UNIVERSITY FOR DEVELOPMENT STUDIES

EFFECTS OF DEFORESTATION AND FOREST DEGRADATION IN THE RED VOLTA EAST FOREST RESERVE OF THE UPPER EAST REGION ON THE LIVELIHOODS OF ADJOINING COMMUNITIES

BY

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DECLARATION

Student

I hereby declare that this dissertation is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere:

Candidate's Signature: ……. Date: ……

Bernard Kpare

Supervisor

I hereby declare that the preparation and presentation of the dissertation was supervised in accordance with the guidelines on supervision of dissertation/thesis laid down by the University for Development Studies.

Principal Supervisor's Signature: ……. Date: …….

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ABSTRACT

The main objective of this study was to assess the effects of deforestation and forest degradation in the Red Volta East Forest Reserve on the livelihoods of the people of Zongoiri. The specific objectives of the study focused on Zongoiri community members' perceptions of causes of deforestation and forest degradation, how these processes affect their livelihoods, finding out how local peoples' subsistence activities influence deforestation, assessing the extent to which the people are concerned about degradation of the forest resources and options for reversing the situation. A sample of one hundred (100) people was interviewed from the Zongoiri Community in Bawku West District and 98 questionnaires used for the analysis. The study adopted both qualitative and quantitative research methods. Quantitative data was obtained from the respondents through the use of a semi-structured questionnaire. Data was analysed using the Statistical Package for Social Sciences (SPSS Version 16). The findings revealed that the respondents perceived deforestation as mainly caused by uncontrolled tree cutting and overgrazing. Human induced forest degradation also impacts on the micro-climate in terms of unreliable rainfall in recent years. The results indicate that livelihoods are affected through reduced crop yields, reduced availability of timber, firewood and other uses. Forest products from the reserve provide critical livelihood support to the people, and with increasing population growth and associated problems, demand for forest-based products will grow. There is therefore the need for policy reforms on forest resource utilisation that recognise the long-term impacts on rural populations in order not to entrench or worsen poverty.

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DEDICATION

This work is dedicated to my wife, Rebecca and my children: Andrew, Joel, Anna and Jude. They have always been a constant source of love, encouragement and inspiration to me.

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LIST OF ACRONYMS

BWDA	Bawku West District Assembly
CBNRM	Community-Based Natural Resource Management
CIFOR	Center for International Forestry Research
DA	District Assembly
EPA	Environmental Protection Agency (Ghana)
FAO	Food and Agriculture Organization (United Nations)
FC	Forestry Commission
FMNR	Farmer Managed Natural Regeneration
FSD	Forestry Services Division
GSS	Ghana Statistical Service
ITTO	International Tropical Timber Organisation
JHS	Junior High School
MLNR	Ministry of Land and Natural Resources
MSLC	Middle School Leaving Certificate
NGO	Non-governmental Organization
NWFP	Non-wood Forests Products
SHS	Senior High School
UNEP	United Nations Environment Programme

CHAPTER ONE

INTRODUCTION

1.1 Background

Forests and woodlands are an important natural resource comprising a wide variety of ecosystems in Africa and elsewhere in the world that range from dense tropical rainforests to open savannah woodlands. Forests and woodlands are also some of the most biologically diverse systems on the planet (Food and Agriculture Organization [FAO], 2005). Forests and woodlands as essential components of ecosystems play a key role in protecting the environment. They support the provision of a wide range of services including ecological services such as the regulation of water systems by intercepting rainfall and regulating its flow through the hydrological cycle; the maintenance of soil quality and the provision of organic materials through leaf and branch fall; the limiting of erosion and protection of soil from the direct impact of rainfall; moderating local climate; being key components of biodiversity both in themselves and as habitats for other species; and serving as carbon sinks (Gullison et al., 2007; Sebukeeraet al., 2006). In view of this, forests and woodlands are therefore of high conservation priority worldwide (Maina, et al., 2013). As Gullison et al. (2007) pointed out, the world's forests are important carbon stores and sinks that accumulate and store some harmful carbon-containing chemical compounds for an indefinite period,and loss of forests cover thus affects both the global and local climates adversely through global warming and local climate change variability.

In addition, forests and woodlands provide extensive socio-economic and cultural benefits from wood, Non-Wood Forests Products (NWFP) and recreation to millions of people

worldwide (Bharvaga, 2006; FAO, 2012). Bharvaga (2006) estimates that about 60 million people are almost wholly dependent on forests and another 350 million who live within or on the edge of forests depend on them largely for subsistence and income generation. In developing countries, about 1.2 billion people, including more than 400 million in Africa rely on closed forests and open woodlands systems to sustain agricultural productivity and income generation (Bharvaga, 2006).

In the 1990s, approximately 30 percent of the global land area was forested (Achard et al., 2002), and currently a little more than four (4) billion hectares is forested, with mean global deforestation of about 13 million hectares a year (FAO, 2010a). Forests and woodlands occupy an estimated 675 million hectares (ha) in Africa, accounting for about 17 percent of global forest area and 23 percent of the total land area on the continent (FAO, 2010a). Africa continued to record rapid loss of its forest and woodland cover - the second largest of any region during the past two decades (FAO, 2010a). This is largely due to continuous deforestation and forest degradation (Schmitt, 2009).

The continuous rapid forest and woodland degradation in Africa is particularly worrisome, more so when about two-thirds of the continent's population depends on forest resources for income and food and 90 percent of the people use fuel wood and charcoal as the primary source of energy (FAO, 2010a). Due to the over reliance on forest resources and Non-Wood Forest Products (NWFPs), deforestation and forests degradation in Africa is estimated at between 3.4 - 4.0 million hectares/year and an average annual negative change rate of -0.62 percent from 2000 to 2005 (FAO, 2010a; Rademaekers et al., 2010).

Worldwide, the trend of accelerated environmental degradation has primarily been driven by land use changes as a consequence of agricultural expansion of marginal lands and population growth (Schmitt, 2009; Westing et al., 2001). In addition, it is asserted that various unsustainable land use practices have adversely affected the natural forests, the environment and the whole biosphere (Westing et al., 2001). Socio-economic, weak institutional arrangements and political factors have created incentives for rapid exploitation of forests, and as a result intensified pressure on the remaining tropical forests and arid woodlands (Schmitt, 2009). Forests and woodland resources in Africa remain the second most depleted of all the tropical regions globally with only 30 percent of the historical stands("a recognizable area of the forest that is relatively homogeneous and can be managed as a single unit. Stands are the basic management units of the forest") still remaining (United Nations Environment Programme [UNEP] 1994; FAO, 2010a), though the rate of degradation has slowed down in recent years (FAO, 2010a).

In Ghana, the Ministry of Lands and Natural Resources (MLNR) (2012), indicates that the forest resources of the country are being depleted at an unacceptable rate. With a forest cover of 8.2 million hectares at the beginning of the 20th Century only an estimated 1.6 million hectares of Ghana's forests cover remain (MLNR, 2012: IV). At a deforestation rate of 2.0 percent, Ghana's annual loss of forest cover is estimated at about 135,000 ha (MLNR, 2012). In other words, forests and woodlands in Ghana are on a serious decline because of over-exploitation to 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 extinction of many trees and other ecological species. This will not only have enormous consequences on the forests

and woodland ecosystems themselves, but also on micro climates and local hydrological cycles as well as the livelihood of the population.

The Upper East Region is the most severely degraded region in Ghana, where land degradation is leading to desertification (Gyasi et al., 2006). The region also has the highest livestock population density (EPA, 2003).As a result,deforestation of the few forests reserves, soil erosion and degradation of agricultural land are very common and pose serious problems in most parts of the region. The region's modified Guinea and Sudan Savanna vegetations, with scattered forests reserves along river banks, provide valuable environmental services and serve as habitats for biodiversity and protect soil and water resources against further degradation (EPA, 2010). Ghana's savannah lands cover about 60 percent of the land area, supports about 18 percent of the population and supplies about 70 percent of Ghana's total annual firewood and charcoal requirement estimated at 16 million m^3 (EPA, 2010). They also provide medicinal plants (the primary source of health care for most rural dwellers), timber for housing, fencing poles and NWFPs, including wild fruits.

The underlying causes of deforestation and woodland degradation globally are complex, representing the interaction of many environmental, social, economic, cultural and political forces at work in any given locality at any given time (Kissinger et al., 2013). Despite this, the deforestation and woodland degradation in the Upper East region have been attributed to the direct effects of human activities such as unsustainable tree cutting (for poles, wood fuel, charcoal burning and medicinal plants), bushfires, population growth and associated demand for more agricultural land, poor farming practices,

overgrazing, soil erosion, destruction of habitats of wildlife and pollution of water bodies (EPA, 2010; Gyasi et al., 2006).

The destruction of forests and woodlands in the region appear to exceed their regeneration capacities. But as pointed out by Nilsson (1996), deforestation and forests degradation resulting from the removal of trees without sufficient reforestation results in the decline of habitats and biodiversity, wood for fuel and industrial use, and reduced quality of life generally. The destruction of forests and woodlands particularly has a direct consequence on the lives and productive activities of rural people who live on the edge of forests reserves. Deforestation in the region has resulted in acute shortage of wood for construction and fuel, change in the micro-climate (rainfall variability, increasing temperature, dry spells and floods), and soil erosion of vast lands (Gyasi et al., 2006). Therefore, deforestation has direct and indirect impact on socio-economic and sustainable development in the region in particular and the country as a whole.

According to Siaw (2001), an estimated 20,000 hectares of forests reserves in the Northern, Upper East and Upper West Regions is lost to agriculture or through bush fires and other human activities annually. The Upper East region has 28 forests reserves – seventeen (17) in the Kassena-Nankana and Builsa districts, eight (8) in the Bawku West and former Bawku East districts and three (3) in the Bolgatanga Municipality and Bongo districts (Saaka, 1998), with an estimated land area of 1,536 km^2 (Siaw, 2001). These are mainly gallery forest reserves (narrow forest strips that lined major rivers and streams).Blench (2006) reported that these forest reserves are under pressure from fringe communities who are desperately in dire need of firewood, timber and graze land. In

densely populated communities, the local people are actually encroaching on the reserves to graze animals or obtain wood and fruits. There have been reports about environmental threats posed by small scale gold mining (galamsey) on the Tankwiddi East Forest Reserve near Bolgatanga (Siaw, 2001). No wonder District Assemblies are under pressure to open the reserved areas to their 'owners', the local communities for co-management (Blench, 2006).

1.2 Problem Statement

The condition of Ghana's forests has been in decline for many years, particularly since the 1970s. Many forest reserves are heavily encroached and degraded, and the off-reserve stocks are being rapidly depleted (MLNR, 2012; Government of Ghana [GoG], 2010). Whereas forest resources contribute significantly to household incomes, energy and food security, as well as providing sustenance and revenue for about 2.5 million people in the country, rapid deforestation has been identified as a key environmental issue that needs serious attention (MLNR, 2012). Ghana has lost more than 33.7 percent, equivalent to 2,500,000 hectares of its forest cover within two decades since the 1990s (FAO, 2010b). Deforestation rates are 1.68 percent per annum (about 65,000 hectares per annum), and between 2005 and 2010, Ghana had the sixth highest deforestation rate globally (FAO, 2010b).At the current rate of deforestation, the country's forests could completely disappear in less than 25 years (Boafo, 2012). As a result of these, some policy makers and environmentally conscious scholars have asserted that governments of developing countries and people living in communities where deforestation and degradation are rampant have a key role to play in order to promote sustainable development (World Commission on Environment and Development, 1987).

According to the Forestry Commission (FC), the problem of forest depletion in Ghana is one of gradual 'degradation' rather than 'deforestation', and is incremental rather than dramatic, with no single dominant driver (Government of Ghana, 2010). However, the FC has noted that the underlying causes of forests degradation involve a complex mix of demographic, economic and policy influences. The immediate drivers include: forest industry over-capacity; policy/market failures in the timber sector; burgeoning population in both rural and urban areas; increasing local demand for agricultural and wood products; high demand for wood and forest products on the international market; heavy dependence on charcoal and firewood for rural and urban energy; and continued reliance on 'slash and burn' methods to maintain soil fertility (GoG, 2010).

The Red Volta East Forest Reserve, which is located in the extreme south of the Bawku West District of the Upper East Region, is part of a network of adjoining gallery forest reserves along the Red Volta Valley (Adjewodah, Oduro & Asase, 2012). The Reserve is managed by the Forests Services Division (FSD) with the primary aim of protecting watersheds and river basin ecosystems. Zongoiri in the Bawku West District is the nearest fringe community to the Forest Reserve. Over the years, the forest reserve has been subjected to degradation of various kinds, including bushfires, cutting of trees for fuelwood and charcoal production, and expansion of agricultural land (Adjewodah, 2010). The Reserve is currently facing threat of future survival due to uncontrolled deforestation and associated degradation. It is not unusual to see several truckloads of charcoal and firewood from communities on the edge of the Reserve bound for the urban centres of Zebilla, Bolgatanga, Bawku, and beyond on a daily basis along the Bolgatanga-Bawku trunk road. The biggest concern regarding the massive rate of exploitation of the forest

reserve is the fact that economically valuable trees such as the Shea and the African Locust bean "dawadawa" are being cut for fuelwood and for charcoal production. Coupled with the fact that the entire Bawku West District is predominantly rural, the relevance of these economic trees to the micro-economy and household livelihoods cannot be over-emphasized.

The main challenge confronting management of the Reserve, however, is how to reconcile the short term extractive needs with the long term conservation and environmental protection interests. But in order to succeed in this endeavour, the cooperation and support of the local communities is needed. Understanding local communities' perceptions of the effects of deforestation and forest degradation by external stakeholders and forests policy makers is important for designing management policies that address the dual goal of community interest and conservation requirements (Andrade and Rhodes, 2012). It is against this background that this study was conducted in the Zongoiri Community with the main objective of assessing local people's perceptions of the effects of deforestation and forests degradation in the Red Volta East Forests Reserve. The study attempts to answer a few specific questions in order to understand how local people living on the fringe of a protected forest reserve perceive the effects of deforestation and forests degradation on their livelihoods and micro-climate. It is anticipated that local perceptions would be vital in the search for remedial measures for the pervasive environmental degradation.

1.3 Research Questions

This study seeks to find answers to the following research questions:

1) How do local people understand the causes of deforestation and forest degradation in the Red Volta East Forest Reserve near Zongoiri?
2) How do local residents perceive the effects of deforestation and degradation of the reserve on their livelihood?
3) What options are available from the perspective of the local people to address the causes and effects of deforestation and degradation in the reserve?

1.4 Objectives of the study

The main objective of the study was to determine the effects of deforestation and forest degradation in the Red Volta East Forest Reserve on the livelihood of the people of Zongoiri.

1.3.1 Specific objectives

The specific objectives were:

1) To identify the causes of deforestation and forests degradation in the Red Volta East Forests Reserve near the Zongoiri community.
2) To assess the effects/impacts of deforestation on the livelihood of the people of Zongoiri.
3) To identify options for dealing with the current situation of deforestation and forests degradation in the study area.

1.5 Justification of the study

Forest and woodland reserves in the Upper East Region and elsewhere in Ghana are fast depleting as a result of human activities geared towards maintaining a living. The case of the Red Volta East Forests Reserve near Zongoiri in the Bawku West district is not any different. The people of Zongoiri who have in the past obtained traditional medicinal plants and other gains (e.g. fuel wood, food) from the reserve for the treatment of various diseases have in recent times lamented the fast depletion of the resource. Deforestation has virtually affected the working and earning of people in the Zongoiri community who virtually depend on the forest as a source of livelihood. To ameliorate the effects of deforestation, appropriate local, national and global actions are needed to meet these challenges which require taking into account the local needs and priorities.

However, very scanty information is available on the perceptions of people living in local communities with respect to forests resources conservation and management in the Upper East Region, particularly on the socio-economic effects of deforestation and forests

degradation in the Red Volta East Forests Reserve. The findings of this study will fill in this gap of knowledge. In addition, findings of this study will provide invaluable information on local people's concerns regarding deforestation and degradation of the reserve to the District Assembly, FSD, and their development partners working with the community to find practical approaches to halting the rapid deforestation in the area. Moreover, poverty reduction and rural development practitioners in governments and the Non-governmental (NGO) sector as well as other researchers and students of development studies will find the results of the study useful. As an academic exercise, findings of this study will add to the growing body of knowledge on local peoples' perceptions on the conservation of protected areas and their management in Ghana and elsewhere in the world.

1.6 Limitations of the study

This study has some limitations that should be acknowledged. First, a study of this nature required an in-depth examination and analysis of wider local perceptions regarding the complex underlying causes of deforestation and forests degradation beyond the case study community, but this was not possible because of time constraints. The field data was also collected during the farming season when most respondents were busy on their farms. In most cases, respondents were interviewed late in the evenings after they had returned from their farms. Despite this, data quality was not affected as the data collectors took their time to complete the questionnaires at the pace of the interviewees.

1.7 Organisation of the study

The study is organized into five chapters. Chapter one provides a background overview of the study, problem statement, objectives, scope and justification. Chapter two presents a

review of relevant literature related to the topic, including key concepts. Chapter three presents the study area and methodology. Chapter four presents the results and discussions, and finally chapter five presents the summary of results, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a comprehensive review of the literature related to the topic. The objective of the chapter is to put the study in the proper context as well as to identify what has been studied on the subject in Ghana and elsewhere in the world. The chapter has been divided into three main sections. The first section explains the concepts of forest, deforestation, forest degradation and forest reserves. The second section explores the literature on the causes of deforestation and forest degradation whilst the third section examines the effects of deforestation and related issues.

2.2 Operationalising some key definitions and concepts

This section of the literature review presents some key definitions and concepts in order to put the study in context.

2.2.1 Forest

According to the FAO (2010b) and Penman, et al., (2003) forests is defined as land covering more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds *in situ*. It does not include land that is predominantly under agricultural or urban land use.

2.2.2 Deforestation

The term “deforestation” is used quite differently, so it is important to have a precise definition. The FAO (2010a) uses two different parameters in defining deforestation. Based on land use, deforestation is defined as the conversion of forest land to another

land use, and in terms of tree cover, deforestation refers to change of land cover with depletion of tree crown cover to less than 10 percent (FAO, 2010a). Both of these definitions can present problems for assessing deforestation on the ground - while the first requires a clear and unambiguous definition for forest (see section 2.2.1), the second implies an arbitrary threshold.

Deforestation can also be defined broadly to include not only conversion to non-forest, but also degradation that reduces forest quality – the density and structure of the trees, the ecological services supplied, the biomass of plants and animals, the species diversity and the genetic diversity (United Nations Research Institute for Social Development [UNRISD], 1990:7). The UNRISD uses a broad definition of deforestation, while the FAO uses a narrow definition. This study adopts the broader definition of deforestation. The term deforestation has also been used to refer to fuel wood cutting, commercial logging and slash and burn cultivation. Other scholars have also defined deforestation as the clearance of naturally occurring forests by logging and burning. It is the permanent destruction of indigenous forests and woodlands. The term does not include the removal of industrial forests such as plantations of gums or pines (Ogbuene, 2010).

2.2.3 Forest degradation

Forest degradation is a process leading to a ‘temporary or permanent deterioration in the density or structure of vegetation cover or its species composition’. It is a change in forest attributes that leads to a lower productive capacity caused by an increase in disturbances. The time-scale of processes of forest degradation is in the order of a few years to a few decades (Tejaswi, 2007). Forest degradation takes different forms particularly in open

forest formations deriving mainly from human activities such as overgrazing, overexploitation (for fuelwood or timber), repeated fires, or due to attacks by insects, diseases, plant parasites or other natural sources such as cyclones. In most cases, degradation does not show as a decrease in the area of woody vegetation but rather as a gradual reduction of biomass, changes in species composition and soil degradation. Unsustainable logging practices can contribute to degradation if the extraction of mature trees is not accompanied with their regeneration or if the use of heavy machinery causes soil compaction or loss of productive forest area (Ahmed, 2008).

Quite often forest degradation, as compared to deforestation, does not show up so much in decrease of woody vegetation but rather as a gradual reduction in biomass, changes in species composition and soil degradation. In other words, forest degradation is the long-term reduction of the overall potential supply of benefits from the forest, which includes wood, biodiversity and any other product or service (Tejaswi, 2007).

2.2.4 Forest reserves and protected areas

Forest reserves and protected areas are portions of state or communal lands where commercial harvesting of wood products is excluded through legal or other effective means in order to protect and maintain biodiversity, and associated cultural resources that can be missing from sustainably harvested sites (FAO, 2010b; Commonwealth of Massachusetts/Executive Office of Environmental Affairs, n.d).Small reserves conserve sensitive, localized resources such as steep slopes, watersheds, fragile soils, and habitat for certain rare species that benefit from intact forest canopies. Large reserves represent

the diversity of relatively un-fragmented forest landscapes (Commonwealth of Massachusetts/Executive Office of Environmental Affairs, n.d).

The educational and research argument for nature reserves is that they enable people to experience and to understand how forest ecosystems function when timber and other wood products that are normally extracted for human use remain in place. While it is important to have some forestland open to the sustainable harvest of wood products in order to support human society, it is equally important to retain portions of forests landscapes in a condition where all components of the ecosystem remain in place for posterity.

The concept of creating protected areas or nature conservation reserves in the world can be traced back to1872 when the first one was established in Yellowstone. This was in response from western civilization to uncontrolled degradation of biodiversity and ecosystem services (Pretty & Smith, 2004, Chape et al., 2008). According to Chape et al. (2008), in 2005, the world reached a total of 144,296 protected sites, covering an area of 19,381,000 km², or 12.9 percent of the earth's land area.

Many protected areas have been established across the world following the same conventional and exclusionary top-down approach applied at Yellowstone in 1872 (Pretty & Smith, 2004). As such, many forest reserves have failed to consider other important local factors, including social, cultural, and political issues (Andrade & Rhodes, 2012). Typically, communities are restricted from extracting natural resources that are important for their livelihoods, and in some instances, fringe communities are removed from their lands with little consultation or adequate compensation (Anthony, 2007), which has often

triggered adverse social consequences on local people, including disrupting their traditional ways of living (Andrade & Rhodes, 2012).

2.3 The causes of deforestation and degradation

This section is largely based on Kanninen et al. (2007).The causes of deforestation and degradation can usefully be separated into two categories. The first involves factors that are directly linked to the act of clearing or degrading land, referred to as direct or proximate causes. The second category includes the background societal factors that drive these direct causes, which are referred to as underlying causes (Kaimowitz & Angelsen, 1998). In addition, Kaimowitz &Angelsen (1998) introduced the term 'sources of deforestation' to refer to the agents or activities leading to deforestation (e.g. agricultural expansion by small scale farmers).

Another distinction is between deforestation and degradation driven by causes originating within the forest sector itself (so-called "intra-sectoral factors") and activities driven by causes originating from other sectors ("extra-sectoralfactors") (Contreras-Hermosilla, 2000). Indeed, most causes do not operate within the forestry sector itself, but originate predominantly in relation to agriculture (for food, fibre or energy), or via infrastructure development, industrial fibre demands, etc. Activities outside the forest sector usually contribute much more to deforestation than timber extraction.

Deforestation and degradation usually result from a combination of factors. The different causes of deforestation (direct and underlying, intra- and extra-sectoral) interact in complex and variable ways. For example, Sunderlin & Wunder (2000) illustrate how oil booms may affect deforestation in opposing ways under different market and policy

settings. While wealth from oil can lead to forest protection due to the decline of agricultural competitiveness, this same wealth can have the opposite effect when it is used predominantly for road building, frontier expansion and transport subsidies.

From analysis of deforestation patterns in 152 countries, Geist & Lambin (2002) suggest three dominant sources of deforestation: agricultural expansion, wood extraction and infrastructure extension. These interact with five principal underlying factors: demographic, economic, technological, policy and cultural variables. Their study concludes that deforestation is best explained by a combination of proximate (direct) and underlying causes, described in further detail below.

2.3.1 Direct causes of deforestation and degradation

The following are the main direct causes of deforestation and degradation that have been described in the literature (related to the three main sources mentioned above):

Agricultural expansion is one the direct causes of deforestation and degradation.Agricultural activities that result in the clearing and conversion of forestland include the establishment of permanent cropland, shifting cultivation and cattle ranching. The expansion of agricultural frontier is the clearly dominant contributor to deforestation (DeFries et al., 2010). Shifting cultivation can be less harmful than other agricultural activities, due to re-growth and secondary forest succession following this type of agricultural use - but only under very low rural population densities where long fallows can be maintained (Boucher et al., 2011; Guariguata and Ostertag, 2001). The direct causes that stimulate the decision to convert forestland include:

- → Favourable environmental conditions (e.g. forests in area with good drainage and soil fertility are more likely to be converted into agriculture).
- → High prices for agricultural outputs (more profitable production, and thus more clearing).
- → Low wages (smaller costs of forest clearing, and thus more deforestation).
- → Demographic changes (e.g. population growth and higher rural populations can foster further deforestation).

Kaimowitz and Angelsen (1998) conclude that agricultural expansion is the main source of deforestation, highlighting the Latin American cases of beef production in Central America and soybean production in Brazil. In Indonesia, conversion of forest to oil-palm plantations is a significant contributor. The high price of crude palm oil is driving the expansion of the area planted to oil-palm. In each of these cases, deforestation is driven much more by large scale industrial farms than by small scale agriculturalists. The additional rents available from timber generated by land clearing drive the expansion to take place on forested rather than degraded land.

Wood extraction is the principal intra-sectoral cause of forest degradation, and can also lead to deforestation, either directly or indirectly. Wood is extracted from forests for timber, pulpwood, fuelwood and charcoal. While logging practices usually degrade forests, selective logging need not trigger severe degradation or deforestation.

The literature often cites fuelwood and charcoal production for domestic and industrial energy as a major cause of deforestation (Wurster, 2010). In Ghana, over 75 percent of the forest biomass is removed for energy in the form of fuelwood and charcoal for both

domestic and commercial use (FAO, 1995). Boucher et al., (2011) observed that though firewood collection has been largely implicated for deforestation and forest degradation in developing countries, most of it comes from already dead trees and branches, from non-forest areas, or from small trees and shrubs in the understory (forests undergrowth). In their view, firewood harvesting should not be blamed across board for deforestation or even significant degradation. However, Boucher et al., (2011) pointed out that charcoal production, particularly to supply nearby cities, can be a locally important driver of degradation and eventual deforestation, especially in Africa. This is because charcoal provides a reliable, convenient and accessible source of energy for cooking in many African countries and cannot be easily replaced in the short term with alternative energy sources that are comparably affordable (NL Agency, 2010). Moreover, as NL Agency (2010) pointed out continuous urbanisation and rapid population growth in Africa translates in ever increasing charcoal demand, and thus the economic importance of the charcoal industry is substantial as hundreds of thousands of people earn their livelihoods from charcoal.

However, uncontrolled or under-regulated timber extraction, whether legal or illegal, often lead to degradation, and indirectly to deforestation (Kaimowitz et al., 1998). Poor logging practices - which leave behind large volumes of combustible waste - make forests vulnerable to escaped fires that have been set to clear land for commercial or subsistence agriculture, further degrading the forest (Gustafson et al., 2007; Meijaard et al., 2005;Nepstad et al.,1999). Once a forest area has been degraded, it may be abandoned, leaving it vulnerable to “open access” exploitation. Degraded forests may also be designated as eligible for conversion to other uses.

Logging and pulpwood clear-cutting have been a major cause of deforestation in Southeast Asia, whereas unsustainable fuelwood extraction and charcoal production primarily occur in the drier forest of sub-Saharan Africa (Kaimowitz and Angelsen, 1998). Other "extra-sectoral" industrial activities, such as mining, may also use sizeable amounts of timber or charcoal, and may thereby contribute to high levels of forest degradation, through direct use and population expansion.

Forests can also be cleared to construct roads, settlements, public services, pipelines, open-pit mines, hydro-electric dams, and other infrastructure. However, none of these activities tends to be a large factor in terms of the scale of forestland cleared. But indirectly, road construction and improvement is by far the infrastructure development that contributes most to deforestation (Chomitz et al., 2007). This occurs not through the direct space roads occupy but through their reduction of transport costs, which in turn, enable productive activities to take place in remote areas. Such activities often promote frontier expansion and forest destruction, as illustrated by cycles of timber harvesting, charcoal extraction and subsequent conversion to agriculture and pastures (Chomitz,et al., 2007). Direct causes of deforestation differ significantly across countries, following broader patterns of agricultural and infrastructure expansion, and commercial and domestic demand for wood products (Geist & Lambin, 2002).

2.3.2 Underlying causes of deforestation and degradation

Over the last decade, the strong effects of macroeconomic forces, weak governance, and other broader societal characteristics on deforestation and forest degradation have been

amply documented (see for example, Chomitz etal.,2007). The main underlying causes of deforestation are described below.

Actors responding to market forces will often clear land to accommodate higher demand for products that can be cultivated (or grazed) on converted forest land. Economic growth may increase deforestation at early economic development stages, when forests are cleared for agricultural commodity production. In later stages of economic development, pressures on forests may decrease as agricultural production becomes more intensive; service sectors increase their share in the economy, and the demand for forest products and services rises, making timberland more valuable (Kanninen et al., 2007).

As discussed earlier, the higher profitability of agriculture (agricultural rent) is the main economic factor underlying the conversion of forests to other uses (Wunder & Verbist, 2003). Rising agricultural output prices and reduced input prices render agriculture more profitable, and lead to expanded areas under production. Other macroeconomic factors with significant potential to impact upon deforestation include external debt, foreign exchange-rate policy, and trade policies governing sectors linked to deforestation (mainly agriculture and cattle ranching) and forest degradation (mainly timber extraction). The net impacts of such policies on forests are however, highly variable. For example, a devaluation or currency depreciation will stimulate exports, and the deforestation impact depends on whether or not export crops are suitable for cultivation on cleared forest land (Kanninen et al., 2007).

Economic crisis can also stimulate deforestation. When Indonesia's economy collapsed in 1997, many people who had lost their jobs in the formal sector turned to the forest for

supplemental income. Their activities included the clearing of forest for cultivation, illegal logging on idle timber concessions, and the use of fire to facilitate access to fish and reptiles (Chokkalingam et al., 2006). However, the crisis also slowed large scale infrastructure and land development projects which would have otherwise had a significant impact on rates of deforestation. Policies supporting the expansion of forest product industries and related debt can be a significant force driving deforestation. Once production capacity is in place, both market and political factors exert pressures to maintain the supply of raw materials from natural forests if plantation generated supplies are insufficient (Kanninen et al., 2007).

Governance plays a major role in determining what happens to forests. Deforestation and degradation can result from the effect of forest tenure and institutions, which in turn, determine the set of incentives which lead to overexploitation (Ostrom 1990; Reyer, 2009).With respect to tenure, deforestation and degradation can occur as a consequence of poorly defined property rights, including systems that reward deforestation with tenure establishment. Where property rights are ambiguous, overlapping or weak, incentives for investing in long term returns from natural resources are also weak. For example, when land designated as public forest is poorly regulated or “policed”, these areas will be treated as “open access” resources and subject to predatory use (Agrawal & Ostrom, 2001). When property rights are secured on paper and in practice, longer term investments in sustainable management are made possible.Yet, secure property rights, while critical, are often insufficient for ensuring sustainable forest management. Where property rights are held in common but local institutions specifying clear rights and

responsibilities for forest management are absent, forest degradation can result (Ostrom 1990; 1999).

Non-transparent decision making regarding the allocation or conversion of state forest resources, and associated rent seeking behaviour, is a second significant factor that drives deforestation and degradation (Kanninen et al., 2007). Ambiguous or overlapping laws, regulations and jurisdictions across sectors, and confusion introduced by incomplete decentralization, provide opportunities for entrepreneurs to exploit "grey areas" to circumvent forest protection policies (Kanninen, 2007). Similarly, national economic and political elites often use their positions of power to leverage economic control over forest resources and contribute to unsustainable exploitation (Milledge et al., 2007; Colchester et al., 2006; Barr, 1998). Timber and wood-processing companies with close ties to government officials frequently are able to gain preferred access to valuable logging and plantation concessions and to capture a significant portion of the economic rents associated with these resources (Barr, 2001). Opportunities for such "elite capture" within and across national borders may be exacerbated under situations of conflict (Baker et al., 2003; United Nations Security Council [UNSC], 2002).

A third set of governance factors affecting the fate of forest resources are inappropriate forest law, coupled with weak law enforcement capacity and weak institutions (Edusah, 2011). Forest laws often define some sustainable forest activities as illegal, while at the same time treating other unsustainable activities as legal. Colchester et al.(2006) found that forestry laws tend to render forest based sources of income for the poor technically illegal, while laws outside the forestry sector that protect communities' rights are often

weak, ambiguous or ignored. At the same time, forestry laws have proven weak instruments for dealing with large scale forest crime (Damnyag et al., 2013, Kissinger et al., 2012; Blasser and Sarre, 2010; Wells, 2006).

2.3.3 Other factors

*Cultural factors:*Local culture can directly affect the use given to land. For instance, sacred forest or groves areas are often protected from land conversion and degradation (Eneji et al., 2012; Kangah-Kesse et al., 2007; Anthwal et al., 2006). However, other cultural factors can exert pressure on forests. For example, a "cowboy culture" in Latin America goes along with high meat consumption, with most forest clearing aimed at pasture establishment (Watkins, n.d).

*Demographic factors:*Increasing rural populations and migration to the agricultural frontier increase the labour force available for deforestation (DeFries et al., 2010). An increasing population in urban and rural areas also raises demand for food and other land-demanding commodities, thus requiring more land to increase production (Boucher et al., 2011). As population growth is often viewed as the main cause of deforestation, it is important to nuance this with the observation that most deforestation is from the conversion of forest to agricultural land – and much of this is from industrialized rather than smallholder agriculture(López-Carr and Burgdorfer, 2013; Kanninen et al., 2007; Geist and Lambin, 2001).

*Technological factors:*Technological improvements can affect deforestation rates. The adoption of land-extensive technologies, for example, can result in the expansion of agriculture at the expense of forests. Or, a new technology that results in more intensive

agriculture can pull resources out of extensive agriculture at the forest frontier, and thereby reduce deforestation (Angelsen, 2007; Chomitz et al., 2007; Angelsen and Kaimowitz, 2001). Generally, the role of improved agricultural technologies in terms of deforestation is ambiguous, and depends on the relative strengths of two opposing forces. First, new technologies will be adopted if they increase profitability, and higher agricultural profitability makes forest conversion more attractive. Second, the increased supply of products (and demand for inputs like labour) will change prices in a way that dampens - and possibly reverses - the increase in profitability (Kanninen et al., 2007).

2.4 Context of forests resource management in Ghana

For several years, deforestation and forests degradation in protected forest reserves has been driven by socio-economic factors whilst at the same time, posing serious challenges for the sustainable use and management of biodiversity in Ghana (Giliba et al., 2011, Boon et al., 2009). Since 1948, forest resource management policies in Ghana provided for the creation of permanent forest reserves that sought primarily to protect watersheds, provide favourable conditions for agricultural productivity, as well as promote public education and research (Adjewodah et al., 2012; Forestry Commission [FC], 1994). The Forestry Department, now Forestry Services Division (FSD) of the Forestry Commission was established in 1908, following an enactment in 1906 to control the felling of commercial tree species in demarcated forest reserves (Boon et al., 2009).

The forests and woodlands conservation approach of creating protected areas that excluded the local people from consumptive use, and aimed at minimizing other forms of human impact was then fashionable in Ghana and elsewhere in Africa and for a long time

dominated mainstream thinking in conservation (Guthiga, 2008). Generally, this approach viewed development objectives of local communities as being in direct conflict with the objectives of biodiversity conservation, and was therefore labelled as 'fortress conservation', 'coercive conservation' or 'fences and fines approach' (Guthiga 2008; Brown, 2002).

As Brown (2002) noted, protected areas in different forms will continue to play a major role in nature conservation worldwide and in Ghana for that matter in the foreseeable future. However, in most cases the top-down exclusionary approaches to protected areas have not succeeded in preventing deforestation and the associated loss of forest biodiversity (Brown, 2002; Geist & Lambin, 2002).

Thus, beginning in the 1980s a new thinking in conservation that stressed the need to incorporate the needs and aspirations of the local people emerged in recognition of the challenges associated with the strict fortress approach (Guthiga, 2008). Unlike fortress conservation that viewed people as a 'threat' to conservation, the new approach viewed local communities as potential partners in biodiversity conservation (Andrade & Rhodes, 2012). This approach, which is based on the sustainable development concept, allowed people on the edge of protected forests reserves to participate in the conservation process and at the same time enabled protected area administrators to link the objectives of conservation with local development needs (Guthiga, 2008).Aswani & Weiant (2004) pointed out that, when local communities are excluded from protected areas management and their needs and aspirations are ignored, it becomes extremely difficult to enforce conservation policies. This perhaps informed the current decentralised approach of forests

and woodland conservation and management in Ghana, where the local people are involved in the formulation and implementation of natural management by-laws (Sasu, n.d).

The literature on forests resource utilization often cites fuelwood and charcoal production for domestic and industrial energy consumption as major causes of deforestation globally (Wurster, 2010). In Ghana, over 75 percent of the forest biomass is removed for energy in the form of fuelwood and charcoal for both domestic and commercial use (FAO, 1995). Boucher, et al (2011) observed that though firewood collection has been largely implicated for deforestation and forest degradation in developing countries, most of it comes from already dead trees and branches, from non-forest areas, or from small trees and shrubs in the understory. Thus, firewood harvesting should not be blamed across board for deforestation or even significant degradation as has been championed by many conservationists. However, Boucher et al (2011) pointed out that charcoal production, particularly to supply nearby cities, can be a locally important driver of degradation and eventual deforestation, especially in Africa. The authors reported that while firewood use is expected to diminish in the tropics in coming decades, charcoal production, on the other hand, is likely to grow.

Forest dependent economic activities such as legal and illegal logging, clearing trees to increase arable land, wood extraction for fuel and charcoal production, bushfires and mining have been blamed for deforestation in Ghana. The various causes are differentiated across the different forest zones and geographic locations in the country. In the close and open forest zones of the south, timber exploitation, mining and agriculture

expansion have been identified as main causes (Boafo, 2012), while in the north, unsustainable charcoal and firewood production, forest fires and agriculture expansion are the major causes (Agyeman et al., 2012).

The removal of forest biomass is both a cause of forest degradation as well as a consequence of the socio-economic structure of the Ghanaian society, reflecting an interaction of factors such as economic wellbeing, population pressure and settlement structure (Yiridoe and Nanang, 2001). Population pressure is more important in determining fuelwood consumption than agricultural production. Rural population which is typically poorer and live closer to forest tend to depend more on forest for fuelwood energy than urban dwellers (Yiridoe and Nanang, 2001).

2.5 Effects of Deforestation

In the context of this study, deforestation and woodland degradation give rise to a host of ramifications such as soil erosion, silting of river beds, flooding, drought and loss of agricultural and forest productivity in fringe communities. Beyond the immediate impacts on local communities, Chakravarty (2012) notes that the long term cumulative effects of deforestation across the world range from desertification to higher carbon dioxide levels in the air, thereby contributing to global warming and climate change variability. According to Karkee (2004) the environmental functions and services that local people derive from forest ecosystems are gradually reduced or even lost, depending on the extent of deforestation. The forests reserve contains numerous species of flora and fauna which are lost through deforestation, thus reducing the biological diversity and species richness of forested land. Consequently, the benefits local communities often derived from these

flora and fauna are often lost due to deforestation. For example, tree crown cover protects the soil from the direct impact of rain and tree leaf litter enriches the soil fertility for agriculture by providing organic matter. However, the removal of tree crown cover through forests degradation exposes soil to agents of erosion such as wind and rainfall (Karkee, 2004). Soil erosion results in siltation of rivers and streams which eventually become dead. This in turn leads to flooding of homes, farmlands and sometimes loss of lives and property in forests fringe communities like Zongoiri.

Myers et al. (2000) noted that a number of localized environmental problems are primarily due to deforestation and uncontrolled forests degradation including lowered water tables, desertification and loss of biodiversity. This is worrisome for forests fringe rural communities like Zongoiri that depend heavily on ground water resources for potable water supply. It is therefore not surprising for Atipoka (2010:216) to observe that though soils in most parts of the Upper East Region have higher natural fertility, they are increasingly prone to seasonal floods due to land degradation resulting in poor staple crop harvests. Deforestation is also closely associated with a loss of biodiversity (Gardner et al., 2009; Vieira, et al., 2008; Ayanwuyi et al., 2007). For instance, Ayanwuyi et al., (2007) in a study among rural women in Oyo State in Nigeria reported that the scarcity of bush meat and snails were problems perceived to be caused by deforestation.

Maina et al., (2013) has observed that deforestation contributes significantly to micro climate change and variability. Forest soils are moist, but without protection from sun-blocking tree cover they quickly dry out. Trees also help perpetuate the water cycle by returning water vapour back into the atmosphere. Therefore, removing trees deprive the

forest of portions of its canopy, which blocks the sun's rays during the day and holds in heat at night. This disruption leads to more extreme temperature swings that can be harmful to crops and livestock (Chakravarty, 2012).

Seagle (2010) reported that rural communities like Zongoiri are most directly affected by deforestation and other types of environmental degradation as they rely most heavily on natural resources for survival. Deforestation resulting from commercial logging for charcoal production or mineral extraction through illegal gold mining causes food insecurity through degradation of arable land.

2.6 Local perceptions of natural resource conservation

Local perception refers to local people's attitudes and understanding that reflect their everyday way of life, as well as their shared expectations (Uddin & Foisal, 2007). Although, this indigenous body of knowledge is handed down from one generation to another, individuals in each generation adapt and add to the existing knowledge in a dynamic fashion according to changing socio-economic and environmental circumstances. It is observed that people who live on the frontiers of forests reserves have a deep understanding of natural resource management (Sekhar, 2003).

In 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, Edusah (2011) reported that the perceptions of fringe communities were diverse, and therefore reflected in different attitudestowards the forest reserves. According to Edusah (2011) the people perceive nearby forests as key sources of timber and non-wood forest products (NWFPs) in order to meet their basic needs; forests provide them with income

and jobs; play an important role in local traditionalreligions, beliefs and practices; and have an important role in protectingand enriching the natural environment.

Ayanwuyi et al. (2007) found the 99.5 percent of the respondents interviewed in their study indicated that, the quality of fuelwood used in the past are not of the same quality with the ones used after deforestation. This is an indication that local people belief trees no longer mature before being harvested for domestic and commercial purposes.

2.7 Forest resources and rural livelihoods

The UK's Department for International Development (DFID, 1999) has defined livelihood as 'the capabilities, assets, and activities required for a means of living'. In this context, individuals have a better livelihood if they: 1) have a higher income, 2) receive more government services, 3) have their physical security respected, 4) have better health, 5) have adequate food, 6) are less vulnerable to changes in markets or their environment, 7) rely on natural resources that are managed sustainably, 8) can participate in political processes, and 9) can maintain their cultural heritage and self-esteem. Within the context of forest resource utilization and management, Kaimowitz (2003) identified the following broad areas where the livelihoods of forest fringe communities can be enhanced:

- *Income*: higher incomes for low-income rural households can come from small-scale forest-based activities or wage labour earned from working on forests resource conservation or management.
- *Government services*: taxes revenues from forestry can finance government services for the rural poor such as the provision of educational facilities, improved water sources, good roads, and related social services.

- *Physical security*: respecting forest users' physical security implies not physically mistreating them or imprisoning them without adequate due process.
- *Food, health, and vulnerability*: poor rural households with access to wild meat, vegetables, fruits, and medicinal plants and animals from the forests are likely to have better food security and health. This is especially crucial in situations where families have already exhausted the food from their last harvest and in periods of economic crisis, war, or crop failure.
- *Sustainable natural resource management*: if people use forest resources sustainably rural families should be able to maintain the benefits forests provide over time.
- *Participation and cultural heritage*: governments and other groups can politically enfranchise low-income forest dependent people, protect their cultural heritage and legal rights, and encourage their self-esteem by providing institutional mechanisms for participation in decision-making and respecting their rights, cultures and opinions.

2.8 Approaches to halt deforestation and forest degradation

In recent decades, the need to halt deforestation and forest degradation and promote sustainable forest management has received much attention. Though approaches on the subject are varied, the underlying principles remain the same - the conservation and sustainable use of forest resources (Marfo, Danso &Nketiah, 2013).

It appears though there are no easy solutions to the problem of deforestation and degradation in sight. The FAO (2012) notes that the key drivers of deforestation and

forest degradation are deep rooted both inside and outside the forest sector and may have local, national and global implications. Thus, to begin addressing the problem, a robust analysis of the drivers of deforestation is a must in order to evaluate the impacts at all levels, but particularly on local communities. Competing land uses, socio-economic factors and commercial interests driving deforestation and forest degradation involve different authorities and stakeholders. Thus careful, conscious and committed analytical assessment of drivers should ensure the full and effective participation of all stakeholders (FAO, 2012). This could be facilitated by, for example, establishing collaborative mechanisms or using existing information-sharing platforms. The FAO (2012) cautioned that in facilitating the process, care should be taken to ensure the informed and meaningful participation of all stakeholders, including indigenous peoples and forest-dependent people, and that gender representation is considered.

Another widely proposed approach is the application of forest resource governance and the control of illegal activities. In countries, where the forest sector has a significant role, effective governance structures have been developed, including putting in place legislations and institutional structures to favour certain types of forest utilization (Marfo et al., 2013, Agrawal & Ostrom, 2001). Forest governance works effectively through the existence of relevant institutions. Here, it is foreseen that institutions provide the backbone for the effective implementation of forest governance. In a broad sense, institutions include the constitutions, rules, laws, property rights, organizations, informal or tacit institutions, individual habits, customs, codes of conduct, group routines, social norms, values, sanctions, taboos and traditions. It is important to note that some experts

often separate these institutions to stand alone from the governance approach as the institutional approach (Oksanen, Pajari & Tuomasjukka, 2002).

Whatever approach is used, there is the need to coordinate policy implementation between the forest sector, environment, agriculture, rural development and other sectors relevant in a specific country. The experience so far with national forest programmes suggests that these issues cannot be solved within a sectoral policy planning process or using ad hoc consultations. National level governance is effective if the local government authorities and decentralized departments of ministries play an active role in this regard. This is especially necessary in the case of countries such as Ghana, where the forests of some communities play a major role in the livelihoods of households and are not necessarily important for providing exportable timber (Marfo et al., 2013; Sasu, n.d).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the profile of the study area and methodology. It also presents the study design and a profile of the study area. The chapter also explains the study population and sampling procedure used for data collection, fieldwork and how the data was collected and subsequently analysed.

3.2 Research design

This study adopted a descriptive cross-sectional case study design that used an interview schedule to collect both quantitative and qualitative data from the study participants (see Appendix 1 for the interview schedule sample).

The main reason for the use of the interview schedule is that it enhances data collection from respondents who cannot read and write and also has the advantage of ensuring a high retrieval rate for responses due to the high level of interaction between the questioner and respondent.

3.3. Profile of the Study Area

The Bawku West District is one of 13 districts located in the north-eastern part of the Upper East Region of Ghana. It was created in 1988 with Zebilla as the district capital. It lies approximately between latitude 10^0 30' North and 11^0 10' North, and between longitude 0^0 20'East and 0^0 35'East. The District covers an area of approximately 1,070 square kilometres, which constitutes about 12 percent of the total land area of the Upper East Region (Figure 1). The District shares boundaries with Burkina Faso in the north, Binduri District (newly carved out of Bawku Municipality) to the east, Talensi and Nabdam Districts to the west, Garu-Tempane District to the south east and East Mamprusi District in the Northern Region to the south (BWDA, 2013).

The Bawku West District is drained mainly by the Red Volta and White Volta Rivers and their tributaries. The topography consists of gentle undulating plains, interspersed in some places with hills and low mountain ranges formed by rock outcrops of Voltaian sandstone origins (BWDA, 2013). The area experiences two climatic seasons (dry and wet). The wet

season extends fromMay to November and the dry season from December to April. Mean annual rainfall is about 896 mm with an annual peak in August and September (Adjewodah et al., 2012). Temperatures are generally high throughout the year with the maximum occurring in March/April and the lowest between December/January. The mean monthly temperature is about 27^0c. The dry season is characterized by the harmattan winds which are dry, dusty and cold in the morning and very hot at noon.

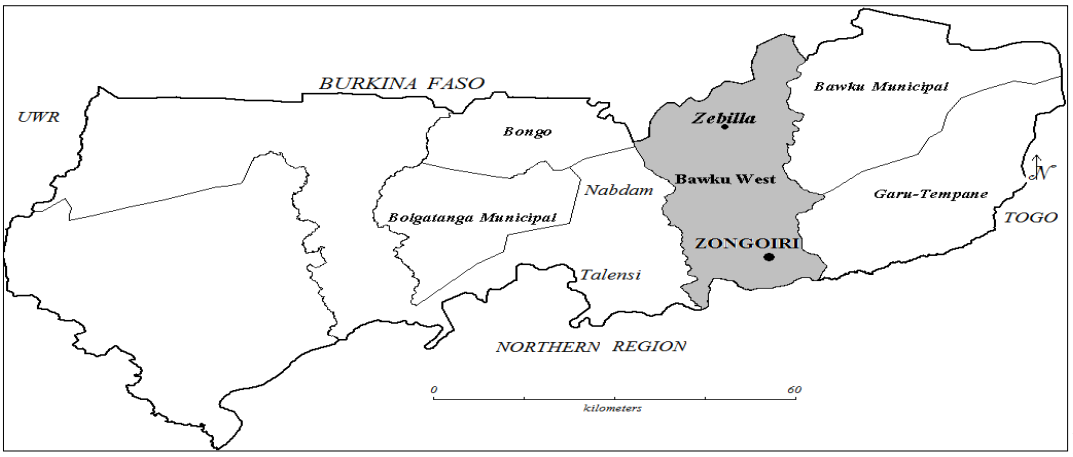

Figure 3.1: A sketch map of Upper East Region, showing the study location

Source: Author's Construct

The natural vegetation is Guinea and Sudan Savannah, which has been largely modified by human activities. The major socio-economically valuable trees include the sheanut tree (*Vitellaria paradoxa*), African Locust tree "dawadawa" (*Parkia biglobosa*), baobab, acacia and neem. The trees are scattered except along the river valleys where isolated woodland or gallery forests are found. The population of the District in 2010 was 94,034 comprising 45, 114 males (48%) and 48,920 females (52%) with an average household size of 6.1 (GSS, 2012). The district is predominantly rural with 91percent of the people living in rural communities. The major ethnic group is the Kusal speaking people.

Agriculture, mostly smallholder crop production and animal husbandry are the main sources of livelihood for rural households in the district. Some rural households also engage in off-farm income-generating activities such as food processing, petty trading, and handicrafts, charcoal burning and sale of firewood (BWDA, 2013). Maize, sorghum, millet, and rice are the common staple cereal crops produced in the district. Leguminous grains, including groundnut, cowpea, and soybean, are also produced. In addition, horticultural produce, such as pepper, eggplant, tomato, water melon and onion, are common in the area (BWDA, 2013).

3.3.1 Description of the Zongoiri Community

Zongoiri is a rural community, which lies within latitude 10^0 30' to 10^0 45' North, and longitude 0^0 30' to 0^0 00' West, in the extreme south of the Bawku West District near the Red Volta East Forest Reserve. The 2013 projected population of the community is 760, comprising 375 males and 385 females (projected population is based on the 2000 PHC figure of 588 and on the 1984 population figure of 429, using an annual growth rate of 0.0199 (1.98%). Subsistence food crop production and livestock rearing are the major livelihood activities for a vast majority of the people. Both male and female household members engage in farming. Major crops cultivated are millet, sorghum, groundnuts and maize during the rainy season. In addition, some inhabitants engage in secondary income generating activities like fishing in the nearby Red Volta and White Volta rivers, and in firewood and charcoal sale because of abundant and readily available wood from the Red Volta East Forest Reserve. Zongoiri was purposively selected for the study because of its proximity to the forest reserve, and based on the researcher's personal working experience in the community around natural resource conservation in a previous position

as a District Agricultural Development Officer. Zongoiri is a big settlement that has 11 sections, namely Zongoiri-Natenga, Yiboni, Bulinga, Dagunga, Gbango, Kansoogo, Apodabogo, Kuk, Bugaar, Peeri and Ga. Apart from Apodabogo and Peeri, all the other sections of the community are located close to the reserve and do farming near it.

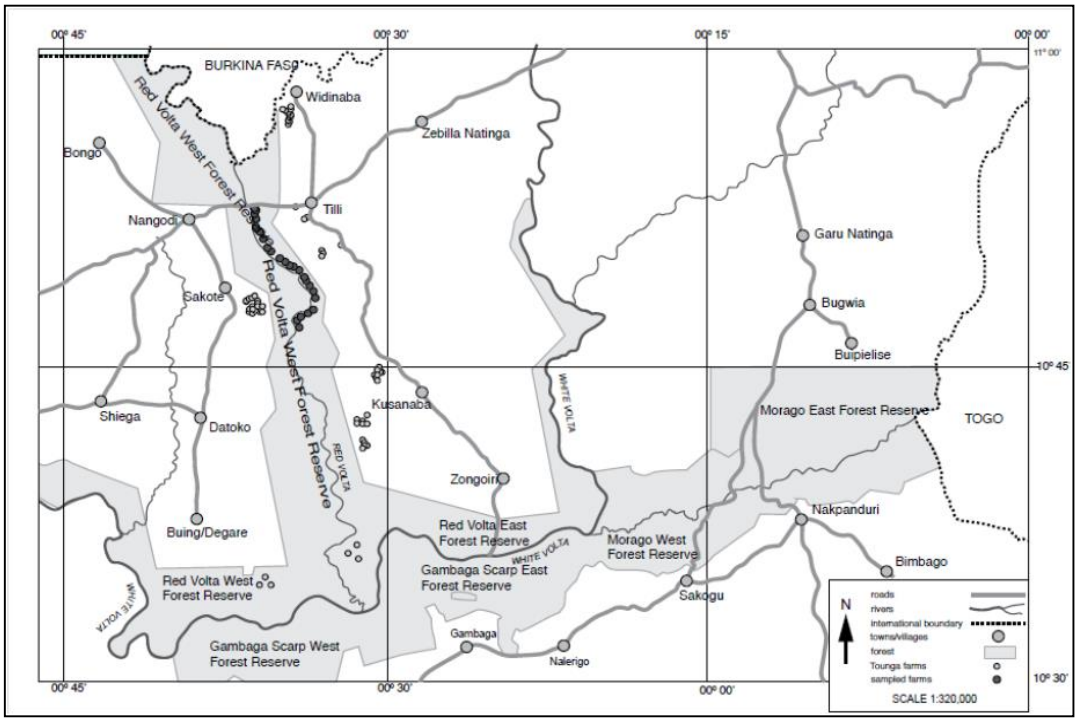

Figure 3.2: Detailed map of the study area
Source: Adjewodah et al., (2012)

3.4 Study population and sampling

People living in the Zongoiri community formed the population of the study. However, the primary respondents were adult community members of 18 years and above (both males and females), being representatives of farmers, charcoal burners, fire volunteers and community leaders. Simple random sampling (SRS), employing the lottery method, was used to select four sections (Zongoiri-Natenga, Yiboni, Kuk and Bulinga) out of the nine sections of Zongoiri that are close to the forests reserve for participation in data collection. In the absence of an existing up-to-date household sampling frame, an Agricultural Extension Officer who works with farmers in the community assisted the researcher to identify and list compounds in the selected sections of the community. Again, simple random sampling was used to select compounds and households in compounds for data collection. The primary respondent to interview was any adult household member, preferably the household head. Then, a convenient sample of 100 respondents was interviewed, 50 participants drawn from each of the two sections.

3.5 Fieldwork

The questionnaire was pre-tested before the actual conduct of the survey. The interviewers were five research assistants with post-secondary school education who were experienced in administering questionnaires in surveys. They were all native speakers of the local Kusaal language. They were trained on how to administer the questionnaire and on some basic concepts of deforestation and forests degradation relevant to the study. In line with the principles of conducting ethically sensitive research as approved by the University for Development Studies, consent was duly obtained from the study

participants prior to beginning the interviews and confidentiality was assured, as the interviewers did not record the names of the respondents. The respondents were reminded about their right to refuse to participate or refuse to answer any question at any point in the course of the research.

The study was conducted from the second week of July to the second week of August, 2013. In all, 100 questionnaires were administered and 98 were found to be complete and good for inclusion in the analysis after checking. This implies that the questionnaire recorded a response rate of about 98%. Data collectors were advised to cross-check the data at the end of each interview session and at the end of each day, to ensure the completeness and correctness of information where necessary.

3.6 Data analysis

The Statistical Package for the Social Sciences (SPSS Version 16) was used for entering the data, cleaning and for analysing it. The data was edited for completeness and consistency. The same statistical package was used for computing the frequencies and percentages used for the analysis. This laid a foundation for discussing key research findings and for drawing conclusions.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents descriptive statistical analysis of the study results followed by a detailed discussion of the findings. The chapter first presents results of selected socio-demographic characteristics of respondents, their major occupations and how long they have lived in the study community. This is followed by an analysis of respondents' understanding of deforestation and forest degradation, an assessment of trees that are typically cut from the forest reserve, uses of trees cut and perceptions on the consequences of uncontrolled forests degradation. Then, the results and discussion of findings on perceptions of the effects of deforestation and forest degradation, concerns about the depletion of the forest reserve and measures adopted by the local people to protect the reserve from uncontrolled tree felling are presented. The chapter concludes with recommendations on mitigation measures from the perspectives of the study participants.

4.2 Socio-demographic characteristics of respondents

4.2.1 Sex distribution of respondents

A total number of 98 people were interviewed. Out of this number, as shown in table 4.1,males were 64, and this represented 65.3 percent of the respondents whilst females were 34 representing 34.7 percent of the sample population respectively. Out ofabout two-thirds (65%) of the respondents who were males,a majority of them (58%)was in the age group of 21-40 years. This is an indication that respondents were in the youthful and productive age group and could have been much more concerned about the degradation of

the community forests on their future livelihoods. Table 4.1 describes the sex distribution of respondents.

Table 4.1: Sex distribution of respondents

Sex	Freq	Percent (%)
Male	64	65.3
Female	34	34.7
Total	98	100

Source: Fieldwork (2013)

4.2.2 Age distribution of respondents (Years)

The ages of respondents were in the rangeof 15and70years. As shown in table 4.2, the dominant age group of respondents fell within 31-40 years (33.7%),compared to the aged (60-70yrs), who represent a mere 4.1 percent.

Table 4.2: Age distribution of respondents

Age group	Freq	Percent (%)
15-20yrs	5	5.1
21-30yrs	24	24.5
31-40yrs	33	33.7
41-50yrs	25	25.5
51-60yrs	7	7.1
60-70yrs	4	4.1
Total	98	100

Source: Fieldwork (2013)

4.2.3 Marital status of respondents

In terms of respondents' marital status, the results showed thata total of 71 respondents representing 72.5 percent were married, 11 respondents were singles representing 11.2 percent, nine respondents were divorced representing 9.2 percent and seven respondents were widowed representing 7.1 percent.These are illustrated in table 4.3.

Table 4.3: Marital status of respondents

Marital status	**Frequency**	**Percent (%)**
Married	71	72.5
Single	11	11.2
Divorced	9	9.2
Widowed	7	7.1
Total	98	100.0

Source: Fieldwork (2013)

4.2.4 Education level of respondents

With regard to formal educational attainment of the respondents, table 4.4 shows that about two-thirds (65%) of them had no formal education, 21 percent had basic education (primary/JHS/MSLC) and only 12 percent had received some secondary/technical education and tertiary (1%). This is an indication that illiteracy is quite high among the adult population in the study community. Ekpeyong (n.d) observed that high illiteracy and poverty are causes as well as consequences of environmental degradation in many parts of Africa. According to Ekpeyong, the poor and people without formal education are often more interested in issues related to their daily survival than environmental management.

Table 4.4: Educational attainment of respondents

Level of education	Frequency	Percent (%)
Primary/JHS/MSLC	21	21.4
SHS/Sec/post-sec	13	12.2
Tertiary	1	1.0
No formal education	64	65.3
Total	98	100.0

Source: Fieldwork (2013)

4.2.5 Religious affiliation of respondents

The religious affiliations of respondents were categorised into four; namely Christianity, African Traditional religion, Islam and others. The majority (63.3%) of the respondents believed in African Traditional religion. This was followed by 21.4percent of them who believed in Islam whilst 14.3percentbelieved in Christianity. Only one respondent could not identify with any of the known religious groups. Table 4.5 illustrates details of the various religious groups.

Table 4.5: Religious affiliations of respondents

Religious affiliation	Freq	Percent (%)
Christianity	14	14.3
African Traditional	62	63.3
Islam	21	21.4
Others	1	1.0
Total	98	100.0

Source: Fieldwork (2013)

The above findingsare important as they corroborate Eneji et al. (2012) whoemphasised that traditional religion is supportive of natural resource conservation through the ascription of psychic powers to both animate and inanimate objects like rocks, streams, trees and forest land. The belief and respect for the gods of the land is the source of reverence and respect for these objects. According to Eneji et al. (2012), belief in the existence of a supreme being responsible for the protection of the community enable traditional African societies to voluntarily take and participate in the management of natural resources seriously in the past.

4.2.6 Household size of respondents

Data obtained from the field revealed variations of household size. For instance, household sizes were categorised into 1-6, 7-10 and 11 and above. Table 4.6 indicates household size between1-6 (45.9%),followed by household size 7-10 (28.6%) and the least being household size 11and above (25.5%).The results further revealed that household sizes in the study community are relatively large compared to the district average of 6 persons per household (GSS, 2012).It can be argued that larger household

sizes are likely to have higher dependency rates, especially in households that have only one breadwinner. Table 4.6 below shows the household size of respondents.

Table 4.6: Household size of respondents

Household size	Frequency	Percent (%)
1-6	45	45.9
7-10	28	28.6
11and above	25	25.5
Total	98	100.0

Source: Fieldwork (2013)

The large household sizes have serious implications for the management of the forest reserve in a typical agrarian society because the need to feed larger household members will increase the demand for farmland and thus encroachment of the forest.

4.2.7 Occupation of respondents

The results as shown in table 4.7 indicate that the main occupation of majority (60%) of the respondents is rain-fed crop cultivation and animal husbandry, followed by crop cultivation (28%). This suggests that subsistence agriculture is the main occupation of the people. Some households keep cattle as well as sheep, goats, chickens and guinea fowls. The cattle are kept for socio-cultural and security reasons or as capital assets. The main food crops grown are cereals (maize, rice, sorghum, millet), pulses (groundnuts, cowpea and Bambara beans), and vegetables.

The farming practices in the area are still predominantly the traditional continuous mono and mix cropping, shifting cultivation, rotational bush fallow or slash and burn systems. The productivity of these systems depends largely on the fertility of the soil, which is usually maintained by long fallow periods when population sizes were small. With increasing population, fallow periods have reduced and as a result, soil fertility is also declining. This partly explains the pressure on the community forests reserve for agricultural expansion.

Just a few (4%) reported charcoal burning as their main occupation. Despite this, charcoal production is a highly lucrative activity for the local people particularly in recent years because electricity and gas prices appear to have gone beyond the reach of most urban dwellers and the growing urban population have to depend on charcoal as their primary source of cooking energy. Thus, 24percent of the respondents engage in charcoal burning as an off-farm economic and livelihood activity. Twenty percent reported Shea butter extraction as a secondary occupation while 15percent said they were engaged in fishing as their off season occupation. This is an indication that charcoal burning constitutes a key off-season livelihood activity for the people, and partly explains the degradation of the forests. This finding is supported by a study in Senegal where Wurster (2010) reported that the extraction of wood for charcoal production was perceived to drive forest degradation. Eight percent of the respondents who reported the other category as their secondary occupation included a community police, driver's mate, teacher, small scale miner and a carpenter.

Table 4.7: Occupations of respondents

	Main occupation		Secondary occupation	
Type of occupation	Frequency	Percent	Frequency	Percent
Charcoal burning	4	4.1	24	23.5
Livestock rearing	4	4.1	12	12.2
Crop farming	27	27.6	-	-
Livestock and crop farming	59	60.2	-	-
Petty trading	2	2.0	20	20.4
Shea butter extraction	-	-	20	20.4
Fishing	-	-	15	15.3
Other/none	2	2.0	8	8.2
Total	98	100	98	100

Source: Fieldwork (2013)

4.2.8 Years lived in the Community

The results indicate that almost 57percent of the respondents have stayed in the village for a period of more than 30 years and only nine percent have lived there for less than 11 years (see table 4.8). It is expected that since most of the respondents have stayed in the village for many years, they would have accumulated enough knowledge about the trends of deforestation activities and associated problems in the area. This is because people who live in a certain area for a long period of time accumulate experience on various problems associated with natural resources in their locality as well as the need for conservation or otherwise of the resources. Similar observations were reported by Kajembe (1994) which showed that people who have stayed longer in an area were likely to provide relatively reliable historical data that those who have stayed for a long period of time. Thus, the

duration in which people have lived in an area increases their knowledge about their immediate environment. Table 4.8 shows the length of respondents stay in the study community expressed in years.

Table 4.8: Years lived in the Community by respondents

Period	Freq	Percent (%)
5-10 years	9	9.2
11-20 years	21	21.4
21-30 years	12	12.2
31+ years	56	57.1
Total	98	100.0

Source: Fieldwork (2013)

In addition, increase in the number of years of residence of the households in the village adjacent to the forest reserve increases the likelihood of the perception on forest reserve disturbance. With the increasing population in this predominantly rural agrarian community, it is more likely that the local residents will increasingly exploit the reserve for their livelihoods. Thus, more forest products are demanded from the reserve and more land is required to meet the demands of the growing population.

4.3 Respondent's views about deforestation and forest degradation

From the onset, it was important to assess the study participants' understanding of deforestation and forest degradation. By definition, deforestation involves a decrease in the area covered by forest. However, Lanly (2003) contends that it cannot be so defined without making reference to its use, and thus, call for the need to distinguish certain forms

of forest utilization that clear temporarily the forest cover while guaranteeing its maintenance. For instance, the clear cutting of areas where forest will regenerate itself or be regenerated, or of the final cut in an even-aged forest once natural regeneration can be assured. This means, there is no deforestation if there is a guarantee of continuity in maintaining the forest cover.

Degradation on the other hand does not involve a reduction of the forest area, but rather a quality decrease in its condition, especially relating to one or more different forest ecosystem components (vegetation layer, fauna, soil, etc.) to the interactions between these components, and more generally to its functioning (Lanly, 2003).

Though the respondents could not define or make a fine distinction between the terms deforestation and forest degradation, they had a fair idea of the direct drivers (causes) of deforestation and degradation of the community forests as illustrated in table 4.9. In a multiple response question, almost all (N = 96, [98%]) of the respondents cited indiscriminate cutting of trees in the forest reserve as being responsible for on-going deforestation and forest degradation. The respondents appear not to consider bushfires and overgrazing as major factors for deforestation and forest degradation. The results further suggest that majority of the respondents' understanding of deforestation and forests degradation is the wanton felling of trees without replacement. This is an indication that tree cutting is the underlying direct cause of deforestation and forests degradation in the area, even though there may be other factors that appear less visible to the people.

A few respondents mentioned farmers' encroachment of forest (conversion of forests to agricultural land), illegal gold mining (galamsey), activities of Fulani herdsmen, charcoal burning and fuelwood extraction as some causes of deforestation and degradation of the Zongoiri forests reserve. With the increasing population of fringe settlements, the conversion of portions of the forest reserve into agricultural land for crop cultivation could become a major threat to conservation measures. This finding is consistent with the observation of Ahmed (2008) that the principal human-related causes of deforestation worldwide are agriculture, livestock grazing and the increasing demand for wood for energy and for construction.

Table 4.9:Respondents understanding of deforestation and forest degradation

	Responses	
Causes of deforestation	**N=96**	**%**
Bush burning	36	37.5
Overgrazing	7	7.3
Indiscriminate tree cutting	94	97.9

Valid cases = 96 Missing = 2

Source: Fieldwork (2013)

4.4 Trees typically cut from the forest reserve

Respondents were asked to indicate the type of trees (tree species) that are commonly cut from the community forests reserve. The multiple response results presented in Table 4.10 show that majority (N = 83, [86%]) of the study participants reported that mahogany was the typical tree species cut from the forests, followed by Shea trees (N = 23, [24%]). Teak was mentioned as the tree people rarely fell (N =5 [5%]). This finding is not surprising because mahogany is mostly cut indiscriminately by illegal chain-saw operators for sale as timber in the local markets, due to the shortage of quality timber for building purposes from southern Ghana. Even though the Shea tree is an economic tree which is traditionally protected on farmlands and community woodlands, it is increasingly being harvested illegally by charcoal burners because of the high quality of its charcoal, which attracts good price in the urban areas. Firewood is the main energy source of the people and in the past they were only allowed to cut dead trees and branches for firewood and not allowed to cut living trees, particularly economically valuable trees like Shea, African Locust bean tree (dawadawa), and the African Ebony tree.

Acheampong & Marfo (2011) reported that wood from forest reserves was the second most important source of timber among chainsaw operators in Ghana. This confirms why mahogany is perhaps the most important tree harvested from the forest reserve in the study area. It appears the current policy and forest reserves management regime does not provide enough incentives to local people to participate actively in co-management. There may even be the tendency for some local people and some community leaders to collude with chainsaw operators to exploit the forest reserve or directly engage in the activity themselves for personal gain.

Table 4.10: Trees typically cut from the forest

Trees commonly cut from the Reserve	Responses N=97	%
Dawadawa	7	7.2
Mahogany	83	85.6
Shea	23	23.7
Teak	5	5.2

Valid cases =97 Missing = 1

Source: Fieldwork (2013)

4.5 Forest tree utilization

The multiple response results as presented in table 4.11 show that the main uses of woody resources from the forest reserve was for domestic fuel wood as reported by almost all (97%) of the respondents, followed by commercial fuel wood (92%) and charcoal burning (91%). From the results, it appears the major problem to address is the illegal tree cutting by some villagers for commercial purposes due to the high demand firewood and charcoal in the nearby urban towns.

Similarly, MacGregor, Palmer and Barnes (2007) in a survey on household level utilisation of forest resources in North Central Namibia reported that the main woody resources used by households were fuel wood, poles and Non-Timber Forests Products (NTFPs). The authors pointed out that the availability of environmental resources was a key indicator of household's reliance on woody resources.

Table 4.11: Uses of trees cut from reserve

Uses of trees cut from reserve	Responses

	N=98	%
Charcoal burning	89	90.8
Fencing material	68	69.4
Fuelwood for household use	95	96.9
Poles	60	61.2
Rafters	49	50.0
Fuelwood for sale	90	91.8

Valid cases = 98 Missing = 0

Source: Fieldwork (2013).

4.6 Consequences of indiscriminate tree cutting

As indiscriminate tree cutting appear to be the major cause of deforestation and forest degradation in the area, the study participants were asked for their views on the consequence of uncontrolled tree felling on their livelihoods. As illustrated in table 4.12, the vast majority of the respondents (90%) reported that uncontrolled logging will lead to land degradation in the forests reserve, while 37percent and 21percent of them thought the consequences of illegal cutting of trees in the reserve is the erratic rainfall being experienced and the increasing severity of windstorms respectively. Fewer respondents thought the cutting of trees in the reserve could lead to scarcity of wild fruits (9%) and reduced availability of livestock feed (7%). This finding is an indication that the people are more concerned that when trees are cut without conscious effort at regeneration, the soil cover, which consists mainly of vegetation, is lost as well. This exposes the bare soil to extreme weather conditions leading to land degradation.

Table 4.12: Consequences of tree felling

Consequences	Responses N=91	%
Reduced availability of animal feed	6	6.6
Land degradation	82	90.1
Scarcity of wild fruits	8	8.8
Loss of some plant and wild animal species	14	15.4
Rainfall variability (erratic rainfall)	34	37.4
Increased severity of windstorms	19	20.9

Source: Fieldwork (2013)

4.7 Effects of deforestation and forests degradation

Almost all of the respondents (97%) indicated that deforestation and forest degradation has negative effects on the community. The respondents were then asked to mention these negative effects. The multiple response results presented in table 4.13 show that majority of the respondents (70%) cited reduced rainfall as a direct effect of deforestation and forest degradation, almost half (48%) of them mentioned poverty and poor crop yields, close to a third (29%) cited increased frequency and severity of windstorms, and nearly one-quarter (23%) identified drying up of local perennial rivers and streams (change in local hydrological system). Again, almost one out of five (17%) of the respondents perceive loss of scarcity of wildlife and other flora and fauna (loss of biodiversity) being the direct effects of deforestation. This is an indication that many of the community people may not perceive loss of biodiversity as a serious problem associated with deforestation and forest degradation. However, Ahmed (2008) and Clark (2012) have noted the loss of biodiversity is probably the most serious consequence of deforestation.

In other words, it means the destruction and extinction of many plants and animal species will continue, many of which will remain unknown and the benefits left undiscovered.

Table 4.13: Negative effects of deforestation

	Responses	
Effects	**N=94**	**%**
Low crop productivity/poverty/poor crop yields	45	47.9
Reduced rainfalls	66	70.2
Reduced availability of livestock feed	15	16.0
Increased frequency & severity of windstorms	27	28.7
Some perennial water bodies drying up	22	23.4
Scarcity of wildlife	16	17.0

Valid cases = 94 Missing =4

Source: Fieldwork (2013)

Thoms (2008) in a study in Nepal reported that deforestation and forest degradation reduced poorer rural households' ability to access both the direct and indirect benefits of community forest reserves. The direct benefits of forest reserves to the local people identified in the study include food, fuel, timber, fodder, construction materials, medicinal plants, bedding for animals and leaves for compositing. The indirect benefits include

ecological services such as watershed protection, erosion control, soil fertility and windbreaks for farmlands.

4.8 Concerns about depletion of the forest reserve

Having enumerated the negative effects of deforestation and forest degradation, the respondents were asked for their views or opinions on the current state of managing the forest reserve. From the multiple response results as shown in table 4.14, three-quarters (76%) of the study participants thought the forest reserve should be protected from further degradation. This suggests that the local people are concerned about preserving the forest reserve, if only they could have diversified sources of livelihoods that are less dependent on natural resource exploitation.

In addition to the above, it emerged that 41percent of the respondents were worried that uncontrolled exploitation of the forest reserve could lead to reduced availability of some forests resources (trees, medicinal plants, wild fruits and wildlife, especially elephants) that support the livelihood strategies of the local people. This finding is important because the use of trees for charcoal production in particular has several ecological implications. At first, there is a depletion of matured Shea trees, which are preferred for charcoal production. As the most commonly used tree species become scarce, the less preferred matured trees are also used in order to sustain charcoal production. The fate of the forest reserve at that time will depend on external factors such as population pressure and resulting land uses. In the case of shifting cultivation, usually the land is abandoned after a period, and left to regenerate as open woodland. In the case of permanent cultivation and settlement, stumps are cleared and the land remains cleared indefinitely.

Interestingly, a few (7%) of the respondents cited the drying up and siltation of the White Volta and Red Volta Rivers and their tributaries that drain the area due to deforestation and forest degradation of their catchment areas forests reserves as a concern to them. This finding is worrisome because the forest reserve protects these river systems and thus the forest degradation would lead to siltation and consequently flooding along the banks of the river systems.

Table 4.14: Respondents' concerns about forest reserve use

	Responses	
Concerns	**N=74**	**%**
Forests depletion causing soil erosion	12	16.2
Need to protect forests from depletion	56	75.7
Reduced availability of some trees & wildlife species	30	40.5
Water bodies drying up	5	6.8
Loss of soil fertility	8	10.8

Source: Fieldwork (2013)

Ahmed (2008) notes that deforestation can result in the inability of watersheds to sustain and regulate water flows from rivers and streams. This is because trees are highly effective in absorbing excess water quantities, keeping the amount of water in watersheds to a manageable level. More importantly, forests also serve as a cover against erosion. Thus, removing the tree cover will result in downstream flooding, which has become the annual ritual areas of the district and elsewhere in the region.

In general, it appears the local people are willing to comply with the forests reserve conservation policies and rules when they are included in the decision-making process.

The inclusion and strengthening of local communities in the reserve decision-making processes may promote a sense of ownership, where the local people would cooperatively protect reserves from outsiders and also regulate their own use of natural resources (Aswani et al., 2004; Pretty and Smith, 2004). In Roviana, Solomon Islands, for instance, women involved in a conservation project realized the greater value of being empowered by their own community. As a consequence, they are now managing and monitoring natural resources more comprehensively and setting their own rules to halt illegal activities inside strict resource use zones (Aswani et al., 2004). According to Aswani et al., (2004), the programme's success may be attributed to five important factors: (1) a high level of participatory involvement and community leadership, (2) the enhancement of local perception that natural resources have been recovering gradually, (3) a combination of scientific and traditional knowledge, (4) economic incentives created by the alternative income generation, and (5) well-defined boundaries allowing enforcement to take place. These issues can offer useful lessons for managers of the forest reserve in the study area to effectively collaborate with local communities to reverse degradation.

4.9 Measures adopted by the community to protect forest reserve

Asked whether the respondents were aware of measures adopted by the community stakeholders to conserve and protect the forest reserve, a vast majority (77%) reported that they knew of the existence of such measures. The results shown in figure 4.1 revealed that more than half (51%) of the respondents are aware that community fire volunteers operate in the area to prevent excess depletion of the reserve, 56percent knew of the presence of community forest management and utilization bye-laws, and 30percent

reported that farmers were trained to create fire belts along the fringes of the forest reserve to prevent bush fires.

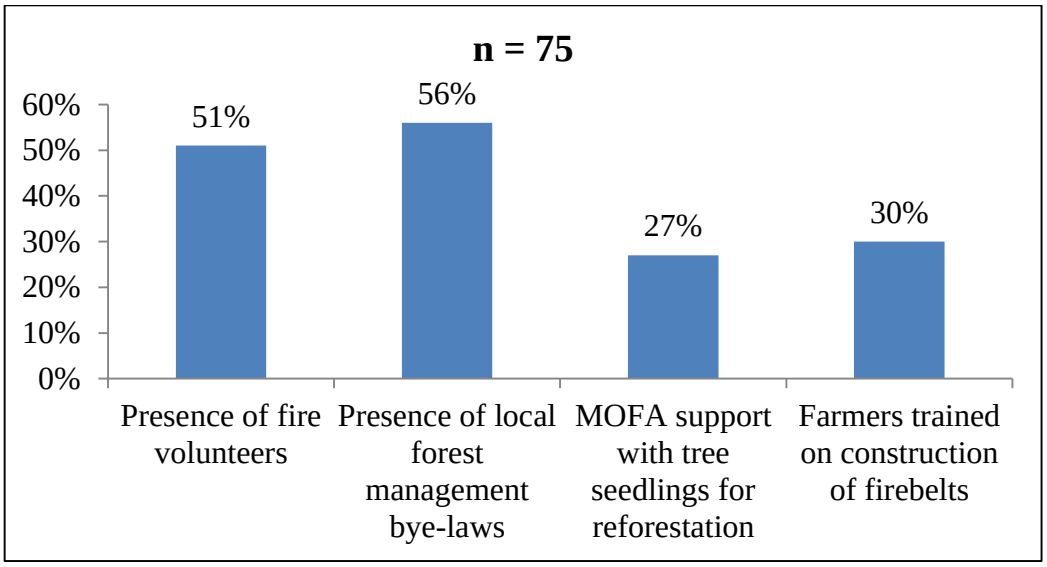

Figure 4.1: Knowledge of community measures to protect forest reserve

Source: Fieldwork (2013)

It is encouraging that the respondents were aware of these community strategies for conserving the forest reserve, though whether these measures are effective enough in addressing the problem is another matter. After all, proponents of decentralized forest policy argue that rules and regulations made by elected local actors and community stakeholders are more effective because they are considered to be more relevant to local situations and are considered as legitimate by the local communities (Clairs 2006; Gibson, 2005).

Thus, it has become fashionable in Ghana and elsewhere in Africa for national Forestry Agencies to encourage the formation of community forestry committees at the unit level in order to enhance community empowerment and participation in natural resource

management (Sasu, n.d). However, the weaknesses of local institutions and their influence on the development and effective implementation of common pool forest resource management approaches appear to defeat the strategy.

Kosoe (2012) reported that local level stakeholders were generally not actively involved in fire management at the community level, despite the presence of fire volunteers. Kosoe found that this was largely due to the absence of incentives to motivate the volunteers to effectively participate in community fire management initiatives. Similarly, Banana et al., (2007)in a study in Uganda, reported that members of local Environment Committees were reluctant to take on extra duties of managing forest resources due to lack of motivation.

Furthermore, Banana et al., (2007) reported very high levels of compliance to both timber and fuelwood harvesting rules in Mpanga Forest Reserve in Uganda, because there was a very high level of monitoring and rule enforcement.

4.10 Knowledge of external support to protect forest reserve

A vast majority (81%) of the respondents were aware of external agencies that were supporting the community to manage and conserve the forest reserve. Agencies that were mentioned by the respondents included the Catholic Relief Services (CRS), Green Ghana, World Vision Ghana (WVG), CODI (a local NGO), Actionaid, and the Ministry of Food and Agriculture (MOFA).

This is an indication that various stakeholders are involved in trying to halt the degradation of the forest reserve. These stakeholders may come in with different interests, which in some cases may conflict. According to Pretty and Smith (2004), for any success

in forest resource management there is the need for a participatory management approach involving all stakeholders and through collective learning of the ecological and physical aspects of an ecosystem. This promotes positive changes in attitudes toward conservation strategies (Pretty and Smith, 2004). Environmental education and training should include capacity building in technical areas such as financial management, agriculture improvements, and marketing are some examples of capacity building in local communities. Capacity building must also be extended to forest resource management personnel, thus improving their natural resource management, conservation planning, and social skills in conflict resolution and diplomacy (Andrade and Rhodes, 2012).

4.11 Recommendations on mitigation measures

The study participants recommended the continuous sensitization of the people on the importance of forests preservation through community durbars, strict enforcement of community forest bye-laws, and the strict regulation of the activities of alien Fulani herdsmen. They also emphasized the need for reforestation of the degraded parts of the forest, and efforts made to stop cutting of economic trees like the Shea and dawadawa for firewood and charcoal. Some respondents advocated for people who violate community forests bye-laws to be sanctioned through prosecution to serve as a deterrent to others. A few respondents were of the view that the District Assembly should liaise with the community stakeholders to evolve workable strategies to stop bush fires and charcoal burning.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the findings and conclusions reached based on the findings. This is then followed by recommendations for next steps. The objective of the study was to assess local people's perceptions of the effects of deforestation and forest degradation in the Red Volta East Forest Reserve on the socio-economic lives of the people of Zongoiri. Specifically, the study sought to identify and understand the causes of deforestation and forests degradation in the Red Volta East Forests Reserve; assess the effects/impacts of deforestation on the lives of the people; and identify and recommend options for dealing with the current situation of deforestation and forests degradation in the study area.

5.2 Summary of findings

The study interviewed 100 local community people who lived on the fringes of the Red Volta East Forest Reserve near Zongoiri to elicit their perceptions on the effects of deforestation and degradation of the reserve. Majority of the study participants (65%) had no formal education, while only 21percent had basic education. The results revealed that household sizes in the study community are large and this may have serious implications for the management of the forest reserve. For instance, members of large households are more likely to engage in collecting forest resources primarily for their subsistence consumption and for sale in local markets to earn income for their needs because there are limited alternative livelihood options. In addition, more agricultural land will be required to produce food to feed family members. In other words, larger family size would

translate into more requirements for both wood and non-wood forest products, and thus intensify degradation of the forest reserve.

The main occupation of majority (60%) of the respondents is rain-fed crop cultivation and animal husbandry. The farming practices in the area are still predominantly traditional hoe and cutlass land tillage under shifting cultivation, rotational bush fallow or slash and burn systems. Major burning and firewood harvesting for domestic use and for sale is a major off-farm livelihood strategy of the people.

Almost all of the respondents (98%) cited indiscriminate tree felling in the forest reserve as responsible for the deforestation and forest degradation, while a few respondents mentioned encroachment of forest by farmers (conversion of forests to agricultural land), illegal mining (galamsey), activities of Fulani herdsmen, charcoal burning and fuelwood extraction as some causes of deforestation and degradation of the forests reserve.

The majority (86%) of the respondents reported that mahogany was the typical tree most harvested from the forest reserve, followed by the Shea tree. Trees harvested from the reserve are for domestic energy needs reported by almost all (97%) of the respondents, followed by harvesting for sale as fuelwood (92%) and charcoal burning (91%).

On the consequences of unregulated tree cutting, a vast majority (90%) of the respondents reported that the practice will lead to land degradation in the forest reserve. Again, almost all of the respondents (97%) indicated that deforestation and forest degradation has negative effects on the community such as reduced rainfall, increased frequency and severity of windstorm, and the drying up of local rivers and streams (change in local hydrological system).

A majority (76%) of the respondents were concerned that the forest reserve should be protected and conserved from degradation. This suggests that the local people are very concerned about preserving the forest reserve, if only they could have diversified sources of livelihoods that are less dependent on natural resource exploitation. On the other hand, a fewrespondents (7%) cited the drying up and siltation of the White Volta and Red Volta Rivers systems and their tributaries that drain the area as a concern due to deforestation and forest degradation of their catchment areas.

The findings revealed that a little more than half of the respondents (51%) are aware of the presence of community fire volunteers, whoare supposed to guard against excess depletion of the reserve, 56 percent knew of the presence of community forest management and utilization bye-laws, and 30 percent reported that farmers were trained to create fire belts along the fringes of the forest reserve to prevent bush fires. In addition, a vast majority (81%) of the respondents were aware of external agencies' support to the community to manage and conserve the forest reserve.

The respondents recommended the continuous sensitization of the people on the importance of forests preservation through community durbars, strict enforcement of community forest bye-laws, and the strict regulation of the activities of Fulani herdsmen, among others.

5.3 Conclusions

This study contributes to the literature on local perceptions on the causes and effects of deforestation and forest degradation in Ghana and the findings are relevant for the gallery forest reserves in the northern savannah agro-ecological zone most likely also for gallery

forest reserves that protect watersheds and provide invaluable livelihood services to fringe communities throughout the country.

The findings agree with those from other parts of the developing world that local people are very familiar with the direct and immediate causes of deforestation and forest degradation. Forest resources, especially wood, are significant contributors to rural livelihoods in Ghana. The people of Zongoiri rely on wood from the forest reserve for their energy supply, for construction and for income. The forest also serves as windbreak for farmlands and moderates the local climate as well as provide graze for their livestock.

As a result, the people are very conversant with the negative effects of deforestation and forest degradation on their livelihoods, and are very concerned about the need to halt the overexploitation of the forest resources. However, it appears opportunities for improving livelihoods by increasing efficiency, productivity, and income generation through sustainable use of resources from the reserve seem limited. Moreover, with increasing population growth, unemployment and urban demand for wood based energy sources, the potential for increased trade in wood and NWFPs as well as other forest-based products will grow.

The study results suggest that without participation and consent of local communities, outreach programmes by external partners might not be effective in halting illegal activity inside the forest reserve. Local community stewardship of the forest reserve through the enforcement of local bye-laws may only be effective if alternative economic incentive packages are developed through participatory processes. The most important goal in this case is to foster economic development of local communities, improve their livelihoods

and at the same time reduce the exploitation of natural resources inside the reserve (DeFries et al., 2007).

Moreover, if implemented as the sole strategy, alternative income generation programmes could promote dependencies, creating a misconception that locals support external economic assistance. Instead, alternative income generation must be aligned to capacity building, which is likely to play an important role in ensuring long-term sustainability (Pretty and Smith, 2004).

5.4 Recommendations

Based on the results, discussion and conclusions, any national and local policy reforms on forest resources utilisation or conservation must take into consideration the impact on the rural population if it is not to worsen existing poverty. Forest products, apart from providing a safety net, 'could also provide a launch pad for innovation, economic development and poverty alleviation, as has been the case elsewhere' (Macgregor et al., 2007:I). The development of policies that offer clear and unambiguous incentives to promote both poverty alleviation and forest conservation must become the goal for all stakeholders.

Thus, it is important for the Bawku West District Assembly, the Forestry Commission and their collaborators to consider developing measures to ensure that local people are able to take advantage of potential income from expanding opportunities in non-wood extraction benefits from the reserve such as ecological tourism, handicrafts development and alternative livelihoods opportunities from NWFPs. Here the government agencies

have a role to play, alongside the NGOs working in the area. They can provide assistance with marketing, negotiation and other appropriate business skills development.

The importance of NWFPs and the forest for livelihoods means that uncontrolled exploitation could prove fatal to the adjoining rural communities and their livelihoods. Hence, opportunities to identify best conservation practices, the transfer of skills and benefit sharing should be explored by all stakeholders taking into consideration the participation of the local people. Again, the government, alongside local NGOs, should provide assistance in building capacity and monitoring firewood and charcoal market development using socially-focused criteria. Spill overs from outside demands for wood and NWFPs require constant attention and monitoring.

Government, through the District Assembly, also needs to identify forest reserve areas of significant local social value and external value in order to guide protection efforts where possible, such as through land tenure reforms. In this regard, the Community-based Natural Resource Management (CBNRM) and Farmer Managed Natural Regeneration (FMNR) concepts should be vigorously pursued. For instance, the community forestry initiative could be expanded to embrace some local forest reserves.

The fundamental role of the Forestry Services Division needs to be reviewed and efforts made to shift from a focus on forest protection to one of efficient collaborative forest management. Sustainable financing for these forest reserves should come from locally managed and enforced sustainable harvesting. Innovative use and well defined property rights to local communities combined with judicious capacity-building and monitoring-

enforcement efforts can help to devolve and expand forest protection and management capacity.

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APPENDIX 1: INTERVIEW SCHEDULE FOR HOUSEHOLD RESPONDENTS

INTERVIEWEE CONSENT FORM

Dear Respondent,

My name is Bernard Kpare. I am a postgraduate student at the Institute for Continuing Education and Interdisciplinary Research of the University for Development Studies, Navrongo. In partial fulfilment of the requirement for the award of my degree, I am carrying out a study in this community.

The attached questionnaire is designed for the collection of information on the effects of deforestation in Zongoiri community, my research topic. I will very much appreciate it if you would spare some minutes of your time to answer a few questions related to this topic.

Please answer the questions as accurately as possible. Your responses would be kept confidential and will only be used for the purpose of this study.

Thank you very much in advance.

Household Identification Number_____

1.	Sex:	Male ☐1	Female ☐2			
2.	Age:	15-20yrs ☐1	21-30yrs ☐2	31-40yrs ☐3	41-50yrs ☐4	51-60 yrs ☐5
		60+ yrs.☐6				
3.	Marital status:	Single ☐1	Married ☐2	Divorced ☐3	Widowed ☐4	
4.	Religion:	Christian ☐1	traditionalist ☐2	Moslem ☐3	Other.....	
5.	Major Occupation:	Charcoal burning ☐1	Livestock rearing ☐2			
	Crop farmer ☐3	Livestock and crop farmer ☐4	Other (specify).....			
6.	Minor Occupation:	Livestock rearing ☐1	Petty trading ☐2			
	Shea butter processing ☐3	Charcoal burning ☐4	Other (specify).....			
7.	Educ:	Not educated ☐1	Basic education ☐2	SHS ☐3	Post-sec/tertiary ☐4	
	Other (specify).....					
8.	Years lived in community :	5-10 yrs ☐1	10-20 yrs ☐2	21-30 yrs ☐3	31+yrs ☐4	
9.	Household size:	1-3 ☐1	4-6 ☐2	7-10 ☐3	11+ ☐4	None ☐5

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

SECTION B: PERCEPTIONS ON DEFORESTATION AND FORESTS DEGRADATION

I: Causes of deforestation and forest degradation

10) What do you understand by the term deforestation?

……

……

11) Which trees are usually cut from the forest?

Yes No

Teak	☐1	☐2
Dawadawa	☐1	☐2
Shea tree	☐1	☐2
Mahogany	☐1	☐2

Other (specify)…….

12) What are the cut trees used for? (Enumerate in order of importance)

	Yes	No
Rafters	☐1	☐2
Poles	☐1	☐2
For sale	☐1	☐2
Domestic/commercial Firewood	☐1	☐2
Charcoal production	☐1	☐2
Fencing material	☐1	☐2

Other (specify)……

13) Do you think the cutting of trees can cause deforestation? Yes ☐1 No ☐2

14) If YES to question 13 above can you give reasons? If No go to Q15

(a)……

……

(b)……

……

(c)……

……

15) If NO to question 13 above can you give reasons for your answer?

(a)……

…….....

(b)……

…..…….....

(c)……

…….....

16) . Are there other causes of deforestation you know about? Yes ☐1
No ☐2

17) . If YES, name them. If No go to Q18

(a)……
…….....

(b)……
…….....

(c)……
…….....

II: Effects of deforestation and forest degradation

18) From your opinion what can you say about the depletion of the Zongoiri forest
……
…….....

19) Do you think the present deforestation has any negative effect on the lives of the people in Zongoiri? Yes ☐1 No ☐2

20) If YES what are your reasons for your response? If No go to Q 21

(a) ……
….....

(b) ……
…….....

(c) ……
…….....

21) Do you think the present deforestation has any positive effect on the lives of the people in Zongoiri? Yes ☐1 No ☐2

22) If YES, what are your reasons for your response? If No go to Q23

(a)……

….....

(b)……

…….....

(c)……

…….....

III: Knowledge of community involvement in forest reserve conservation

23) Do you know of any measures taken by the Zongoiri community to control use of the forest and forest products? Yes ☐1 No ☐2

24) If yes, state them. If no go to Q25

(a)……

.....

(b)……

…….....

(c)……

…….....

25) Are you aware of any external interventions to help curb the rate of deforestation of the forest reserve near Zongoiri? Yes ☐1 No ☐2

26) If yes, state them. If No go to Q27

(a)……

…….....

(b)……

…….....

(c)……

…….....

IV: Recommendations to mitigate deforestation and forest degradation

27) What do you think can be done to reduce the impact of deforestation in the Zongoiri forest?

(a)……

…….....

(b)……

…….....

(c)……

…….....