the growing demand for food (Rudel, 2013). Meanwhile, the biotechnological alternative has continuously faced setbacks in its adoption in Africa (Wambugu, 2012). Both small- and large-scale farming activities contribute to deforestation. The expansion of large-scale agriculture, namely cocoa farming, palm oil production, and rubber cultivation, has depleted our forest areas in Ghana to accommodate the increased farming operations. Also, mining on a small or large scale, as mentioned above, constitutes a significant cause of deforestation in Ghana, resulting in soil degradation and loss of biodiversity.

Mining operations have and continue to result in widespread deforestation throughout numerous countries. Large-scale mining operations are highly harmful. Mining encompasses destroying extensive land areas; although it fosters development and attracts population increase, it leads to deforestation. The deforestation rate in Guyana caused by mining activities has risen to 2.77 between 2000 and 2008, as the World Wildlife Fund Guianas reported. Also, mining has emerged as one of the primary sources or causes of deforestation in Ghana (Mensah et al., 2015). The World Wildlife Fund (WWF) reports significant deforestation in Latin American nations such as Brazil, Peru, Colombia, and Venezuela. In addition, Ghana is not excluded from these countries that have seen significant adverse impacts.

2.3 Socio-Economic Benefits of Deforestation

Socioeconomic benefits of deforestation can be a complex issue with both positive and negative implications. While deforestation can lead to short-term economic gains through logging, agriculture, and infrastructure development, the long-term socio-economic

impacts can be detrimental. Deforestation can result in the loss of ecosystem services such as clean water, climate regulation, and biodiversity, essential for human well-being and economic activities (Naidoo et al., 2008). The financial benefits of deforestation, such as timber production and agricultural land conversion, need to be carefully weighed against the long-term socio-economic costs associated with environmental degradation and loss of ecosystem services (Kpare, 2016). Studies have shown that socio-economic factors play a significant role in driving deforestation. For example, population growth, poverty reduction, national income, economic growth, and foreign debt have been identified as crucial macroeconomic factors influencing deforestation rates (Dezécache et al., 2017). Additionally, local and national socio-economic factors can influence deforestation patterns, highlighting the interconnectedness between economic activities and environmental outcomes (Phompila et al., 2017). The pressure to convert forests into land for food production to support growing populations and provide socioeconomic benefits has been a significant driver of deforestation in many regions (Asrat et al., 2018; Boafo, 2013).

Furthermore, the socio-economic consequences of deforestation extend beyond environmental degradation. It is crucial to consider the socio-economic implications of deforestation, as it highlights the need for a holistic approach to environmental issues. Areas undergoing active deforestation often exhibit lower socio-economic indicators, indicating a precarious socio-economic situation in these regions (Tritsch & Arvor, 2016). As per the UNEP (2006), sustainable livelihoods guarantee that people possess and are entitled to a range of essential resources and opportunities that contribute to their overall welfare. This is of utmost importance for Indigenous individuals, especially those residing in villages near forests, because they tend to lack the essential resources necessary to maintain a satisfactory standard of living, such as a sufficient amount of nourishing food, appropriate housing, healthcare accessibility, energy sources, safe drinking water, education, and a pollution-free environment. This is because, when the trees are cut down, the resulting products provide a source of revenue for traditional leaders, local government, and the entire nation. The revenue is from royalties, personal income, taxes, and export revenues from individuals exploiting forest products. While deforestation may offer short-term economic benefits, the long-term socio-economic costs can be substantial. It is essential to consider the socio-economic implications of deforestation and adopt sustainable land

management practices that preserve ecosystem services and support long-term economic development.

2.4 Negative Effects of Deforestation

The adverse effects of deforestation are said to be numerous and interconnected. The loss of forest cover and biodiversity are directly linked to deforestation (Gardner et al., 2009; Vieira et al., 2008; Ayanwuyi et al., 2007). For instance, Ayanwuyi et al. (2007) found that the scarcity of snails, mushrooms, and bush meat were issues rural women in Oyo State, Nigeria, said were caused by deforestation. Deforestation and other forms of environmental degradation mainly affect rural populations like Zongoiri in the Northern region of Ghana since they depend primarily on natural resources for their existence, according to Seagle (2010) in Kpare (2016). The role of these rural populations in the effects of deforestation is significant, as it underscores the impact on local communities and the need for their involvement in solutions. Also, food insecurity arises from the deforestation caused by illegal gold mining, commercial logging for charcoal production, or other activities that degrade agricultural land (Kpare, 2016). A study conducted by Marfo and Acheampong (2011) suggests that the loss of forests not only lowers the economic growth contributions of forest communities to the country but, more importantly, jeopardizes the customs and means of livelihood for people who live in forests and rural areas in Ghana. Forest communities frequently have to travel farther into the forest to obtain goods that support their food security and socioeconomic well-being as the availability of NTFPs declines along with the trees that support them (Bosu et al., 2010).

In addition, logging operations have adversely affected the local community's ability to obtain non-timber Forest Products (NTFPs) throughout Ghana. Communities that live in forests or rely on them for their livelihoods seldom profit from timber harvesting because concessions are set aside only for corporate use (despite widespread illegal tree cutting). Social responsibility agreements do not provide sufficient compensation for damage caused to the farming operations of forest dwellers during the harvesting process (TBI, 2010). The loss of biodiversity, a consequence of deforestation, threatens the production systems. Environmentalists say that when trees are cut down, the forest cannot continue assisting with wildlife or efficiently preserve clean water as it used to, which may put the people who live there in danger (Knox & Martson, 1998). More so, the forest serves as a habitat for various wild creatures; birds can construct their nests on trees, while some other animals

can create their homes within the trees. Additionally, the forest casts shadows over bodies of water, shielding them from the sun's rays and preventing them from drying out, particularly during the dry season. The drying out of water bodies is a consequence of deforestation, which hurts the lives of aquatic species and wildlife.

A significant connection exists between deforestation, income, and poverty in rural households, which has received much attention (TEEB, 2010; Kerr et al., 2004; Pfaff et al., 2008, in particular). People living in communities in the forest border regions depend on various resources for their livelihoods, including money, employment, food, medicine, and energy. As a result of increased deforestation, these supplies start to run out. Because most people depend on these forest resources, poverty, typically prominent in rural regions, will likely worsen with deforestation.

Furthermore, there are a variety of repercussions that can be brought about by deforestation, which, in the long term, has brought about various environmental consequences, such as the deterioration of soil, the loss of biodiversity, and the acceleration of global warming. Deforestation in some developing nations is responsible for about 18% to 20% of the rise in the production of greenhouse gases, which are responsible for climate change and global warming. It is associated with global warming because tropical forests act as large carbon sinks (Gorte & Sheikh, 2010). Climate change challenges manifest in various forms, including changes in rainfall patterns and regimes and the frequency and severity of extreme weather events such as drought and flooding (Davis, 2011).

2.5 Locals' Perception of Deforestation

Uddin and Foisal (2007) defined local perception as local people’s attitude, knowledge, and apprehension that show their everyday way of life and shared expectations. Although this autochthonous body of knowledge is handed down from one generation to another, individuals in each generation adapt and add to the existing knowledge dynamically according to changing socio-economic and environmental circumstances. Sekhar (2003) observed that people living on forest reserve frontiers deeply understand natural resource management. A study conducted by Edusah (2010), a survey of how the livelihoods of forest fringe communities have been affected by the establishment of four forest reserves in the Brong Ahafo and Ashanti Regions of Ghana, suggested that the perceptions of forest fringe communities were diverse, and therefore reflected in different attitudes towards the

forest reserves. According to Edusah (2011), people perceive nearby forests as critical sources of timber and non-timber forest products (NTFPs) to meet their basic needs; forests provide them with income and jobs. The forest plays a vital role in local traditions, religions, beliefs, and practices and is essential in protecting and enriching the natural environment, as Edusah (2011) argues. According to Ayanwuyi et al. (2007), about 99.5 percent of the respondents interviewed in their study indicated that the quality of firewood used in the past is not the same as the ones used after deforestation. This implies that the quality of forest products changes due to deforestation. Also, it indicates that local people believe trees no longer mature before being harvested for domestic and commercial purposes.

According to a study by Kpare (2016), the number of years lived in a community has a crucial role in one's perception or knowledge about the state and use of natural resources. Kpare's (2016) results indicated that about 57 percent of the respondents have stayed in the village for more than 30 years, and only nine percent have lived there for less than 11 years. It is expected that since most of the respondents have stayed in the village for many years, they have accumulated enough knowledge about the trends of deforestation activities and associated problems in the area. This is because people who live in a particular area for an extended period accumulate experience with various problems associated with natural resources in their locality and the need for conservation or otherwise of the resources. Similar observations were reported by Kajembe (1994), which showed that people who had stayed longer in an area were likely to have provided relatively reliable historical data.

However, the perception of the locals on the degree or extent of deforestation over the years has not been clearly stated. This is a pressing issue, as the transition of the forest in form, structure, and composition over the past decades has not been mentioned. Also, these studies mentioned above have been conducted in different forest zones in Ghana, excluding the Bibiani-Awhiaso-Bekwai forest zones. In this regard, this study is urgently needed to address the gaps in how individuals and communities that heavily depend on forests and forest resources perceive the extent of deforestation and its associated problems on their livelihoods.

2.6 Sustainable Forest Management in Ghana

Sustainable forest management, according to the FAO (2010), is the practice of managing forests for the greatest possible social and economic benefits while maintaining, or, ideally,

improving over time, environmental values like biodiversity, soil, water, carbon sequestration, forest health, and productive capacity. The realization that using forest resources should maximize socio-economic benefits without degrading the environmental vitality of the forest environment is a crucial point that should not be overlooked.

A multi-faceted approach is crucial to address deforestation in Ghana and promote sustainable forest management. Ghana has indeed implemented various forest policy interventions to ensure the sustainable management of its forest resources. However, challenges persist, with agricultural expansion, particularly cocoa farming, a significant driver of deforestation in Ghana's high forest zone (Asare et al., 2013). The country's forest and wildlife policies have been befuddled with environmental protection challenges, especially in addressing deforestation and environmental pollution (Adom, 2017).

Ghana is dedicated to ensuring environmental sustainability through sustainable interventions, particularly forest management. These include the introduction of the Forest and Wildlife Policy in 2012 aimed to combat deforestation and guide forest governance initiatives in Ghana (Somuah et al., 2021). Also, the country has endorsed and implemented global agreements for sustainable forest management, including the International Tropical Timber Organization (ITTO) and the Voluntary Partnership Agreement (VPA). Additionally, the World Bank Forest Investment Program and the Government of Ghana have explored supporting forest restoration and plantation management under Reduced Emissions from Deforestation and Degradation (REDD+) to address deforestation (Besten et al., 2019). Traditional natural resource management practices in Ghana have shown significant potential for biodiversity conservation, and their preservation is crucial (Sarfo-Mensah & Oduro, 2007).

In Ghana, smallholder cocoa farming significantly contributes to agricultural emissions and deforestation, highlighting the need for sustainable land use practices (Akrofi-Atitianti et al., 2018). Conflict over forest resources, particularly timber, has been investigated in Ghana, emphasizing the importance of effective conflict management strategies (Derkyi et al., 2014). Increasing forest restoration and improving sustainable forest management are crucial to addressing deforestation and degradation (Mackey et al., 2020).

Furthermore, there is the Forest Replacement Association (FRA), a framework that allows small, medium-sized, and other businesses that utilize wood to work together to develop a

program for replanting. According to De-Miranda et al. (2010), partners are expected to replace any trees cut down to assist the replanting initiative or participate in other sustainable practices. As a result of these intentions and behaviors, the forest will be conserved, and the trees that have been cut down will be restored so that people can continue to make a living. This is because individuals living in the surrounding forest area will be responsible for conserving the forest resources for their mutual benefit, and these strategies will be effective. Additionally, this may assist in avoiding conflicts in forest land use, which is frequently observed in developing nations such as Ghana.

The key to successful climate change mitigation in Ghana lies in halting deforestation as a priority to transition forests from a net carbon source to a net carbon sink. This requires ending deforestation in the Global South, like Ghana, and reducing wood harvest in the Global North to enhance the carbon sink in forest biomass (Noë et al., 2021). There are institutional, solid, and informal structures that control forests. A significant institutional enhancement was the establishment of the Forestry Commission of Ghana, which is formally responsible for forest governance and sustainable management of the country's forests and wildlife resources. The Commission includes many public authorities and agencies, such as the Forest Services Division, Wildlife Division, Timber Industry Development Division, Wood Industries Training Centre, and the Resource Management Support Centre. These bodies and agencies are distributed nationwide to assist in fulfilling their duty.

2.7 Description of Livelihood and Human Well-Being

Ellis's (2000) definition of livelihood has been adopted for this study. Livelihood is defined as assets (natural, physical, human, financial, and social capital), the activities, and access to these (mediated by institutions and social relations) that determine the living gained by the individual or households. The study may pay attention more to the [activities, access, and living gained (income)] derived from the forest that contributes to their livelihoods. According to Adusei-Poku et al. (2003), a livelihood encompasses much more than a job. It encompasses the vast and varied spectrum of human endeavors, including capabilities, assets, and activities necessary for subsistence (means of living). Most Ghanaian rural residents, particularly those in the Bibiani-Anhwiaso-Bekwai municipality, rely on the resources in their immediate surroundings to support their livelihoods.

On the other hand, human well-being is a multidimensional concept capturing diverse ideas about what constitutes a ‘‘good life” (MacKinnon et al., 2016; Schleicher et al., 2018). This is a positive physical, social, and mental state (Summers et al., 2012). Based on international development discourse, human well-being is commonly understood to comprise the objective material circumstances of people’s lives, such as health, housing, and income; social aspects, such as community relations and trust; and a subjective dimension relating to how individuals view their circumstances (OECD, 2017). An edited volume on the topic (Colfer, 2012) provides a global overview of several critical issues for research, policy, and practice, while more recent empirical studies demonstrate deforestation's negative impacts on human health. For instance, forest loss has been associated with increases in the local incidence of malaria (Berazneva & Byker, 2017; Vittor, 2009), and declining quality in fuelwood has been linked to increased incidence of acute respiratory infection among women and children in East African contexts (Das, Jagger, & Yeatts, 2017; Jagger & Shively, 2014). However, this study adopts economic well-being with a focus on income that people living around the forest derived from their forest-based livelihood activities to cater to their households.

3.0 Theories

The effect of deforestation on Ghanaian community livelihoods, especially in the Bibiani-Anhwiaso-Bekwai municipality, is a complicated problem influenced by many different variables. Dei (1990) highlights how interconnected socio-economic, political, ecological, and historical factors cause deforestation. As shown by Pouliot (2012), who discovered that agricultural lands and the non-forest environment are more valuable to rural households, this is further worsened by the limited contribution of forests to rural livelihoods. Manyisa Ahebwa & van der Duim (2013) and Edusah (2011) highlight the environmental issues brought on by deforestation, including decreased soil fertility, soil erosion, and a decrease in game and wildlife, all of which have an additional negative influence on the community livelihoods. These studies indicate that deforestation in the Bibiani-Anhwiaso-Bekwai municipality significantly affects the community's livelihood. Addressing this issue requires a multifaceted approach that considers the socio-economic, political, and environmental factors at play. Meanwhile, Lartey (2009) cautions that the awarding of timber rights, a key driver of deforestation, can have mixed socio-economic and land use impacts on forest fringe communities. Understanding the effects of deforestation on livelihoods requires a grasp of theoretical frameworks. These frameworks provide a

structured approach to analyzing the complex interrelationships between forest resources, climate change, and community well-being, offering valuable policy and decision-making insights.

3.1 Current Consumption, Safety Nets, and Pathway out of Poverty

These concepts have been theorized by some scholars including; [Fisher, Chaudhury, & McCusker, 2010; McSweeney, 2005; Pattanayak & Sills, 2001; Shackleton & Shackleton, 2004; Angelsen et al., 2014; Cavendish, 2000; Ickowitz, Powell, Salim, & Sunderland, 2014; Pimentel, McNair, Buck, Pimentel, & Kamil, 1997; Shackleton, Delang, & Angelsen, 2011], found in Miller & Hajjar, (2020) to analyze the diverse contributions of forests and forest resources to rural livelihoods. This study draws from these concepts to analyze the impact of deforestation on community forest-based livelihoods. However, the study adopts current consumption and safety net concepts.

Literature shows that people who rely on forests for their livelihoods extract products from forests or benefit from ecosystem services derived from forests directly and indirectly. These forest resources may be used directly for subsistence livelihoods, where household dietary, housing, fuel, medicinal, and other needs are partially derived from these resources. Such dependency may also be rooted in commercial livelihoods if some household income comes from a forest-based economic activity, such as selling forest products or working in forest-based enterprises (Newton et al., 2016). Based on Sunderlin et al. (2005) and Angelsen et al. (2014) in Miller and Hajjar (2020), the different contributions of forest resources and services to rural livelihoods have been classified along three concepts: 1) support for current consumption, 2) use as safety nets, and 3) providing means for asset accumulation as a way to ameliorate poverty.

3.1.1 Current consumption

The contributions from forests to livelihoods that address basic needs related to food, fiber, and shelter may be referred to as support for current consumption. Those living in or near forests draw substantial parts of their subsistence needs from goods provided freely by natural, non-cultivated ecosystems (Angelsen et al., 2014; Cavendish, 2000; Ickowitz et al., 2014; Pimentel et al., 1997; Shackleton et al., 2011) based on Miller and Hajjar, (2020). They often rely on environmental income, which covers regular expenditures, such as selling forest products and services.

Recent research suggests that the average income contribution of forests can vary widely in different contexts. For example, a major comparative study found that forests provided an average of 22.2% of total income across a sample of nearly 8000 households in forest-adjacent communities in 24 LMICs. However, this contribution ranged from 5.5% to 63%, depending on the study site and household characteristics (Angelsen et al., 2014). Within LMIC contexts and between them, there are differences in the reliance on forest resources and services for present consumption. More affluent households extract more from the forest and have more considerable absolute forest earnings. However, poorer households in communities near forests tend to rely more on forest and environmental revenue (Angelsen et al., 2014), as found in Miller & Hajjar (2020).

According to a recent case study from Tanzania, structurally poor households (those with low income and assets) have a higher share of forest income than total income. However, random non-poor households (those with high income and low assets) have the most significant reliance on forests and the highest absolute forest income (Dokken & Angelsen, 2015). A recent case study from Tanzania showed, for instance, that the share of forest income relative to total income was high among structurally poor households (i.e., those having low income and assets), but the most significant forest reliance was found among random non-poor households (i.e., those having high income and low assets), which also had the highest absolute forest income (Dokken & Angelsen, 2015).

3.1.2. Safety nets

Safety nets from forests can assist households in mitigating the effects of seasonal fluctuations, times of scarcity, or environmental stress (Wunder et al., 2014). A substantial body of case studies demonstrates that when crops fail, there is a drought or other abrupt shocks, people use forest resources more to help fulfill their subsistence needs or supplement their income. (Fisher, Chaudhury, & McCusker, 2010; McSweeney, 2005; Pattanayak & Sills, 2001; Shackleton & Shackleton, 2004). However, a recent worldwide comparative study discovered that reactions to such shocks, such as shifting labor to other sectors, receiving help from outside the home, selling assets, or reducing consumption, were more frequently employed than forest-extraction strategies (Wunder et al., 2014). The study concluded that forest extraction is one of many coping mechanisms for income shortfalls and further suggests that the role of forest extraction in seasonal gap-filling may be less critical than previously thought.

3.1.3 Pathway out of poverty

It is essential to recognize that forests play vital roles in providing subsistence and safety nets for impoverished communities, enabling them to maintain a minimal standard of living and avert increasing hardship. However, trees might also contribute to providing a way out of poverty. Such a route might be provided by forests, which provide goods or services that raise household income in an environmentally friendly way. (Vedeld, Angelsen, Bojö, Sjaastad, & Kobugabe Berg, 2007). For example, a Democratic Republic of Congo case study found that the sale of fuelwood helped mitigate poverty and enabled some groups to improve their welfare by investing in other productive activities such as agriculture and petty trade (Schure et al., 2014). However, this approach was less accessible to comparatively lower socioeconomic groups that could not invest much fuelwood income, and concerns about its long-term viability still exist.

Current Consumption and Safety Nets	Material Living Standards: Assets owned, access to food, fiber, fuel, and shelter
	Economic Living Standards: Income, employment opportunities

Fig. 1. A conceptual framework for analyzing benefits derived from forests and impacts of deforestation on forest livelihoods (adapted from typologies presented in Miller and Hajjar, 2020)

3.2 Sustainable Livelihoods Framework

The Sustainable Livelihoods Framework (SLF) is a comprehensive approach to understanding and improving livelihoods, with five key components: physical, human, financial, social, and natural capital (Kumar et al., 2023). ***Physical capital*** comprises the basic infrastructure and producer goods needed to support livelihoods. Infrastructure includes affordable transport, adequate water supply and sanitation, affordable energy, and access to communication. ***Human capital*** represents the skills, knowledge, ability to labor, and good health that enable people to pursue different livelihood strategies and achieve their livelihood objectives. ***Financial capital*** is the financial resources people use to achieve

their livelihood objectives. There are two primary sources of financial capital: available stocks and regular inflows. ***Social capital*** means the social resources people draw to pursue their livelihood objectives. It is developed through networks and connections, membership in more formalized groups, and relationships of trust. However, the most related capital asset to the study is natural assets since livelihoods in forest fringe communities are mostly predicated on natural resources. Thus, ***Natural capital*** is the term used for the natural resource stocks from which resource flows and services valuable for livelihoods are derived. Natural capital is significant to those who derive all or part of their livelihoods from forest-based activities such as farming, fuel-wood gathering, hunting, timber harvesting, and mineral extraction.

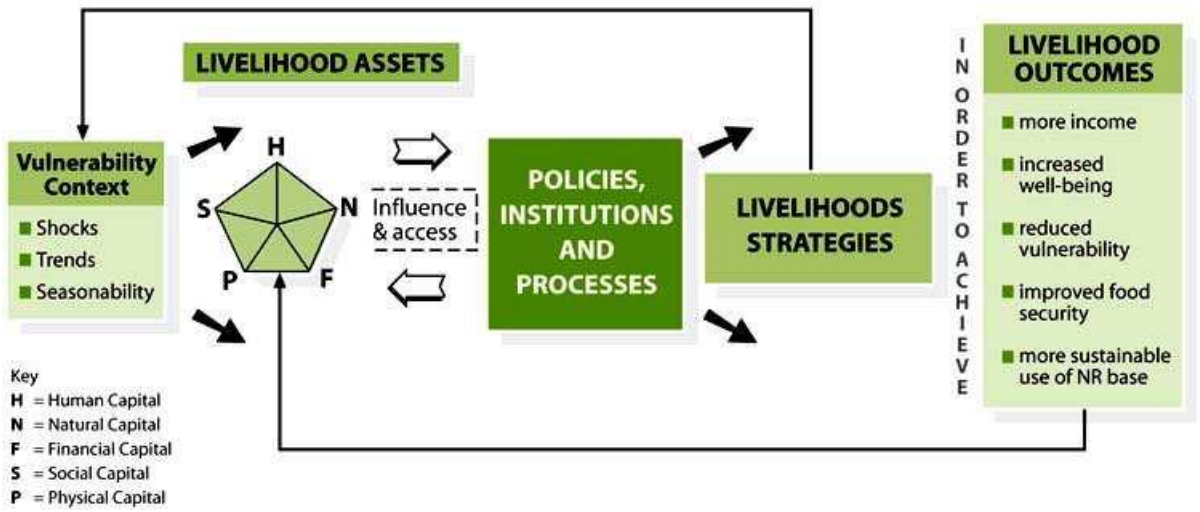
The Sustainable livelihood framework effectively analyzes the livelihoods of low-income people and can be a valuable tool for rural development (Lusinga-Machikicho & Mutanana, 2022). It provides a framework for analyzing the complex social and physical environment relationship and can be applied to project identification, design, and planning (Haiyang, 2009). Numerous studies (Yemiru et al., 2010; Pagnani et al., 2020; Alemu & Tolossa, 2022; Essacu, 2018; Muringai et al., 2019) have employed the SLF to examine the connection between deforestation and livelihoods. Stressing the complex relationships between forest resources and community well-being offers a thorough understanding of the relationships between livelihood resources, methods, and outcomes (Pagnani et al., 2020). Torres-Slimming et al. (2020) and Ofoegbu et al. (2017) have noted that the SLF has also been utilized to evaluate the effects of climate change on water systems and community livelihoods in the Amazon and South Africa respectively, emphasizing the aggravating influence of deforestation in these areas.

Moreover, the SLF has been instrumental in comprehending the effects of resource development projects on community livelihoods, underscoring the necessity of considering livelihood assets in the context of natural resource development (Essacu, 2018). Oldekop et al. (2020), in their study, delineate five significant trends they propose would have a massive impact on the forest and forest-based livelihoods: forest mega-disturbances, changing rural demographics, the rise of the middle-class in low- and middle-income countries, increased availability, access, and use of digital technologies; and large-scale infrastructure development. In the realm of deforestation, the SLF has been pivotal in scrutinizing the impacts of climate change on the livelihood and food security of small-

scale fishers, accentuating the interconnectedness of livelihood assets, external factors, and livelihood strategies (Muringai et al., 2019). Furthermore, the SLF has been applied to examine the impacts of large-scale agricultural investments on livelihoods, underlining the theoretical concept with empirical evidence (Alemu & Tolossa, 2022; Banerjee & Madhurima, 2013). This underscores the importance of considering livelihood impacts in the context of land-use changes, such as deforestation due to agricultural expansion and practicalities like this kind.

The SLF has been pivotal in understanding the impacts on water systems and adaptation challenges in Indigenous communities, shedding light on the role of non-climatic drivers, including deforestation, in exacerbating climate change impacts on water systems and community livelihoods (Torres-Slimming et al., 2020; Osoba et al., 2019). Studies have revealed the potential impact of forest reserves in alleviating poverty among forest-based individuals (Sunderlin et al., 2008; Sunderlin et al., 2005). The Sustainable Livelihood Framework is essential for comprehensively understanding the multifaceted impacts of deforestation on community livelihoods.

Figure 2 provides a sustainable livelihood framework developed by DFID:



Source: DFID (1999) Sustainable Livelihoods Guidance Sheets

3.3 Methodological Approaches in Assessing Deforestation Impacts

A range of methodological approaches have been employed in previous studies assessing the impact of deforestation on community forest-based livelihoods in Ghana. Edusah (2011) used structured questionnaires and semi-structured interviews to gather data on the

livelihoods of forest fringe communities, revealing the significant role of farming and environmental problems such as deforestation. Malleson et al. (2008) and Edusah (2011) both employed a combination of participatory and survey methods to investigate rural livelihood strategies and the impact of forest reserves on fringe communities, respectively. These approaches allowed for a comprehensive understanding of the economic importance of non-timber forest products and the challenges these communities face. Also, Appiah (2024) focused on remote sensing technology for deforestation, highlighting the need for evidence-based decision-making and sustainable land management practices. Moreover, Insaidoo et al. (2012) reviewed reforestation schemes, drawing on desk studies, interviews, and surveys to identify lessons and challenges. In addition, Benhin and Barbier (2001) investigated the impact of the structural adjustment program on forest loss, using an optimal control model and reduced-form equations to analyze the influence of input and output prices. However, Bare et al. (2015) found that international conservation aid, which could potentially mitigate the impact of deforestation, was associated with higher rates of forest loss in Africa. This suggests that the effectiveness of conservation aid in Ghana and its impact on deforestation needs to be further explored. Baffoe and Matsuda (2018) highlighted the importance of incorporating local ecological perceptions in conservation policies, indicating a need for a more community-centered approach to addressing deforestation in Ghana. These studies underscore the need for a comprehensive and interdisciplinary approach to effectively address Ghana's deforestation challenges, especially in the Bibiani-Bekwai-Awhiaso municipality, since they rely heavily on incomes generated from forests and forest resources. Also, little attention has been paid to this municipality. However, it has been saddened by the high deforestation rate, highlighting the importance of integrating ecological, social, and economic perspectives in policy and management decisions, ultimately improving deforestation's impact on livelihoods.

4.0 Methods and Materials

4.1 Introduction

The research methodology provides the approach by which data was collected and analyzed. This chapter presents the study area, research design, target population, sampling method, data collection procedure, variables definition, and the data analysis process.

4.2 Study Area

The study was conducted within the Bibiani-Anhwiaso-Bekwai municipal in the Western North Region of Ghana. The municipality has a population of 167,971, with 82,798 males and 85,173 females, according to the 2021 population and housing census (Ghana Statistical Service). According to the same census, the municipality has an area of 831.1 km^2 (320.9 sq. mi) and a population density of 202.1/km^2. The Bibiani-Anhwiaso-Bekwai Municipal is situated at a position on the map with latitude (width) 6°27'07.1" N (6.4519600°) and longitude (length) 2°18'58.9" W (-2.3163500°). With a long history, the municipality has developed into a dynamic center of commercial operations, cultural heritage, and social interactions. The community's advantageous position, surrounded by abundant forest and mineral-rich land, has consistently drawn settlers involved in mining, agriculture, and commerce.

Despite its economic potential, the Bibiani-Anhwiaso-Bekwai district has various obstacles, such as environmental degradation, poverty, and restricted access to critical services. The intricate interaction of these factors makes Bibiani-Anhwiaso-Bekwai and its environs a compelling and relevant field for further investigation. A varied population and economic activities characterize the Municipal socio-economic profile. Vacillating from Small-scale mining operations, commercial agriculture, and commerce are the main drivers of the community's economy.

Mining offers job prospects but also presents environmental hazards and social disturbances. Agriculture, namely cocoa and plantain growing, continues to be a fundamental source of income for numerous locals. The municipality also has a diverse cultural heritage characterized by dynamic customs, festivals, and traditional practices influencing community life. Family and kinship networks are crucial for social cohesiveness, and traditional governance structures maintain local customs and values. In the end, this thesis aims to contribute to a more in-depth understanding of the impact of deforestation on the livelihood of the people in that community.

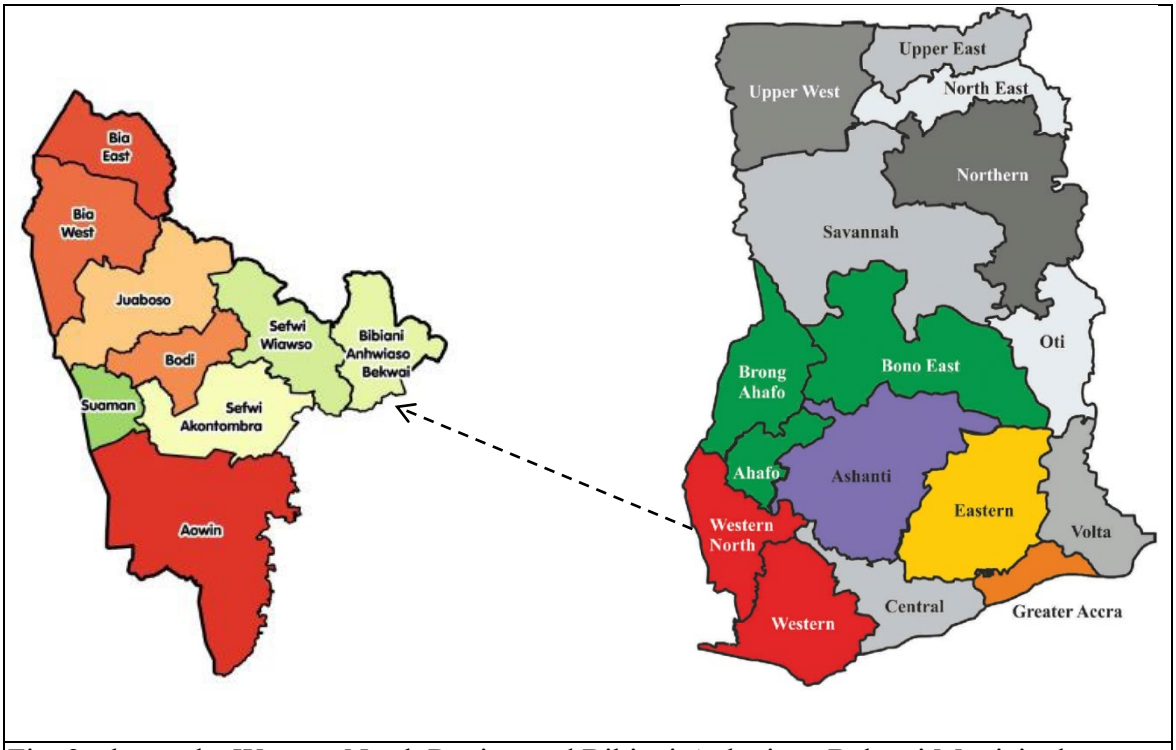


Fig. 3. shows the Western North Region and Bibiani-Anhwiaso-Bekwai Municipal

4.3 Research Design

Quantitative and qualitative explanatory methods were used to gain more insight into assessing the impact of deforestation on the community's livelihood in Bibiani-Anhwiaso-Bekwai municipal in the Western North Region of Ghana. The study design was used because it provided more perceptiveness and understanding of the study's objectives. The method of this study was a mixed method approach, which gave answers to the research questions that formed the basis of the study, allowing respondents to express their perceptions, and the answers were explained in detail. The focus of the study was to assess the impact deforestation has on the livelihood of the people of Bibiani-Anhwiaso-Bekwai Municipal. The sources of the data were primary or field data.

4.4 Target Population

This study targeted all indigenes from the Bibiani, Hwenampori, Abesinsuom, Aboduabo, Merewa, and Chine communities in the Bibiani-Anhwiaso-Bekwai Municipal in Ghana.

4.5 Sampling Technique and Sample Size

The technique for this study was a comprehensive blend of probability and non-probability sampling, reflecting the thoroughness of our mixed-method research design. We employed purposive sampling to select the communities, focusing on the most degraded forested areas in the municipality. Simple random sampling was then used to select the respondents,

ensuring a fair and unbiased representation. Additionally, quota sampling was utilized to select the respondents based on the population size of their respective communities, further enhancing the study's comprehensiveness. I interviewed 80 respondents from the Bibiani, Hwenampori, Abesinsuom, Aboduabo, Merewa, and Chine communities, providing a robust and diverse dataset.

The use of mixed sampling techniques aligns with the mixed-method research design. This approach allows for targeted selection of relevant areas (purposive sampling) and representative sampling within those areas (simple random and quota sampling). Combining these methods helps ensure that the study captures data from the most relevant locations while maintaining a degree of randomness and proportionality in respondent selection. The purposive selection of the most degraded forested areas ensures that the study focuses on the regions of most significant concern. In contrast, the random and quota sampling of respondents within these areas helps to reduce bias and ensure representation across different community sizes.

Data Collection Procedure and Tool

The data was collected from 80 respondents in the six communities in the municipality, ensuring a balanced gender distribution with 48 male and 32 female participants. This gender balance significantly enhances the inclusivity and representativeness of our study. The 80 respondents provide a reasonable spread across the six communities mentioned (Bibiani, Hwenampori, Abesinsuom, Aboduabo, Merewa, and Chine). More so, it was observed that the 80 interviews had reached data saturation, where additional interviews would yield little or no new information. To ensure the accuracy and credibility of the qualitative data, I adopted the participants checking technique, where the researcher shared their interpretations with participants and invited their feedback.

A researcher-administered questionnaire, a reliable and thorough data collection tool, was used in the data collection. This type of survey design allows researchers to collect comprehensive information from participants in a structured manner. The questions were based on the study's objectives and categorized into different parts. The personal information of the participants was part A. This section typically collects demographic data such as age, gender, education level, and occupation. This information is crucial for understanding the characteristics of the respondents and how these factors might influence their perceptions and experiences. Part B was divided into three parts: the first was about forest-based livelihood

activities (this section aims to understand how the local community interacts with and depends on the forest), the second was about the local perception of forest cover change (this part focuses on the community's observations and opinions regarding changes in forest cover over time), and the last was about the effects of forest cover change on livelihood and economic (income) well-being. This questionnaire structure allows researchers to gather both quantitative and qualitative data.

4.7 Study Variables

The study adopted the following definitions of the variables used:

Livelihood Activities: These are related activities to the forest that provide a means of living.

Stakeholders: These are people who directly or indirectly benefit from using forests and forest resources.

Deforestation: The state of forest cover loss or depletion of the forest.

Economic Well-Being means people have their most basic survival needs met and have sustainable income or present and future financial security.

Financial situation: Earnings are income from forest-related livelihood activities.

4.8 Exclusion and Inclusion Criteria

The study employed these exclusion and inclusion criteria: Participants under 18 were not considered. Also, only participants who lived in the communities continuously for at least five years or more were interviewed.

Data Analysis

Quantitative data was analyzed with Statistical Package for Social Sciences (SPSS) version 28. Frequencies and percentages were used to summarize the background information and the variables related to the various objectives. A cross-tabulation between the various stakeholders (represented by their socio-demographics) and livelihood activities practiced, locals' perception of forest cover change, livelihood activities affected, and economic well-being were done using Chi-square analysis. Qualitative data were analyzed through content analysis, using various objectives. Content analysis is a systematic research method used to analyze and interpret the content of various forms of communication, including texts, audio, video, and images. It involves quantifying and analyzing the presence, meanings, and

relationships of certain words, themes, or concepts within the content. This method is widely used in social sciences, media studies, psychology, and other fields to understand communication patterns, cultural trends, and social phenomena. In the context provided above, the following detailed methods were employed:

Descriptive Statistics: Frequencies and percentages were utilized to summarize background information and variables related to the study's objectives. This allows researchers to present a clear overview of the participants' data distribution and demographic characteristics. Cross-tabulation: A cross-tabulation analysis was conducted to examine the relationship between multiple stakeholders (identified by their socio-demographics) and various factors such as livelihood activities practiced, perceptions of forest cover change, livelihood activities affected, and economic well-being. This method helps understand how different demographic groups respond to the variables of interest. The chi-square analysis assessed the significance of the relationships identified in the cross-tabulation. This statistical test determines whether there is a significant association between categorical variables, which is crucial for understanding the impact of socio-demographic factors on the studied outcomes. In addition to quantitative methods, qualitative data were analyzed through content analysis, focusing on the study's various objectives. This method involves coding and interpreting textual data to identify patterns, providing deeper insights into participants' experiences and perceptions. These methodologies collectively enable a comprehensive quantitative and qualitative data analysis, facilitating a robust understanding of the research questions posed.

5.0 Results

This section provides the findings based on the research questions: 1. What forest-based livelihood activities are practiced in the community, and by which stakeholders? 2. How do local people perceive forest cover changes in the area over the past two decades? 3. How has this forest cover change affected locals' forest-based livelihood activities and household economic (income) well-being?

5.1 Summary description of the study participants

Table 1 presents the summary description of the study participants. A total of 80 respondents were used for the study. Of the 80 participants, 60% were 40 years or older, most were males (60%) and 85% were married. With education, only 12.5% attained tertiary education. Most respondents were household heads, and most households had five or more members. Most respondents engaged in farming activities, forming 75%, and cocoa, plantain, oil palm, and yam were the principal crops planted. Only 2.5% of the respondents were teachers. Most respondents (90%) envisage the forest as their source of livelihood, and only 2.5% see it as carbon storage. Interestingly, all the respondents agreed that women have some form of restrictions and a recognizable change in the forest cover.

Most respondents, 77.5%, describe the change in the forest cover as highly degraded, and 7.5% said the forest cover was very highly degraded. Some causes of the loss of forest cover include commercial farming, mining, and illegal logging. However, 20% of the respondents mentioned bushfires as one of the causes. Most respondents alluded to the fact that forest cover change has negatively affected forest-based livelihood activities, but 2.5% of the respondents hold a contrary view. The most affected are farming, 87.5%, and NTFPs, 95%. The respondents attributed this to the fact that "forest cover loss has a direct effect on rainfall pattern so they have delayed or little rainfall compared to the past years with dense forest cover which has affected their crop yield. Also, there are currently few or no snails and mushrooms in the forest". As a result of the effect, 47.5% of participants engaged in alternative livelihood activities. Most respondents earn below GHC 1000 (USD 69) monthly, and only 12.5% earn GHC 1000 (USD 69) and above monthly. About 100% of the respondent's financial situation (income levels) has been affected, and 5% described their economic well-being as the same as the forest cover change. It has been generally observed that about 90% of the respondents were only interested in the income generated from forest-based activities.

Table 1: Summary description of the study participants

Variable	Frequency	Percent
Age group		
18-25	2	2,5
26-35	6	7,5
36-45	24	30,0
46 or more	48	60,0
Sex		
Female	32	40,0
Male	48	60,0
Marital status		
Single	8	10,0
Married	68	85,0
Divorced	4	5,0
Education		
No education	24	30,0
Basic	38	47,5
Secondary	8	10,0
Tertiary	10	12,5
Household head Status		
No	34	42,5
Yes	46	57,5
Household size		
<5	26	32,5
5 or more	54	67,5
Occupation		
Artisan	10	12,5
Farmer	60	75,0
Trader	8	10,0
Teacher	2	2,5

Table 1: continued.

Variable	Frequency	Percent
Forest-based livelihood type		
Farming (Cocoa/Plantain, Oil palm)		
No	22	27,5
Yes	58	72,5
Wood (Odum, Wawa, mahogany)		
No	68	85,0
Yes	12	15,0
Hunting		
No	64	80,0
Yes	16	20,0
Firewood		
No	50	62,5
Yes	30	37,5
NTFPs(snails/mushroom)		
No	38	47,5
Yes	42	52,5
Alternative Livelihood		
Livestock/poultry farming	12	15,0
Driver/Journalist	12	15,0
None	42	52,5
Trader	14	17,5
No. of dependents		
<5	22	27,5
5 or more	58	72,5
Identity with the forest		
Source of livelihood	72	90,0
Source of rainfall	6	7,5
Carbon storage	2	2,5
Restrictions of entry of women to the forest		
Yes	80	100,0

Table 1: Continued.

Variable	Frequency	Percent
Reasons for restrictions		
When menstruating	80	100,0
Whether forest cover has changed		
Yes	80	100,0
Description of the current forest cover		
Less degraded	12	15,0
Highly degraded	62	77,5
Exist in books	6	7,5
Causes of forest cover loss		
Commercial farming, mining, illegal logging		
Yes	80	100,0
Bushfire		
No	64	80,0
Yes	16	20,0
Whether forest cover change has negatively affected livelihood		
No	2	2,5
Yes	78	97,5
No	10	12,5
Livelihood activities affected by forest cover change.		
farming		
Yes	70	87,5
NTFPs		
No	4	5,0
Yes	76	95,0
Timber		
No	70	87,5
Yes	10	12,5
Average household income per month		
<500	34	42,5
500-1000	36	45,0
More than 1000	10	12,5
Whether the financial situation is affected due to forest cover loss		
No	10	12,5
Yes	70	87,5
The current state of economic well-being		
the same	4	5,0
Little affected	18	22,5
Worse	58	72,5

5.2 Chi-square (Bi-variate) analysis of the socio-demographics of the participants (stakeholders) and the forest-based livelihood activities practiced.

Table 2 presents findings from a bi-variate chi-square analysis of the socio-demographics of the participants (stakeholders) and the forest-based livelihood activities practiced. The study finds out that farming (cocoa, plantain, oil palm), hunting, firewood gathering, NTFPs picking, and wood harvesting were the forest-based livelihood activities practiced in the Bibiani-Anhwiaso-Bekwai municipal by the locals for subsistence. These benefits or services provided or derived from the forest bring to mind the theory of the support for current consumption and safety nets. This is because most of the participant's main concern was achieving material living standards (assets owned, access to food, fiber, fuel, and shelter) and general living standards (income, employment opportunities).

5.2.1 Farming

With farming, participants (79.2%) within the age group 45 years or more and participants (66.7%) within the age group 26-35 practiced farming. Interestingly, 75% were males, 73.5% were married, and 73.9% were household heads. Based on the statistics stated above, farming seems to be male dominated with 36 (75%) of males who practiced farming and 22 (68%) females that practiced farming among the participants.

For instance, most participants said, "Farming is the dominant livelihood activity in the communities, and almost everyone engages in one form of farming, whether in the forest, close to the forest, or outside the forest."

5.2.2 Hunting

Regarding hunting, participants (33.3%) aged 36-45 practiced hunting. 29.2% and 25% of the participants were male and single, respectively. However, participants (20.6%) were married, and 21.7% of the participants were household heads. It is worth noting that hunting activity was also male dominated.

5.2.3 Firewood Gathering

Of participants who engaged in firewood gathering, 45.8% were in the age group of 45 years or older. Interestingly, participants (81.3%) were female, and there was a clear difference between males and females who engaged in firewood gathering as a livelihood activity. Also, divorced participants (100%) engaged in firewood gathering as a livelihood activity, and 13% of the participants were household heads. This may be attributed to men

being household heads in the Ghanaian cultural settings; a female usually becomes the household head in the absence of the husband, either by divorce or death. Here, it was evident that the firewood gathering was a forest-base activity that was practiced by most females.

"*Some participants mentioned that "the woman has to fetch firewood and bring it home; a man can help cut the firewood sometimes, but it is the responsibility of women. You would hardly see the man carrying firewood; it may seem awkward."*

5.2.4 NTFPs Picking

The common NTFPs usually picked by participants include snails, mushrooms, and sometimes herbs to prepare local medicines. Out of the participants engaged in NTFP picking, participants (100%) were in the age group 26-35 years. Females were 62.5%, and participants (75%) were single, and 43.5% of the participants were household heads. This was a forest-base activity that was practiced by most females.

Interestingly, some participants said, "Our sons and daughters usually pick the snails and mushrooms in the forest and sometimes herbs for local medicines." This may have accounted for the higher proportion of participants who were single and engaged in NTFP picking in the municipality.

5.2.5 Wood Harvesting

The participants (100%) were in the 18-25 age group, and 25% were male and single (50%). Also, 21.7% were household heads. It was interesting to note that no female was engaged in this livelihood activity.

These participants in wood harvesting mentioned that "wawa, Odum, mahogany, and sapele were the most wood species harvested and used in making pestle and mortar principally."

Table 2: Chi-Square (Bi-variate) Analysis of Forest-based Livelihood activities practiced in the Community by Stakeholders

	Forest-Base Livelihood Activities Practiced								
	Farming			**Hunting**			**Firewood Gathering**		
Variable	No n(%)	Yes n(%)	P-Value	No n(%)	Yes n(%)	P-Value	No n (%)	Yes n (%)	P-Value
Age group			0.226			0.172			0.234
18-25	0(0)	2(100)		2(100)	0(0)		2(100)	0(0)	
26-35	2(33.3)	4(66.)		6(100)	0(0)		4(66.7)	2(33.3)	
36-45	10(41.7)	14(58)		16(66.7)	8(33.3)		18(75)	6(25)	
45 or more	10(20.8)	38(79)		40(83.3)	8(16.7)		26(54.2)	22(45.8)	
Sex			0.540			0.540			0.000
Female	10(31.3)	22(68)		30(93.8)	2(6.3)		6(18.8)	26(81.3)	
Male	12(25)	36(75)		34(70.8)	14(29.2)		44(91.7)	4(8,3)	
Marital Status			0.167			0.566			0.003
Single	4(50)	4(50)		6(75)	2(25)		8(100)	0(0)	
Married	18(26.5)	50(73)		54(79.4)	14(20.6)		42(61.8)	26(38.2)	
Divorced	0(0)	4(100)		4(100)	0(0)		0(0)	4(100)	
Household Heads Status			0.742			0.651			0.000
No	10(29.4)	24(70)		28(82.4)	6(17.6)		10(29.4)	24(70.6)	
Yes	12(26.1)	34(73)		36(78.3)	10(21.7)		40(87)	6(13)	

Table 2 (continued).

	Livelihood Activities Practiced					
	NTFPs Picking			Wood Harvesting		
Variable	No – n (%)	Yes - n (%)	P-Value	No - n (%)	Yes – (%)	P-Value
Age group			0.032			0.001
18-25	2(100)	0(0)		0(0)	2(100)	
26-35	0(0)	6(100)		6(100)	0(0)	
36-45	10(41.7)	14(58.3)		18(75)	6(25)	
45 or more	26(54.2)	22(45.8)		44(91.7)	4(8.3)	
Sex			0.144			0.002
Female	12(37.5)	20(62.5)		32(100)	0(0)	
Male	26(54.2)	22(45.8)		36(75)	12(25)	
Marital Status			0.406			0.011
Single	2(25)	6(75)		4(50)	4(50)	
Married	34(50)	34(50)		60(88.2)	8(11.8)	
Divorced	2(50)	2(50)		4(100)	0(0)	
Household Heads			0.060			0.050
No	12(35.3)	22(64.7)		32(94.1)	2(5.9)	
Yes	26(56.5)	20(43.5)		36(78.3)	10(21.7)	

5.3 The perceived description of the forest cover change over the past two decades in the Bibiani-Anhwiaso-Bekwai Municipality

Table 3 shows the perceived description of the forest cover depletion over the past two decades in the Bibiani-Anhwiaso-Bekwai Municipality. It was interesting to note that all participants agreed that there was a tremendous change in the forest cover. The participants described these changes as little, highly, and very high degraded. Little degraded was referred to as less tree cover loss over the past decades, highly degraded means huge or high tree cover loss and associated forest resources, and very high degraded refers to the forest getting to complete extinction; thus, minimal tree cover remaining at few portions on the forested land.

Observation from the field study revealed that a few participants who described the forest cover change as little were not privy to the nature of the forest in the past decades and did not have much knowledge. Also, some of these participants considered the cocoa plantations to be part of the forest, and they did not have a drive through the forest to observe the current nature of the forest. Most participants described the forest cover change as highly degraded, and most of them were in the age range of 36 years and above. This implies that, at least, a participant was 16 years or more, considering the past two decades, and lived in the community throughout their lives. Also, these participants who described the forest cover change as highly degraded were vigorously engaged in one forest-based livelihood activity or another related to the forest. These participants have observed the changes in the forest cover over the past two decades and have vivid knowledge about the change because they have lived in the communities for many years. I had a drive (motor ride) through the forests in these communities. I observed that the current nature of the forest was constituted mainly by cocoa plantations, leaving few trees in the plantations and several mining sites at various places with little tree cover. However, from a standpoint in the community, one may observe and think that these plantations were forested areas with trees; unfortunately, not so with a drive through the forest.

For instance, some of the participants described the forest cover change with these attributes: "The forest is gone, it is a cocoa plantation now, it is a mining ground, we do not have forest now, depleted forest, our source of rainfall is gone, very sad." The major causes of the forest cover change were attributed to "mining by some mining companies

and commercial farming by some elites and rich in society as well as logging activities," mentioned by some participants.

These mining companies were owned privately by persons living in the cities, and some individuals in the communities and surrounding villages also carried out illegal mining (surface mining) in these forests, leaving the forest degraded. These mining sites were scattered in the forests. Though the community dwellers were carrying out cocoa farming (small scale), most of the commercial cocoa plantations that got the forest cleared were owned by some wealthy individuals residing in nearby cities but had farmers in these communities engaging in these commercial farming to the detriment of people living in the communities whose livelihoods were dependent on the forest. I have observed that much of the forest was converted to cocoa plantations with significantly fewer trees scattered across. Unfortunately, these mining companies and commercial farm owners hardly employ these community dwellers depriving them of income generating activity.

Out of the total participants (80), 83.3% and 33.3% were in the age group 45 years or more,

and 26-35 years said the change in the forest cover can be described as highly degraded and very highly degraded, respectively. Also, participants (75%) in the age group 36-45 years described the forest cover change as highly degraded. Participants (100%) in the age group 18-25 years described the change as little degraded. This may be attributed to their ages (young), and they were not privileged to observe the forest cover change over the past two decades since the study seeks to understand perceptions over the past two decades. They may be very young to know that but only give their perception of what they have observed recently. 75% and 81.3% of the participants who described the forest cover change as highly degraded were male and female, respectively. Also, participants (100%) who have completed tertiary education described the forest cover change as highly degraded. This may connote that the forest cover change within the past two decades was very significant. More so, participants who were household heads (78.3%) and non-household heads (76.5%) described the forest cover change as highly degraded.

Table 3: Chi-square (Bi-variate) analysis of Stakeholders (Locals) and their Perception of the Forest Cover Change

	Description of the Forest Cover Change			
	Little Degraded	**Highly Degraded**	**Very High Degraded**	P-Value
Age group	n (%)	n (%)	n (%)	0.004
18-25	2(100)	0(0)	0(0)	
26-35	0(0)	4(66.7)	2(33.3)	
36-45	4(16.7)	18(75)	2(8.3)	
45 or more	6(12.5)	40(83.3)	2(4.2)	
Sex				0.806
Female	4(12.5)	26(81.3)	2(6.3)	
Male	8(16.7)	36(75)	4(8.3)	
Education				0.311
No Education	4(16.7)	18(75)	2(8.3)	
Basic	8(21.1)	26(68.4)	4(10.5)	
Secondary	0(0)	8(100)	0(0)	
Tertiary	0(0)	10(100)	0(0)	
Household Heads				0.003
No	2(5.9)	26(76.5)	6(17.6)	
Yes	10(21.7)	36(78.3)	0(0)	

5.4 The forest-base livelihood activities affected by the forest cover change as indicated by the Participants

Table 4 shows forest-based livelihood activities affected by the forest cover change by the participants (stakeholders). All the participants concluded that forest cover change has affected one or more forest-based livelihoods in the communities. Most participants said, *"The major activities affected include farming and NTFP picking*." Regarding farming, the participants mentioned that *"the rains do not fall again as first due to the forest cover loss, greatly affecting crop yield, and also, there are no snails and mushrooms in the forest now compared to previous years."* The Forest-based livelihood activities mainly affected by forest cover change include farming, NTFP picking, and Wood harvesting.

5.4.1 Farming Activity

With farming, 44 participants, forming 91.7% in the age group of 45 years or more, alluded to the fact that farming activity has been affected by the forest cover loss. Of the 70 participants

who agreed that farming activity had been affected, 32(100%) were female, 88.2% were married, and 4(100%) were divorced. Participants (82.6%) were household heads, and non-household heads (94.1%) also mentioned that farming as a livelihood activity was affected. Interestingly, the proportion of non-household heads who complained about the effect was higher. This may imply that many individuals and households suffer from forest cover loss since an average household size is five or more, and households largely depend on farming for their livelihoods. Most of the participants who lamented about the impact of forest cover loss were in the age group 36 years or more, and these people formed most community dwellers who engaged in farming activity as a livelihood. Most of the time, mining companies destroy farmlands belonging to the rural folks without necessary compensation. The same scenario was observed with illegal mining activities as well. This often results in conflicts, and at the time of my field visit, there was an ongoing conflict between one mining company and farmers in the Aboduabo community, which was ongoing at the district court. Also, people engaged in commercial farming use their influence to possess large portions of forested lands, including those cultivated by rural folks (community dwellers) for cocoa plantations. This brings to mind the need to adopt sustainable and collective forest management practices. Moreover, some participants mentioned that rainfall patterns have changed due to the forest cover loss, adversely affecting crop yield.

5.4.2 NTFPs Picking

Out of the 80 participants, 76 (83.3%) of the participants said NTFP's presence in the forest has been scarce due to forest cover loss. The community dwellers said they hardly get mushrooms and snails from the forest. This situation was recent and attributed to the forest cover loss said by some of the participants. These participants (83.3%) belong to the age group 36-45 years, and participants (100%) who belong to the age group 45 years or more lamented the adverse impact of the forest cover loss on NTFP picking. Most of the participants in these age groups depended on forest-based livelihoods and lived in these communities for over three decades. Also, this implies that any effect on them may have a ripple effect on their dependents. The participants (93.8%) were female, and 97.1% who were married also complained about the adverse effect of the forest cover depletion on NTFP picking. Also, participants (91.3%) who were household heads complained.

5.4.3 Wood Harvesting

Regarding wood harvesting, participants (100%) who belong to the age group 18-25 years said wood harvesting had been affected by the depletion of the forest cover. 20.8% and 50% of participants who lamented about the effect were male and single, respectively. About 17.4% of participants who were household heads also complained about the impact. The participants indicated that the wood species (wawa, Odum, sapele, and mahogany) often used to be scarce in the forest nowadays because the same wood species were logged as timber and cut down for mining and commercial farming purposes. This depletion of the forest cover makes it hard to find these tree species in the forest.

Table 4: Chi-Square (Bi-variate) analysis of Stakeholders and Forest-Base Livelihood Activities Affected

	Livelihood Activities Affected by Deforestation			**Livelihood Activities Affected by Deforestation**			**Livelihood Activities Affected by Deforestation**		
Variable (Locals)	***Farming Activity*** No - n(%)	Yes - n(%)	P-Value	***NTFPs Picking*** No - n(%)	Yes - n(%)	P-Value	***Wood Harvesting*** No - n(%)	Yes - n(%)	P-Value
Age group			0.283			0.020			0.000
18-25	0(0)	2(100)		0(0)	2(100)		0(0)	2(100)	
26-35	2(33.3)	4(66.7)		0(0)	6(100)		6(100)	0(0)	
36-45	4(16.7)	20(83.3)		4(16.7)	20(83.3)		18(75)	6(25)	
45 or more	4(8.3)	44(91.7)		0(0)	48(100)		46(95.8)	2(4.2)	
Sex			0.006			0.675			0.006
Female	0(0)	32(100)		2(6.3)	30(93.8)		32(100)	0(0)	
Male	10(20.8)	38(79.2)		2(4.2)	46(95.8)		38(79.2)	10(20.8)	
Marital Status			0.417			0.023			0.003
Single	2(25)	6(75)		2(25)	6(75)		4(50)	4(50)	
Married	8(11.8)	60(88.2)		2(2.9)	66(97.1)		62(91.2)	6(8.8)	
Household Heads			0.124			0.078			0.124
No	2(5.9)	32(94.1)		0(0)	34(100)		32(94.1)	2(5.9)	
Yes	8(17.4)	38(82.6)		4(8.7)	42(91.3)		38(82.6)	8(17.4)	

5.5 The effects of forest cover loss on the finance (income) and economic Well-Being of the stakeholders

Table 5 indicates the effects of forest cover loss on the stakeholders' finances (income) and economic well-being. This study considered Economic Well-Being as people meeting their most basic survival needs and having sustainable income or present and future financial security. This implies that community dwellers may be assured of earning income from using forest resources now and in the future. This may come from the direct use of the products and services derived from the use of the forest or the sale of the products to generate income to cater for their households. From the study, most of the participants (87.5%) lamented about the adverse effect of forest cover change on their finances (income) since their source of income was attached to forest-based livelihoods that have been affected. The money obtained from selling the forest-related products and the yield has reduced. Among those who lamented, 87.5% were in the age group of 45 years or more, and 87.5% of these participants were both male and female. Also, 85.3% and 100% of those who lamented were married and divorced, respectively. Participants (87%) who were household heads lamented, while those who were not household heads but lamented were 88.2%**.** From the field observation and interrogation with the participants, it was clear that the income generated from the forest and forest resources has been affected due to forest cover loss, which has a ripple effect on their household income. This implies that their ability to cater for their dependents may also be affected, especially for participants who do not have alternative sources of livelihood but solely depend on forest-based livelihood activities.

For instance, some participants described the effect on their income as "We do not get money from the forest compared to previous years. It is bad now. Our money has been reduced now. I do not make enough money to cater for my family now."

Furthermore, the participants described their economic well-being with forest cover change as the same, little affected, and worse. Participants who described their economic well-being as the same noted that the forest cover change has no direct effect on their income-generating activity presently or in the future. This was because these participants do not rely on forest-based livelihoods. However, these participants complained that products such as mushrooms, snails, plantain, bush meat, pestle, and mortar, among others, have become expensive at the market compared to the past 5-10 years. This situation was attributed to

forest cover loss since these products from the forest-related livelihoods have become scarce. Participants who described their economic well-being as little affected noted that the change in the forest cover loss affected their present income generation since they depended on forest-based livelihoods but not solely. These participants have alternative livelihood sources that were doing well and contributing to their household income and financial security. It has been observed that 33.3% of the age group 36-45 years, 25% of male, 23.5% married, and 30.4% of household heads lamented that their economic well-being had been little affected. Finally, the last group of participants described their economic well-being with the forest cover loss as worse because they largely depend on forest-based livelihood activities without thriving alternative livelihood sources. The participants noted that the yield from forest-related farms was low due to irregular patterns of rainfall nowadays, non-timber forest products have become scarce, and specific wood species (used for pestle and mortar) were almost extinct. All these were attributed to the change in forest cover over the past decades, as mentioned by the participants. Coupled with economic hardship in Ghana, specifically in these communities, income generated from their product sales has decreased drastically. Market forces usually compel them to reduce their prices to make sales since they do not have the technology to preserve these forest-related products for long. These participants' livelihood activities and income generation were attached to the forest and forest resources. Most of these participants were in the age group of 36 years or more, and it was observed that the same age group was actively engaged in forest-based livelihood activities. In addition, these age groups were the participants who lived in the community continuously for more than three decades and have observed the change in the forest cover with its corresponding adverse effects over the years. Interestingly, 83.3% of the participants who agonized about their worsened economic well-being belong to the age group 45 years or older. Also, female (81.3%), 70.6% married, and 88.2% non-household heads agonized about their economic well-being and described it as worse. Furthermore, 60.9% of household heads, 100% divorced, 66.7% male, and 100% of the age group 18-25 lamented their economic well-being dramatically affected by the forest cover loss by describing the situation as worse. Generally, observations from the field study indicated that the income of the participants decreased with the forest cover loss, especially for those dependent on forest-based livelihood activities.

Some participants described their economic well-being as "not good at all. I can only feed my family once a day. I have no money to cater for my household, no money to send my kids

to school. It was better some years back than now. We cannot survive in the next ten years with the current rate of deforestation," among other things.

Table 5: Chi-Square Test on the impact of the Forest Cover Loss on Stakeholder Finances and Economic Well-Being

	The financial situation Affected due to the forest cover loss (Deforestation)			Description of Economic Well-Being due to Forest Cover Loss (Deforestation)			
Variable	No - n(%)	Yes - n(%)	P-Value	Same n (%)	Little Affected n(%)	Worse n(%)	P-Value
Age group			0.677				0.022
18-25	0(0)	2(100)		0(0)	0(0)	2(100)	
26-35	0(0)	6(100)		0(0)	2(33.3)	4(66.7)	
36-45	4(16.7)	20(83.3)		4(16.7)	8(33.3)	12(50)	
45 or more	6(12.5)	42(87.5)		0(0)	8(16.7)	40(83.3)	
Sex			1.000				0.168
Female	4(12.5)	28(87.5)		0(0)	6(18.8)	26(81.3)	
Male	6(12.5)	42(87.5)		4(8.3)	12(25)	32(66.7)	
Marital Status			0.365				0.714
Single	0(0)	8(100)		0(0)	2(25)	6(75)	
Married	10(14.7)	58(85.3)		4(5.9)	16(23.5)	48(70.6)	
Divorced	0(0)	4(100)		0(0)	0(0)	4(100)	
Household Heads			0.864				0.018
No	4(11.8)	30(88.2)		0(0)	4(11.8)	30(88.2)	
Yes	6(13)	40(87)		4(8.7)	14(30.4)	28(60.9)	

6.0 Discussion of Results

This section provides significant findings based on the objectives discussed with the theories and concepts. The theories and concepts adopted in this discussion include support for current consumption, safety nets, a sustainable livelihood framework, and sustainable forest resources management. A brief discussion was provided with the theories mentioned.

6.1 Livelihood Activities Practiced and Support for Current Consumption

Several research studies have established that forests provide essential services for the support of life on the planet, and forest fringe communities primarily depend on forests for livelihoods. Forests are complex and dynamic ecosystems essential to human communities' well-being. Bibiani-Anhwiaso-Bekwai communities primarily depend on the surrounding forest for their livelihoods.

The livelihood activities in the Bibiani-Anhwiaso-Bekwai communities include: 1. Farming (cocoa, plantain, and oil palm) usually cultivated in and around the forest. Farming was observed to be male-dominated and practiced by most participants. This may result from men (male) being household heads in Ghanaian settings when married and were expected to provide for the household, 2. NTFPs (Non-Timber Forest Products) mainly include mushrooms, snails, and herbs that the locals largely depend on for food and medicine. The forest freely provided these products and supported the current consumption argument, 3. Firewood gathering serves as a significant source of fuel for the locals and helps generate income from the sale of it. This livelihood activity was female-dominated, evident in Ghanaian settings, 4. Wood harvesting was one of the income-generating sources for men in the communities, and 5 Hunting is also a male-dominated livelihood activity. The forest helps provide these essential livelihood services to the Bibiani-Anhwiaso-Bekwai inhabitants. This correlates with some of the findings of Sunderlin et al. (2005), that forest-based livelihood type includes Hunting and Gathering and swidden cultivation, and further mentioned some principal forest uses for poverty alleviation, which include timber, fuel, and NTFPs, among others. This highlighted the concept of support for current consumption where the locals depend on products and services provided by the forest and forest resources. This concept argues that forests contribute to the livelihoods of people living near or around to help provide their basic needs like food, fuel, and shelter. This research

suggests that people in the Bibiani-Anhwiaso-Bekwai municipality rely on forest resources for their basic needs.

Also, according to Kpare (2016), forest ecosystems provide a wide range of ecosystem services, including the purification of air and water, the prevention of soil erosion, the regulation of climate, and the provision of food, fuel, and other natural resources. For these services to be provided by the forest, there ought to be effective forest management and conservation practices for the forest to provide these essential services to humankind sustainably. According to Keenan et al. (2015), sustainable forest management practices, such as selective logging, reforestation, and biodiversity protection, are crucial for ensuring the long-term viability of ecosystems. However, this was not the situation in the Bibiani-Anhwiaso-Bekwai municipality. The forest ecosystem in the municipality was indiscriminately logged, depleted with no sign of reforestation, and left unprotected. Therefore, relevant authorities in the Bibiani-Anhwiaso-Bekwai communities must engage various stakeholders in managing and protecting the forest to continue providing its essential services. This is because, based on Boafo (2012), the loss of these forest resources can lead to various adverse outcomes, including food insecurity, poverty, and the disruption of cultural practice. This calls for sustainable forest resources management where all stakeholders' voices and interests, especially the locals, are considered in managing the forest sustainably to benefit local communities and the global environment.

6.2 Forest Cover Change, Sustainable Forest Management, and Safety Nets

This research revealed that all participants agreed that the forest cover changed drastically. These changes, they say, have ripple effects on them in several ways. The change was described as less, highly, and very highly degraded in the Bibiani-Anhwiaso-Bekwai municipality. It was observed from the findings that participants who lived in these communities for a very long time perceived the forest cover to be highly degraded, adversely affecting their livelihood activities. This aligns with Kpare (2016), who states that the number of years lived in a community has a crucial role in one's perception or knowledge about the state and use of natural resources. Kpare's (2016) results indicated that about 57 percent of the respondents have stayed in the village for more than 30 years, and only nine percent have lived there for less than 11 years. It is expected that since most of the respondents have stayed in the village for many years, they have accumulated enough knowledge about the trends of deforestation activities and associated problems in the area. This is because people who live in a particular area for an extended period accumulate

experience with various problems associated with natural resources in their locality. Similar observations were reported by Kajembe (1994) found in Kpare (2016), who showed that people who have stayed longer in an area were likely to provide relatively reliable historical data about changes in the state of natural resources in their locality.

These drastic changes in the forest cover in the Bibiani-Anhwiaso-Bekwai municipality resulted from some elites, affluent individuals, and mining companies that have taken the use of the forest for their self-interest instead of the interest of all in the communities. These happenings undermine the concept of sustainable forest management, where some of the stakeholder's interests were not considered in managing and using the forest resources. The concept of sustainable forest management suggests that all stakeholders ought to be involved in the practice of managing forests for the greatest possible social and economic benefits to all stakeholders while maintaining or, ideally, improving over time, environmental values like biodiversity, soil, water, carbon sequestration, forest health, and productive capacity FAO (2010). Although Ghana has adopted and implemented several interventions, sustainable forest management has not yet been achieved. Some of these interventions include the Forest and Wildlife Policy 2012, which aimed to combat deforestation and guide forest governance initiatives in Ghana (Somuah et al., 2021). The World Bank Forest Investment Program and the Government of Ghana have explored supporting forest restoration and plantation management under Reduced Emissions from Deforestation and Degradation (REDD+) to address deforestation (Besten et al., 2019). However, challenges persist, with agricultural expansion, particularly cocoa farming, a significant driver of deforestation in Ghana's high forest zone (Asare et al., 2013). This was the case in the Bibiani-Anhwiaso-Bekwai municipalities, where the elites acquired large-scale forested lands for commercial cocoa farming to the detriment of the whole community. Also, mining companies have acquired significant phases of the forest for mining activities. These activities destroyed individual farmlands, polluted water bodies, and degraded portions of the land. These situations further marginalized the local people since they lost access to resources, resulting in further impoverishment.

According to Dauvergne (2005), these self-interested individuals and companies should learn the virtue of sharing and abstain from egocentric needs for the good of the entire community. Also, according to N. Sambe et al. (2018), one cannot overstate the priceless contributions that Nigerian forests provide to advancing sustainable livelihood, availability

of industrial raw materials, food security, medicine, and health care research. Moreover, to add to their argument, proper accountability and a decentralized governing system must be established to ensure that the needs of the local people are respected. However, individual self-interest often drives the overuse of shared resources, hindering the effective use and distribution of its abundant resources, especially for smallholder farmers. This was not different in the case of Bibiani-Anhwiaso-Bekwai communities and Ghana as a country. Furthermore, Ghana's forests have been degraded and lost due to agricultural expansion, logging, and mining (Owusu & Asante, 2019).

Rudel et al. (2005) identified two main pathways of the forest cover change: the economic development path, where forest cover declines initially due to agricultural expansion and then increases as economies shift towards industrialization and urbanization, and the forest scarcity path, where deforestation leads to wood shortages, prompting active reforestation efforts. Considering the economic development path, in the case of Bibiani-Anhwiaso-Bekwai, the forest cover declines due to agricultural expansion but does not increase as economies shift to industrialization, possibly because no industrialization processes have been implemented. Also, deforestation is prevalent with the forest scarcity path, but no reforestation efforts have been instituted. These same factors were prevalent in the Bibiani-Anhwiaso-Bekwai municipality. Therefore, there is a need for responsible institutions like the Forestry Commission of Ghana, Ministry of Lands and Natural Resources, and Bibiani-Anhwiaso-Bekwai Municipal Council to effectively engage the residents of the various communities, adopt sustainable management practices, establish channels and measures of accountability, regulate powerful actors and decentralized power to local people to curtail this self-interest exploitation of the forest. Unfortunately, there was no evidence of reforestation strategies to halt deforestation in the municipality.

For the forest to serve as a safety net, it needs to provide its essential services to meet the basic needs of people living near and around the forest and supplement income or help meet subsistence needs during periods of crop failure, drought, or other seasonal shocks (Fisher et al., 2010; McSweeney, 2005; Pattanayak & Sills, 2001; Shackleton & Shackleton, 2004) found in Miller & Hajjar (2020). However, the current state of the forest resources in the Bibiani-Anhwiaso-Bekwai municipality, as described by the participants as highly and very highly degraded, may not be in the state to serve as a safety net. This situation ought to be

considered by various authorities to engage all stakeholders to ameliorate the situation sustainably.

6.3 Affected Livelihoods, Effect on Economic Well-Being and Sustainable Livelihood Framework

Over the past century, there has been a decrease of more than one-third in the number of original-growth forests lost to loggers and economic development (Boafo, 2012). Concerning the forest cover change (transition) concept, it posits that countries or regions often undergo a shift from net deforestation to net reforestation as they progress through various economic development stages. Based on empirical observation, this implies that as income (economic status) rises within developing countries or regions, deforestation increases to a certain point but then decreases. However, this was not the case for the Bibiani-Anhwiaso-Bekwai communities and Ghana. Deforestation is rising without any evidence of economic development in the Bibiani-Anhwiaso-Bekwai municipality. In the case of Bibiani-Anhwiaso-Bekwai municipality, deforestation continues to increase. In contrast, the income levels of the locals continue to decrease because the forest cannot support current consumption or serve as a safety net. The scenario in this municipality was inversely related to the fundamentals of forests supporting current consumption and as a safety net. Most of the participants in these communities said their finances (income) were negatively affected by deforestation. Thus, their finances(income) decrease as deforestation increases, which is a worrying trend. This was linked to the fact that most of the livelihood activities practiced by the locals were adversely affected by the rate of deforestation, thereby reducing the income generated from the sale of products obtained from forest-based livelihood activities. Livelihood activities include timber harvesting, farming, fuelwood gathering, and picking non-timber forest products. This was also observed in a study conducted by Ayanwuyi et al. (2007), that the scarcity of snails, mushrooms, and bush meat were issues rural women in Oyo State, Nigeria, said were caused by deforestation. In addition, the participant's material living standards (assets owned, access to food, fiber, fuel, and shelter) and economic living standards (income and employment opportunities) were affected by deforestation due to its negative impact on forest-based livelihood activities. However, according to Edusah (2011), the people living around forests perceive nearby forests as critical sources of timber and non-timber forest products (NTFPs) to meet their basic needs; forests provide them with income and jobs. In addition, with reference to the sustainable livelihood framework, physical capital such as road networks were in a

deplorable state. In most of the communities, commercial vehicles do not go there, the only means of transportation was the use of motorbikes making it very difficult for farmers to transport farm produce and other forest products to a nearby market located in Bibiani township. Also, there was no constant power supply for the few farmers that may be able to afford to preserve some of their farm produce. Moreover, a means of storage was a problem for most participants. These setbacks hindered participants' ways of generating income. Sadly, these elite commercial farmers and mining companies hire personnel from outside these communities, though, the indigenes were equally qualified to do the job. This act denied them, especially the youth, from being employed, thereby affecting their source of income. More so, most of these communities do not have formalized group or organized village or community groups to serve as a voice for advocacy purposes, hence, denying them of some opportunities that may serve as a source of income generation

Furthermore, most participants described their economic well-being as worse due to deforestation. Based on international development discourse, human well-being is commonly understood to comprise the objective material circumstances of people's lives, such as health, housing, and income; social aspects, such as community relations and trust; and a subjective dimension relating to how individuals view their circumstances (OECD, 2017). However, this study considers the Economic Well-Being of the locals in the Bibiani-Anhwiaso-Bekwai municipality. This suggests that people have their most basic survival needs met and have sustainable income or present and future financial security from using the forest resources. It was observed that people from the municipality were more concerned about the income generated from the use or sale of forest products, and that mainly defined their well-being. This relates to the findings of Appiah et al. (2009), who conducted a study in three forest regions, for instance, and found that household income from forest products contributes around 38% more than income from any other sources. This tends to imply that income is vital in determining the well-being of the locals in the municipality. Furthermore, considering the Sustainable Livelihoods Guidance sheet adopted from DFID (1999), more income and increased well-being were priorities to achieve sustainable livelihoods. However, most participants in the Bibiani-Anhwiaso-Bekwai municipality described their well-being as worsened by increasing deforestation, affecting their livelihood activities and, hence, their income.

The state of the forest resources and the worsened nature of their well-being calls for sustainable livelihood strategies and sustainable forest management approaches to address the situation since the livelihoods of these communities have been threatened by forest cover loss. Community involvement in managing the forest and lessening deforestation is the way to combat this situation. Dyer et al. (2014) highlights the need for meaningful community participation and propose that open and participatory definitions of "community" and two-way communication are essential. The potential of local involvement in lessening forest degradation is further highlighted by Boissière et al. (2009), especially when it comes to protected zones. Together, these studies highlight how crucial it is to significantly give local communities a voice in managing natural resources when mitigating deforestation. In public participation procedures, Jabbour and Balsillie (2003) emphasize the significance of institutional structures, collaboration, and two-way information flow. To lessen conflicts over forest management and enhance local livelihoods, sustainable livelihood strategies need to be implemented and monitored (Senganimalunje et al., 2016).

6.4. Limitations of the Study

The study faced a gender imbalance among the interviewees with male participants dominating. This gender disparity might influence the findings, since men and women may have diverse roles, perspectives and usage of the forest. Also, a larger sample size may offer a more comprehensive view and aid in generalization of the findings to Ghana, however, these findings were limited to the municipality.

7.0. Conclusion and Recommendations

This section provides the significant findings and possible recommendations for further studies. Generally, the study seeks to assess the impact of deforestation on community livelihoods in Bibiani-Anhwiaso-Bekwai municipality, Ghana.

First, some of the livelihood activities practiced in these communities include farming, especially cocoa, plantain, and oil palm; picking NTFPs; mushrooms, snails, and herbs; wood harvesting “Odum, mahogany, sapele, and wawa”; hunting; and gathering firewood. Secondly, most of the locals said that there has been a drastic loss of forest cover. This has been attributed to mining activities, commercial farming, and logging. Few of the locals mentioned bushfires.

Lastly, most locals said their livelihood activities were affected by the forest cover loss, especially their farming activity, NTFPs, and wood harvesting. Also, the participants indicated that their finances (income) and economic well-being have been severely affected by deforestation, with the majority describing the effect as being worse. This indicates that forest resources are vital in the livelihoods of forest fringe communities and more essential in developing rural and forested areas. This implies that, in rural development, keen attention must be paid to the natural resources, especially forest resources available, local people's dependency on them, and their implications for their livelihoods. Since rural folks depend highly on these forest resources, effective harnessing, equal access, and fair distribution are essential for rural development. Also, sustainable livelihood strategies, critical policy interventions, and implementations need to be monitored to achieve effective and efficient rural development concepts. In the case of Bibiani-Anhwiaso-Bekwai, adopting sustainable management practices, establishing channels and measures of accountability, regulating influential actors, and decentralizing power to local people may help achieve the rural development concepts in the municipality.

Therefore, I strongly recommend further studies in this field and other communities with high forest depletion. These studies should focus on the impact of forest management strategies adopted, institutions, and structures on livelihoods and the effectiveness of policy interventions implemented. It is also crucial to investigate past reforestation efforts and the measures taken by appropriate authorities to address the current threat to the livelihoods of these communities. For instance, it is essential to determine if mining companies in these areas have effective reforestation strategies in place. Unfortunately, this was not the case for the Bibiani-Anhwiaso-Bekwai municipality, and it is distressing to note that most mining communities in Ghana are impoverished and underdeveloped, with inadequate social amenities and poor road networks.

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APPENDICES

1.0 QUESTIONNAIRE

SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCES, UPPSALA

DEPARTMENT OF RURAL DEVELOPMENT

These questionnaires enable the researcher to obtain information from respondents to achieve the research objectives of the topic "THE IMPACT OF DEFORESTATION ON COMMUNITY LIVELIHOODS IN BIBIANI-AHWIASO-BEKWAI MUNICIPALITY, GHANA." All information provided in this study will be treated as CONFIDENTIAL, and your anonymity is highly assured. By responding, you have consented to the information provided being used for the intended purpose.

PART- A

PERSONAL INFORMATION/ HOUSEHOLD'S GENERAL INFORMATION

1. Age a. 18-25 b. 26-35 c.36-45 d. 46 and above

2. Gender Male [ ] Female[ ] Prefer Not to Say [ ]

3. Marital Status 1) Single [ ] 2) Married [ ] 3) Divorced [ ]

4. Level of Education 1) Basic 2) Secondary 3) Tertiary 4) No Education

5. Are you the head of your household? 1) Yes 2) No

6. How many are your household members? a. 1-2 b. 3-4 c. 5 and above

7. What is your main occupation? a. Trading (NTFPs) b. Farming c. Hunting d. others (please specify)……

8. Do you have other sources of income?.....… If yes, specify the sources ……..

9. How many dependents do you have? a. 1-2 b. 3-4 c. 5 and above d. None

10. How many years have you lived in the community? a. 5-10 b. 11-20 c.21-30 d. 31+

PART-B

(I) FOREST-BASE LIVELIHOOD ACTIVITIES AND STAKEHOLDERS

11. Which livelihood activities do you derive from the forest? Which livelihood activity(s) does the forest provide you with? a) Hunting b) Firewood/Fuel c) recreational services d) Farming e) Timber harvesting f) Non-Timber Forest Products (NTFPs) g) Other (specify)……..

11. a. If farming in Q11, what type of farming are you engaged in?…….

11. b. If NTFPs in Q11, which ones do you often harvest?……..

11. c. If Timber harvesting, which tree species do you harvest?…….

12. Which of these stakeholders do you identify with? (choose all that is applicable)

a) Hunters b) Farmer c) Timber Harvester (chain saw operator) d) Miner d) NTFPs Harvester e) Other (specify)…….

(II) - LOCALS PERCEPTION ON FOREST COVER CHANGE

12. How do you identify yourself with the forest? a) Source of livelihoods b) Sacred grooves c) carbon store d) other (specify)……

13. Do you suffer any restrictions to access or use the forest? Yes [ ] No [ ]

13. a. If YES, what are some of the restrictions? a) home of gods b) taboo c) forest reserve d) other (specify)…….

13. b. Do we have specific restrictions on women's access to the forest? Yes [ ] No [ ]

13. c. If Yes, what are some of these restrictions?…….

14. In your opinion, has the forest cover changed over the past periods? Yes [ ] No [ ]

15. How would you describe this forest cover loss or change? ……
……

16. What are some of the causes of this forest cover loss? a) commercial farming b) mining activities c) illegal logging d) bushfires e) other (specify)……

(II) EFFECTS OF FOREST COVER CHANGE ON LIVELIHOODS AND WELL-BEING

17. Has the forest cover change negatively affected the livelihood activities of the locals? Yes [ ] No [ ]

17. a. If Yes, which livelihood activities are affected and how?……

…..……

……..

--- Household Income and Expenditure

18. Have forest-based livelihood activities helped generate income? a) Yes [ ] b) No [ ]

19. What is your average household income per month? GHC

a) Less than 500 b) 501 - 1000 c)1001 and above

20. How much do you spend on average as your household expenditure per month?

a) Less than 500 b) 501 - 1000 c)1001 and above

21. Do forest-based livelihood activities help increase household income at the moment?

a) Yes [ ] b) No [ ]

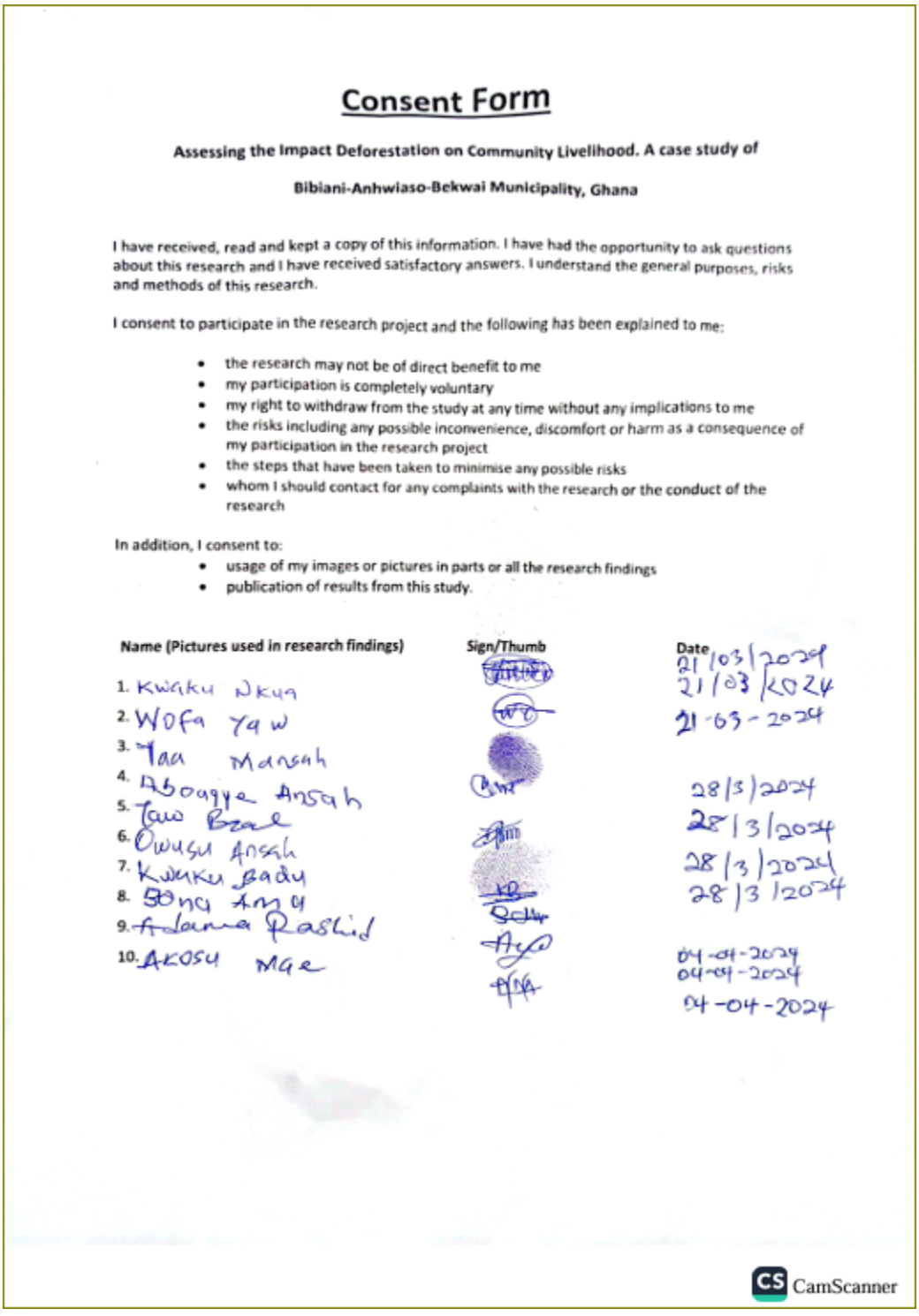
---- Well-being

22. Has your financial situation (income reduced) been worsened by the forest cover change/loss?

a) Yes [ ] b)No [ ]

23. How would you describe your well-being after/with the forest cover change/loss?

a) Much worse now b) worse now c) Same d) better now e) Much better now



Consent Form

Assessing the Impact Deforestation on Community Livelihood. A case study of

Bibiani-Anhwiaso-Bekwai Municipality, Ghana

I have received, read and kept a copy of this information. I have had the opportunity to ask questions about this research and I have received satisfactory answers. I understand the general purposes, risks and methods of this research.

I consent to participate in the research project and the following has been explained to me:

- the research may not be of direct benefit to me
- my participation is completely voluntary
- my right to withdraw from the study at any time without any implications to me
- the risks including any possible inconvenience, discomfort or harm as a consequence of my participation in the research project
- the steps that have been taken to minimise any possible risks
- whom I should contact for any complaints with the research or the conduct of the research

In addition, I consent to:

- usage of my images or pictures in parts or all the research findings
- publication of results from this study.

Name (Pictures used in research findings)	Sign/Thumb	Date
1. Kwaku Nkua		21/03/2024
2. Wofa Yaw		21/03/2024
3. Yaa Mansah		21-03-2024
4. Aboagye Ansah		28/3/2024
5. Yaw Baah		28/3/2024
6. Owusu Ansah		28/3/2024
7. Kwaku Baby		28/3/2024
8. Bonsu Amy		
9. Adama Rashid		04-04-2024
10. Akosua Mae		04-04-2024
		04-04-2024

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3.0 Pictures from Data Collection


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