



THE CAUSES OF AND IMPACT FROM DEFORESTATION ON LOCAL LEVEL
SUSTAINABLE FOREST MANAGEMENT IN GHANA. A SURVEY OF DWEASE
AND PRAASO COMMUNITIES IN THE ASHANTI REGION

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Abstract

The objective of this study has been to examine the causes of and the impact from deforestation and inquire into the conditions for local level sustainable forest management in Ghana. This has become necessary in the light of the fact that research and policy on deforestation has often asserted it as “*evil*” because of the long term environmental implication for sustainable development evident in global warming, biodiversity loss and soil degradation. While this is true, it is also undeniable that forest degradation and deforestation have contributed tremendously to the development of households’ livelihoods, income and employment as well as social amenities for the sustenance of indigenous people. Considering the negative consequences albeit socio-economic benefits, this current research has provided a holistic discussion on the impact of deforestation on sustainable management of forests, and has rather asserted deforestation as a “*necessary evil*”. Using a cross-sectional design approach, the research questions are fashioned and built on the tripartite relationship that between development, environment and management, the major tenets of sustainable development, thereby inquiring into the conditions for local level sustainable forest management in two communities: Dwease and Praaso of the Asante Akim Central Municipality of Ghana. A key argument advanced by this study is that sustainable forest management is a collaborative activity, hence at the local level efforts should be made ensure broad public participation of all stakeholders in decision making and policy design and implementation.

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All errors remain my own.

Dedication

“This thesis is dedicated to my Family”

Declaration

I, Peter Dok Tindan, hereby declare that this thesis “*The Causes of and Impact from Deforestation on Local Level Sustainable Forest Management in Ghana. A survey of Dwease and Praaso communities in the Ashanti Region*” has not been submitted to any other Universities than University of Agder, Norway.

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List of Abbreviations and Acronyms

AACM: Asante Akim Central Municipality

CBD: Convention on Biological Diversity

C&I: Criteria and Indicators

CIFOR: Center for International Forestry Research

CF: Community Forestry

CFM: Collaborative Forest Management

CFMP: Community Forest Management Project

CSR: Corporate Social Responsibility

FAO: Food and Agriculture Organization

FC: Forestry Commission

FDMP: Forest Development Master Plan

FM: Forest Management

FRA: Forest Replacement Association

FSD: Forestry Services Division

GHG: Greenhouse Gas

IISD: International Institute for Sustainable Development

ITTO: International Tropical Timber Organization

LI: Legislative Instrument

MADU: Municipal Agricultural Development Unit

MDGs: Millennium Development Goals

MTS: Modified Taungya System

NGOs: Non-governmental Organizations

NTFPs: Non-timber Forest Products

NFPDP: National Forest Plantation Development Programme

PD: Plantation Department

REDD+: Reduced Emissions for Deforestation and Degradation

SFM: Sustainable Forest Management

TBI: Tropenbos International

TEEB: The Economics of Ecosystems and Biodiversity

TFPs: Timber Forest Products

TM: Thematic Map

UN: United Nations

UNDP: United Nations Development Programme

UNEP: United Nations Environmental Programme

USDA: United States Department for Agriculture

VPA: Voluntary Partnership Agreement

CHAPTER ONE: Background to the Study

1.1 Introduction

Deforestation is a conventional environmental challenge substantially affecting the resilience and distribution of forests across different boundaries. It is simply defined as the loss of trees' cover usually as a result of forests being cleared for other land uses (Gorte and Sheikh, 2010). Over the years, the world has experienced unprecedented loss of its forests particularly in tropical areas, though it is observed on a global scale that the rate of deforestation has shown sign of a decrease. This is because the Food and Agriculture Organization (FAO, 2010, p.10) states that in the 2000s about 13 million hectares of forest were converted to other uses – largely agriculture – or lost through natural causes each year as compared with 16 million hectares in the 1990s. That notwithstanding the rate of deforestation is still alarming because in 2010 it is observed that the world had just over 4 billion hectares of forested area, which corresponds to an average of 0.6 forest per capita (FAO, 2010).

As a recognized global challenge, tropical deforestation has gained greater impetus in policy and research. Mahapatra and Kant (2003, p.2) state that since the early 1980s, policy makers have responded to tropical deforestation with various bilateral and multi-lateral initiatives such as Tropical Forestry Action Plan, International Tropical Timber Organization and Forest Principles. They also indicated that there is increasing research on various dimensions of tropical deforestation by many scientists.

Though a recognized problem, it is important to highlight that the rate and extent of deforestation has however varied across continental, national, regional and local boundaries (FAO, 2005, p. viii). For instance, Brazil and Indonesia, which had the highest net loss of forests in the 1990s, have significantly reduced their rate of loss in the 2000s while at the same time Australia experienced exacerbated forest loss due to internal factors such as; severe drought and forest fires (FAO, 2010, p.10). It has been observed that tropical deforestation in Africa has been overwhelming in the last two decades. Between 1990 and 2000, the continent lost about 52 million ha of forest, which

accounts for 56 percent of the global reduction in forest cover (FAO, 2003, p.8). It is stated for that period, the continent experienced an average forest cover loss of 0.8 per cent which was higher than the world average of 0.2 per cent (FAO 2005).

The causes of deforestation are varied but may broadly be categorized into anthropogenic and natural factors. For the anthropogenic factors, increased wood fuel collection, clearing of forests for agriculture, illegal and poorly regulated timber extraction, social and environmental conflicts, increasing urbanization and industrialization are the primary known causes for the loss of forests and woodlands (FAO, 2002). For the natural factors, the impacts of drought and natural forest fires have been highlighted in the cases of Australia and Ghana (FAO, 2010, Insaidoo et al, 2012).

There is increasing societal concern about the impact of deforestation especially in this 21st century because of the mixed effects; socio-economic benefits and negative effects that it produces. On the positive side, the loss of the world's forest resources has contributed to the fulfillment of households' livelihoods and provided other socio-economic, cultural and spiritual benefits. It is identified about 500 million to 1.6 billion people live in and around forests benefitting partly from the forests for their livelihoods (Mayers and Vermeulen, 2002; TEEB 2010). Deforestation has also been noted to contribute tremendously to long-term environmental consequences like global warming, biodiversity loss and soil degradation (Mahapatra and Kant, 2003, p.2) as well as increased poverty in forest fringe communities. Based on this analysis, deforestation posits a challenge for the practice of sustainable forest management, which focuses on balancing environmental benefits and development of livelihoods for the rural poor so that deforestation can be avoided in the long term.

It is in the light of this, the current research focused on assessing the impact of deforestation on sustainable forest management in Dwease and Praaso communities in the Ashanti region of Ghana. The study was approached empirically using a mixed research strategy towards the collection, analysis and presentation of findings.

1.2 Main Objective

The main objective of this study is to examine the causes of and the impacts from deforestation on local level and inquire into the conditions for sustainable forest management in Ghana.

1.2.1 Specific objectives

To analyze how people understand the nature of forest types, extent of deforestation and its main causes in Dwease and Praaso.

To examine the major types of forest products extracted as well as the social and economic benefits of deforestation on livelihoods and in a gender perspective, as perceived by the local people in Dwease and Praaso.

To identify the negative local effects, also in a gender perspective, of deforestation in Dwease and Praaso.

To examine the understanding and strategies of sustainable forest management employed by local people, traditional rulers and FSD in Dwease and Praaso and how effective these have been in promoting sustainable forest management.

1.2.2 Research questions

- a) To what extent has deforestation been witnessed in Dwease and Praaso and what are the main causes? How are these causes perceived by traditional rulers and local people?
- b) What are the social and economic benefits, as well in a gender perspective, of deforestation on livelihoods in Dwease and Praaso? How are these perceived by local people?
- c) What are the negative local effects, also in a gender perspective, of deforestation in Dwease and Praaso? How are these perceived by local people?

- d) What are strategies of sustainable forest management employed by local people, traditional rulers and FSD in controlling deforestation in Dwease and Praaso? To what extent has these been effective at promoting sustainable forest management?

1.3 Problem statement

The rate of deforestation has been remarkably high in Ghana. It is estimated that over 90 percent of the high forest¹ have been logged since the late 1940s with current rates of deforestation being 5 percent in off-reserves² and 2 percent in on-reserves (Tamakloe, n.d). Tamakloe also argues that, off-reserves have been seriously degraded and fragmented to less than 5 percent of the forested area of 83,500 km². This is congruent with Insaadoo et al (2012) who note the country current reserves stand at only 5%, 395,000 hectares. It is evident that there is rapid forest-cover loss in many humid and sub-humid tropical areas but that notwithstanding there is much debate on the rate and extent of deforestation (Adams, 2009, p.242). In most cases, the available statistics on the extent of deforestation are often national figures and may not reflect the local conditions. Therefore, the researcher questions: to what extent has a deforestation process been witnessed by the local people in Dwease and Praaso communities?

There are varied opinions on the factors accounting for forest loss in Ghana. For instance, the FAO (2001) argues that excessive logging, unsustainable agricultural practices, bush burning, mining and quarrying, and settlement and related infrastructure construction are factors accounting for the change and dynamics of Ghana forests (cited in Domson and Vlosky, 2007). It is also indicated that increased population growth and migration in forest fringe communities have exerted undue pressure on biological and wildlife populations in Ghana especially in the high forest zone (National Development Planning Commission, 2010, p.10). According to Mahapatra and Kant, (2003), the size of the forest is probably an underlying factor that could influence the process of deforestation. These various perspectives raised questions in the mind of the researcher hence the need

¹ High forest is the ecological zone that spans the South-western third of the country characterized by high annual precipitation and vegetation cover (Boon, 2000).

² Off-reserves refer to the forested areas outside the boundaries of demarcated forest reserves (on-reserves).

to probe into the causes of deforestation and how are these perceived by the local people and traditional rulers in the Dwease and Praaso communities.

It is identified that there are benefits in the form of livelihood fulfillments that may accrue from the process of deforestation. For instance, in the forest fringe communities of Ghana, the loss of forest resources through activities like wild-meat production, fuel wood and charcoal production, wood-carving and canoe-carving, rattan production, chew stick-gathering, chainsaw lumber production and hunting have positively affected about 2 million people who engage in such as livelihood activities (Domson and Volsky, 2007). The question therefore is; what are the socio-economic benefits of deforestation on livelihoods as perceived by the local people? Another objective is how the benefits accruing from the process of deforestation differ in a gender perspective particularly, in terms of the income earned by male and female households. This is because in rural Ghana it is observed there is difference between the nominal incomes earned by male and female headed households (Ghana Statistical Service, 2008). Such an analytical comparison is worthwhile as a basis for developing strategies for poverty reduction and sustainable development in rural Ghana that take account of gender issues.

Increased global warming, soil degradation and loss of biodiversity are renowned negative outcomes of deforestation. Quite apart from these, it is noted that deforestation is a known cause of poverty (Dery and Dorway, 2007, p.14). This is because increased deforestation can cause loss of livelihoods- through loss of assets- and increasing vulnerability to poverty (Owusu *et al*, 2011). Therefore, the researcher also probed into the negative effects of deforestation. It is believed that, deforestation is closely connected with poverty which is always engendered, thus the need to examine how the negative effects of deforestation manifest in a gender perspective. This is particularly important for Dwease and Praaso communities where poverty is argued to be more prevalent among females than men (Asante Akim Central Municipal Assembly, 2010).

There is a challenge for sustainable forest management in Ghana. This is related to that fact that there are both benefits and challenges associated with the process of deforestation. According to Mayers and Venmeulen (2002) the challenge is to develop

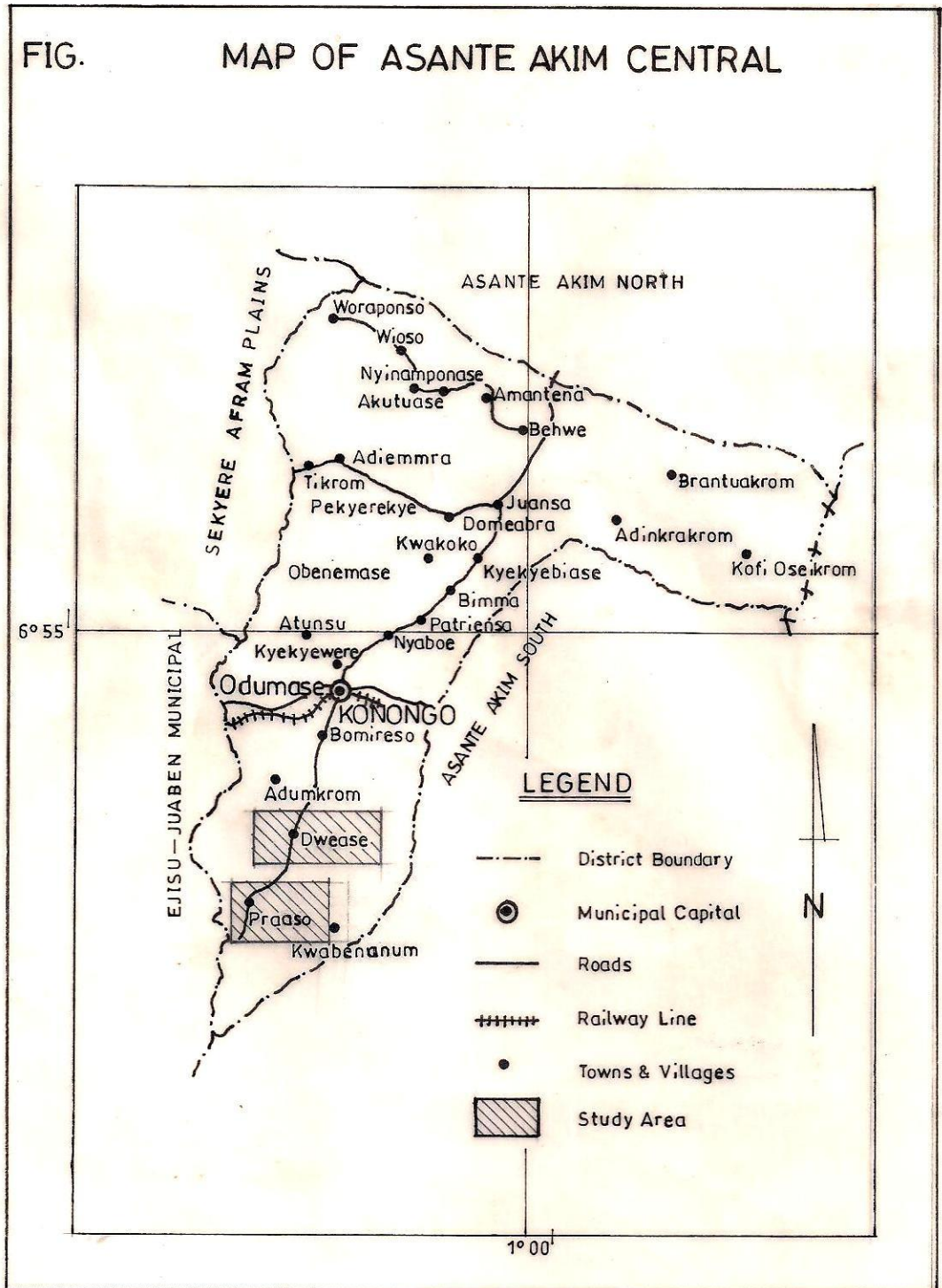
strategies that will enhance development of trees and forest resources as well of the livelihoods of people. In the light of this challenge, the researcher is interested in identifying the mitigation strategies employed by the people, traditional rulers and Forest Services Division (FSD) in ensuring sustainable forest management. In Ghana it is often realized that there are gaps between planned strategies adopted and implementation at the local level. As a result, the researcher probed into how the planned strategies of sustainable forest management differ from practices adopted for forest management.

1.4 Profile of the Study Area

1.4.1 Location and size

Dwease and Praaso communities form part of the Asante Akim Central Municipal Assembly (AACMA) located in the eastern part of Ashanti Region and lies between latitude $6^{\circ} 30'$ North and $7^{\circ} 30'$ North and longitude $0^{\circ} 15'$ West and $1^{\circ} 20'$ West. The municipality has a land area of $1,160 \text{ km}^2$ and an estimated population of 169,976 in 2010 (projection from 2000 Population Census). It shares boundaries with the following districts namely Asante Akim North to the north; Asante Akim South to the east and south and Ejisu-Juaben to the west (Asante Akim Central Municipal Assembly, 2010).

Figure 1.1: A map of Asante Akim Central Municipal Assembly



SOURCE: Asante Akim Central Municipal Assembly

1.4.2 Climate and Vegetation

Climatically, the municipality lies within the semi-equatorial belt and is characterized by double-maxima³ rainfall pattern. The first rainy season starts from May to July while the second is from September to November. The dry season (popularly called harmattan) occurs between December and April and is associated with drought conditions which often cause the drying up of water bodies (Asante Akim Central Municipal Assembly, 2010). Temperature is found to be uniformly high all year round with a mean annual temperature of 26°C. The impact of climate change has resulted in irregular climatic conditions in the municipality such as delay in rainy season; unreliable rainfall; and long dry seasons (Asante Akim Central Municipal Assembly, 2010).

The vegetation type of the Municipality can be categorized under the moist semi-deciduous forest belt. The vegetation pattern is distributed in three dimensions; Open Forest which covers 576 km² and spreads over the highlands of the municipality. The other two include the Closed Forest covering 230 km² on the range and the Wooded Savannah covering 246 km². The different tree species produce tropical woods such as Wawa, Ofram, Sapele, Sanfina, Okyere (Kofo), Onyina, Kyenkyen, Otie and Yaya, which have high economic value (Asante Akim Central Municipal Assembly, 2010).

Apart from wood products, foodstuffs (delicacies such as snails and mushroom) and other raw materials are obtained from the forest for industrial and domestic use. Most of the original forest in the Municipality has degenerated into secondary forest through anthropogenic activities. In order to address deforestation a collaborative forest management strategy is being pursued in some parts of the Municipality (Asante Akim Central Municipal Assembly, 2010).

1.4.3 Relief and Soil Types

The topography of the Municipality is generally undulating. From the north, the land rises gently to heights between 305 and 610 meters and is interrupted by a stretch of the

³ Describes the two different rainy seasons experienced within the Southern half of the country due to the movement of the Inter-tropical Continental Zone (ITCZ).

Akwapim-Mampong Range, which is between 610 and 762 meters. Beyond this range is the southern part of the Municipality covered by highlands ranging between 305 and 610 meters. Lowland areas rise between 152 and 305 meters and are found in the north where the land slopes gently towards the Volta Lake (Asante Akim Central Municipal Assembly, 2010).

The soil types in the Municipality are the Forest Ochrosol and Savannah Ochrosol. The Forest Ochrosol is fertile and supports cereals, oil palm, cassava, plantain, cocoa and vegetables. The Savannah Ochrosol is well leached, richly supplied with organic matter and is good for the cultivation of yam, maize, cassava, groundnut and vegetables. There is a relationship between soil types, geological structure, vegetation and types of crops grown in the Municipality. The soil type in the Dwease-Praaso area council is Offinso compound with a geological structure based on granite, biotite and muscovite and the vegetation cover of open forest and is suitable for cultivating cocoa, plantain and cocoyam (Asante Akim Central Municipal Assembly, 2010).

1.4.4 Population and Household Size

According to the Ghana Statistical Service (2005) the total population of the municipality in 2010 was 169,976 with an annual growth rate of 3% and population density of 147 persons per sq. Km. The population growth and density for Dwease and Praaso are estimated at 5%, 160 km² and 5%, 148 km² respectively. The Municipality has 12,762 houses and a total of 22,876 households. The population per house stands at 9.9 while the average household size is 5.5. The ethnic composition of the population include the Akan constituting 77.4%; Mole-Dagbanis, 8.5%; Ewes, 4.6%; Grusis, 2.4%; Mande-Busangas, 2.2%; Guans, 1.6%; Ga-Dangbes, 1.5% and the Grumas, 1.2% (Asante Akim Central Municipal Assembly, 2010).

1.4.5 Administration and Governance

Politically, it is identified that the institutional and administrative arrangements of the Asante Akim Central Municipality is in line with the provisions of the Local Government System Act, 1993 (ACT 462). The Assembly is made up of 68 Assembly members of

whom 47 or two-thirds are elected by universal adult suffrage and 21 are government appointees with the Member of Parliament and the Municipal Chief Executive as Ex-officio members (Asante Akim Central Municipal Assembly, 2010).

For effective decentralization and effective planning, the municipality is divided into six (6) Zonal Councils; Konongo-Odumasi, Agogo, Dwease-Praaso, Oweriagya, Owerriman and Amantenaman with 47 Unit Committees and 1 electoral constituency. The role of traditional Chiefs and Queen Mothers in governance at the local level (towns and villages) is recognized. The Municipality is therefore divided into three (3) traditional councils namely Agogo, Konongo, and Odumasi (Asante Akim Central Municipal Assembly, 2010).

1.4.6 Economic activities

About 82% of the population in the municipality is engaged in private informal occupations like agriculture, trading, vocational services (hair dressing, sewing and driving), carpentry and masonry. Agriculture stands out as the major occupation employing 53.9% of the people especially those aged 15 years and above. The major staple food crops produced include maize, cassava, plantain, cocoyam and yam while cocoa is the major cash crop. Agricultural production is however largely on subsistence basis (72% of the farmers cultivating less than 3 acres of land) while about 6% engaged in large-scale farming (Asante Akim Central Municipal Assembly, 2010).

Industrial activities are virtually absent except for some private entrepreneurs who are engaged in wood processing, batik⁴ making and gari⁵ processing. Other significant economic activities include trading (16.3%), vocational services (13.1%), Labour (masonry, carpentry) and professional occupations (teachers, pharmacist, etc.). Poverty is endemic in the Municipality and is manifested along a rural-urban split. Also there is increasing poverty amongst female household heads as compared with their male counterparts. It is therefore identified that appropriate pro-poor programmes should be

⁴ Locally hand-woven clothes making

⁵ Gari is a local staple food made from cassava mostly used in Ghana and other West African countries.

designed to promote poverty reduction and rapid development (Asante Akim Central Municipal Assembly, 2010).

1.5 Research Methods in Brief

The study employed a mixed research strategy in the collection, analysis and presentation of findings, though the different epistemological and ontological grounds are acknowledged. The choice is influenced by the researcher interest to draw from the benefits of both quantitative and qualitative methods. It is explained that technically, mixed research methods can be used in social research because of “the need to give greater prominence to the strengths of data collection and data analysis techniques with which quantitative and qualitative research each are associated with and to see how these are capable of being fused” (Bryman, 2008, p.606). The tools of data collection included satellite image interpretation, structured interviewing, self-administered questionnaire, and participant observation.

1.6 Thesis Outline

The thesis is organized in six chapters. Chapter one provides a general background to the study and including introduction, problem formulation, research objectives and questions, and brief outline of research methods. Chapter two focuses on an in-depth review of the relevant literature on the various subthemes or research questions outlined in chapter one. The theoretical framework that underpins the study is also discussed. Chapter three discusses the research methodology, which is establishing the epistemological and ontological considerations of the study. The focus in this chapter is mainly to explain the “how”, “what” and “why” of the research methods used.

Chapter four contains the presentation of data and analysis. The purpose of this chapter is to establish meaning from the data collected in relation to the research questions and the literature reviewed as well as the background to the study area. Chapter five presents a summary of the major findings. Chapter six contains the conclusion and provides the implications of the research for policy and further research.

CHAPTER TWO: Literature Review and Theoretical Framework

2.1 Introduction

This section reviews the scientific literature on how deforestation impacts on sustainable forest management. It discusses the understanding and nature of forests in general, tropical deforestation and its known causes. It also reviews the benefits and negative effects of deforestation, the mitigation strategies to ensure sustainable forest management. The section is divided into sub-headings as follows;

2.2 Understanding and Nature of forests and tropical deforestation

Forests in general are complex and contested spaces, not fixed entities whose nature can be stated in an absolute way. The way forests are understood and the way they are valued is inextricably linked with the ideas of the diverse actors who view or lay claim on them (Adams, 2009). For instance, conservation scientists who are chiefly interested in tropical forests because of their rich diversity of species may define them floristically, while a forester who sees forests as resource, defines them by the amount of timber they comprise (Adams, 2009).

The understanding and nature of forest types is therefore varied because of the different approaches or criteria of definition. It is stated that the crown cover threshold and land use criteria are the two most critical factors often used in defining forest types (UNEP, u.d). The essence of using the crown cover to define forests is to distinguish the forests' biome from other forms of terrestrial biomes. This is because, it is noted the dominant vegetation of the plant communities is often used to classify the Earth's major terrestrial biomes and forests for that matter are easily recognized as associations of large, woody, perennial tree species, generally several times the height of a human, and with a more or less closed canopy of leaves overhead (Gabler et al, 2007). This is congruent with Purnomo (2003) who defines forest as an ecosystem characterized by more or less dense and extensive tree cover, often consisting of stands that vary in species composition, structure, age, class, and associated processes.

The UNEP highlights a 10 per cent minimum threshold of crown cover for defining both opened and closed forests. It is thus inferred from this, by using the crown cover threshold, forests may be categorized broadly into two main types namely, closed and opened forests. The term closed forest refers to areas where tree cover exceeds 40 per cent while the term open forest refers to areas where tree cover is between 10 and 40 per cent (UNEP, u.d).

Using the land use criterion, the understanding of forests is linked with the “main purpose or use” of the forest resources. Based on this Carle and Holmgren (2000) define forests as tree covered areas not predominantly used for purposes other than forestry and is thus distinguished into natural forests and planted secondary or plantation forests. The former is explained as forests regenerated naturally without human intervention while the latter is defined as forests planted or seeded with human intervention, where the main land use is for production (wood and fibre), protection (soil, water and other environmental values), conservation of biological diversity, socio-economic (recreation, amenity, cultural) or combinations of these.

In the wake of increased deforestation especially in the tropics, where natural forests are now being designated as protected areas, plantation forests have been recognized to have an increasing role as sustainable, efficient and environmentally and socially friendly source of world round wood, fibre, fuel wood, non-wood forest products and other social and environmental values (Carle and Holmgren, 2000). Notwithstanding the definition of a particular forest type, a peculiar characteristic of forests in general is that, they are found only in areas where the annual moisture balance is positive-where moisture availability considerably exceeds potential evapo-transpiration in the growing season and these mainly include the tropics and middle latitudes (Gabler et al, 2007).

The tropical forests, the focus of this study, are understood to have evolved differently in different areas in response to the nature of the physical limitations. Tropical forests are generally defined by their location—between the Tropic of Cancer and the Tropic of Capricorn, 23½° north and south of the equator, respectively (Gorte and Sheikh, 2010). An important characteristic is that, they have developed in less restrictive environments

where temperatures are always high, though not extreme and especially in the humid tropics, this has encouraged rapid and luxuriant growth (Gabler et al, 2007).

Tropical forests are conventionally known to be the home of the world's rich biodiversity and round wood as well as a source of livelihood for many people who live in and around the forests. As a result, over the years, greater attention has been drawn to their vitality and risks of losing tropical forests. For instance, it is noted in the 1980s that tropical deforestation became a significant theme amongst environmentalists and scientists especially in the developed world (Adams, 2009). For instance Secrett (1985) recounts the claim by the Friends of the Earth Tropical Rainforest Campaign in 1985 that, 7.5 million hectares of undisturbed tropical moist forest were being destroyed or degraded annually, which was estimated at 14 hectares being cleared every minute (cited in Adams, 2009, p.242). The specificity of information outlined in this claim completely points out that it is possible to accurately measure the extent and rate of tropical deforestation.

This viewpoint has however been refuted by Adams (2009, p.242) who claims that “though there is no doubt about the rapidity of forest cover changes in many humid and sub-humid tropical areas, particularly from 1980s onwards, there remains much debate about its rate and extent”. He argues the difficulty of finding consistent and reliable data on the rates of forest loss as the reason that has perpetuated this debate. This difficulty is in turn partly linked with the difficulties of definition of both forest types and what is meant by deforestation (Adams, 2009).

It is observed the rate and extent of deforestation varies among continents, countries, regional and local boundaries (FAO, 2005, p. viii). This indicates that global statistics on the rate and extent of deforestation are extrapolations from local, national, and continental findings. As a result the tendency that such global estimate on the extent of deforestation to be misleading is likely due to underestimation or overestimation and general changes of parameters and internal variations within the different locations. A typical example of internal variation is the case of Brazil and Indonesia which had the highest net loss of forests in the 1990s and have significantly reduced their rate of loss in

the 2000s while at the same time Australia experienced exacerbated forest loss due to internal factors such as; severe drought and forest fires (FAO, 2010, p.10). It is therefore important to reiterate the viewpoint by Adams (2009) that research and policy development on deforestation must be location specific.

The available evidence from the 1980s and throughout the 1990s indicates the massive loss of tropical forests. Though the rate of loss seems to have reduced in the 2000s, 13 million hectares of forest loss as compared with 16 million hectares during the 1990s, it is imperative to mention tropical deforestation is still a wanton challenge in 2010, because the world had just over 4 billion hectares of forested area, which corresponds to an average of 0.6 forest per capita (FAO, 2010). In relation to the Africa, the rate of deforestation has been overwhelming because between 1990 and 2000, the continent lost about 52 million ha of forest, which accounts for 56 percent of the global reduction in forest cover (FAO, 2003, p.8). It is noted the continent experienced an average forest cover loss of 0.8 per cent and this is higher than the world average of 0.2 per cent for the same period (FAO 2005). There are a number of known and anticipated factors that may have accounted for the increased rate of forests loss especially in Africa and these are discussed in the next section below.

2.3 Causes of Deforestation

The causative factors of deforestation have their roots in different sectors (Mahapatra and Kant, 2003) and as a result, the effects produced are also varied across the global, national and local boundaries. These factors may be categorized broadly into anthropogenic and natural. In most cases the anthropogenic causes are often easily identifiable probably because of the increasingly recognition of human footprints on the earth's system (McCarthy, 2009). It is important to note the human drivers of environmental change (deforestation) vary in nature and scope but can be broadly grouped together as economic, conflict and governance, demographic, social and science and technology (UNEP, 2006).

Agriculture and wood extraction and processing are renowned economic activities substantially causing environmental change particularly deforestation. According to

Shafik (1994) the process of deforestation is conventionally associated with direct causes or factors such as agricultural/pasture expansion and forest products consumption and export (cited in Mahapatra and Kant, 2003, p.4). This perspective is not entirely different from the argument advanced by Insaído et al (2012) who acknowledge the bush fires, indiscriminate logging and conversion of forest to farmland as the predominant causes of deforestation. Forests clearance and the subsequent agricultural development according to Yasuka and Levins (2007) has a detrimental effect on every element of local ecosystems such as microclimate, soil and aquatic conditions, and most significantly, the ecology of local plants and animals including human disease factors (cited in Beyene, 2011, p.13).

From the above analysis, it needs to be highlighted that it is not the operation of these economic activities per se but the “nature” of their operation. For instance, agriculture does not necessarily lead to deforestation but how it is operated may lead to deforestation. Chomitz (1999) points out that conventional wisdom ties the impact of agricultural development as a cause of deforestation to subsistence-oriented slash-and-bush cultivation, which involves cutting down of trees for farm lands. He also argues that, there is an emerging revisionist analysis which relates increased deforestation to large scale commercial cultivation because of the expansion of cultivated area into forest lands (Chomitz, 1999).

Though these two viewpoints have been debated and will continually be debated upon, what is worth noting is the need to recognize the impact of either subsistence slash-and-burn cultivation or large scale commercial agriculture as a causative agent of tropical deforestation will definitely vary between places because the rate and extent of deforestation is case specific and must be considered as such.

On the part of forest product consumption and expansion, over the years, timber production has been discussed to be the major and known cause of deforestation and this needs not be overemphasized considering the evidence from the 1980s. But an increasingly recognized effect is linked with wood fuel production. Miller (1998) argues that forest reserves are rapidly being used up in many peripheral regions because of great demand for wood fuel. This is particularly true in rural areas where forests are valuable

sources of energy for most households (TEEB, 2010). For example, in Eastern, Western and Southern Africa, more than 90 per cent of rural households depend on wood fuel, including fuel wood and charcoal, for their energy requirements (UNEP, 2006).

It is observed that, social and environmental conflicts, population growth, increasing urbanization and industrialization are also known causes for the loss of forests and woodlands especially in the developing countries (FAO, 2002). Conflict on issues regarding the extent and state of ownership by local communities and formal state institutions especially in developing countries has caused destruction of natural resources like forests at many places. It is observed that most of the world's forests are located in remote areas yet it is estimated that 87% of global forests are owned by the state (Siry et al, 2005 cited in Adams, 2009, p.246). Though the state has taken authority to regulate the use of forest land, timber and other forest products, in most cases it often lacks the authority and power to implement such regulations. This is because the legal basis of such claims by the state often flies in the face of the rights of indigenous people and ignores their systems of tenure and rules of resources management (Adams, 2009).

As Adams explains, such disputes posit the forests as de facto open-access resources widely open to any entrepreneur able to negotiate unofficial access to the forest land independently of an official legal regime and this may convert a slow, sustainable trickle of economic benefits into one-off windfall of timber or cleared land. The issue of poor coordination regarding the management and usage of forest resources could be closely tied with the types of democratic governance (whether representative or participatory democracy) being practiced in an area (Mahapatra and Kant, 2003; Tadesses et al, 2006).

From the UN Millennium Project (2005a), demographic change is the major driver of land cover change: its primary and most direct impact is through opening new land for agricultural, settlement and infrastructural development (cited in UNEP, 2006, p.4). The role of increased population growth and density and urbanization are major factors currently exerting immense pressure on forest resources in major towns and cities in developing countries. For instance in Ghana, these factors have affected biological diversity and wildlife populations (National Development Planning Commission, 2010).

Critical social dimensions for environmental change including deforestation are poverty and health (UNEP, 2006). As a result of poverty, human well-being especially for those in forest fringe communities has been compromised. According to the Millennium Assessment (2005a) human well-being is multidimensional and requires access to resources to live a good life in good health, such as income, food, clean water and energy; personal security through the absence of conflict, the ability to mitigate environmental disasters and good governance; good social relations which include all people and promote fairness and equity; and the opportunity to make choices (cited in UNEP, 2006, p.7).

Probably related with the conflict and governance, people whose livelihoods are linked with forest resources often have limited or illegal access and this causes deforestation. This is well argued by the Secretariat of the Convention on Biological Diversity (2009) that increased illegal hunting continues to be a major threat to forest biodiversity in many countries because it is intimately linked to the food security and livelihood of numerous tropical forest-region inhabitants, as many of these forest-dependent people have few alternative sources of protein and income.

The role of science and technology as underlying cause of deforestation may be linked with how industrial development, which has been much remarkable in the 20th century. The advancement in science and technology has helped to improve production capacities and demand for more resources in many countries. This is particularly true of China, where industrial expansion and development is noted to be an underlying force driving deforestation in Southeast Asia (Rudel, 2008 cited in Gorte and Sheikh, 2010, p.21). Also, warming is a common characteristic of the industrial drive and this could lead to deforestation. According to Gorte and Sheikh (2010, p.22) “warming in tropical regions could increase the susceptibility of tropical forests to fires and increase tree mortality due to drought, as discussed earlier. In addition, reduced precipitation might reduce agricultural productivity, leading to increased deforestation simply to maintain agricultural output levels”.

Political ecology is central to the issue of deforestation. Jarosz (1996) argues that explanations of deforestation are socially and politically constructed to the advantage of powerful people (cited in Adams, 2009, p.251). Though the term political ecology is variedly understood, the definition by Øyhus (2011a) is appropriate for this discussion. He states that political ecology is the study of how political, economic, and social factors affect environmental issues. It analyzes the influence that societies, states, businesses, international economic structures, and geo-political power relations have on environmental problems, and also how these organizations and institutions may influence environmental policy at various levels. According to Adams (2009) forest clearance (deforestation) in many cases has been a reflection of the material interests of powerful actors working either directly or through the apparatus of the state and is only analyzed within the political frame.

Policy and institutions, although most often thought of as the response to mitigate such change, may also drive environment change and impact directly on human vulnerability (UNEP, 2006, p.4). Gorte and Sheikh (2010) argue that government action (or inaction) can be an underlying cause of deforestation in several ways such as through infrastructural development, law enforcement, land rights/tenure and institutional factors. Delang (2005) provides a good example of Thailand, of how political decisions in the first decades of the twentieth century led to the construction of railways into remote forested regions and the links between agricultural colonization and the demand of the industrial manufacturing sector for cheap rural labour led to many years of deforestation (cited in Adams, 2009).

All these anthropogenic drivers of deforestation may probably be summed up in the model on tropical deforestation espoused by Mahapatra and Kant (2003). According to the model, Mahapatra and Kant advances an argument that, though the above factors seem to be the “direct causes” of deforestation, there are however “underlying causes” like increasing population growth and economic activities which have influenced these rather “direct causes”. They argue the underlying causes of deforestation to originate from six sectors namely, forest (e.g. extent of forest area), demographic (e.g. population growth), macroeconomic (e.g. economic growth and debt service growth), agriculture

(e.g. agricultural growth), infrastructure (e.g. development of road) and political (e.g. level of democracy).

Apart from the pronounced impact of anthropogenic drivers leading to the process of deforestation, the impact of natural factors on forest degradation and deforestation at global, national and local scales cannot be underestimated. A major factor is the impact of natural forest fires which destroy some or all the trees and biodiversity in a forest. According to Gorte and Sheikh (2010, p.5), “the nature and extent of natural fires are related to the evolutionary development of the natural fire regimes, to climatic conditions such as drought, and to the amount of woody fuels in some ecosystems and drought”. Typical example is Australia, which experienced rapid loss of forests between 1990s and 2000s due to natural factors such as increased drought and forest fires (FAO, 2010). Also, the impact of natural forest fires coupled with drought in 1983 are argued to have caused loss of forests in Ghana and it is believed that, such loss actually served as the bench mark for increased deforestation in the country (Insaidoo et al, 2012).

Although each of the drivers of deforestation has been discussed individually, there are links between the different drivers – sometimes acting in concerted manner to maximize negative impacts and sometimes producing positive change” (UNEP, 2006, p.4).

2.4 Socio-economic benefits of Deforestation

Deforestation is often asserted as “evil” because of the long term environmental implication for sustainable development. Though it is undeniable that the dependence of millions of people on forests leads to degradation and deforestation, there are numerous benefits accruing from such loss (in the form of livelihoods, income and employment) for the sustenance of indigenous people. According to the World Bank (2004), it is estimated that approximately 60 million indigenous people are almost wholly dependent on forests while 350 million people depend on forests for a high degree for subsistence and income, and about 1.2 billion people rely on agro-forestry farming systems (cited in Secretariat of the Convention on Biological Diversity, 2009, p.3).

The sustenance of people (human well-being) is core to the sustainable development which is achievable through sustainable livelihoods. According to the UNEP (2006) sustainable livelihoods guarantee access and entitlement to a range of assets and opportunities which are essential in achieving human well-being. This is essential for most indigenous people especially in forest fringe communities who often lack the basic necessities to maintain a decent standard of living such as sufficient and nutritious food, adequate shelter, access to health services, energy sources, safe drinking-water, education and a healthy environment (Secretariat of the Convention on Biological Diversity, 2009).

The trade of wood products is an obvious source of substantial income for national and local governments as well as traditional rulers and individuals. This often comes in the form of export earnings, taxes, royalties and personal income for those engaged either directly or indirectly in the exploitation of these forest products. According to the World Commission on Forests and Sustainable Development (1998), export of tropical wood contributes approximately US \$ 100 billion annually, about 0.5% of global gross domestic product (cited in Mahapatra and Kant, 2003, p.1). The sale and distribution of chainsaw lumber is argued to generate some un-estimated revenue in the form of market tolls, income tax, taxes from waybills and custom duties within national economies (Obiri and Damnyag, 2011).

Research by the CIFOR Poverty Environment Network (PEN) found that income from forest activities makes up about one fifth of total household income for rural households living in or near forests (Manfre and Rubin (2012). In a survey of forest districts in Ghana, Obiri and Damnyag state that the magnitude of employment income or earnings by individuals engaged in the chainsaw lumber production process ranged from less than GH¢5,000 to GH¢50,000 in time periods from 2004 to 2008. Such incomes may contribute substantively to the economic development of a nation as well as improve the standard of living of individuals and households.

To reiterate the issue of employment, a case is argued of Ghana where chainsaw operation apart from offering livelihood opportunities to large number of rural dwellers also provides jobs for about 130,000 Ghanaians (Tropenbos International Ghana, 2010).

Also, the exploitation of forests could improve the social asset base of dependent communities. It is realized that often because forests are located in remote areas where investments by national governments are low, the people lack certain basic amenities and mostly characterized by poor development (Secretariat of Convention on Biological Diversity, 2009). However, through the exploitation and trade of forest resources, the social rapport established through partnership has formed the basis for development of social amenities such as good roads, schools, electricity and good water supply in forest fringe communities (Obiri and Damnyag, 2011).

With the adoption of the 3rd MDG on Gender equality and Empowerment of women there is a hard-won recognition that 'development if not engendered is endangered', as a result there is the incorporation of gender perspectives into all aspects of development theory and practice (UNDP, 2003, p.2). It is in the light of this, the research also discusses how the socio-economic accrued to individuals vary in a gender perspective. Integrating gender into forestry research has placed emphasis on the contribution of forestry activities to household income for men and women which has received varied opinions. This is necessary because changes in rules associated with access and use of forest resources will affect their livelihoods differently (Manfre and Rubin, 2012, p.xiv).

The World Bank *et al* (2009) for instance indicate women in forest communities to derive 50% of their income from forests, while men derive only a third (cited in Manfre and Rubin, 2012, p.xiv). Though this perspective points to women benefiting substantively in terms of income than their men counterparts, there are no reasons offered to explain the “why and how” of such difference. The contrast is established in the research findings by CIFOR that men contribute more to household income than women because their forest activities are income generating whereas women are more involved in subsistence activities (Manfre and Rubin, 2012, p.xiv).

The situation in Ghana directly reflects with the findings by CIFOR because, it is stated that the nominal incomes earned by male in rural forested areas are higher than their female counterparts (Ghana Statistical Service, 2008). This is not far-fetched from the opinion held within the municipality that women are more prone to poverty than men

(Asante Akim Central Municipal Assembly, 2010). Though the latter opinion that women are more prone to poverty does not necessarily mean income, the Gender Development Index (GDI), one of the gender-related indices of the UNDP on human wellbeing acknowledges income as one of the gaps that needs to be considered in policy and research on gender (Bardhan and Klasen, 1999).

Based on the above analysis, it is therefore hypothesized that, “*there is difference in personal income generated by male and female forestry activities in the municipality*”. A bivariate analysis of the relation between gender and household income resulting directly from forest activities will be established at 0.05 level of significance⁶ or probability value⁷ ($P < 0.05$). The finding thereof will be used to either reject the null hypothesis⁸ or confirm the working or alternative hypothesis⁹.

It is hope that such a finding will contribute greatly to unravel the obstacles that have created this inequality and to find ways to redress the imbalances. According to Manfre and Rubin (2012, p.5), failure to capture the complexity of gender roles and social relations may result in failure to see opportunities for improved forest management and the possibilities of building greater equity.

2.5 Negative effects of Deforestation

The process of tropical deforestation may produce many negative effects of varied and mixed implications but conventionally the long-term dangerous environmental consequences such as global warming, biodiversity loss and soil degradation which are often identified (Mahapatra and Kant, 2003, p.2).

On the part of global warming, it is noted that deforestation and forest degradation in developing countries are held to account for about 18% to 20% of increased emission of greenhouse gases (GHGs) that are responsible for global warming and climate change

⁶ It also measures the level of risk that there is a relationship between two variables in the population, thus it provides the basis to reject the null hypothesis.

⁷The $p < 0.05$ means that if 100 samples are drawn, we are recognizing that as many as 5 chances might show relationship when there is none in the population

⁸ The null hypothesis is always concerned with establishing no relationship between the variables

⁹ The alternative or working hypothesis is always concerned with establishing relationship between the variables

(Owusu et al, 2011; TEEB, 2010, Insaadoo et al, 2012). There is an established relationship between deforestation and global warming because forests, notably tropical forests are major carbon sinks (Gorte and Sheikh, 2010). The loss of tropical forests in many countries means the collapse of major carbon sinks and generation of more carbon dioxide which is a serious threat to global climate and atmospheric temperature distribution.

Though the economic impacts of climate change are uncertain and difficult to quantify, these are evidently visible and are known to affect the poor and their occupations particularly agriculture in the developing countries, as the frequency and severity of drought increases (Chomitz, 1999). That is, the conversion of forests to grasslands increases surface temperatures above the treeless ground and this also increases the water-holding capacity of the warmer air. As wind moves the hotter, drier air, it tends to exert a drying effect on adjacent forest and agricultural lands. Trees and crops outside the denuded area experience heat and aridity stress which is not normal to their geographical locations (Getis et al, 2005). The increased evapo-transpiration contributes to increased dryness of the land, and this may lead to desertification (Waugh, 1995). This is true in Africa where the loss of forest and woodland cover (which is fairly about 650 million hectares or 21.8% of the total land area) has produced tremendous impact on the diverse yet fragile ecological conditions (FAO, 2003, p.6).

Deforestation also leads to biodiversity loss and it seems plausible that biodiversity loss endangers production systems though this is difficult to demonstrate especially for cross-ecosystem effects (Chomitz, 1999). Environmentalists argue that when trees are cut, the forest no longer supports the same wildlife or maintains clean water as effectively as it did before and this may place its inhabitants at risk (Knox and Marston, 1998). Bergman and Renwick (1999) provide a good example of how the spotted owl was endangered in the original-growth forests of Oregon and Washington when timber interests wanted to cut the habitat during the late 1980s.

Soil degradation particularly loss of soil fertility is a known effect of the loss of forests to grasslands. According to Gabler et al (2007, pp. 240), “the relationship between the soil

beneath the selva and the vegetation that soil support is so close that there exist a nearly perfect ecological balance between the two, threatened only by people's efforts to earn a living from the soil". It is realized forest vegetation and biodiversity have become indispensable in soil nutrients maintenance. This is because as the leaves, flowers and branches fall to the ground or as roots die, the numerous soil-dwelling animals and bacteria act on them, transforming the forest litter into organic matter, which is a reliable supply of soil fertility (Gabler et al, 2007).

Apart from the impact on soil nutrients, the close relationship between the soil and lifecycle of the vegetation could affect the soil carbon content. Though this may be critical, Gorte and Sheikh (2010) indicate the impact of deforestation on soils, and the release of soil carbon, depends on the magnitude of soil disturbance and the type of soil. Karkee (2004) also highlights soil erosion as one of the degrading processes likely to arise due to increased deforestation (cited in Beyene, 2011, p.14). Its impact cannot be underestimated because it is believed to affect approximately one-third of topsoil and soil nutrients needed to support crops and vegetation growth (Keller, 2005).

The close relationship between deforestation and poverty of rural households is an established policy narrative in the development discourse (TEEB, 2010; Zwane, 2002; Kerr et al, 2004; Pfaff et al, 2008). This is because increased deforestation means loss of livelihood assets and outcomes (loss incomes, employment, food, medicine, and energy) for most of the 500 million to 1.6 billion people in forest fringe communities who directly and indirectly depend on forest resources for their survival (Owusu et al, 2011; Mayers and Vermeulen, 2002). Since the survival of most households is dependent on these livelihoods it is likely to aggravate poverty which is often endemic in rural areas. An important emphasis is to understand how this increased poverty manifest within a gender perspective. While gender is often variedly defined, this study considered it as the socially determined roles female or male are expected to play in a society (Chakrabarti, 2005). This assessment is important because according to the district's poverty profiling, it is stated that women are more vulnerable to poverty than men (Asante Akim Central Municipal Assembly, 2010).

2.6 Sustainable Forest Management: understanding and criteria and indicators

Deforestation may be considered a “necessary evil” development process because of the numerous benefits albeit negative consequences. This is inferred from Rist (1997, p.13) definition of development as “a set of practices, sometimes appearing to conflict with one another, which require- for the reproduction of society- the general transformation and destruction of the natural environment and social relations”. Based on this description, it may be highlighted that sustainable use which is a central theme of the global call for sustainable development becomes very important. The Brundtland Commission report (Agenda 21), the blueprint on sustainability defines sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

It is identifiable that sustainability is very broad and covers all facets of the development processes and resources hence various subthemes have been developed based on the niche that is been considered. In relation to forest resources, the concept of sustainable forest management has become an established policy narrative with the general aim of ensuring that current usage of forest resources does not compromise future use. While this seems to be the common understanding, a broader analysis reveals that there is varied understanding of the concept.

The FAO (2010) states sustainable forest management as the management of forests for maximum social and economic benefits without compromising (and, ideally, even enhancing), over time, environmental values such as forest health, productive capacity, biodiversity, soil, water, and carbon sequestration. An important issue worth emphasizing is the recognition that the usage of forest resources should produce maximal socio-economic benefits without reducing environmental vitality of the forest environment. This emphasis broadens the focus of traditional forest management efforts which had often focused much on preservation either no or less interest in enhancing the socio-economic benefits of people depending on the forests.

This viewpoint is similarly shared by the Maine Council on Sustainable Forest Management (1996) cited in the USDA (2000, pp. 3) that forest management is the process that enhances and maintains the biological productivity and diversity of Maine's forests, thereby assuring economic and social opportunities for this and future generations. As observed in the latter definition, it is important to recognize the maximization of these socio-economic benefits from sustainable forest management is directly linked with effective biodiversity maintenance and productivity. This reiterates the viewpoint established earlier that sustainable forest management is achievable through enriched environmental vitality and resilience.

In a different understanding, sustainable forest management is also connoted with effective planning and stewardship of the processes and use of forest resources. This is expressed by Carle and Holmgren (2000) who define forest management as the process of planning and implementing practices for stewardship and use of the forest aimed at fulfilling relevant ecological, economic and social functions of the forest. In this definition sustainable forest management is seen as a planned process and fits well with Carle and Holmgren's explanation of plantation forests. Accordingly, it is explained that the establishment of plantation forests is helpful in managing the use of forests intensively for production, protection, conservation or socio-economic purposes.

The International Tropical Timber Organization (ITTO) defines sustainable forest management as the process of managing forest to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment. Because the desired products and services may varied across board, it is important to recognize the position and role of every stakeholder(s) in pursuing the specified objectives of management. Thus, sustainable forest management is a collaborative activity or process with known examples like community forestry (CF) practiced notably in Canada, and the collaborative forest management (CFM) being practiced in Ghana.

The most widely intergovernmental agreed definition of sustainable forest management was adopted by the General Assembly of the United Nations in 2007. Accordingly, sustainable forest management is defined as a dynamic and evolving concept aimed at maintaining and enhancing the economic, social and environmental value of all types of forests, for the benefit of present and future generations (cited in Secretariat of the Convention on Biological Diversity, 2009, p.8). According to the CBD (2009), this definition emphasizes seven elements that should be considered in sustainable forest management and they include; the extent of forest resources; forest biological diversity; forest health and vitality; productive functions of forest resources; protective functions of forest resources; socio-economic functions of forests; and legal, policy and institutional framework.

It is imperative to state from the above discussion that the processes of forest management are not static but may change over time and must be acknowledged as such. The change might involve the emergence of entirely new ideas or modified perspectives of the practices already in existence. Also, the seven elements as highlighted in the definition adopted by the UN comprehensively capture the key considerations in the different definition indicated here. Hence it is possible to conclude these elements can be regarded as the criteria and indicators of sustainable forest management. It is recognized internationally that the initiatives for sustainable forest management are established in two fold namely criteria and indicators as the first category and certification as the second (International Institute for Sustainable Development, IISD, 1996). But for this study, the focus is on the criteria and indicators (C&I) because these are more generic and widely used initiatives for sustainable forest management.

Stork *et al* (1997) define criteria and indicators as tools which can be used to collect and organize information in a manner that is useful in conceptualizing, evaluating and implementing sustainable forest management. The importance of this viewpoint is that, criteria and indicators (C&I) help to harmonize information effectively through collaborative processes and engagement, thus, stakeholder analysis becomes an indispensable part of sustainable forest management and must be acknowledged as such. C&I can be used at the global, regional (and eco-regional), national and local levels, but

for their application to be effective and gain acceptance, they should be easy to understand and simple to apply. They must provide information to forest managers and policy makers that is relevant, scientifically sound and cost-effective (Stork *et al*, 1997, p.2).

Globally, there are about five known initiatives on C&I, and these include Amazonian process, Montreal process, International Tropical Timber Organization (ITTO), Helsinki process and Center for International Forestry Research (CIFOR). The first four are formal intergovernmental discussions and agreements, while last one is more of an international comparison. But it is certain that each initiative has arrived at a set of suggested C&I for measuring sustainable forest management (IISD, 1996).

The adoption and implementation of C & I has enhanced information building for sustainable forest management, yet there are others who have thought otherwise. For instance, many observers argue that much of the debate on C&I is driven by economic considerations such as trade (IISD, 1996). This is probably because logging for many years became the known threat to sustainable management of forest resources especially in tropical regions. As this may be true, trade is just one reason for the exploitation of forest resources, therefore it is necessary to embrace a broad analysis of the factors involved.

Another reason against the use of C&I is concern with the issue that, there is nothing like consumer demand for sustainably managed forest product to ensure the commercial and political atmosphere. In certain countries, C&I and certification may be viewed as irrelevant especially at national level because they are nothing more than chips to bargain with at international negotiations (IISD, 1996).

2.6.1 Strategies of Sustainable Forest Management

The strategies of sustainable forest management are as varied as the understanding of the concept. Haggett (2001) argues there are two main ecological principles needed to ensure modern sustainable forest management. The first is sustained-yield forestry which involves the continuous production of forest products from an area at some appropriate

yield level. This is achieved through planned rotational systems, careful species selection, and protection of the timber crop from both fire and diseases.

The second ecological principle followed in managing forests as a renewable resource is that of multiple-use forestry. With this, a forest's yield must be measured in more than wood products and the objective is to maximize the total flow. That is, timber production may have to be balanced against the role of forest as a protection against erosion and pollution, as a wilderness or wildlife refuge, or as a recreational area. It is identified that these ecological principles encourages maintenance and maximization of already existing forests (particularly tree cover) without necessarily engaging in tree planting. Apart from the fact that, these processes preserve the current category of biodiversity in the forest, they may be effective in minimizing the monetary costs associated with tree planting. It is stated that tree planting is viewed as a relatively long-term activity especially from the perspective of the rural poor (Oksanen et al, 2003). This is because most of the rural poor are often in seeking and developing economic incentives to bridge the gap in the form of compensation for environmental benefits or advance payments for future sales of products.

It is possible to suggest that, due to the challenges associated with strategies of sustainable forest management which involve tree planting as discussed earlier, the two ways argued by De-Miranda et al (2010) are probably more appropriate for the local settings. The first is the concept of Community Based Wood fuel Production and this seeks to transfer the management responsibilities formerly administered by a country's national or state-level forest service to local authorities. It is stated that depending on geography and demographics, the composition can be several villages or a single village located in proximity to productive forests. What happens is that, the communities or village(s) will then sign a contract with the forest services division and this clearly defines the rights and obligations and effectively restricting free access by outside loggers and traders. Once this is done, the community must organize a management committee as their representative body, and must apply sustainable management techniques to forest resources.

The second method is through the Forest Replacement Association (FRA) which is a mechanism by which small, medium-sized and other wood-consuming businesses collaborate to create a reforestation program. Participants are bound by national, state or local regulation to replace through reforestation, or other sustainable practice, the wood that they consume (De-Miranda et al, 2010). It is realized these methods are welcoming and effective since the residents of a forested area have the shared responsibility of maintaining the forest resources for their cooperate benefit, and this can help eliminate tenurial conflicts in forest land-use common in developing countries and a good example is Ghana. While it is recognized that forest ownership in Ghana should be dual (legal estate in the government and the beneficial estate in the local communities), in practice, it is solely handed by one side. This is because the Forest Ordinance No. 13 of 1927 (Cape 157) along with subsequent enactments in the Forestry sector have operated to expropriate all forest lands from the communities (both the legal estate and management powers) to the government (Kasanga, 2002) and this has often created conflicts regarding the sharing of forests benefits as well as issues relating to ownership and management.

It is evidenced from the above analysis that generally the strategies of sustainable forest management emphasize three broad ways of management and these include those concerned with maintaining and enhancing the vitality of available forests (protective functions); those concerned with regeneration of new forests (productive functions) and lastly those concerned with the legal and institutional framework processes of forest management. But it is important to note that there is no clear cut distinction between these because they merge into one another.

2.6.2 Sustainable forest management in the Ghanaian context

Ghana as a country is committed to ensuring environmental sustainability and for that matter forest management. The country has signed and ratified international agreements on sustainable forest management such as the International Tropical Timber Organization (ITTO) and Reduced Emissions from Deforestation and Degradation plus (REDD+) and the Voluntary Partnership Agreement (VPA).

There are also formidable formal and informal institutions of forest governance. The major institutional strengthening was the creation of the Forestry Commission of Ghana, which is officially vested with the mandate of forest governance and sustainable management of the country's forests and wildlife resources. The Commission embodies other public bodies and agencies like the Forest Services Division, Wildlife Division, Timber Industry Development Division, Wood Industries Training Centre and the Resource Management Support Centre. These bodies and agencies are decentralized across the country to help in achieving its mandate. The availability of these institutions is a first step in sustainable forest management because, such public bodies are essential in forging synergistic efforts between state and civil societies in the country (Evans, 1996).

Over the years, some key national strategies have been implemented to ensure management of environmental resources including forests. Some of the renowned ones include the Environmental Action Plan (1990-2000), the Forestry and Wildlife Policy and the Forestry Development Master Plan (1996-2000), the National Land Policy, the Land Administration Project and many more (Gadzekpo and Waldman, 2005). While these strategies have probably been effective in ensuring sustainable management of country's forests, it is worth indicating that these plans and policies have lost their relevance over time as noted earlier.

As a result of that, the current focus of forest management in the country is geared towards reforestation. This strategy was first embarked on by the Ghanaian government as part of the new Forest and Wildlife Policy of 1994 and this led to the creation of a Forest Development Master Plan launched in 1996 (FDMP 1996–2020). The plan had the aim of promoting private plantation development, with a target of 10,000 ha/year for 20 years (Insaidoo et al, 2012). The programme faced initial challenges due to various inadequacies hence it was re-launched in September, 2001 to operate under three main strategies and five components (Forestry Commission, 2008).

The first and more recognized reforestation strategy is the Modified Taungya System (MTS) which involves the establishment of plantations by the Forest Services Division

(FSD) in partnership with farmers. It is stated that the FSD provides technical direction, surveys and demarcates degraded forest reserve lands and supplies pegs and seedlings while the farmers provide all the labour inputs in the form of site clearing, pegging, planting, maintenance and fire protection (Forestry Commission, FC, 2008, p.3). The MTS can be argued to be a modified form of agro-forestry, which is a renowned way of promoting sustainable forest management. The difference probably lies in the shared responsibilities and right to ownership of crops and forest resources generated.

The FC (2008) argues that under the MTS, the farmers, in addition to the food crops they harvest, have a 40% share in the returns from the investment in the trees. The Government also has a 40% share while the landowner and community will have a 15% and 5% share respectively (p.3). The strategy is however in two categories based on the mode of sponsorship. These include, the National MTS – implemented and coordinated by the Forest Services Division – and the MTS under the Community Forest Management Project (CFMP) (Insaideo et al, 2012).

The second strategy utilizes hired labour and contract supervisors to establish industrial plantations. Plantation workers are hired and paid a monthly allowance to establish and maintain plantations while plantation supervisors are given one year renewable contract employment to supervise and offer technical direction. The Plantations Department (PD) exercises general oversight and monitors field activities to ensure compliance with quality standards for plantation establishment (FC, 2008, p.3). The third and last strategy involves the release of degraded forest reserve lands by the FC to private entities after vetting and endorsing their reforestation and business plans. The operations of these private developers are then monitored through periodic field visits by the PD to ensure compliance with the approved reforestation plans. The private investor earns 90% of the total proceeds from the plantation while the FC, Landowner and community earn 2%, 6% and 2% respectively (Forestry Commission, 2008, p.3).

Although these various reforestation strategies have contributed to the substantive regeneration of degraded forest areas across the country, it is however difficult to attain an approximate measure of forest covers. This is due to certain critical concerns and one

of great concern is the emerging financial challenge associated with effective implementation of the Modified Taungya System (MTS) programme. It is argued that in 2008, out of the total GH¢846,485.21 released to the Plantation Department to engage in tree planting, GH¢391,667.23 of this amount was used to pay for out-standing cost for seedlings supplied in 2007. Yet still the Department owed some communities for pegs and seeds supplied in 2007 (Forestry Commission, 2008).

The creation of forest reserves by the Forestry Commission across the country is a major strategy in achieving sustainable forest management in Ghana. Though there is continual encroachment on forest reserves, the rate and extent of deforestation is quite minimal as compared with deforestation resulting from off-reserve areas. The forest certification programme is also a key strategy to control deforestation resulting especially from timber production in the country. According to the Forestry Commission (2005) this concept dates back to 1996, however it only gained a more formal and legislative approval in 2002 (cited in Domson and Vlosky, 2007, p.6).

In its new development, the legislature approved some policy reforms which are believed to be effective in ensuring sustainable forest management and suggested the following: increase in off-reserve annual allowable cut; competitive bidding for timber rights; reconciling policy reform with forest legislation; increase stumpage fees for timber; and rationalization of timber industry taxation and other forest fiscal/incentive regimes (Domson and Vlosky, 2007). Objective pursuance of these directives will reduce more drastically the loss of tree cover resulting from timber production and this can position the country's efforts to achieve sustainable forest management in a new dimension.

The vitality of these strategies to national and local levels sustainable forest management cannot be downplayed but that will depend on how effective these are implemented and enforced by the appropriate authorities in these operational areas. This problem is partly due to the insufficient capacity and incentives for staff under the institutions of forest management (Domson and Vlosky, 2007). As discussed earlier, most forests are located in remote areas worldwide and for that matter in Ghana and these communities are often perceived to be unattractive by some forestry workers. As a result, they may refuse

postage to such places and even in case they do, such personnel often neglect responsibilities and this can affect their role in forest governance. It is in this light that the role of indigenous and traditional leaders and people are encouraged in forest management. In Ghana the most renowned traditional strategy has been the creation of sacred groves. Though the purpose of their creation is spiritually oriented, it is undeniable that these groves have partly facilitated the management of forest resources within such vicinities. Because of the spiritual connotation of such forest types, as the abode of the god of an area, encroachment is probably non-existent except in rare cases, where the local leaders (Tindanas and Chiefs) can authorize some extraction of some of the trees in the forests.

2.7 Theoretical framework

Figure 2.1 is a theoretical framework adopted from the literature review. The core aim is to serve as a guide to help the research outline and methodology employed in achieving the study objectives.

From the reviewed literature, deforestation is a known development challenge. It is proposed that people have an understanding of forest types and that deforestation influence the local perception of the rate and extent of deforestation and its causes (Adams, 2009). As identified, the known causes of deforestation are categorized into anthropogenic and natural factors. The anthropogenic factors according to Mahapatra and Kant (2003) are believed to originate from six sectors and these include forest (e.g. extent of forest area), demographic (e.g. population growth), macroeconomic (e.g. economic growth and debt service growth), agriculture (e.g. agricultural growth), infrastructure (e.g. development of road) and political (e.g. level of democracy). The natural factors are derived mostly from the influence of natural forest fires and drought (FAO, 2010). Through these theories, it will be possible to determine how people's understanding connects with the perceived causes of deforestation and how this is reflected in the strategies for sustainable forest management.

To measure the impact of economic growth Lumely (1997) argues how low levels of income and a lack of access to capital force people to be risk averse and adopt a high

discount rate in utilizing natural resources such as forests that leads to deforestation (cited in Mahapatra and Kant, 2003, p.6). That is how growth in population over the years has created economic incentives to expand agriculture into forest areas leading to deforestation. Measurement of the size of forest will involve Landsat satellite image interpretation of forest cover changes. The impact of agricultural growth will be measured by identifying the sources of agricultural expansion (commercial agriculture, shifting cultivation) and impact of cattle ranching.

The impact of deforestation is analyzed two-fold namely the socio-economic benefits and negative effects. Per the literature reviewed, the socio-economic benefits of deforestation include it serving as a source of livelihood, income and employment for people. In the context of Dwease and Praso livelihoods will be measured by identifying how forest resources have contributed towards households' food supply, energy supply (wood fuel), and the provision of materials for shelter and local craft. Income dimension of these benefits is established by identifying the amount of personal income and royalties paid to the traditional leadership through the exploitation of both timber and non-timber forest products in the communities. For employment benefit is determined by establishing the major forest activities that are practiced in the communities. Manfre and Rubin (2012) point out that integrating gender into forestry research has often focused on income accrued from forestry activities by both males and female. This strategy is used to unravel how the socio-economic benefits vary in a gender perspective in the two communities.

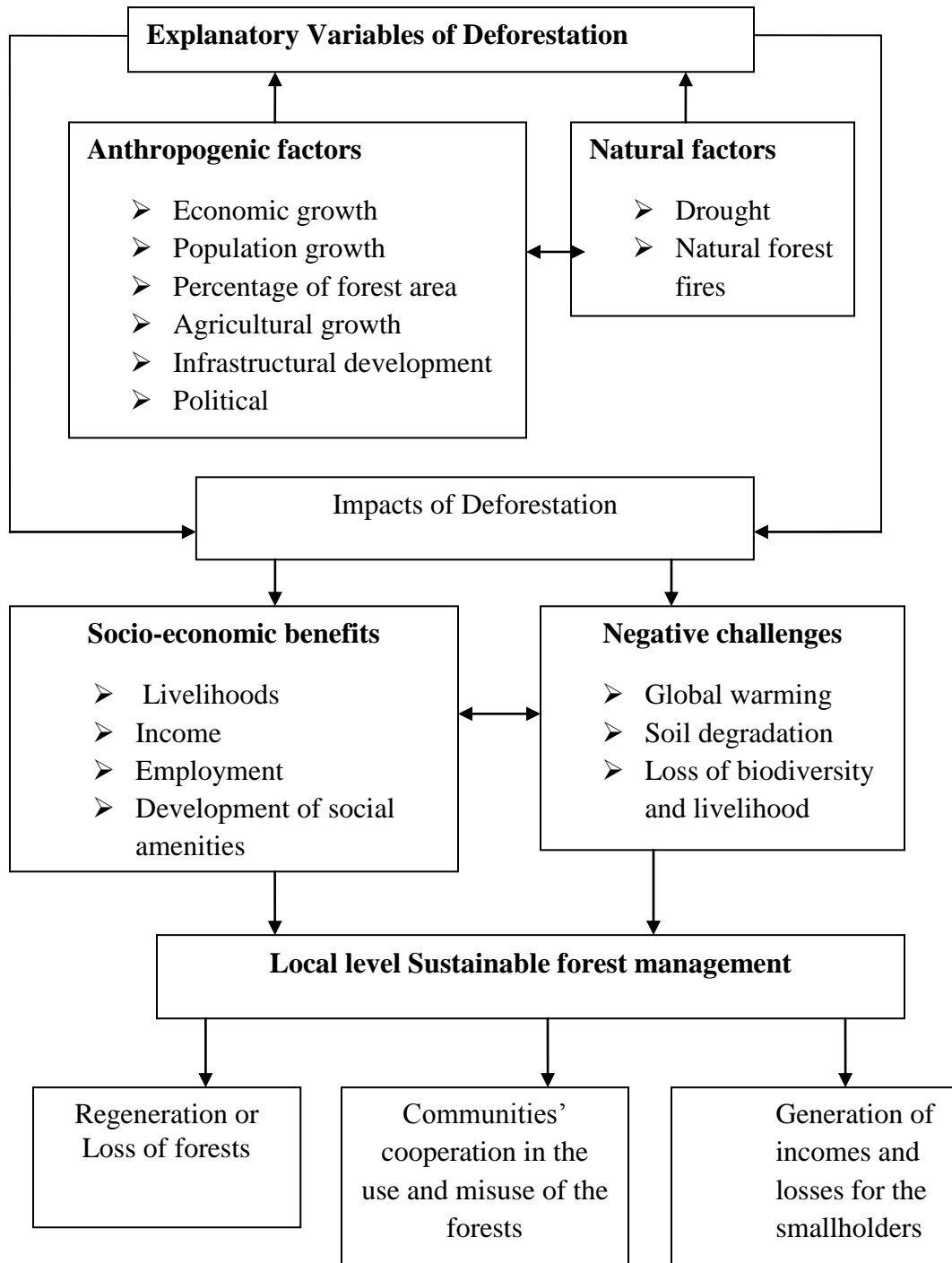
The negative effects of deforestation as discussed include global warming, soil degradation, loss of biodiversity and increased poverty. The frequency and severity of drought and rainfall will be used to determine the effect of global warming. This will be derived from agriculturalists in the two communities because Chomitz (1999) notes agriculture to be a major livelihood that is intensively affected by global warming. For the effect on soil degradation, official statistics on the annual crop yields of the major food and cash crops in the municipality will be analyzed. In addition total supply of chemical fertilizers made to farmers yearly will also be analyzed to measure the effect of

deforestation on soil degradation. This will complement the local perception on the level of soil erosion evident in the communities.

Loss of biodiversity is in two-fold. First the researcher will assess the loss of major timber species like Wawa, Ofram, Sapele, Sanfina, Okyere (Kofo), Onyina, Kyenkyen, Otie and Yaya, which are prevalent in these communities. Second, the ease with which one can access foodstuffs (delicacies such as snails and mushroom) and other raw materials obtained from the forest for industrial and domestic use by local people will also help indicate the loss of other forests biodiversity. In a gender perspective, the impacts are discussed to reveal how deforestation has affected the major livelihood activities of males and females and this is related more specifically to agriculture.

The literature also indicated that, because deforestation is a “necessary evil”, the way forward is sustainable forest management. The researcher will therefore identify the known and suggested strategies of sustainable forest management adopted by the Forestry Services Division, traditional leaders and the local people (on individual basis). The focus is to investigate empirically how these have led to forest regeneration (both natural and planted forest growth), community cooperation and activities related to forest management and benefits and costs related to use and harvesting and sales of forest products that can sustain local people’s livelihoods.

Figure 2.1 Theoretical Framework



Source: Author's construct (Adopted from reviewed literature)

2. 8 Summary of Literature Review

The scientific literature reviewed indicates that discussions on the causes of and impacts from deforestation are much prevalent in scientific research and policy. It has highlighted that the known causes of deforestation and categorized these into human and natural factors. It is realized that deforestation is a known challenge to the broad theme sustainability, but in more specific terms, sustainable forest management. This is because deforestation produces a mixture of benefits and negative effects for the development of livelihoods for the poor as well support of trees and other forest resources. Though the analysis of the impact of deforestation (benefits and negative effects) is discussed broadly, it is narrowed to examine how such impacts vary in a gender perspective in the context of the studied communities. This is important for policy and research which focus on gender mainstreaming in deforestation and poverty. The theme of sustainable forest management has been discussed broadly to establish the understanding, criteria and indicators and more importantly the known strategies adopted in the Ghanaian context.

CHAPTER THREE: Research Methods

3.1 Introduction

This chapter presents the justification and essence of the choice of research methods adopted for the study. It is divided into eight sections with the first section discussing the epistemological and ontological arguments for the choice of research strategy. The second examines the cross-sectional design and this is followed by a discussion on the sources of data, in the third section. The fourth section examines the methods of data collection and the fifth is concerned with sampling technique and frame. The sixth looks at the methods of data analysis and presentation, the seventh, identifies the ethical considerations while the final section examines the challenges related to field survey.

3.2 Research Strategy: Epistemological and Ontological Arguments

The role of theory in social research is a major concern often raised in examining the choice of research methods adopted for a study. The relationship between theory and research is viewed from two perspectives, namely deductive theory and inductive theory. According to Bryman (2008), the key difference between these two is the claim of whether theory is something that occurs before or after the collection and analysis of some or all data associated with a project.

Accordingly, the deductive theory is where the researcher deduces a hypothesis from what is known in a particular domain and subjects that hypothesis to empirical scrutiny, and is often associated with quantitative research. The inductive stance on the other hand sees theory as the outcome of research. That is, the process of induction involves drawing generalized inference out of observations, and this is associated with qualitative research (Bryman, 2008).

Theory is essential in research because it provides a backcloth and rationale for the research that is being conducted. It also serves as a framework within which social phenomena can be understood and the research finding can be interpreted (Bryman, 2008). Based on this, the role of theory has therefore become indispensable, it is acting as

the basis the subjection of the research objectives and hypothesis to empirical enquiry in the two communities with the aim that these theories would be confirmed, rejected or modified to recreated different theories. While the role of theory cannot be overemphasized it is realized much of the concern is placed on the key elements and assumptions upon which all theories rest. According Bond (2006) the most important of these assumptions relate with the “ology” words of which ontology, epistemology and methodology are described as being the most dreaded.

Epistemology is concerned with the question of what is (or should be) regarded as acceptable knowledge in a discipline (Bond, 2006). The major concern is to argue as to whether the social world can and should be studied according to the same principles, procedures and ethos as the natural sciences. Based on this, two schools of thought have emerged; positivism and interpretivism. The positivist epistemology claims the need to study social reality along the same principles and applications of the natural sciences whereas the interpretivist epistemology disagrees with this viewpoint and argues that study of the social world requires different logic of research procedure, one that reflects the distinctiveness of human as against the natural order (Bryman, 2008).

The essence of the different epistemological views is to help define the type of research strategy a particular research should follow or adapt. Interpretivists argue positivism is associated with quantitative research strategy hence it cannot be used to study the social world since human behavior cannot easily be reduced to numerical figures (Bond, 2006). Well the value of this stand is questioned with the increased use of mixed research methods, which support both quantitative and qualitative methods for social research. As a result it is often difficult for one epistemology claim to be better than the other. Einstein therefore enjoins researchers to be epistemologically opportunistic, that is adopting the basis of knowledge claims that suits the objects under study (Bond, 2006). That is the need for the researcher to highlight as to whether the research interest is to offer an “explanation of human behavior”, which relates with positivist approach or to offer an “understanding of human behavior”, pursued by the interpretivist approach (Bryman, 2008).

Ontology on the other hand, at a more general level is defined as a set of assumptions and theories that explore “what the world is like” (Gomez and Jones, 2010). This viewpoint is similarly shared by Bryman (2008), who argue ontology as being concerned with the nature of social entities. The understanding of ontology as explained by Gomez and Jones (2010) and Bryman (2008) is pretty simplified but Bond (2006) takes the discussion further espousing the different levels to a theory’s ontology namely the explicit and implicit dimensions. The former is explained to be concerned with the expression of concepts; which are defined as ideas often used in research which maybe expressed in symbols or words. The emphasis here is that, concepts are in every day usage hence, when applied in research, they should be rigorously defined and have very clear meanings (Bond, 2006, p.21).

According to Bond, the implicit level of ontology discusses whether reality or object of inquiry should exist independent of theories about them. It is realized much of the understanding and writings on ontology are predicated on the implicit level and a typical example is the definition of ontology by Bond (2006) as “the science of existence”. Using the understanding of ontology different writers on research methods, have delineated a theory’s ontology into two categories. Examples include categorization into Monism and dualism (Gomez and Jones, 2010) and objectivism and constructionism (Bryman, 2008). But for the sake of this discussion, the distinction by Bryman (2008) is adopted because explanation of concepts is simplified and can easily be grasped.

According to Bryman (2008), objectivism is an ontological position that implies that social phenomena confront us as external facts and are beyond our reach or influence. As he explains further, social phenomena and their meanings have an existence independent of the social actors hence the categories used in every day discourse also have an existence independent or separate from actors (p.19). Thus, from an objectivist’s ontology, social reality is pre-given hence should be approached objectively and definitively. This view has been refuted by constructionism ontology which asserts that social phenomena and their meaning are continually being accomplished by social actors. As Bryman indicates, the constructionists are not only concerned with how knowledge is produced through social interaction, but emphasis is placed on the constant state of

revision and the fact that, the researcher can present his own specific version of social reality.

As stated earlier in relation to epistemology of a theory, it is also difficult for a particular ontological view to claim superiority over another. What is important is for the researcher to indicate how he/she wants to approach the existence of social entities. That is by either identifying social phenomena as objective and definitive in nature, in which case the objectivists' ontology becomes prominent or to look at social phenomena as being socially constructed and continually being revised, hence leading with constructionists' ontology.

Before choosing the epistemological and ontological claims for this study, it is important to indicate that the emphasis of these in social research is to lay the precedence for the research methodology (research strategy and research methods) (Bond, 2006). While acknowledging the different epistemological and ontological grounds for quantitative and qualitative research strategies, this current research does not identify uniquely a single research strategy. Epistemologically, the study identified with positivism which is linked with quantitative research strategy while ontologically it is constructionist in nature, which is also associated with qualitative research strategy. It is therefore evidenced that, a single research strategy could not be adopted, because the research cross-cut different boundaries, hence a mixed research strategy is appropriate.

Bryman explains that, technically mixed research methods (strategy) can be used in social research because of "the need to give greater prominence to the strengths of data collection and data analysis techniques with which quantitative and qualitative research are each associated with and to see how these are capable of being fused" (Bryman, 2008, p.606). This is also feasible considering that, there is no hard-and-fast rule about such distinctions because studies may have broad characteristics of one strategy and yet possess characteristics of the other (Bryman, 2008, p.23).

3.3 Research design

A research design can be understood as the framework in which data is collected and analyzed (Bryman, 2008, p.31). The cross-sectional design was selected for this study because of its suitability. A critical look at the research questions indicates that a pattern of association between and among the key variables which were sought and the cross-sectional design is a good choice in that regard. As stated by Bryman, “the cross-sectional design entails the collection of data on more than one case and at a single point in time in order to collect a body of quantitative or quantifiable data in connection to two or more variables which are examined to detect a pattern of association” (2008, p.44).

It was also appropriate because the study sought to examine the two communities Dwease and Praaso as distinct cases at the same time. This was necessary to establish their unique pattern of association on the research questions. The cross-sectional design was also a good choice because it supported the mixed research strategy adopted for the study. In addition, the data collection techniques, questionnaires, interviewing, structured observation and official statistics used for field survey are more generic tools of data collection associated with cross-sectional design (Bryman, 2008, p.44).

3.4 Sources of data

Both primary and secondary data sources were used for this study. The primary data resulted from two sources namely satellite image interpretation of Landsat TM 2002 and TM 2004 of the Asante Akim Central Municipality and a two month field survey in the two communities. The secondary data resulted mainly from previewed articles, books, magazines and other sources with relevance to the study. There was also review of official statistics of the Forestry Service Division office at Juaso and the Municipal Agricultural Development Unit (MADU) at Konongo to obtain data on deforestation, crop yields, rainfall patterns and supply of fertilizers.

3.5 Methods of Data Collection

3.5.1 Landsat Image Interpretation

According to Francklin (1991) and Bobbe et al (2001), Landsat satellite image provides different options for land cover monitoring, and the spatial resolution is well suited to detecting changes between major classes of land cover (cited in Wardell, 2002, p.179). Based on this, Landsat TM images 2002 and 2004 of the Asante Akim Central Municipality were acquired and processed with the ERDAS image software version 10.1. Because it was difficult to obtain ground point coordinates of the study area, the study employed unsupervised classification method to delineate the images into three classes to analyze the extent of forest cover and loss in the respective years.

3.5.2 Field Survey

Semi-structured Interviewing

Semi-structured interviewing was used for the key informants (traditional rulers, assembly and the Forest Service Division). Different interview guides were used for the various informants but the content basically covered demands of the research questions. Though respondents were given exactly the same context of questioning (both closed and opened ended questions inclusive) so that the replies could be aggregated, semi-structured interviews by nature are mostly flexible and this gave the interviewees a great deal of leeway in how to reply (Bryman, 2008, 438). It also offered the interviewer the opportunity to probe further and to clarify issues of relevance to the study.

Self-administered Questionnaire

The research also used self-administered questionnaire to solicit the individual views of heads of households regarding the research questions. A questionnaire is a research instrument mostly used for social survey design and involves a battery of usually closed ended questions completed by respondents themselves (Bryman, 2008, p.216). Respondents had equal range of questions to answer under the supervision of the researcher.

This was because the questions needed to be interpreted to respondents (because of inability to effectively read and/or write) and the replies aggregated by the research hence a more generic name of the “self-administered questionnaire” is referred to as “self-completion questionnaire” (Bryman, 2008, p.217). Through this, the various responses could be compared and contrast to establish a pattern of thoughts.

Participant Observation

Participant observation or ethnography was another important data collection technique used to generate qualitative data. Through this technique first-hand information was obtained in relation to the various aspects of the research questions. Assuming my role as “observer-as-participant” (Bryman, 2008, p.402), I was immersed in groups in the communities over the extended period of two months, observed behaviour, listened to what is said in conversations and asked questions. This was not only limited to social observation, but also bio-physical changes on the lands and in the forests (especially the Dome River Forest Reserve).

3.5.3 Text and Document Review

Text and document review of secondary data sources such as official statistics, journals, pre-viewed articles, books, magazine and other relevant sources were examined to provide information for the literature review and background to the study area.

3.6 Sampling Frame and Technique

Both the stratified random and purposive sampling techniques were used because of the mixed research strategy adopted. The stratified random sampling was used to guide the selection of appropriate sample to ensure that, generalization of sample findings are representative of the population which is a key characteristic of all probability sampling techniques (Bryman, 2008, p.171). This technique was used to select household heads for the questionnaire administration. The stratification was based on gender (male and female strata), and respondents were then randomly sampled from these strata depending who expressed interest of being involved in the research. The other technique adopted was purposive sampling which Bryman (2008) argues is used to selected subjects based on

their relationship with the research questions. This technique was used to identify key informants like Forestry Service Division, traditional rulers and assembly man to conduct the interviews.

The sampling frame consisted of two staff from the Forest Service Division (Assistant manager and a forest guard based in Dwease), Chief of Dwease and the Assembly man for Praaso. In addition, a total of One Hundred and Ten (110) households respondents were sampled and this consist of Sixty (60) from Dwease and Fifty (50) from Praaso. The choice of these communities was influenced by the evidence of some of the explanatory variables of deforestation as espoused by Mahapatra and Kant (2003) and the fact that their livelihoods are directly and indirectly dependent on forest resources.

3.7 Data Analysis and Presentation

The quantifiable data was analyzed statistically using basic techniques for descriptive and inferential statistics. This was through the aid of the SPSS computer software which has become effective in that regard (Bryman, 2008, p.314). The raw data was first coded, and this entailed categorizing the variables into the appropriate types namely interval/ratio, ordinal, nominal and dichotomous variables (Bryman, 2008, p.321). The categorization of the variables helped to determine the appropriate quantitative data analysis technique which should be used where necessary.

The univariate data was analyzed using frequency tables, diagrams (pie and bar charts) and measures of central tendency (Bryman, 2008). For the bivariate analysis which involved establishing relationship(s) between two or more variables, the contingency tables, chi-square, spearman's rho, and phi which are renowned in that regard were employed (Bryman, 2008, pp.326-330). The results were subsequently discussed in line with the literature review, theoretical framework and the background to the study. This was important to affirm and refute the theories raised and the possibility of generating new theories.

The qualitative data is analyzed thematically, where key themes identified in the interviews and participation observations and these were outlined through indexing or

coding the data and reflecting and interpreting the data (Bryman, 2008). There are various ways of conducting qualitative data analysis, and Bryman (2008, p. 539) identifies two of such ways namely “analytic induction” and “grounded theory”. In this study, the grounded theory was employed. Bryman explains that the grounded theory is concerned with the development of theory out of data and is an approach that involves iterative or recursive processes (2008, p.541). The grounded theory is selected for this study because its tools of analysis allowed effective coding of the transcript data or information and also allow for constant comparison between data and conceptualization (Bryman 2008, p.542)..

Though there are different ways of coding, this study employed the basic understanding of it as involving a movement from generating codes that stay close to the data to more selective and abstract ways of conceptualizing the phenomenon of interest (Bryman, 2008, p.543). Through that the researcher made meaning of the large volumes of data that was generated from the various instruments of data collection. That notwithstanding, a great limitation of using the coding approach to qualitative data analysis was that it jeopardized the transparency of the research findings (which is greatly emphasized in social research). This came about because the coding approach allows researchers to plunk chunks of text out of the context within which they appear hence the social setting can be lost (Bryman, 2008, p.553), especially in interviews administered. But because the coding was triangulated with findings from the closed ended questions in the household questionnaire, the use of coding as a tool for qualitative data analysis was worth considering.

3.8 Ethical Considerations

The basic understanding of ethics concerns acceptable and unacceptable standards of human behavior and their environment. In social research, ethical considerations may arise at various stages. This is probably because the object and field of study is the human and his environment. It is identified that discussions on ethical considerations have been variedly approached by the different researchers and writers of social research, but these have centered around certain issues which Dierner and Crandall (1978) classified into four areas namely, harm to participant; lack of informed consent; invasion of privacy; and

deception (cited in Bryman, 2008). Some of these areas are discussed in relation to the current research.

The first ethical issue may be discussed in relation to this study is harm to participants. According to the ethical guidelines of the Social Research Association, the content of social research should be under the code of ethics which help reduce or minimize disturbance to both participants themselves and the subjects' relationships with the environment (Bryman, 2008). In relation to this study, the harm to participants is defined in terms of additional stress to respondents. It was observed in the communities that most people had to go to their farms in the morning and return in the afternoon very much exhausted and tired and probably hungry, yet the questionnaire administration was carried out at these times. Though the choice of this timing sought to promote maximum participation from the population, it was inappropriate considering the mental and emotion states of the prospective participants. Though respondents had the ultimate decision to choose whether to be involved or not, most people could not refuse the researcher the opportunity to carry on with interviews since he was a stranger in the community and this was to their detriment.

That notwithstanding the researcher ensured that each participant that was engaged was in a good and relaxed posture to reduce the burden of being stressed. Apart, from the stress, emotional harm was also perceived and expressed by some respondents. Some of the questions asked brought back memories of loss and damages caused to their farms. For instance, a question like “what are the negative effects of deforestation evidenced in this community”, rekindle in the minds of some farmers the destruction caused to their farmland as a result of logging activities (both authorized and illegal), especially where no compensations were paid for the said damages. Though such regrets were expressed, none necessitated the need to discontinue any interview but in all cases, encouragement and counseling was offered to affected participants.

Another ethical issue is the lack of informed consent. This principle emphasizes the need to present prospective participants with absolute information that might be required for them to make informed decisions about their involvement in a given research (2008,

p.121). Though the essence of the research was explained to each participant before engaging them either in an interview or questionnaire administration, they did not have detailed knowledge about the outline of questions- the way the questions were to be asked and how. This was done in order not influence the perception of respondents since this can introduce a bias, thus jeopardizing the reliability of the research findings.

Also, the choice of some research tools for data collection was against the ethical principle of informed consent. For instance, observations in general go against the principle of informed consent, especially in covert observation (Bryman, 2008), even though this technique unequivocally contribute substantively to the research findings discussed in this work. Though respondents did not know that their conversations and behaviour were closely monitored, the overt role of being an “observer-as-participant” adopted was a bit more relaxing than the covert role.

Still in relation to informed consent, there were minor transgressions in the timing for interviews. Respondents were not given prior notice about the amount of time to be spent in interview or administering a questionnaire, for fear that it might push some of them off from being interviewed. Another digression was that no informed consent form was issued to prospective participants to witness before engaging in the research. But because all the respondents were relatively mature, the researcher assumed that their verbal consent was valid enough to guarantee their consent to be involved in the study.

Directly related with the issue of informed consent is the ethical issue of invading the privacy of a respondent. According to Bryman (2008), this principle considers the extent to which invading the privacy of a respondent in the name of research could be condoned. In such rural settings, it is unethical to ask an older person of the age especially when you are younger than the person, yet this privacy was eluded because majority of the respondents were found to be older than the researcher. But since the questions on the age distribution were ranked, it reduced the risk of invading on the respondents’ privacy. Apart the age issue, respondents’ privacy was invaded as they were asked about their level of educational attainment. For those respondents who have no or low educational qualification felt humiliated because since some researchers have considered them as being unserious and ignorant.

Also, most respondents perceived a question like, “what is your average monthly income” as one invading their privacy, hence most people hesitated in given responses. This is because of the fear of taxation if their incomes are perceived as being high. But in all cases respondents were constantly reminded that the confidentiality of their information is ascertained through the use of anonymous codes as a means of identification not their names, though in the research report, they may be identified by what they said and which community they came from.

3.9 Field Challenges

A major challenge was language barrier because most of the people spoke the local dialect or language (Twi) of which I am not proficient in. Though interpreter was used in some cases, there were minor transgressions from what is said in the local language and what is translated into English. This is because some of the words could not be perfectly translated into English as expressed in the native language. Closely related with the issue of language is the culture difference between the researcher and natives, and possibly this affected how certain questions considered as being sensitive were asked. It also affected the flow of understanding in the ideas expressed in the interaction between the respondents and the translator or with the respondents.

Another limitation is regarding the interpretation of satellite images of the municipality. In the first place, it was more prominent that the changes in forest cover should be studied up to 2012 as the least year but there were difficulties of obtaining recently remotely sensed Landsat images of the study area. Though Landsat images of 1976 and 1986 of the area were also acquired, because of inconsistency in the demarcation of the landscape with the available images that were used (2002 and 2004), these had to be discarded. It was also difficult to obtain ground point coordinates (for geo-referencing) of the study because there was a need to travel long distance within a vast geography to obtain such information. This affected the mode of analysis because instead of supervised classification of data, (which is based on geo-referencing), unsupervised classification was rather carried since it does not require ground point coordinates.

Additionally, time became another crucial limitation. Because of the large volumes of data generated each day from interviews, especially for the opened ended questions, transcription was time consuming and burdensome.

CHAPTER FOUR: The Causes of and Impact from Deforestation on Local Level Sustainable Forest Management in Ghana

4.1 Introduction

This chapter presents the empirical findings implored in the field from the 110 household respondents from the two communities (60 respondents from Dwease and 50 respondents from Praaso) and 4 key informants (chief of Dwease, Assembly for Praaso, Assistant District Manager of Forestry Services Division, and a Forest guard based in Dwease). The findings are presented and discussed concurrently in the light of the scientific literature reviewed and theoretical framework as well as data on the background to study area. For proper organization, the discussion is organized in relation to the research questions but where necessary subheadings are employed.

Generally, the chapter is divided into five parts. These include the demographic characteristics of respondents; the extent of and local causes of deforestation; the socio-economic benefits in a gender perspective of deforestation; the negative effects in a gender perspective of deforestation; the strategies of sustainable forest management.

4.2 Demographic characteristics of Respondents

This first section analyses the demographic characteristics of the 110 household respondents in the two communities. The key considerations are the gender; age; marital status; level of education; livelihood occupations; and the length of stay in the community. This is essential to gives an overview of the category of people who were involved in the study.

4.2.1 Gender

The research findings on the gender of the respondent is of relevance in order to effectively achieve the aim of research questions 2 and 3 which include gender mainstreaming as a point of enquiry. A total of 56 respondents (50.9%) were male and

this comprises of 32 for Dwease and 24 for Praaso. The female respondents were 54 respondents (49.1%) consisting of 24 for Dwease and 26 for Praaso. Though respondents were randomly sampled, the highest responses came from the males and this is probably because their total population in the two communities (5353 people) is higher than their female counterparts estimated at (4955 people). That notwithstanding the specific distribution between the two communities varies narrowly. Dwease recorded 32 male respondents and 28 female respondents, which is reflective of the population for males and females in Dwease estimated at 2614 and 2546 respectively. The reverse happened in Praaso where there were more female respondents (26) than male (24), though the community population estimates for males (2739) is more than that for females (2409).

There is no special explanation for this variation but it can be linked with the choice of sampling technique which offered every person whether male or female, the equal chance of being selected. Thus, it may be inferred from this that, the viewpoints expressed by respondents on the various research questions especially question 2 and 3 are representative of their respective populations. Table 4.1 below is a cross-tabulation of the name of community and gender of respondents.

Table 4.2.1 Cross-tabulation of Name of Community and Gender of Respondents

| Name of community | Gender | | Total |
|-------------------|-----------|-----------|------------|
| | Male | Female | |
| Dwease | 32 | 28 | 60 |
| Praaso | 24 | 26 | 50 |
| Total | 56 | 54 | 110 |

Source: Author (Fieldwork, 2013)

4.2.2 Age Distribution

In table 4.2.2, it is indicated that the majority of the respondents are aged 50 years and above as stated by 47 respondents (42.7%), while the next higher response was indicated by 27 respondents (24.5%) and this refers to those within the age category of 42- 49 years. Those aged 26-33 years were identified by 17 respondents (15.5%), followed by those aged between 34-41 years which was stated by 15 respondents (13.6%) and then those aged between 18- 25 years indicated by 4 respondents (3.6%).

These findings for the age distribution of respondents indicate that a more precise minimum age for majority of the respondents is estimated at 26 years and this presumably implies that most of them were adults and may have matured and generated valuable experiences and information to share in relation the research questions. It must however be acknowledged that, there are a number of other factors which influence how relevant the age of a respondent may be juxtaposed with further analysis of the research findings.

Table 4.2.2 Age Distribution of Respondents

| Age category | Frequency | Percent |
|---------------------|------------------|----------------|
| 18-25 years | 4 | 3.6 |
| 26-33 years | 17 | 15.5 |
| 34-41 years | 15 | 13.6 |
| 42-49 years | 27 | 24.5 |
| 50 years and above | 47 | 42.7 |
| Total | 110 | 100.0 |

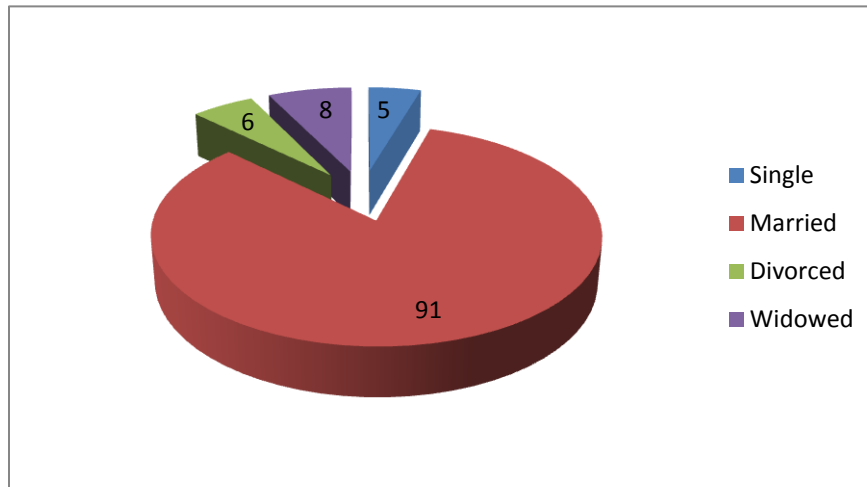
Source: Author (Fieldwork, 2013)

4.2.3 Marital status

Marital status of respondents was also considered since it helps to critically draw out the total number of dependents in a household and how inference can be drawn to examine extent of impact on household income and expenditure. A total of 91 respondents (82.7%) indicated being married, 8 respondents (7.3%) stated being widowed, 6 respondents (5.5%) have divorced and the remaining 5 respondents (4.5%) are single.

It is observed the number of household dependents varies according to the marital status of a respondent. Categorically for those are married, widowed and divorced the average household size is estimated as 6 people. The respondents who are single may be presumed to have less burden of dependents except taking responsibility for their parents who might still be alive and this averagely place their total number of dependents of such people at 2 persons. This is illustrated in figure 4.2.1;

Figure 4.2.1 Marital status of Respondents



Source: Author (Fieldwork, 2013)

4.2.4 Level of Education

The research findings point out that most of the respondents have had some level of formal education as may be inferred from table 4.2.3. For those with formal education, 76 respondents (69.1%) have attained basic level education and this comprises of primary, middle school and Junior high school leavers. A total of 5 respondents (4.5%) indicated having obtained secondary level education, defined here to include those have completed senior high school and other second cycle technical institutes. Another 3 respondents (2.7%) indicated to have attained tertiary education while the remaining 26 respondents (23.6%) stated they have not been to school.

It is realized that most people in the two communities have attempted to acquire some formal education but the majority stopped at either middle school or junior high school and this cuts across the various age category. While that is noted, it is important to state that, those who have had formal education are able to speak and write in English and the local Twi, though not fluently except those with tertiary education. This may be inferred that the literacy rate in the two communities is high. This is because the cumulative percentage of literates (ability to read and write in English and local language) is 76.4%, for the two communities and this far exceeds the literacy rate for the municipality estimated at 64%.

Table 4.2.3 Level of Education of Respondents

| Education | Frequency | Percent |
|------------------|------------------|----------------|
| No schooling | 26 | 23.6 |
| Basic level | 76 | 69.1 |
| Secondary level | 5 | 4.5 |
| Tertiary level | 3 | 2.7 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013)

4.2.5 Major Livelihood Occupations

As part of the research objectives, it was necessary to identify the major livelihood activities practiced in the communities. Based on the findings, the major livelihood activities can be categorized broadly into agricultural production; and other forms of livelihoods. A total of 92 respondents (83.6%) indicate agriculture as their major livelihood activity. The remaining 18 respondents (16.4%) specified other livelihoods activities and these include carpentry, masonry, seamstress, hair dressing, petty trading and teaching. For those engaged in agriculture, animal rearing is not much practiced as crop farming. In terms of crop farming, the majority of farmers cultivate both food and cash crops while some also cultivate only food crops especially those who do not have adequate arable land.

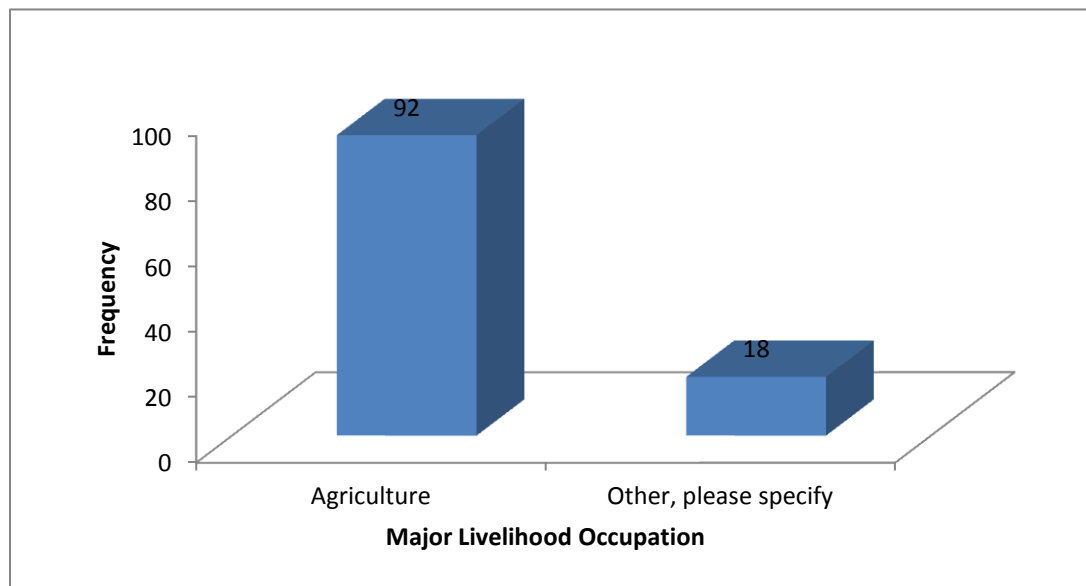
The crop farming is much preferred because the crops yields are reliable supply of farmers' household food requirements and also generates substantive income especially through the sale of cash crop, mostly cocoa and palm nuts. Based on the percentage comparison, it needs to be stated that the number of people involved in agriculture production in these two communities far exceeds the 53.9 % estimated for the municipality. This means agriculture is a viable for sustainable livelihoods development and income generation both for households and the community as a whole. This is confirmed by the following remarks made by a woman during an interview in Praaso;

“..... don't think the people in this community are poor, because they get much money from their farming activities. Some have been able to raise money to send members of

their family abroad (most of the people are based in Italy) to study and/or work.....” (Personal interview, 2013).

It is also observed of the total of 110 respondents sampled, 60 do not have alternative livelihood activities. Of the remaining 50 respondents, 10 respondents indicated agriculture as their alternative livelihood activity and this particularly relates mostly with those whose major livelihood activities were classified as others. Two (2) respondents indicated wood fuel production, 1 respondent stated hunting while the remaining 37 respondents specified different alternative livelihood activities. Figure 4.2.2 illustrates the responses on the major livelihood activities for household respondents.

Figure 4.2.2 Major livelihood occupations of Respondents



Source: Author (Fieldwork, 2013)

4.2.6 Duration of stay in community

The length of stay in a community was also assessed. The highest response of 89 respondents (80.9%) indicated to have stayed in the community for 16 years and above. The next high category of 9 respondents (8.2%) had stayed in the community between 11-15 years, while 8 respondents (7.3%) stated they had stayed between 6-10 years and

lastly 4 respondents (3.6%) had stayed between 1-5 years. These statistics on duration of stay in the community are illustrated in table 4.2.4 below.

Though the household respondents were sampled randomly without prior knowledge of their duration of stay in the respective communities, the findings reveal that every respondent involved in the study supposedly has stayed in the community for a minimum of one year hence was able to share some experiences and knowledge regarding various aspects of the research questions. The essence of this assessment to achieving the overall objective of the study cannot be underestimated because, deforestation is location specific.

Table 4.2.4 Duration of stay of Respondents in community

| Duration of stay in community | Frequency | Percent |
|--------------------------------------|------------------|----------------|
| 1-5years | 4 | 3.6 |
| 6-10years | 8 | 7.3 |
| 11-15years | 9 | 8.2 |
| 16years and above | 89 | 80.9 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013)

4.3. The Causes of Deforestation

The first research question sought to identify the causes of deforestation and how these are perceived by the local people and the key informants. The discussion here entails establishing an understanding of forest and forest types, defining the rate and extent of deforestation, and how these relate to the perceived causes of deforestation.

4.3.1 Understanding of Forest and Forest Types

The literature reviewed showed that forests in general are complex and contested spaces, and not fixed entities whose nature can be stated in an absolute way. A general observation is that the two communities Dwease and Praaso may be said to have forests because of their location and climatic characteristics. As described by Gabler et al (2007), a peculiar characteristic of forests in general is that they are found only in areas where the

annual moisture balance is positive-where moisture availability considerably exceeds potential evapo-transpiration in the growing season. These characteristics are true of the two communities.

Image 4.3.1: A picture of the forest area in Praaso



Source: Author (Fieldwork, 2013)

The concern was to establish how people perceive forests and the forest types, which Adams (2009) argues to be inextricably linked with how the diverse actors view or lay claim on these resources. The views expressed regarding the perception of forests varied but these have been categorized using the two criteria of crown cover threshold and land use which according to the UNEP are most often used to define and distinguish forest types. Table 4.3.1 indicates the various criteria used by the household respondents to explain their understanding of forests.

Table 4.3.1 criteria for defining forest and forest types

| Criteria | Frequency | Percent |
|---|------------------|----------------|
| Crown cover threshold only | 39 | 35.5 |
| Land use criterion only | 24 | 21.8 |
| Crown cover threshold and Land use criteria | 37 | 33.6 |
| Other, please specify | 10 | 9.1 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013)

It is identified that 39 respondents (35.5%) defined forest using the crown cover threshold criterion only. Based on this, a seemingly understanding of forest is expressed as “*a land with large and closed association of tree covering and interaction of other biodiversity*” (Personal interviews, 2013). Though the local people do not necessarily understand the technicalities of what constitute the crown cover threshold to distinguish between opened and closed forest types, their descriptions are congruent with Gabler et al (2007) who explain forests as associations of large, woody, perennial tree species, generally several times the height of a human, and with a more or less closed canopy of leaves overhead.

On a more technical perspective, height is a more preferred denominator used to explain forest based on the crown cover criteria. And according to the UNEP this is stated as 10% minimum threshold. At the local level, it is indicated the minimum threshold is measured as 5 meter and this is solicited in the following definition of forest by the Assistant Manager of the Forest Service Division (FSD):

“A forest is a piece of land earmarked and set aside by prescribed policy with the minimum height of the trees being 5 meters that involves a complex interaction of biodiversity, water bodies, and other physical land characteristics” (Personal interview, FSD, 16/02/2013).

Though the units of measurement; meters and percentage adopted by the FSD and UNEP respectively cannot directly be compared, what is important is that, there is a suitable denominator (height) to delineate forests from other terrestrial biomes and more specifically, other plant communities. Apart from the different units of measuring the threshold of the crown cover, there is also a difference on how to distinguish opened forest

types from closed forest types. According to the UNEP, closed forests refer to areas where the tree cover exceeds 40 per cent while open forests refer to areas where tree cover is between 10 and 40 per cent. The FSD on the other hand uses the conditional score criteria to distinguish between the two forest types. Conditional score as is explained refers to the degree of visibility under the trees canopies for a distance of 800 meters long. The scores are ranged from 1 to 5 with a score of 1 being the highest and this is equivalent to 100% and 5 being the lowest score. Forests with highest condition score often lack undergrowth which aids clear visibility under the canopies and such category are classified as closed forests. Those with low scores have more undergrowth which produces visibility under the canopies and these are defined as opened forests. The Dome River forest reserve, located in Dwease is argued to have a conditional score between 3 and 4 which is low and thus is classified as an opened forest type.

A total of 24 respondents (21.8%) also explained their understanding of forest following the land use criterion only. The common consensus is that, *“forest is land that has never or is partially being cultivated”*. This clearly relates with the definition of forests by Carle and Holmgren (2000) as tree covered areas not predominantly used for purposes other than forestry. As stated in the literature review, the land use criterion can be used to delineate forest into “plantation or secondary forests” and “natural or primary forest”, the major difference being, the role of human intervention in or without the regeneration of a degraded forest. Majority of the household respondents identified the forest areas are being cultivated continually hence these are termed as secondary forests.

It is also highlighted that parts of the Dome River Forest reserve was demarcated for agro-forestry purposes under the Modified Taungya System (MTS). But for about 7 years now, there has not being any crop cultivation within the reserve hence it is has been allowed to regenerate naturally hence may be described as natural or primary forest type. As stated by the Assistant Manager of FSD, the reserve has been placed under *“convalescence”*, which is a natural way of regenerating the forest cover. In this case however, there is slight intervention through the *“Enrichment planting”* which will be discussed in detail under the strategies of forest management. Apart from the forest

reserve, it is also discovered that there are relatively small size of primary forest (3 hectares) located in Praaso.

From table 4.3.1, a total of 37 respondents (33.6%) defined forest using both the crown cover threshold and land use criteria. Per this argument, *“forest is any land with closed covering of trees and other biodiversity that has never or is partially being cultivated”*. Interestingly, the above definition points out, it is possible to generate the following forest types, primary-closed forest; primary-opened forest; secondary-closed forest; and secondary-opened forest as observed in table 4.3.2. Majority indicate the predominant forest type as being secondary-opened which implies that the forest lands are being cultivated and have opened canopies. It is observed and also indicated by respondents that because much of the forests have been cultivated or are still being cultivated and it has essentially affected the crown cover development of trees and has caused loss of indigenous trees and other vegetative species as will be discussed later.

It is realized therefore that, it is a bit challenging to identify a forest which has been cultivated and still exhibits a closed canopy characteristics. This is exemplified in table 4.3.2, where only 4 respondents (3.6%) using both criteria indicated the major the forest type as secondary-closed. That notwithstanding, a good example be the Dome River Forest reserve in its current state since it is under convalescence. Though these views are based on individual perceptions and not based on statistical data to prove the sizes of the different forest types, it is prudent to note that these viewpoints affirm the rate and extent of deforestation as well as the causes and impact on local level sustainable forest management.

Table 4.3.2 Forest types (delineated using both crown cover and land use criteria)

| Forest type | Frequency | Percent |
|-------------------------|------------------|----------------|
| Primary-closed forest | 15 | 13.6 |
| Primary-opened forest | 18 | 16.4 |
| Secondary-closed forest | 4 | 3.6 |
| Secondary-opened forest | 73 | 66.4 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013)

In table 4.3.1, the remaining 10 respondents (9.1%) explained their understanding of forest not to be based on the two known critical factors as explained but identified with different methods and these are categorized as others. One of the critical factors highlighted that to define forest in this regard is the maturity of the trees. A verbal translation of the view expressed by some household respondents indicates forest is “*a land with tree species that are mature*”. As they explained, maturity is defined based on the size of a particular trees measured in terms of the thickness of the tree trunk when it is being harvested. Based on this understanding, it was common to hear some respondents snappily argue that there is no forest because logging especially the operation of chainsaw has destroyed if not all, majority of the trees needed to classify such given a land with trees as forest.

Apart from the maturity of the tree species, still under this category, some indicated another critical factor and that is the institutional policy framework on ownership and management of land defined as forest. On the basis of ownership and management, some attributed lands classified as forests to be solely owned and managed by the government (herein defined as the Forestry Commission, FC); others indicated joined ownership and management by the FC and traditional rulers and while some stated individual ownership and management. Therefore based on ownership and management criteria, it is possible to generate three distinctive classes of forest types and these include government forest, community forestry and individual forest types.

To buttress the above point, the Assistant Manager of the FSD stated when explaining his understanding of forest that, though the minimum threshold of 5 meters is a vital factor, a more important consideration is that the land to constitute forest be earmarked and

demarcated under policy and legislation with responsibility of governance and management vested in the Forest Service Division. These may be in trust for one or more communities and constitute what are commonly referred to as forest reserves. Following this explanation a forest is the same as a forest reserve. In relation to the two communities Dwease has a forest because it shares in the ownership and management of the Dome River Forest Reserve while Praaso does not because there is no forest reserve located in this community and it also has no share in the ownership and management of the reserve at Dwease. The import is that, even though Praaso has extensive trees dominated vegetative species above the minimum threshold of 5 meters, such areas are not regarded as forests according to the understanding of forests as inquired at the local FSD office.

It is useful to assert that this perspective of viewing forest types has fostered ineffective management of forests within off-reserves even though the forestry policy vested all tree ownership in the Forestry Commission. This has put a challenge for forest management in Praaso because there is sheer negligence of responsibility by the FSD except the minimal communal efforts made through the Assemblyman and the Queen mother as well as personal efforts by land owners. It is therefore not surprising that most of respondents highlighted increased illegal logging as the predominant cause of deforestation as will be discussed later.

4.3.2 Extent and rate of deforestation

The loss of tropical forests is evidenced worldwide and in Ghana and for that matter Dwease and Praaso communities are no exception. This is because the majority of the respondents (97%) strongly agreed that deforestation is being witnessed in their communities. It is discovered however that the rate of occurrence as perceived by the local people varies greatly. This confirms the claim by Adams (2009) that, though there is no doubt about forest cover changes in many humid and sub-humid tropical areas, there remains much debate on the rate and extent of deforestation.

From table 4.3.3, 79 respondents (71.8%) identified the rate of deforestation to be rapid. 20 respondents (18.2%) also indicated that the rate of deforestation is moderate; while 6

respondents (5.5%) indicated it being slow and the remaining 5 respondents (4.5%) noted the rate of deforestation to be unpredictable. To validate the claim that deforestation has been rapid, some respondents explained how settlement expansion and agricultural cultivation have caused retreat of forests from the residences and community centers over the years. Some used the scarcity of some non-timber forest products like snails which could easily be obtained around their settlements because the forests were closer then than now.

Table 4.3.3 Rate of deforestation

| Rate of deforestation | Frequency | Percent |
|------------------------------|------------------|----------------|
| Rapid | 79 | 71.8 |
| Moderate | 20 | 18.2 |
| Slow | 6 | 5.5 |
| Unpredictable | 5 | 4.5 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013)

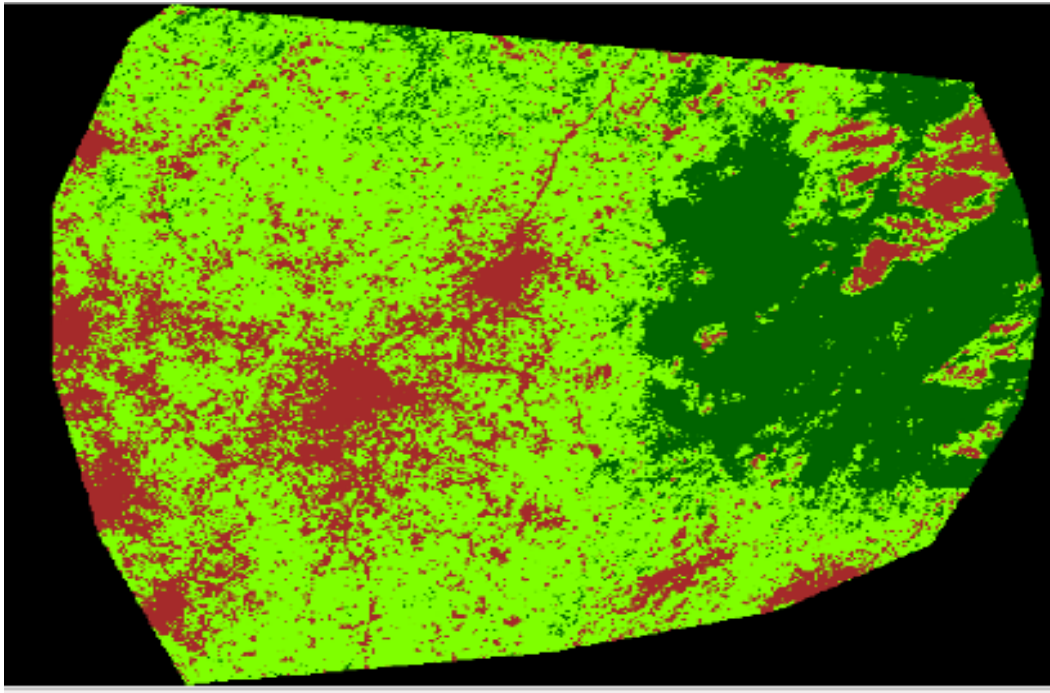
In order to substantiate the arguments made by the household respondents on the rate and extent of deforestation, the researcher also employed satellite image interpretation of Landsat Image 2002 and 2004 for the Asante Akim Central Municipality. The essence was to discover the extent of forest cover and loss in the respective years, as a result, the processed images were distinguished into three classes namely; thick forest, light vegetation and bare ground. The detailed description of the classes is listed in table 4.3.4 below;

Table 4.3.4 Description of Land cover types

| Classification | Description |
|---------------------------|---|
| Thick forest | Surface areas with greater trees development and distribution with crown cover |
| Lighter vegetation | Surface areas with grasses of all kind and degraded portions with sparsely distributed trees |
| Bare ground | Surface areas with farm lands, infrastructure development, settlements and other exposed landscape with less or no tree or grass covering |

Source: Author (Fieldwork, 2013)

Image 4.3.2: Forest Cover in 2002 (3846.69 hectares)

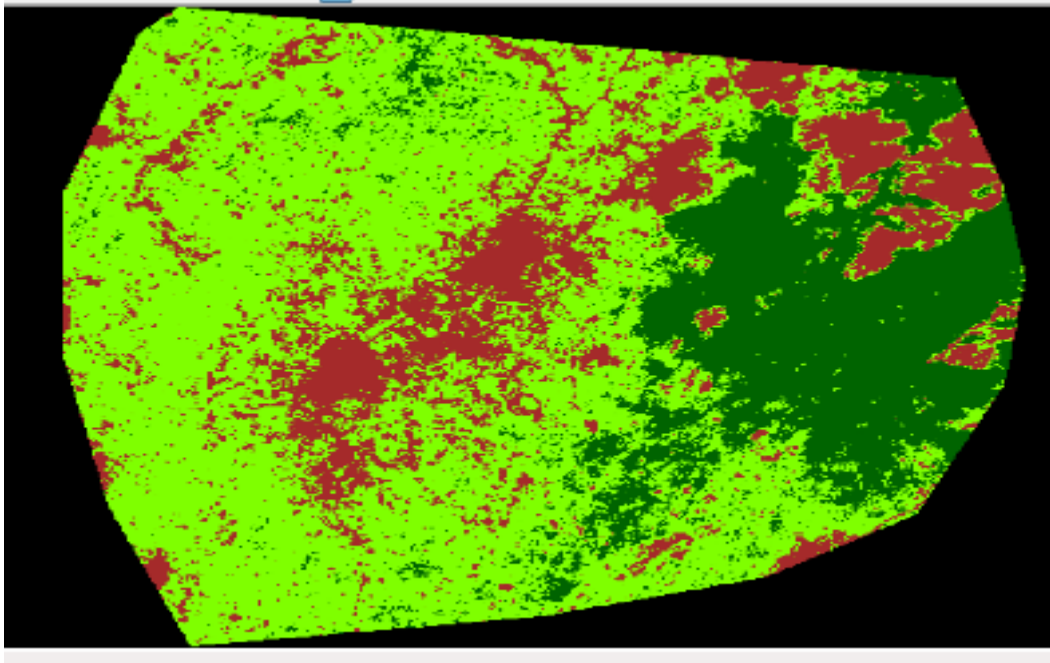


North



Source: Landsat Image 2002 of Asante Akim Central Municipality

Image 4.3.3: Forest Cover in 2004 (3807.99 hectares)



North

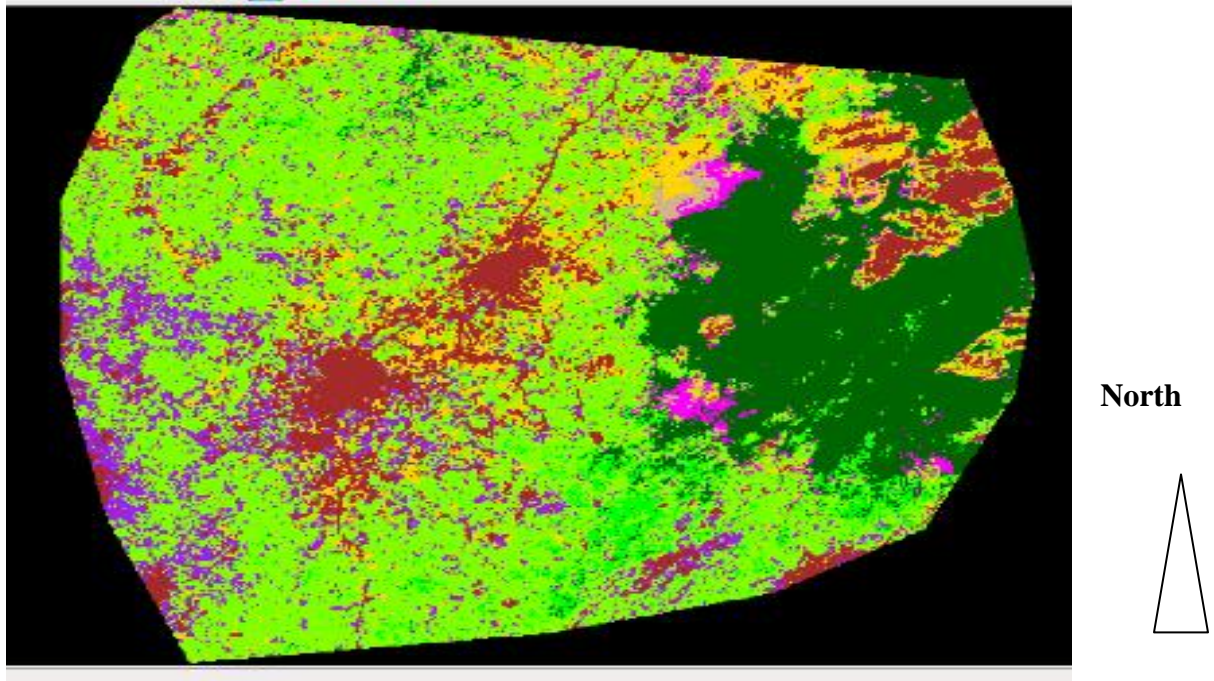


Source: Landsat Image 2004 of Asante Akim Central Municipality

It is observed from images 4.3.2 and 4.3.3 that much of the thick forests in the Asante Akim Central Municipality are concentrated in the extreme eastern corner and a high percentage of the total area is covered by light vegetation. In 2002 as observed from Image 4.3.2, much of the bare ground of farm lands and settlements were located to the extreme west and central portion with minimal development in the thick forests. However, in 2004 much of the bare ground activities migrated with increased concentration in the centre and in the thick forests zones as seen in Image 4.3.3. It is also observed that in 2004, there is slight development of patches of thick forests towards the southern end of the municipality and this was not observed in 2002.

In order to appreciate the remarkable changes in forest cover and loss between 2002 and 2004, the two separate images were merged for effective comparison and this is indicated as Image 4.3.4. From Image 4.3.4, the different shades of colour explain the changes in area lost, gained or maintained by the different classes of thick forests, light vegetation and bare ground. Table 4.3.5 is a transformation matrix which simplifies the definition of the different colours in areas measured in hectares.

Image 4.3.4: Comparison of change between 2002 and 2004



Source: Author (Fieldwork, 2013)

Table 4.3.5: Transformation matrix (land cover changes between 2002 and 2004)

| Year 2002 (Areas in Hectares) | Year 2004 (Area in Hectares) | | | |
|-------------------------------|------------------------------|----------------------|-----------------|-----------------|
| | Thick Forest (1) | Light Vegetation (2) | Bare ground (3) | Total |
| Thick Forest (1) | 3144.78 | 608.4 | 93.51 | 3846.69 |
| Light Vegetation (2) | 662.22 | 8326.53 | 1506.78 | 10495.53 |
| Bare ground (3) | 0.99 | 1671.93 | 1919.97 | 3592.89 |
| Total | 3807.99 | 10606.86 | 3520.26 | 17935.11 |

Source: (Landsat Satellite TM 2002 and 2004 of Asante Akim Central Municipality)

In table 4.3.5, it is shown that in 2002, a total of 3846.69 hectares (21.45%) was recognized as thick forest, 10495.53 hectares (58.52%) as light vegetation and 3592.89 hectares (20%) as bare ground. Between 2002 and 2004, various changes in the forest cover and loss occurred. At the end of 2004, the total amount of thick forest in relation to the total area is 3807.99 hectares (21.2%), light vegetation, 10606.86 hectares (59.14%) and bare ground, 3520.26 hectares (19.6%).

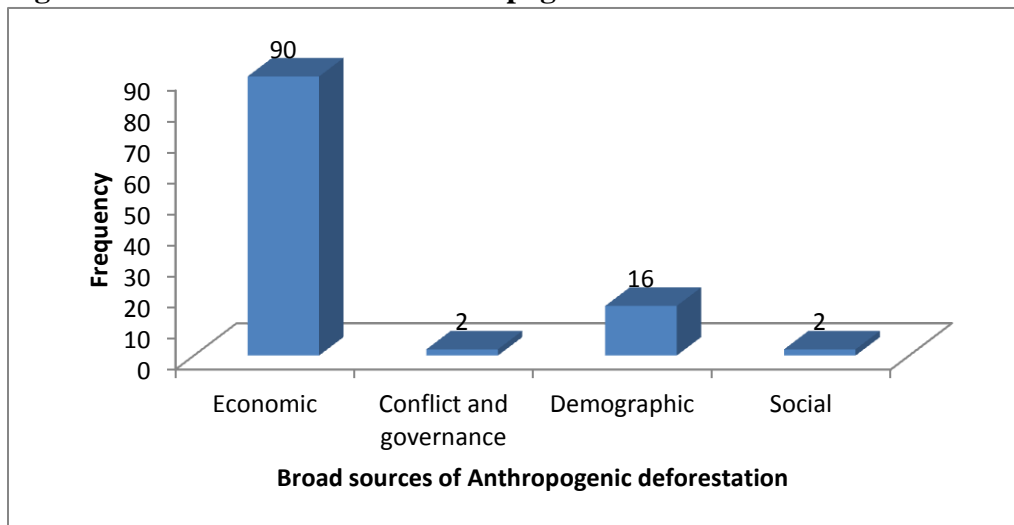
It is realized between 2002 and 2004 the municipality experienced forest cover loss of 0.3% (the percentage difference in the forest cover between 2004 and 2002). While this figure may seem minimal because it falls within the national estimates of 2% to 5% for deforestation rates in both off-reserves and on-reserves as indicated in the literature review, it is imperative to note that this figure however points to that deforestation at the local level is a real challenge. This is because it ranks higher than the level for global rate of deforestation (extrapolated from local level analyses) estimated for the same period as 0.2% (FAO 2005).

4.3.3 The Causes of Deforestation

The majority of household respondents, (89%) indicated that the process of deforestation in the municipality is solely driven by anthropogenic factors, while less than 2% is solely influenced by natural factors. The remaining 9% argued that the process of deforestation is caused by a combination of both anthropogenic and natural factors. It is also identified that, the broad sources of anthropogenic deforestation in the communities include economic, demographic, conflict and governance, and social factors and that these are

similar to the factors highlighted by the UNEP (2006). From figure 4.3.1, the economic reasons received the highest responses (90 respondents) and this is because the forests are valuable sources of woods for trade by indigenous people and outsiders as well as for other households' needs. For those who identified with demographics as the key factor, explained that deforestation has been caused by the continual expansion of settlements into forested areas.

Figure 4.3.1 Broad sources of anthropogenic deforestation



Source: Author (Fieldwork, 2013)

It was also found out that the process of deforestation results directly and indirectly from livelihood activities of the local people as affirmed by 96% of the household respondents engaged in the study. It is important to note that different livelihood activities are indicated and these are also highlighted to produce varied impacts. As seen in table 4.3.6, 53 respondents (48.2%) indicated chainsaw operation as the major activity influencing deforestation. This is followed by 42 respondents (38.2%) who named agriculture, 9 respondents (8.2%) stated hunting, with 5 respondents (4.5%) also noting wood fuel production while only 1 respondent (0.9%) indicated a different livelihood activity.

Table 4.3.6 Major livelihood activities causing deforestation

| Major livelihood activity | Frequency | Percent |
|----------------------------------|------------------|----------------|
| Agriculture | 42 | 38.2 |
| Wood fuel production | 5 | 4.5 |
| Chainsaw operation | 53 | 48.2 |
| Hunting | 9 | 8.2 |
| Other, please specify | 1 | .9 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013)

It is observed from table 4.3.6 that, deforestation is mostly caused by chainsaw operation and agriculture though the impacts from the other activities are recognizable.

Respondents argued that chainsaw operation destroyed forests much more than other livelihood activities because it occurs deep in the core of the forests as compared with the other livelihood activities which are most often carried out on the fringes of the forests. Quite apart from that, the felling of trees by chainsaw operators is argued to be carried out indiscriminately. As a result of this, they hardly consider if a tree is harvestable or not. Or in a different understanding some respondents explained chainsaw operators do not consider the “*maturity*” (defined as the size and/or thickness) of a tree before felling.

It is also argued that chainsaw operation induces wood fuel production (especially charcoal burning). This is because, most wood fuel producers only use dead trees or parts of logged trees as the raw materials to burn charcoal. Because chainsaw operators cut indiscriminately destroying other trees apart from those they actually intended to cut, they invariably create chances for increased activity of wood gathering for both firewood and charcoal in the forests.

The operation of chainsaw is generally considered to be illegal in the communities. The discussion on the demographic characteristics of respondents revealed that, none of the respondents indicated chainsaw operation to be either the major or alternative livelihood activity, yet this activity is widely being practiced. Upon further questioning, the local people stated that, it is actually difficult to pinpoint who engages in chainsaw operation since their activities are carried out secretly and deep in the night. This is probably because the operators are not duly registered as prescribed in regulations 29 and 30 of the

Timber Resources Management Regulations, LI 1649 (Forestry Commission, 1998). Even if some of the operators are even registered per the regulations of the LI 1649, the provisions of regulations 31 and 32 (1) probably explains why chainsaw is still operated illegally. The provisions state that,

“31. No person shall use a chainsaw for felling or converting timber unless the chainsaw has been registered with the District Forest Office in accordance with regulation 30.

32. (1) No person shall use a chainsaw whether registered or unregistered, to convert timber into lumber or other forest products for sale, exchange or any commercial purpose”.

The importance of these regulations is that, chainsaw should neither be used to harvest timber (trees which could be turned into logs) nor convert the timber into lumber (logs). But as explained by respondents, the exact activities of chainsaw operators in the communities directly relate with the limitations in regulation 32 (1). It is argued that the felling of trees and the subsequent division of these into logs by chainsaw operator is carried out during the night in the forests and these are quickly transported to the cities for sale, and this accounts for why it is illegal.

This challenge may partially be attributed to the issues of conflict and governance. As pointed out in the literature review about 87% of global forests are owned by the state (Siry et al, 2005 cited in Adams, 2009, p.246), and the case of Ghana is so peculiar because the tree tenure is vested in the state not the local communities. Because the legal basis of such claims by the state often flies in the face of the rights of indigenous people and ignores their systems of tenure and rules of resources management (Adams, 2009), the local people are often left with less or no options than to neglect personal management. It is realized particularly in Praaso that forests have become de facto open-access resources widely open to any entrepreneur who is able to negotiate unofficial access to the forest land independently of an official legal regime in place. This is because despite the fact that the state has taken authority to regulate the use of forest

land, timber and other forest products, in most cases it often lacks the authority and power to implement such regulations (Adams, 2009).

Even though chainsaw operation is typified as the major activity that destroys forests, particularly the trees cover, it must be noted that the impact from agriculture and hunting cannot be underestimated, especially in relation to the destruction of other forest biodiversity. This is pointed out by the Assistant Manager of the FSD, who states that, the destruction of forests undergrowth results mainly from agricultural practices such as slash and burn cultivation as well as hunting. This opinion is congruent with the conventional claim that the impact from agriculture as a cause of deforestation is tied to slash and burnt cultivation (Chomitz, 1999). While most farmers agreed to have cut down some trees in order to prepare or expand their farmlands, they however argue that it is selective. They explained that in clearing the land, trees (such as Silk cotton, Mahogany and others) which are believed to help maintain soil moisture are preserved while those trees which could limit the effective development of crops especially (those that produce much shade) are cut down. But this in turn is also dependent on the type of crop being cultivated by farmers.

The impact from slash and burn cultivation, as a reason for the loss of trees especially timber species on farmlands is explained in relation to how illegal and unauthorized logging has caused affected effective development and yield of crops. As stated earlier, because the forests have become more or less a de facto open-access resources, with unlawful entry notably by chainsaw operators have often caused destruction of crops on the farms where these trees are accessed because of the indiscriminate logging. Though, compensations ought to be paid to the affected farmers, such payment are hardly made because the harvesting of the timber is carried out illegally in the absence of farmers. Even if payments are made some farmers argued that, the amount of money often paid is woefully inadequate compared with the forest damages or losses incurred. As a result, most farmers think it is better to cut down any timber species on their farms in order to reduce the risk of losing or allowing anyone else to cause damage to the crops on their farmlands.

Image 4.3.5 Examples of Maize and Cassava farms established in the forests



Source: Author (Fieldwork, 2013)

The impact from hunting is also worth mentioning because it is connected with forest fires. Though forest fires may either be from anthropogenic or natural sources, it is realized that natural forest fires are rare in the history of deforestation in Ghana except the remarkable example of 1983. That notwithstanding, at the time of the field survey, there was an intense forest fire in the Dome River Forest Reserve and though the source could not be ascertained most people believed, it was probably from hunting activities. This fire led to the massive destruction of young trees planted and biodiversity in the Reserve. Upon visiting the Reserve, personal observation confirmed that the whole of compartment 33 and portions of compartment 13, where “enrichment planting” (will be explained later) by the FSD has been completely burnt.

The demise of other forest biodiversity due to the impact of the fire cannot be overemphasized. Disclosed information from interviews within the communities indicates that those people who went to help put out the fire came back with dead animals like antelopes, beers, rabbits and others and these animals were argued to have been destroyed by the fire. Image 4.3.6 indicates the part of compartment 33 which was completely burnt and compartment 13 which was partially burnt by the fire.

Image: 4.3.6 Portions of Compartment 33 and Compartment 13 (partially burnt)



Source: Author (Fieldwork, 2013)

4. 4 The Socio-economic Benefits of Deforestation

The second objective of the study sought to identify broadly the socio-economic benefits of deforestation and how these vary in a gender perspective. Specifically, it discusses the types of forest products that are extracted from the forests and how these outputs benefit household livelihoods. It also assesses how the loss of trees cover affects household income and how this impact varies between the male and female population. It also discusses the other benefits created in terms of employment and social development in the communities.

4.4.1 Type of Forest Products Extracted

The products extracted from the forests are broadly categorized into Timber Forest Products (TFPs) and Non-Timber Forest Products (NTFPs). The former refers to all timber species that are extracted through authorized (timber contractors) and unauthorized (chainsaw operation) for the purpose of lumber (processed into logs) while the latter refers to other products derived from the forests which are not necessarily timber species. Table 4.4.1 defines the specific elements that are extracted under both TFPs and NTFPs within the two communities.

Table 4.4.1 Examples of TFPs and NTFPs extracted in Dwease and Praaso

| Timber Forest products (TFPs) | | Non-timber forest products (NTFPs) |
|-------------------------------|------------------------------------|------------------------------------|
| English/ Local name (Twi) | Scientific name | |
| Wawa | <i>Triplochiton scleroxylon</i> | Bush meat, |
| Framo | <i>Terminalia superb</i> | Materials for crafting, |
| Teak | <i>Tectona grandis</i> | Building materials, |
| Odum | <i>Milicia excels</i> | Mushroom, |
| Oyina | <i>Ceiba pentandra</i> | Snail, |
| Kisia | <i>Nauclea spp.</i> | Firewood |
| Emiri | <i>Pseudospondias microcarpa</i> | Fruits |
| Okeseria | | Pistil |
| Mahogany | <i>Khaya senegalensis</i> | Herbs |
| Denya | <i>Cylicodiscus gabunensis</i> | Tortoise |
| Apuro | <i>Nesogordonia papaverifera</i> | Honey |
| Asanfena | | Bamboo |
| Esa | <i>Celtis mildbraedii</i> | |
| Cedar | <i>Cedrus</i> | |
| Eporu | | |
| Awianfoo | <i>Albizia ferruginea</i> | |
| Berma | | |
| Dahoma | <i>Piptadeniastrum africanum</i> | |
| Sapele | <i>Entandrophragma utile</i> | |
| Ofonto | <i>Fieus vogelii</i> | |
| Oyame dua | <i>Alstonia boonei</i> | |
| Otie | <i>Pycnanthus angolensis</i> | |
| Osisiri | <i>Spathodea campanulata</i> | |
| Akata | <i>Rhodognaphalon buonopozense</i> | |
| Okrea | | |
| Kyenkyen | <i>Antiaris Africana</i> | |
| Matamata | | |
| Apralu | | |
| Fortou | | |

Source: Author (Fieldwork, 2013)

The findings indicate that about 77 % of household respondents stated they extract NTFPs only, 3% extract TFPs only while the remaining 20% indicated to exploit both TFPs and NTFPs. It was therefore realized that the extraction of NTFPs is more likely to

contribute more importantly to household livelihoods development than TFPs. Most respondent explained that they engage in extracting more of NTFPs because it is difficult to obtain permit in order to have a concession for TFPs. It is found out at the local office of the Forestry Service Division, Juaso, that before giving concession to any individual or company or groups of companies, some criteria are sought. The prospective person or company should be formally registered, letter of tax clearance from the Ghana Revenue Authority, letter from the Ghana Timber Association (GTA) indicating registration, track records of good conducts and not owing the FC anything. And because most of the local people cannot meet the terms of these criteria, they tend to extract more of NTFPs because these are more accessible within the fringes of the forests as compared with TFPs. Access of TFPs by the local people is done mainly through chainsaw operation which is considered illegal.

Notwithstanding whichever kind of forest products that is exploited by the local people, it is important to highlight that there are enormous socio-economic benefits associated with the extraction of these products. In the literature review, it was clearly pointed out that deforestation promoted various socio-economic benefits in the form of livelihoods, income, employment and development of social amenities. Table 4.4.2 represents the viewpoints expressed by household respondents regarding the benefits they derived from forests.

Table 4.4.2 The Socio-economic benefits of deforestation

| Benefits derived | Frequency | Percent |
|------------------------------------|------------------|----------------|
| Livelihoods only | 15 | 13.6 |
| Income only | 6 | 5.5 |
| Employment only | 2 | 1.8 |
| Livelihoods and Income only | 44 | 40.0 |
| Livelihoods and Employment only | 6 | 5.5 |
| Income and Employment only | 6 | 5.5 |
| Livelihoods, income and employment | 31 | 28.2 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013)

It is observed from the table 4.4.2 that, the perceived benefits for exploiting forest resources vary among respondents. As indicated, some identified only one benefit, while others stated two or more benefits that influence their exploitation of forest resources. The highest response of 44 respondents (40%) indicated that the forests contribute to their household livelihoods and income. The next highest response of 31 respondents (28.2%) indicated livelihoods, income and employments. It is generally observed per the explanation offered that these benefits are interrelated as a result the impacts on one benefit could be magnified in another.

4.4.3 How deforestation contributes to household livelihoods in the communities

The process of deforestation substantively benefited household livelihoods in both communities. The definition of livelihood adapted is “*the access and entitlement to a range of assets and opportunities which are essential in achieving human well-being*” (UNEP, 2006). The research findings indicate the exploitation of forest resources particularly NTFPs have contributed to household livelihoods through energy supply, food supply, materials for shelter and local craft materials.

Table 4.4.3 Contribution of deforestation to Household livelihoods

| Types of livelihood outcome | Frequency | Percent |
|------------------------------------|------------------|----------------|
| Energy supply | 19 | 17.3 |
| Food supply | 78 | 70.9 |
| Materials for shelter | 6 | 5.5 |
| Local crafts materials | 7 | 6.4 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013)

It is observed from table 4.4.3 that, the most important livelihood outcome derived from the forests is food supply. The majority of the local people are into agriculture as indicated earlier and it is realized that the forests are sources of rich agricultural products. This is because of forest vegetation the support the effective development of the soils. The major cash and food crops cultivated include cocoa, oil palm, plantain, cocoyam, cassava, yam, cereals and vegetable and these develop effectively on the Offinso compound, a category of the Forest Ochrosol. And it is noted that the influence of the

vegetation cover of open forests is a key factor in the soil formation and composition (Asante Akim Central Municipal Assembly, 2010). This argument concurs with Gabler et al (2007, pp. 240) that, “the relationship between the soil beneath the selva and the vegetation that soil support is so close that there exist a nearly perfect ecological balance between the two, threatened only by people’s efforts to earn a living from the soil”.

It is affirmed that the sale of both cash crops and sometime food crops provide personal income for farmers and their households. In addition to cultivated food crops, the forests are reliable sources of household protein required derived from forest products such snails, mushrooms, tortoise and other bush meat, though these have shown signs of extinction. Respondents also argued there are varied edible fruits, honey, herbs and other food products which are also obtained from the forests.

Another household livelihood outcome directly derived from the forests is energy supply. Generally, it is noted that in Eastern, Western and Southern Africa that, more than 90% of rural households depend on wood fuel (fuel wood and charcoal) for their energy requirements (UNEP, 2006) and this is true of the households in Dwease and Praaso. In the, both communities, it is identified that, the use of fire wood is much more prevalent than charcoal. Personal observations revealed that, most households had heaps of fire wood stored in dry places, and this is to ensure constant supply all year. While it is undeniable that, energy requirements are derived from the forests, most respondents ascertained that they do not necessarily cut down trees but rather rely on dead and/or parts of tree species logged. Thus, based on the above analysis, it is possible to say that, the extraction of household energy and its impact on forest cover loss- in the communities is low as compared with the impact from illegal logging and agriculture. Yet, this cannot be underestimated considering that there are either few or no alternative sources of energy supply for most of the local people apart from wood fuel from the forests, which is their reliable source.

The forests also provide local craft materials for households and other small scale artisans in both communities. The major extracts are wood, bamboo, and forest plant species which are used to develop items such as pistil, stools, beds and doors amongst other

designs household usage and sale in the local markets. In addition, some respondents also indicated that they directly derived materials for shelter from the forests.

The findings above therefore provide some level of evidence to state that Dwease and Praaso do not necessarily lack the basic necessities to maintain a decent standard of living because they have sufficient and nutritious food, adequate shelter, access to herbs, and energy sources. Thus, the claim that most forest fringe communities lack the basic amenities for survival and a healthy environment by the Secretariat of the Convention on Biological Diversity, (2009) cannot be generalized for these two communities. A major concern however is with regards to how sustainability these benefits can be in the wake of rapid deforestation and forest degradation, because there seems to be excessive demand within confined territories. Image 4.8 gives a pictorial illustration of some of the household livelihood outcomes derived both directly and indirectly from the process of deforestation in the two communities.

Image 4.4.1 Examples of Household livelihood outcomes derived from deforestation



Source: Author (Fieldwork, 2013)

4.4.4 How Deforestation contributes to Income generation in the communities

The research findings identified that the process of deforestation contributes to income generation in the communities in two ways: personal income and royalty.

Table 4.4.4 Contribution of deforestation to income generation in communities

| Income type | Frequency | Percent |
|--------------------|------------------|----------------|
| Personal income | 92 | 83.6 |
| Royalty | 18 | 16.4 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013).

From table 4.4.4, 92 respondents (83.6%) perceived that the process of deforestation has contributed to the generation of personal income for individuals. This is obtained through their engagement in the various forest activities (agriculture, chainsaw operation, wood fuel production, hunting, local crafting and carpentry) which are practiced in the communities. The amount earned however varies considerably depending on the kind of forest activity an individual engages in. Categorization of the monthly average income of the various respondents revealed that a substantive number of them earn below GH¢ 100 while others also earn higher than GH¢ 600 with the average monthly income estimated at GH¢ 300. A general characteristic of personal income derived from the various forestry activities is that, it is seasonal and this is especially true for agriculturalists.

Thus the view of Obiri and Damnyag (2011) that individuals in forest districts of Ghana earn a magnitude of employment income is reflected in these two communities. In their study, they call that between 2004 and 2008, the total amount of income earned ranged from GH¢5,000 to GH¢50,000. Though it is not stated how they arrived at these composite figures for the respective years, such analysis has relevance for inquiring into the deforestation contributes to personal income in Dwease and Praaso based on the current findings. With an average monthly income of GH¢ 300, the expected annual income will be estimated as GH¢ 3,600. If the GH¢ 5,000 referred to in Obiri and Damnyag (2011) is the base year (2004) and the calculated GH¢ 3,600 in the current study is to serve as the base year (2013), then it implies that personal incomes from forestry activities have been decreasing. This is because the estimate for 2004 as a base

year is far higher than the estimate for 2013 as a current base year. Thus, based on the statistics highlighted there has been a 28% decrease in personal incomes between 2004 and 2013. Though, there are a number of factors that determine the amount of income that individuals derive from forestry activities, it is critical factor to mention that the apparent loss of forest resources will continue to affect potential income sources for households and individuals who depend on them.

The remaining 18 respondents (16.4%) were however of the view that deforestation contributes to income generation through royalty paid to the chiefs in the communities. This is also confirmed by the chief of Dwease who however argues “*there is no personal income for the local people because they are not directly involved in the extraction of timber products from the forests but it is the timber contractors who only pay royalty to the stool*” (Personal interview, 2013). Even with the royalty, the chief of Dwease stated strongly that he disagrees with how monies paid by the timber contractors for extracting timber from the communities is being shared because it not equitable. As he explained the stool (*described herein as the traditional area headed by the chief*) receives only 25% of the income, 20% goes to the Omanhene (*herein referring to the paramount chief of the Asante Kingdom headed by His majesty Otumfuo Osei Tutu II*) and 55% goes to the District Assembly. This he believes retards local development (both physical and human) efforts because the community does not get maximum benefits from the exploitation of its resources since the great part of the shared-benefits goes to District Assembly, which may house a number of forest fringe communities like Dwease and Praaso.

Does Personal Income generated from Forestry Activities vary with Gender?

Under the literature review, it is discussed that integrating gender perspectives into forestry research has often focused on the contribution of forestry activities to household income for men and women (Manfre and Rubin, 2012, p.xiv). As a result, the researcher also sought to identify how personal income from forestry activities varies with gender in the communities. It is observed from the table 4.4.5 that, 76 respondents (69.1%) noted a variation in the incomes generated by male and female forestry activities and this was argued predominantly by the females (75.9%). The remaining 34 respondents (30.9%)

indicated that there is no variation in the incomes generated from male and female forestry activities and within this, the highest response came from the males (37.5%).

Table 4.4.5 Contingency table Variation in Income with Gender of Respondents

| Variation in Income | Gender | | Total |
|---------------------|--------------------------|--------------------------|---------------------------|
| | Male | Female | |
| Yes | 35 62.5% | 41 75.9% | 76 69.1% |
| No | 21 37.5% | 13 24.1% | 34 30.9% |
| Total | 56 100% | 54 100% | 110 100% |

Source: Author (Fieldwork, 2013)

This finding was also used to test the hypothesis of the study that, “*there is difference in personal income generated by male and female forestry activities in the municipality*”. In order to achieve this, a bivariate analysis was carried out to establish the Pearson Chi-square (X^2); and Phi and Cramer’s V test statistics (a test of independence) at the significance level of 0.05 or $p < 0.05$. The summary of these findings are indicated respectively in table 4.4.6 and 4.4.7.

Table 4.4.6 Pearson Chi-square (X^2) Test Analysis

| | Value | Degree of freedom (df) | Asymp. Sig. (2-sided) |
|--------------------|--------------------|------------------------|-----------------------|
| Pearson Chi-Square | 2.320 ^a | 1 | .128 |

Source: Author (Fieldwork, 2013)

Table 4.4.7 Symmetric Measures

| | Value | Approx. Sig. |
|------------|-------|--------------|
| Phi | -.145 | .128 |
| Cramer's V | .145 | .128 |

Source: Author (Fieldwork, 2013)

The Chi-square test provided the basis for rejecting or accepting the research hypothesis. The interpretation of the X^2 value is often stated as: “at the stated degree of freedom, if the probability value (defined herein as Asymp. Sig. (2-sided) in table 4.4.6), is less than the level of statistical significance (measured in probability, p-value as $p < 0.05$), then the

null hypothesis (which usually defines a case of no relationship between the two variables) should be rejected”. Therefore from table 4.4.6, it is observed that at 1 degree of freedom, the P-value is 0.128 and this is greater than the level of statistical significance of 0.05, hence the null hypothesis that, “*there is no difference in personal income generated from male and female forestry activities in the municipality*” should be rejected. What this means is that, in a sample of 100 household respondents, there are only five (5) chances that, an established relationship between incomes and gender of respondents should arise by chance.

In order to ascertain the strength of the relationship between the two variables and the significance of such a relationship, the Phi and Cramer’s V, which are noted for such measurements (Bryman, 2008, pp.329-330) were also calculated. According to Bryman, the Phi value is like correlation and measures between 0 and 1 or -1 and this is calculated as -0.145 in table 4.4.7. In relation to the hypothesis, it means that, income generated from male forestry activities is more likely to be more than income generated from female forestry activities. This is not far-fetched from the following reasons offered by respondents who pinpointed that males are more likely to earn higher incomes than females.

“The males are engaged in a variety of activities which are much more income rewarding than those engaged by the females. For instance, in relation to agriculture, the males mostly own the farmlands, with the female playing assisting roles. As a result, higher percentage of the returns of income from the farms goes to them. In addition, the male are also engaged more in cash crop farming, (with less emphasis on food crops) and the return from these crops is very substantive, thus contributing to higher income for them as compared with the females who are mainly involved in only food crops and vegetables which are less rewarding. It is also argued that male earn more income because they are able to engage in hired labour commonly called “By-day” which their female counterparts cannot get involved because it is hard labour” (Personal interviews, 2013).

The value for the Cramer's V is 0.128 and this indicates that the relationship between variation in income and gender is weak and probably insignificant. This may be explained by the following viewpoints offered by those who claim the incomes from forest activities do not vary between the male and female population in the communities.

“The males are mostly involved in cash crops, which are harvestable seasonally or may take a long time to mature. As a result, they are not able to earn adequate incomes from their activities as compared with the females who are much involved in food crop and vegetables farming which generate substantive incomes all year for them.That aside, even if the males earn higher income than females, increased expenditure on the part of the males as heads of households siphons much of their income, and this places their female counterparts in a better capacity to earn more income than them” (Personal interviews, 2013).

Though the relationship maybe insignificant, it is important to recognize that, the returns from the various forestry activities practiced in the communities vary between males and females, and the males are at a perceived advantage. Therefore sustainable forest management efforts must capture the complexity of the different gender roles and social relations. This is necessary it may result in failure to see opportunities for improved forest management and the possibilities of building greater equity, which is keenly emphasized in the 3rd Millennium Development Goals (MDG) (Manfre and Rubin, 2012).

4.4.5 Development of social amenities

It is a fact that forests are predominantly located in the remote parts of the world and these places often lack certain basic social amenities. But it is also established that through the exploitation of forests, the social rapport and partnership established particularly in timber production has formed the basis for development of social amenities such as good roads, schools, electricity and good water supply in most forest fringe communities (Obiri and Damnyag, 2011). As a result, the study also sought to ascertain whether the exploitation of forests in Dwease and Praaso has contributed to the development of social amenities in the communities.

Generally, a higher proportion, about 91.8% of the household respondents engaged in this study claimed that there is neither present nor past examples to register the development of amenities pioneered by persons and/or group of persons or companies who exploits in their communities. The remaining 8.2% however acknowledged there have been some efforts in that regard. For instance the chief of Dwease remarked that, *“apart from the royalty paid to the stool, the community also benefits from the Corporate Social Responsibility (CSR) of some timber companies. He mentions that through such benefits, his community has been able to acquire some money and which has been used to purchase concrete blocks to rebuild the chief’s palace”*. About the CSR of timber companies, it is interesting to note, most people either have less knowledge or do not know about these and how they contribute to the social development in the communities. Despite this claim, some household respondents also stated of the development of community library, which is believed to have been pioneered by timber contractors, though no particular name is mentioned.

The Assembly man of Praaso also explained that there are few outcomes of social amenities whose development is connected with the exploitation of forests in the community. He spoke the effort made by a timber contractor (about 4 years ago) who drilled a borehole and also provided one pack of aluminum roofing sheets for a school building in the community. Some respondents highlighted the vocational and technical training workshop on wood processing that was organized by some timber contractors for Junior High school students in community.

4.5 The Negative Effects of Deforestation

The third research question sought to identify the negative effects of deforestation and in a gender perspective as perceived by the local people. A general observation is that locally, the negative effects of deforestation manifest in several ways, though similarly in two the communities. The major examples include global warming; soil degradation; and loss of biodiversity; and loss of livelihoods and these relate totally with the conventional negative effects of deforestation as espoused in the scientific literature (Mahapatra and Kant, 2003; Mayers and Vermeulen, 2002). But it is important to recognize that the

perception on how these effect(s) are really manifesting varies from respondent to respondent and community to community and this difference can be explained from the opinion that deforestation is location specific (Adams, 2009).

Another major characteristic of the research findings discussed in this regard is that, the identified (both predicted and perceived) effects exhibit a “cause-effect” relationship. It is therefore difficult to completely detach the analysis of one parameter or effect from the other because of such interrelationships. The gender dimension is discussed by drawing inferences on how these negative effects have affected the livelihoods of both male and female populations in the communities.

4.5.1 The manifestation of Global warming as an effect of deforestation

The respondents highlighted changes in the local climate typified in global warming as a major effect of deforestation. While most household respondents do not understand the scientific dynamics of how deforestation influences global warming and for that matter climate change (Gorte and Sheikh, 2010; Insaadoo et al, 2012), they could clearly share their experiences on the manifestations of global warming.

Table 4.5.1 Manifestations of Global Warming

| Manifestations | Frequency | Percent |
|--|------------------|----------------|
| Warmer temperatures only | 3 | 2.7 |
| Increased dryness of land only | 3 | 2.7 |
| Changes in rainfall pattern only | 9 | 8.2 |
| Warmer temperatures and increased dryness of land only | 11 | 10.0 |
| Warmer temperatures and changes in rainfall pattern only | 22 | 20.0 |
| Increased dryness of land and changes in rainfall pattern only | 8 | 7.3 |
| All the manifestations (three-fold) | 54 | 49.1 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013)

These experiences are built on their understanding of the local climate and which in turn are related with a respondent’s age, livelihood and probably length of stay in the community. The perceived manifestations of global warming as identified by household

respondents are summarized in table 4.5.1. From table 4.5.1, it is identified that, though different viewpoints are suggested, a higher proportion of the household respondents (49.1%) indicated a three-fold manifestation of the effects of global warming namely; increased surface temperatures; increased dryness of land and drought; and changes in rainfall patterns. Though there are renowned scientific efforts to accurately measure and predict the manifestations of the effects of global warming especially in the developed countries, in the case of remote communities like Dwease and Praaso in Ghana, such methods and techniques are not much known to the ordinary person.

That notwithstanding, it is identified that the local people have their own parameters and techniques to predict the manifestations of these effects of global warming. This is because it is mentioned that the effects of global warming are evidently visible and are known to affect the livelihood activities of local people particularly related to agriculture in terms of increase in the frequency and severity of drought (Chomitz, 1999). The local people affirmed the drying and dying state of crops on their farms, reduced soil moisture and general over heating of the air as evidence of global warming and this they perceived is due to the increased and continual loss of trees cover. This is built on their comparative analysis of the micro-climate of the area over time, for length of their stay in the respective communities. Their explanation substantiates the technical assessment by Getis et al (2005) that, *“the conversion of forests to grasslands increases surface temperatures above the treeless ground and this also increases the water-holding capacity of the warmer air and as the wind moves the hotter, drier air, it tends to exert a drying effect on adjacent forest and agricultural lands”*.

It is therefore observed that the farmers (both food and cash crops) in Dwease and Praaso have exhibited a good understanding of the dynamics of the impacts of global warming on their livelihood hence this impacts on where they locate their farming activities. Getis et al (2005) explain that deforestation causes trees and crops outside the denuded areas to experience heat and aridity stress which is not normal to their geographical locations. What this means is that location and proximity of one's farmlands to the denuded areas determine how excessive the perceived impact can affect the crops. Based on this, it may confidently be indicated that the local people understand these dynamics, because

surprisingly most farmers locate their farms or wish to establish them within forested areas which are less likely to experience increased heating, loss of soil moisture, and drying of crops and land surfaces. It also points out that farmlands which are located in the forests are less likely to suffer from the impacts of global warming as compared with those located outside the forests and around the settlements.

In term of the perceived impact on males and females in the communities, it is recognized that the severity of global warming is more prone to affect females because their farmlands are most often located around the settlements since they cannot travel the long distance daily to the forests as the male do. This is also directly related with the fact that, women engage in cultivation of food crops and vegetables which could be located around the communities as compared with cash crops (which are mostly engaged in by males) and which are located in forests. Based on this analysis, it is inferred that the expansion of arable lands into to forested areas has caused a massive loss of global forests and that this loss of the trees cover also has produced temperature variations and ecological conditions which accelerate expansion of agricultural lands into forests. Thus, the analyses are complex and interrelated hence for the purpose of policy and research relating to this dimension, there is the need to recognize this “cause-effect” interrelationship in order to draw pragmatic recommendations or solutions.

The analysis of the official statistics; for example, the rainfall data for the municipality indicates that there is a general change in the rainfall pattern, both in terms of the total amount of rainfall and number of rainy days. Comparison of the data in table 4.5.2 point outs that the total amount of rainfall in 2012 was recorded as 1230 mm, compared with the total of 1820 mm recorded in the previous year; and this reveals a 32 % reduction in total rainfall recorded. That aside, there is also reduction in the number of rainy days from 64 days in 2011 to 49 days in 2012. Most respondents especially farmers, complained about these changes and especially reduction in the number of rainy days in the first quarter of the year. This change clearly affected the preparation of their lands for cultivation from 2011 to 2012. For instance, at the time of the field survey (January-February, 2013), it was realized that the farmers were waiting for the first rain so that they could start preparing their land and also to revitalize cash crops that were drying up

due to lack of soil moisture. The irregular and reduced amount of rainfall and number of rainy days thus became key factors influencing the prolonged drought being experienced in the municipality and this may also in turn be linked with changes in global temperatures.

Table 4.5.4 Rainfall Data for the years 2011 and 2012

| Rainfall parameters | 1 st Quarter | | 2 nd Quarter | | 3 rd Quarter | | 4 th Quarter | | TOTAL | |
|----------------------|-------------------------|------|-------------------------|------|-------------------------|------|-------------------------|------|-------|------|
| | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 |
| Rainfall (mm) | 340 | 263 | 655 | 487 | 695 | 336 | 130 | 144 | 1820 | 1230 |
| Rainy days | 112 | 7 | 20 | 24 | 17 | 11 | 15 | 7 | 64 | 49 |

Source: Municipal Agriculture Development Unit (MADU), AACMA, 2012

4.5.2 Manifestations of Soil degradation as an effect of deforestation

The presence of trees cover in a particular area contributes substantively to the maintenance of the soil beneath in terms of fertility and structure. Thus, the loss of tropical forests implies increased degradation of forest soils. This will however depends on the magnitude of soil disturbance and the type of soil (Gorte and Sheikh, 2010). The perception of the impact from soil degradation varies from person to person and place to place and this is true of the views opined by the household respondents engaged in this study. Table 4.5.3 shows the household understanding of the perceived manifestations of soil degradation as an effect of deforestation in their communities.

Table 4.5.3 Manifestations of Soil degradation

| Manifestations | Frequency | Percent |
|-----------------------------|------------|--------------|
| Reduced soil fertility only | 76 | 69.1 |
| Increased soil erosion only | 4 | 3.6 |
| Both | 30 | 27.3 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013)

The majority of respondents felt that reduced soil fertility (69.1%) is the predominant effect resulting from the loss of the forests in the communities. The explanations they offered relay with Gabler et al (2007) that, as the leaves, flowers and branches fall to the ground or as roots die, the numerous soil-dwelling animals and bacteria act on them,

transforming the forest litter into organic matter, which is a reliable supply of soil fertility. Respondents therefore argued that, the unprecedented loss of forests has ruined the role of forest biodiversity in facilitating natural replenishment of soil nutrients.

Image 4.5.1 Contribution of dead branches and leaves to fertility of forest soils



Source: Author (Fieldwork, 2013)

It is identified that the perception of soil erosion being the sole effect resulting from deforestation is not prevalent. Only 4 respondents (3.6%) indicated so as seen in table 4.5.3. Although soil erosion might not stand out as the single most important manifestation of soil degradation in the communities, the close or reinforcing relationship between reduced soil fertility and soil erosion (Keller, 2005), posits it a challenge to be mindful of, hence its impact cannot be downplayed. This probably influenced the perception of 30 respondents (27.3%) who indicated both reduced soil fertility and increased soil erosion as to how soil degradation manifest in the communities.

While the resulting effects from soil degradation may vary between the two communities, a general observation of the views expressed indicates that it has reduced the resilience of the soil in terms of its fertility and structure. The loss of these attributes of the soil has highly affected agriculture because 96% of the household respondents as well as the key informants argued that crop production has been declining. Respondents stated that because of reduced soil fertility the average yield of main food crops cultivated in the areas have not been remarkably high and even a crop such as cocoyam has experienced

continuous decline in production over the years. This is observable from the compiled statistics on production yields of the major food crops as illustrated in Table 4.5.4.

Table 4.5.4 Data on production of Major Food Crops in the Municipality

| Name of crop | Production Yield (Metric tons) per year | | | | | | | | |
|-----------------|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2011 | 2012 |
| Maize | 9,990 | 8,299 | 11, 165 | 11,331 | 10,669 | 9,869 | 14,693 | 13,472 | 15,324 |
| Rice | 360 | 1,491 | 1, 189 | 1,257 | 1,332 | 1,485 | 385 | 929 | 1,020 |
| Cassava | 60,770 | 59,555 | 63, 550 | 64,021 | 59,075 | 60,035 | 59,910 | 83,520 | 97,440 |
| Yam | 2,280 | 2,326 | 3, 985 | 4,356 | 6,769 | 8,315 | 11,778 | 10,326 | 11,089 |
| Cocoyam | 19,620 | 18,639 | 17, 364 | 17,028 | 13,603 | 13,221 | 10,975 | 8,316 | 13,476 |
| Plantain | 9,860 | 9,742 | 11,973 | 12,438 | 31,603 | 37,943 | 71,571 | 89,179 | 95,411 |
| Total | 102,880 | 100,052 | 109,226 | 110,431 | 123,051 | 130,868 | 169,312 | 205,742 | 233,760 |

Source: Author (compiled from Municipal Agriculture Development Unit (MADU))

While there are many factors that could have influenced the production trends of crops in the municipality such as increase in the areas cultivated and the number of people engaged in agriculture, the role played by the application of chemical fertilizers is highlighted. As a result of the reduced crop production, some respondents stated that there has been increased expenditure on the purchase of chemical fertilizers. This is as a result of their quest to enhance crop yields and production. Because respondents could not provide records on the amount of money they had spent on purchasing fertilizers, the researcher rather examined the amount of fertilizers (often used by food crop farmers) that is distributed yearly by the Municipal Agriculture Development Unit. And as shown in table 4.5.5, it is realized that between 2009 and 2012, there has been continuous increase in the total supply of fertilizers except for 2010. This could be explained partly by fact that there has been reduced soil fertility as stated earlier.

Table 4.5.5 Quantity of Fertilizers distributed per year

| Type of fertilizer | Quantity distributed yearly | | | |
|--------------------|-----------------------------|--------------|---------------|---------------|
| | 2009 | 2010 | 2011 | 2012 |
| NPK | 8,900 | 2,359 | 22,455 | 13,125 |
| SOA | 2700 | 680 | 4,946 | 3,61 |
| UREA | 2650 | 178 | 2,042 | 5,151 |
| TOTAL | 14,250 | 3,217 | 29,443 | 21,893 |

Source: Municipal Agriculture Development Unit (MADU), AACMA)

In comparative analysis, it is realized from table 4.5.4, that the production of most of the crops were higher in 2011 and 2012 compared to the earlier years for which production statistics are presented. This increase of 2011 and 2012 over the previous years may be explained by the high totals of fertilizers supplied for respective years as stated in table 4.5.5. Because the increased use of fertilizers plays a vital role in towards crop production in the Dwease and Praaso communities, it is possible to argue that, increased expenditure on chemical fertilizers could drain households of their limited income supply. This can impact on the ability to maximize their standard of living because with reduced income, they might not be able to obtain certain basic needs for survival. Also, it means that, those individuals who are unable to purchase these fertilizers, will continue to experienced reduced crops yield and this will definitely affect household food supply. Since most people directly depend on their farms food and income, the reduced crops yield could aggravate poverty in the communities in the form of malnutrition and loss of income.

4.5.3 Loss of biodiversity and livelihoods

The last section of this objective sought to identify how deforestation has caused loss of biodiversity and other livelihood outcomes directly derived from the forests. It is explained that most of the indigenous trees are getting extinct. Notably respondents put forward that overexploitation by chainsaw operators has cause loss of timber species such Cedar, Boka, Epuru, Ateteboo, Berkye, Sebri, Apere (*Annona murricata*), Dawonma in the communities. This viewpoint is reiterated by a forest guard at Dome River Forest reserve, who explains that the enrichment planting being carried out in the Reserve by the

FSD has as one of its aims to preserve indigenous timber species, like Wawa, Mahogany, Mazonia, Kukurodua, Kuseiya, Edinam, Amire and Framo.

The loss of forest biodiversity is not only limited to tree species because other plants and animals like forest snails, mushrooms, and Ahomakyem (*Spiropetalum heterophyllum*) were highlighted as being threatened to extinction. The loss of biodiversity is linked with the loss of certain household livelihood outcomes. For example, respondents explained how the loss of snails, mushroom, and animals which serve as bush meat has invariably reduced the protein supply which is partly derived these products. Also, as discussed in the literature review, it is noted that when trees are cut, the forest no longer supports the same wildlife as it did before and this may place its inhabitants at risk (Knox and Marston, 1998). This is true of the forests in Dwease and Praaso because some of forests species have lost their original habitats. This poses great threats and insecurity which could lead to further extinction of animals because they are prone to predators.

Image 4.5.2 Loss of Biodiversity and Livelihoods



Source: Author (Fieldwork, 2013)

4.6 Strategies of Sustainable Forest Management

The last research question sought to identify the strategies adopted by the FSD and traditional rulers as well as the local people in promoting sustainable management of forests. Considering the preceding discussions, it is worth noting, deforestation is a “necessary evil” because it produces numerous benefits albeit the long term negative

consequences and this bring into play the concept of sustainable forest management. The main concern was to establish the local perception of the concept of sustainable forest management and how this relates with the types of strategies being adopted. The other aspect sought to assess whether these strategies have been effective in promoting sustainable forest management.

4.6.1 Understanding of sustainable forest management

It is discovered in Dwease and Praaso that, the understanding of sustainable forest management (SFM) among the household respondents is varied and this relates with the different criteria and indicators used establish the aim of forest management. To ensure that C&I used by the different respondent are effective and can gain acceptance, to be understood and applied (Stork *et al*, 1997, p.2), these views, were categorized into three and this is directly linked with the strategies of SFM as identified in the literature. These include protective functions of forests; productive functions; and legal, policy and institutional framework and regulation. It needs to be settled undoubtedly that is no clear cut distinction between these because they merge into one another.

Table 4.6.1 Understanding of Sustainable Forest Management

| Criteria and indicators to define SFM | Frequency | Percent |
|--|------------------|----------------|
| Productive functions of forest resources | 35 | 31.8 |
| Protective functions of forest resources | 32 | 29.1 |
| Legal, policy and institutional framework and regulation | 43 | 39.1 |
| Total | 110 | 100.0 |

Source: Author (Fieldwork, 2013)

From table 4.6.1, it is identified the majority of 43 respondents (39.1%) expressed their understanding of sustainable forest management as the presence of legal, policy and institutional framework or regulations to ensure that current use of forest resources does not jeopardize future use. This is followed by 35 respondents (31.8%) who conveyed their understanding of SFM in relation to the productive functions of forests. By this, SFM is with concerned with regeneration of new forests. The last category of 32 respondents (29.1%) defined SFM in relation to the protective functions of forests where

the aim is to maintain and enhance the vitality of available forests. These viewpoints are similarly shared by the key informants engaged in this study.

For instance, the Chief of Dwease explained his understanding of SFM in relation to the legal, policy and institutional framework and regulation. Accordingly, he defines SFM as a process which ensures stewardship of forests through effective governance and security. He underscores that institutional security is necessary for forests governance and as a result it becomes necessary that forest guards who are directly in charge of monitoring and guarding forests to receive basic military training on surveillance and effective data recording. This he explains will help them to be able to detect changes in the species pattern and other activities occurring in the forests.

The Assembly man of Praaso also defined SFM as efforts to replant trees in degraded areas and to ensure that these are completely protected. By extension, his understanding is both linked with the productive and protective functions of forests. He also emphasized the need for an established group of persons to oversee the management and this directly relates with the legal, policy and institutional framework and regulations. The Local Forestry Service Division (FSD) has as a working definition of sustainable forest management to be, “*series of activities and processes that ensure that this current generation leaves the future generation with better, richer and more valuable forest resources than inherited*” (Personal interview, 2013). The Assistant District Manager of the office also disclosed further that, this overall objective is achieved through three processes namely regulation, development and protection.

It is important to note the definition by the local FSD is holistic because the three processes synchronize perfectly with the legal, policy and institutional framework and regulation; production function and protective functions criteria used to define sustainable forest management. The challenge however is that the applicability of these C&I is highly questioned, because it is argued that C&I are even considered to be irrelevant at national level except for cases where they are used to serves as chips to bargain at international negotiations (IISD, 1996). For instance, it is ascertained at the local office of the FSD that, the regulation criterion only is being emphasized in timber

extraction because Ghana is a signatory to the Voluntary Partnership Agreement (VPA) of the European Union and the International Tropical Timber Organization. This has greatly affected the kind of strategies adopted by the FSD to manage forests for local benefits.

4.6.2 Strategies of Sustainable Forest Management

This section discusses the strategies adopted by the FSD, the traditional rulers and local people in promoting SFM and to combat deforestation. This is in recognition of the fact that, the understanding of SFM by the ITTO emphasizes the collaborative role of all stakeholders. The focus is to unravel how these strategies have contributed to the regeneration of forests; fostered community partnership; and generation of income and losses for local people as discussed under the theoretical framework.

Strategies by the FSD

About 70% of the household respondents recognized the FSD as the major institution of forests' governance, and claimed that it has taking responsibility for their sustainable management. It is also acknowledged by most respondents that, staff of the FSD pays frequent visits to the communities to monitor and regulate illegal exploitation and processes that destroy forests. It is discovered that the strategies of SFM by the FSD are organized into three according to the working cycles of protection, production and research and regulation. These are directly derived from the definition of SFM as stated earlier. The content of each working cycles is composite and requires in-depth analysis to reveal the specific activities that are actually being carried out to ensure sustainable forest management. In addition, it is important to recognize that at some level there is a merger between these different cycles that are being adopted.

The protection working cycle is argued to consist of two processes namely "*convalescence*" and "*conversion*". Convalescence is defined as a strategy of forest management aims at natural regeneration of forests that have been totally degraded. While the emphasis is on natural regeneration, it is explained that in order to hasten the process of recovery, sometime human intervention is ensured through specific replanting.

Accordingly, this strategy is current being used by the FSD to regenerate the Dome River Forest Reserve located in Dwease which has been degraded over the years through continual logging. The specific activity that is pursued by the FSD is the “Enrichment planting” which involves the process of introducing some trees species (both indigenous and exotic) into a degraded forest and these are inter-planted amidst the already existing trees. The current enrichment planting within the reserve involves eight indigenous tree species namely, Wawa (*Triplochiton scleroxylon*), Mahogany (*Khaya senegalensis*), Mazonia, Kokrodua (*Pericopsis elata*), Kusia (*Nauclea diderrichii*), Edinam (*Entandrophragma angolense*), Amire (*Terminalia ivoresnsis*) and Framo (*Terminalia superb*). The choice is influenced by the belief that these species are being threatened to extinction.

The first phase of Enrichment planting was carried between 2010 -2011 at compartment 13 of the Reserve and this covered a total area of 1.445km² and this area is calculated based on the number of strips (68), the average length of each strip (measured 850 meters) and the width between the strips (measured constantly across all compartments as 20 meters). The second phase was carried out during the later part of 2012 in compartment 33, which is located adjacent compartment 13. This compartment has a total of 68 strips with average length of 1700 meters and the width of 20 meters. Thus, the total area of this compartment is 2.142 km². Based on the above analysis, it means that between the period (2010 and 2012), a total area of 3.597 km² of the Reserve was regenerated. Such efforts would have been remarkable in regenerating the tree cover if not for destruction and loss suffered following the recent forest fire in the Reserve which completely destroyed the young planted trees as well as older trees and other biodiversity in the whole of compartment 33 and portions of compartment 13 (37 strips of this compartment were completely burnt).

Thus, at the time of the field survey, it can be stated for certain that only 0. 629 km² (the remaining fraction of compartment 13, not destroyed by the fire) of total area of the Reserve was regenerated. It is observed that efforts were made to replant areas that had been destroyed by the fire and also within the remaining portions of compartment 13 where the younger trees have died. A key concern is that this strategy is practiced only

with the forest reserves and not the off-reserve zones. Since it solely championed by the FSD through its Plantation department, there is therefore no cooperation with the local communities and no benefits through income generation or losses for smallholders in the either of the communities.

Conversion the second strategy of the protection working cycle is directly connected with the production working cycle hence these are discussed in tandem. In relation to these strategies, focus is shifted from natural regeneration to total human intervention through the use of exotic species to regenerate the forests. Through these, the FSD had pursued varied programmes and activities, under the auspice of the National Forest Plantation Development Programme (NFPDP) (Forestry Commission, FC, 2008; 2011). The main activities were practiced under the Modified Taungya System (MTS), release of land to private companies to establish plantations, and industrial plantation policies.

With regards to the MTS, it is ascertained that, 33 of the household respondents (30%) from both communities indicated to have engaged in this strategy but it is however important to highlight that most of them came from Dwease and this is because it shares ownership of the Dome Reserve (where this strategy was being practiced). Generally, this strategy did foster community cooperation because it was organized in collaboration with chief of Dwease, through whom the registered individuals mainly farmers obtained portions of the degraded land to cultivate their food crops alongside tender tree seedlings which was supplied by the FSD.

It also promoted some benefits because the farmers indicated to have had access to the crop produce. Though it is argued that the farmers, in addition to the food crops they harvest, have a 40% share in the returns from the investment in the trees (FC, 2008), participants in this programme indicated they never had any share in the sales of the trees. It may thus be argued they suffered losses in that regard because the sharing of the benefits was inequitable. In terms of forest regeneration, the strategy was effective promoting trees cover (mainly Teak) even though these are also now being degraded completely because of serious logging. The chief of Dwease, explained that timber contractors have had both authorized and unauthorized access from to cut timber and as a

result most of the trees are now gone. It is therefore not surprising that the Reserve has been placed under convalescence as discussed earlier.

It is found out that the MTS is currently not being practiced in both communities because it faced a number of challenges. The chief of Dwease recounted that there was inadequate supply of tree seedlings because some people who wish to participate were actually not engaged because of the shortage of seedlings. This challenge is linked with the general constraint of effectively implement the strategy due cost. Averagely at the same time, when the programme was being carried out in these communities, the FC was faced with challenge of supplying seedling adequately because, about GH¢391,667.23 of the total of GH¢846,485.21 released to the Plantation Department was used to pay for out-standing cost for seedlings supplied in 2007 (FC, 2008). Aside the shortage of seedlings, it is also revealed some of the local people who were engaged did not actually tender the seedlings as agreed but only used the land cultivate their crops hence the FSD has stopped engaging people in both communities. This challenge is suggestive that there was ineffective monitoring and supervision by the FSD to ensure that the farmers were actually planting and tendering the seedlings as they did for their crops.

Another strategy is the release of land to private individual or companies. It is highlighted in an interview that, the FSD had signed a contract with Ecotech Services Ltd, an NGO, to supervise the establishment and maintenance of plantations and to supply seedlings. This is also confirmed by 4 of the household respondents (3.6%) who indicated to have actually been involved in this strategy. This strategy is similar to the MTS but the different lies in who takes charge of implementation and the sharing of the benefits. In terms of the benefits, it is noted that the private investor (defined here as Ecotech Services Ltd) earns 90% of the total proceeds from the plantation and the Forestry Commission, Landowner and community earn 2%, 6% and 2% respectively (Forestry Commission, 2008), the farmers identified in the communities stated these terms of shared benefits were not established, because they only had access to their crop produces not benefits from the trees, thus, its effectiveness as a strategy to promote forest regeneration, community partnership and income and losses for small holders are same as discussed for the MTS .

The last of the strategies under the production working cycle is industrial plantation. As discussed in the literature review, the mode of operation requires plantation workers to be hired and paid a monthly allowance to establish and maintain plantations. The plantation supervisors are given one year renewable contract employment to supervise and offer technical direction, with the Plantations Department (PD) exercising general oversight and monitors field activities to ensure compliance with quality standards for plantation establishment (FC, 2008). It is discovered that 6 respondents (5.5%) had engaged in this strategy but instead of the monthly allowance, they are paid a daily amount of GH¢ 7, (total of GH¢ 210 per month). This they argued to be woefully inadequate considering how difficulty of tendering the seedling and also the long distance one has to travel before getting to the Reserve (estimated if walking about 2-3 hours and by using the tractor, about 1 hour). This probably explains why few people were involved in this strategy especially those at Praaso, because of the distance from this community to the Reserve is very long.

The third working cycle of the FSD used in promoting sustainable forest management is research and regulation. It was ascertained that, the FSD has established research plots to monitor tree growth and development. In addition, there is also regulation of timber extraction, by providing the legal framework or guidelines to determine which trees are harvested, where they can be obtained and by whom. These regulatory policies particularly with regard to timber forest products are now keenly emphasized because Ghana is a signatory to the Voluntary Partnership Agreement (VPA), and the terms of agreement do not suppose illegal logging.

In line with its regulatory policies, the FSD in collaboration with Tropenbos International Ghana (TBI) is helping to register chainsaw operators within the Jauso Forest district, and this is currently operational in Juaso and yet to be extended to other communities like Dwease and Praaso. The specific aims include helping them to understand the consequences of their activities on the sustainability of forests, enhance their knowledge on branding and marketing their wood products and capacity building in business and financial management. Since chainsaw operation is identified as the major cause of deforestation in the two communities, it is hoped that, the adoption of such an

initiative will help salvage the continual degradation of the forests because members will be challenged to own the sustainability of the forests.

The above discussion has shown that there are and have been various strategies adopted by the FSD to ensure sustainable management of forests in Dwease and Praaso and these are exemplified in the different working cycles. It is however observed that, in practice the real and workable strategies employed are the Enrichment planting and the conventional administrative function of regulating illegal logging. Inferably, it should be argued that the role of the FSD in ensuring sustainable forest management at the local level is very weak. Even with the practical strategies, it is well noted these are mainly applied in the management of forests within reserves. Thus, one can say that, there are no real strategies adopted by the FSD to manage the off-reserve forests which are even more extensive in the two communities. With the re-launch of the NFPDP, which hitherto was largely implemented within degraded forest reserves, but now to cover private lands located outside forest reserves (FC, 2011), it is hoped that it will redirect the focus of the FSD to also effectively ensure sustainable management of forests within off-reserves.

It is also conclusive from the above analysis that strategies of forest management adopted by FSD are directly geared towards the management of Timber Forest Products (TFPs) rather than Non-timber Forest Products (NTFPs). Such approach could compromise local participation in sustainable management efforts because the local people often have less access to the TFPs and/or the resulting benefits accruing from their development. It makes them feel cheat, and this could influence their attitude and perception on policies on sustainability of forests in their communities.

Local leaders and the People

In Ghana, the Local government Act, 1992, Act 490 recognizes the role of local leadership in the governance and management of resources of the local area and this include forest management. The seemly adoption of Collaborative Forest Management (CFM) strategy as part of the National Forest Plantation Development Programme (NFPDP) (FC, 2011) may be a more formidable step to strengthen the role of local leaders and communities in the management of forest resources in the country. However,

the effectiveness of the CFM strategy in forest management is questioned in the studied communities. This is because, the findings indicate there is no or narrow collaboration with local leaders. For instance the chief of Dwease remarked that;

“Though they are supposed to foster collaboration with us for forest management (FM), I have realized our efforts are not appreciated. We suggested a voluntary forestry team from the community to help monitor the chainsaw operations but it has been refuted by the FSD. Yet most of the forest guards used by the FSD cannot read and write and this promoted ineffective data collection, which is a great challenge” (Personal Interview, 2013).

This viewpoint is similarly shared by the Assembly man of Praaso who put forward that though the FSD oversees forest resources in their community, there is no collaboration with the local leaders (neither the assembly man nor chief). That notwithstanding, the chief explained that, a local forestry team has been established to arrest and prosecute any person caught operating chainsaw without a regulated permit within the community. It is realized no such initiative exists in Praaso and this probably because, unlike Dwease that has a community forest, the forest areas in the Praaso has no community forest. But it is generally established in both communities that farmers are banned from using fires to clear farmlands, especially during the dry season until the first rains have come.

There are also local beliefs which play vital roles in ensuring forest management in both communities. For instance in Dwease, it is established that people are not allowed to cultivate maize in the Reserve because it is believed the god of the forest does not like maize. Though the reason is connoted as religious, it has been and continues to be an effective strategy to preserve the forests because, the soil type clearly suppose growth of maize which is often cultivated on commercial basis in the community. There are also unique days in the communities that people cannot enter the forests for farming. In Dwease, this is observed on every Tuesday while it is observed on Fridays in Praaso. The purpose is to regulate the pressure from their activities on land and its resources (particularly forests).

For community comparison, it may be inferred that Dwease has strong local institutional, policy and legal framework and regulations for sustainable management of its forests as compared with Praaso. And this is probably linked with the role played by the respective leaders in these communities. It is identified that people owe much allegiance to the traditional leaders (either the chief or his representatives) as compared with political leaders (the Assembly man or men or unit committee heads). Analyzing the peculiarity of the local conditions, it is important to note that, in promoting the benefits of community forestry (practiced in the municipality as CFM) which is increasingly been accepted as a formidable strategy for sustainable forest management, stakeholder analysis should recognized the important role which could be played by traditional leaders (chiefs). Even though in some areas, the institutional, policy and legal framework and regulations may be weak, the key concern of the Forestry Commission and its diverse bodies should be adopted formidable efforts strengthen these, because in most cases these have proven to be effective managing sustainably forests at local level.

On the individual level, various efforts have been made by community members. First thing that should be talk of is the obedience of community members to observing the various policies initiatives developed by their leaders to ensure forest management. In addition, the other personal practices of forest management related generally with the sustained-yield forestry ecological principle (Hagget, 2001). The sustained-yield forestry is mainly practiced by the farmers who in clearing new farmlands within the forests carry out careful selection of the tree species which should be preserved and which should be cut down. The farmers explained that, this decision is based how they perceived the effect a particular tree species produces on soil moisture requirement. And this too is in turn related with the type of crop being cultivated and its requirement for sunlight. For instance, Oyina (*Ceiba pentandra*) is mostly preserved because they believe it helps to retent soil moisture for crops.

Aside this, there is also various efforts by local people to protect trees against fire and illegal logging so that, they could derive the full benefits from these. However this depends on the economic value people place on the tree species located on their lands. It is argued that Mahogany (*Khaya senegalensis*) and Odum (*Milicia excels*) are more likely

to be preserved because these are considered to attract good sales, hence individuals with these trees on the farms perceive to receive some good share for taking care of the trees. The challenge however is that, such individual could lose the supposed benefits because they may not know when these trees have been harvested especially with the increased illegal logging. As a result, it is highlighted by some farmers that in some cases they would rather prefer to cut down all timber species, (even when these trees are at tender age) because apart from the fact that they don't get the monetary benefits from logging, the process also sometimes destroys their crops and there is also often less or no compensation for the losses.

With the discussion above, it is basically observed that the strategies by the local people have not led to much regeneration of forests. It is however interesting to note that, these may seem to have a greater potential for sustainable forest management at the local level because they eliminate the costs and commitment aspect of tree planting. Thus the claim that rural poor consider tree planting as a relatively long time activity (Oksanen et al, 2003) is true of the Dwease and Praaso communities. Therefore there is the need to reform the strategies of forest management by the FSD and other institutional stakeholders to incorporate the concerns of rural people; to develop economic incentives that bridge the gap in the form of compensation for environmental benefits or advance payments for future sales of products (Oksanen et al, 2003).

CHAPTER FIVE: Implications of Research Findings for Sustainable Forest Management in Ghana.

5.1 Introduction

This chapter presents a summary of major findings of the study as discussed in the previous chapter. The discussion is carried out by raising thought provoking questions regarding various aspects of the research objectives with the aim of ascertaining the issues required for sustainable forest management in Ghana but more precisely in Dwease and Praaso.

5.2 How does the understanding of forest types influence access to and management of forests in Ghana?

The study has pointed out that the understanding of forest is varied and this is reflected in the various criteria used to define it. This variation in understanding has influenced people's perception of the major forest types in Dwease and Praaso. The research findings have indicated that there are four different (though interrelated) criteria used to explain forest types in the communities and these include, crown cover threshold only, land use only, both crown cover and land use criteria and others (maturity and ownership). Such a finding is necessary for local level forests assessment because Olson and Dinnestein (1998) indicate that, foresters' understanding of forest types shapes their definition of forests usage (cited in Adams, 2009, p.243). It is necessary to highlight that the various understandings of the forest as expressed by respondents reveal some critical issues which are pertinent for inquiring into the conditions for local level sustainable forest management. These include "*access to*", "*nature of*" and "*right to*" forest types.

On the part of *access to*, those who explained their understanding using ownership as the criterion explained that the Dome River Forest Reserve is *less accessible* because by definition, such a land has been earmarked by the Forestry Services Division (FSD) as a reserve and access to such forest type is highly regulated. This contrasts greatly with access to the off-reserves forest types. It is explained that, because these are generally being cultivated, they are more of de facto open-access resources widely open to any

entrepreneur and individuals in the communities who are able to negotiate unofficial access to the forests independently of an official legal regime in place. The *nature of* forest types has implications for sustainable management. It is realized that forests within off-reserves which by definition of their *nature* do not fall under the policy regulations of FSD. It is therefore not surprising that the various strategies adopted by the FSD are oriented towards the sustainable management reserves.

While the issue is far beyond the refusal on the part of the FSD to implement policies of forest management in off-reserves, the challenge is rather linked with the “*right to*” management which should define the benefits and responsibilities of the appropriate stakeholders, especially on tree tenure. The scientific literature and the research findings have proven that, though sustainable forest management should be collaborative, the state apparatus (FSD) has tried to expropriate the *right to* management solely one side and this has narrowed the effective role that could be played by the leaders and individuals at community level. Therefore the failure of the state apparatus to effectively manage national forests is evidenced in Dwease and Praaso because chainsaw operators and agriculturalists continue to negotiate illegal access to the secondary opened forest types and causing tremendous loss of tree cover and other biodiversity. Thus to foster sustainable management of forests at the local level, it is recommended that the tree tenure in off-reserves should be reviewed in order to critically consider the shares of the local leaders and individual especially land owners, and this could redefine the local perception on the “*nature of*” and “*right to*” management of forests. It is hoped that with the re-launch of the National Forest Plantation Development Programme (NFPDP) to cover off-reserve areas, efforts will guarantee good ownership, access to and management of the different forests types.

5.3 What is the rate of local level deforestation and how is this relevant for local level sustainable forest management?

Adams (2009) states that, though there is no doubt about forest cover changes in many humid and sub-humid tropical areas, there will always remain much debate on the rate and extent of deforestation. The research findings indicate household perception on the

rate and extent is varied though the majority of the local people perceived it to be rapid. The perception held in this regard is explained by comparing the changes in forest cover and the negative effects resulting from deforestation over time. The researcher was not ignorant of the fact that a respondent age; length of stay in the community and level of understanding of the dynamics of deforestation are peculiar factors to consider at length.

The satellite image interpretation of Landsat TM 2002 and 2004 of the Municipality also points out that, the rate of deforestation is estimated at 0.3% seems very low yet very significant. This has relevance for local level sustainable forest management because, in most cases the available statistics on the extent of deforestation are often national figures and may not reflect the local conditions. And because deforestation, like many environmental problems, is location specific (Adams, 2009), being able to determine the rate of local level deforestation helps to identify the perceived causes and the extent of impact from the process of deforestation. In the case of Dwease and Praaso, it is revealed that deforestation results strongly from economic activities which are sources of livelihood development and from changing population dynamics of the local people. Thus with the asserted knowledge on the rate and extent as well as the revealing causes of deforestation, efforts by the institutions and the role of communities and local people to inquire into the conditions for local level sustainable forest management could be more specific. And these efforts should be woven around changes that lead to a greater role for forest and tree resources and in the development of livelihoods for poor people (Mayers and Venmeulen, 2002).

5.4 Do the perceived causes of deforestation pose challenges for local level sustainable forest management?

The answer to the above question is a definite “yes” because the research findings indicate that deforestation is mainly driven by human activities which are livelihood sources for the local people. In both communities, it is ascertained that, chainsaw and agriculture are the most influential livelihood activities which produce both direct and indirect effects on forests cover changes. The impact from chainsaw operation is known to account for much of the loss of forests crown cover and this is because it is practiced

indiscriminately. It is also noted that, despite the regulations on timber extraction, as described in the Timber Resources Management Regulations, LI 1649 (Forestry Commission, 1998), chainsaw operations are still illegally being practiced in the communities and this poses a challenge for local level sustainable forest management in both communities. This is so because, it is difficult to identify the individuals who are directly involved in the chainsaw operation, for the purposes of prosecution and also to harness the collaborative roles of all stakeholders, including chainsaw operators in sustainable management of the forests.

The impact from agriculture as a cause of deforestation is tied to slash and burn cultivation and/or extensive cultivation. This soil type (forest ochrosols) supports such agricultural practices for the development of the major food and cash crops grown in the two communities. It needs to be emphasized that the loss of forests cover from agriculture is closely linked with the activity of illegal logging. This could pose challenges to effectively combat local level deforestation in Dwease and Praaso. Despite the fact that, slash and bush agriculture has caused loss of forests undergrowth and partly tree crown cover, the research findings revealed that there is a cause-effect interrelationship established between agriculture as cause of deforestation and the impact of deforestation on agriculture in the communities. This makes it difficult to make a simple analysis, therefore it is suggested that policy and research in these dimensions should recognize the complex interrelationship in order to draw pragmatic recommendations and solutions.

5.5 How do the kinds of forest products extracted from the forests influence the sustainable forest management?

The research findings indicated that, the forest products exploited by the local people can broadly be categorized into timber forest products (TFPs) and non-timber forest products (NTFPs). But the majority of the respondents indicated that they extract more of NTFPs including food stuffs, energy supply, local craft material and material for shelter. Because most of the people mainly extract NTFPs, they have adopted the sustained- yield forestry ecological principle to forest management, because by careful selection of species they

are able to satisfy the household livelihood outcomes without jeopardizing future aspirations and needs. It is central to mention that, generally this strategy does not lead to much regeneration of forest cover loss as compared with tree planting which is much promoted by the FSD.

It is also ascertained that because the strategies adopted by FSD are directly geared towards the development of Timber Forest Products (TFPs) with less emphasis on Non-timber Forest Products (NTFPs), it has fostered less collaboration or compromise local participation in sustainable management efforts. This is because the local people have less access to the TFPs and the resulting benefits accruing from their development as a result, it has influenced their attitudes in effectively conserve forests containing timber species for others to have access. Also, local people perceive tree planting as a relatively long term activity (Oksanen et al, 2003). Therefore there is the need to reform the strategies of forest management by the FSD and other institutional stakeholders to incorporate the concerns of rural people; to develop economic incentives that bridge the gap in the form of compensation for environmental benefits or advance payments for future sales of products.

5.6 How relevant is the integration of gender perspective into forestry research for local level sustainable management efforts?

Manfre and Rubin (2012) explain that integrating gender perspectives into forestry research has focused much on the contribution of forestry activities to household income for men and women. The research findings indicate that the exploitation of forest products promotes income generation in the two communities in the form of personal income and royalty, and the former is much acclaimed. It is established that the average monthly income is estimated at GH¢ 300, with a substantive number of people earning below GH¢ 100 per month while there are others earning much above GH¢ 600. But a general characteristic of personal income is that it varies with seasons and this is especially true for the farmers within the communities.

It is also found that personal income varies between male and female populations in the communities because the calculated P-value of 0.128 of the Chi-square (X^2) test statistic

was greater than the level of statistical significance (0.05), therefore the null hypothesis that, “*there is no difference in the incomes generated from male forest activities and female forest activities in the municipality*” was rejected.

From the Phi value, it is asserted that the difference in income favours the males though the strength of the relationship between income and gender is very weak as indicated by the Cramer’s V. Based on this, it is imperative to state that integrating gender into forestry research helps to see opportunities for improved forest management and capture the complexity of inequities generated in the various forestry activities engaged by males and females in the community (Manfre and Rubin, 2012). This is in order necessary to create possibilities of building greater equity, as keenly emphasized in the 3rd MDG.

5.7 How has deforestation influenced changes in local climate and the impact on sustainable forest management?

Climate change is conventionally known to result partially from deforestation and the situation at the local level is no exception. The research findings revealed that, changes in temperatures and rainfall patterns are the major signs of local level climate change. Though household respondents may not understand the scientific dynamics of the connection between deforestation and global warming, it is recognized that they have considerable knowledge because the effects of global warming are evidently visible and are known to affect their livelihood activities and particularly agriculture. People affirmed the drying and dying state of crops on their farms, reduced soil moisture and general over heating of the air as evidence of global warming.

With regards to impact on sustainable forest management, Getis et al (2005) explain that deforestation causes trees and crops outside the denuded areas experience heat and aridity stress which is not normal to their geographical locations. As a result farmers tend to locate their farms within forested areas which are less likely to experience increased heating, loss of soil moisture, and drying of crops and land surfaces. This continual expansion of arable lands into to forested areas apart from the fact that it had caused massive loss of global forests, also produced temperature variations and ecological conditions which propel continual expansion of agricultural lands into forests. Thus, a

“cause-effect” interrelationship is established which should be clearly acknowledged for the purpose of policy and research connected to this dimension. It is also noticed that, there is a change in the rainfall pattern in the communities. This change is manifested in both reduced total amount of rainfall and number of rainy days over the years. And it is notable that these changes have resulted in the prolonged drought being experienced in the communities and its consequences for the growth and development of trees cannot be downplayed.

5.8 How has deforestation affected biodiversity and livelihoods and the influence on sustainable forest management?

The understanding of sustainable forest management as defined by the ITTO (2011) emphasizes the need to ensure the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment. But this could be a great challenge for Dwease and Praaso communities. The research finding ascertained that certain indigenous trees such Cedar, Boka, Epuru, Ateteboo, Berkye, Sebri, Apere (*Annona murricata*), Dawonma are getting extinct due to overexploitation by chainsaw operators. It is also highlighted that, peculiar forest products like snails, mushroom, and animals which serve protein requirements of households are threatened to extinction.

And though remarkable efforts are made to replant these indigenous species through the Enrichment planting programme, Knox and Marston (1998) explain that when trees are cut, the forest no longer supports the same wildlife as effectively as it did before and this may place its inhabitants at risk. This is true of the forests in Dwease and Praaso because some of forests species have lost their original habitats, and this implies great threats and insecurity. This could lead to further extinction because these animals are prone to predators. Also, because the strategies adopted by the FSD are geared extensively towards sustainable management of reserves but not off-reserves, in the face of increased deforestation, it places unbearable stress for the survival of biodiversity in the latter forest types which are more extensive in both communities.

5.9 How effective are the strategies adopted by the FSD, local leaders and people in promoting sustainable forest management?

The research findings espoused that currently actual strategies by the FSD to promote sustainable management of forests in the communities are the Enrichment planting and the conventional administrative function of regulating illegal logging. While the enrichment planting could help regenerate the degraded Reserve in Dwease, the impact from the recent forest fire, (noted during the field survey) has undermined the progress of these initiatives. The narrow scope of the enrichment planting (practiced only in the forest reserves) as well as its poor cooperation with the local communities and lack of benefits for smallholders may rather suggest it to be ineffective in managing forests sustainably in Dwease and Praaso. This is because the amount of forests in off-reserve zones in both communities is rather extensive as compared with the Dome Reserve. With the re-launch of the NFPDP and its redirected focus to cover private lands located outside forest reserves (FC, 2011), it is recommended that the FSD should adopt formidable yet realistic strategies to sustainably managed forests in off-reserves.

The findings have indicated that, the strategies and regulatory polices of FSD are directly geared towards sustainability of Timber Forest Products (TFPs) as compared with Non-timber Forest Products (NTFPs). It is therefore recommended that, this approach be reformed because it could compromise local participation in sustainable management of the forests. This is because most of the local people do not benefit much from the extraction of TFPs as compared with NTFPs. Reiterating the point made earlier, it is therefore necessary to reform the strategies of forest management by the FSD and other institutional stakeholders to incorporate the concerns of rural people; to develop economic incentives that bridge the gap in the form of compensation for environmental benefits or advance payments for future sales of products. This should be done instead of rather emphasizing on tree planting which has been received with poor collaboration as seen in Dwease and Praaso.

On the part of local leaders, the research findings have indicated that, because of poor collaboration from the FSD, their efforts in forest management has not created much

regeneration of forests at the local level. Notwithstanding this fact, the findings have also proven that community forestry is a formidable strategy to ensure sustainable forest management in Dwease and Praaso. It is therefore recommended that, in revitalizing the Collaborative Forest Management strategy which has been adopted in the Municipality, effective participation in decision making as part of the stakeholder analysis, should recognize the important role of traditional leaders (chiefs). Even though in some areas, the institutional, policy and legal framework and regulations may be weak, the key concern of the Forestry Commission and its diverse bodies should be to strengthen them and their enforcement because in many cases they have still proven to be effective in managing forests sustainably at local level. On the part of individuals in the communities, they practice the sustained-yield ecological principle as their way of promoting sustainable forest management. Though this strategy has not led to regeneration of forests, it is noted to have bridged the gap in the form of compensation for environmental benefits or advance payments for future sales of products.

CHAPTER SIX: Conclusion

It is realized that previous, research on deforestation had often asserted it as “*evil*” because of the long term environmental implication for sustainable development as evident in global warming, biodiversity loss and soil degradation. While its negative consequences are undeniable, forest degradation and deforestation have also contributed tremendously to households’ livelihoods, income and employment as well as development of social amenities for the sustenance of indigenous people. As a result, this research has sought to provide a holistic discussion on the impact of deforestation on sustainable forest management. In the light of the negative consequences albeit socio-economic benefits, deforestation has been highlighted as a “*necessary evil*”. The research is a wholesome piece because it has been built on the tripartite relationship between development, environment and management, the major tenets of sustainable development. And in that, the researcher has established both the direct and indirect relationships between these pillars by inquiring into the conditions for local level sustainable forest management in the two communities: Dwease and Praaso.

In the first place, deforestation is identified as a development problem following Øyhus (2011_b) definition of development to be concerned with examining the broad and encompassing process that brings the communities from a lower to a higher level of human dignity. In this, the researcher identified how the process of deforestation has helped in fulfilling various socio-economic benefits for individuals and the local community in both Dwease and Praaso respectively. It is ascertained that, the exploitation of both NTFPs and TFPs contributes to households’ livelihood development through the supply of food, energy, and materials for local craft and shelter. There is also the generation of personal income and royalty for individuals and chiefs respectively. The Chi-square test statistic proves that personal income generated from male forest activities varies considerably from that of female forest activities in the municipality and while the relationship favours the male population, it is conclusive that the correlation is very weak.

Secondly, recognizing that development processes could produce practices which sometimes appear to conflict with one another, requiring for the reproduction of society- the general transformation and destruction of the natural environment and social relations (Rist, 1997), the environmental implications of deforestation were also discussed. The understanding of environment as adopted connotes the geographical factors (natural resources, climate, land, water, populations, infrastructure, etc) which have had an impact on the livelihoods of the communities. The research findings revealed that there are various negative effects of deforestation. Changes in temperatures and rainfall patterns are the major signs of local level climate change and these effects are evidently visible and are known to affect local livelihood activities particularly agriculture. There is also increased soil degradation as well as loss and/or extinction of certain trees species and peculiar forest products like snails, mushroom, and animals which serve protein requirements of households.

Thirdly, the last pillar is concerned with the management, which according to Boddy (2011) is concerned with getting things done in cooperation with people and other resources. The focus was to unravel, the risk and/or rewarding process and the practical actions associated with sustainable management of forests in the two communities. While the Forestry Commission working through its decentralized body; the Forestry Services Division; has adopted various strategies to promote sustainable management of forests in Dwease and Praaso. It is realized the commitment of these forest management bodies (agencies) at the local level is weak especially in off-reserve zones. And as noted the major limitation is the fact that there is ineffective public participation in the design and implementation of these strategies. The FSD is therefore highly recommended to emphasize the collaborative role of all stakeholders at the local level to promote broad public participation. This is a fundamental prerequisite as emphasized in Agenda 21 report, the blueprint on sustainable development (UN, 1992). Apart from harnessing the role of all stakeholders, broad public participation also helps put national bodies and governments on the right track because in most cases they often sign international treaties and conventions yet they may lack the political will or commitment to enforce these at local level.

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Appendix I

Target: Local people

Data Collection Technique: Structured questionnaire **Sampling: Strategic random**

Name of Interviewer:
(Compulsory)

Name of Respondent:
(Optional)

Date: **Code:** **Name of Community:**

Demographic characteristics of respondents

1. Gender
 - Male
 - Female
2. Age
 - a) 18-25years
 - b) 26-33years
 - c) 34-41years
 - d) 42-49 years
 - e) 50years and above
3. Marital status
 - a) Single
 - b) Married
 - c) Divorced
 - d) Separated
 - e) Widowed
4. What is your level of formal education?
 - a) No schooling
 - b) Basic level
 - c) Secondary level
 - d) Tertiary level
 - e) Other, please specify.....
5. What is your major occupation?
 - a) Agricultural production (crop farming and animal rearing)
 - b) Wood fuel production
 - c) Chainsaw operation
 - d) Hunting
 - e) Other, please specify.....

6. What is your alternative livelihood activity?
- a) Agricultural production (crop farming and animal rearing)
 - b) Wood fuel production
 - c) Chainsaw operation
 - d) Hunting
 - e) Other, please specify.....
7. How long have you stayed in this community?
- a) Not stay here
 - b) 1-5years
 - c) 6-10years
 - d) 11-15years
 - e) 16 years and above

Perception, Extent and Causes of deforestation (1st Objective)

8. Which of the following criteria will you use to describe your understanding of forest? i) Crown cover ii) land use
- a) I only
 - b) II only
 - c) I and II only
 - h) Other, please specify.....
- 9a. How will you classify the forest type present in your community?
- i) Primary forest ii) Secondary forest iii) Closed forest iv) Open forest
 - a) I and III
 - b) I and IV
 - c) II and III
 - d) II and IV

e) Other, please specify

9b. What is the reason for your choice of the answer in 9a above?

10 Do you agree deforestation has been witnessed in this community?

a) Strongly agree

b) Agree

c) Disagree

d) Strongly disagree

11. How will you describe the rate and extent of deforestation in this community?

a) Rapid

b) Slow

c) moderate

d) unpredictable

e) Other, please specify

12. How will you categorize the major processes accounting for the loss of forest resources in your community? i) Anthropogenic factors ii) Natural factors

a) I only

b) II only

c) I and II

d) None of the above

e) Other, please specify

13. Which of the following broad elements are known to be the source of anthropogenic deforestation?

a) Economic

b) Conflict and governance

c) Demographic

d) Social

e) Science and technology

14. Do you agree with the assessment that process of deforestation results from activities which serve as livelihoods for people directly and indirectly dependent on forests?

a) Strongly agree

b) Agree

c) Disagree

d) Strongly disagree

15a. Which of the following livelihood activities may be described as the major driver of deforestation in this community?

a) Agriculture

b) Wood fuel production

c) Chainsaw operation

d) Hunting

e) Other, please specify

15b. What is the reason for your answer above?

16. Which natural factors are noted to account for deforestation in this community? i) Natural forest fires ii) Drought

a) I only

b) II only

c) I and II

d) Other, please specify

Socio-economic benefits of deforestation (2nd Objective)

17. What kind of products do you particularly extract the forests?

a) Timber Forest Products (TFPs)

b) Non-Timber Forest Products (NTFPs)

c) Both

d) None

18. Which of the following socio-economic benefits directly influence the exploitation of forest resources in this community? i) Source of livelihoods ii) source of income iii) source of employment

a) I only

b) II only

c) III only

d) I and II only

e) I and III only

f) II and III only

g) I, II and III

h) Other, please specify

19a. Do you agree that Non- timber forest products (NTFPs) contribute more importantly to households' livelihood development than Timber forest products (TFP)?

a) Strongly agree

b) Agree

c) Disagree

d) Strongly disagree

19b. Give a reason for your answer above?

20. Which are the major timber products available in the forests?

21. Which Non- timber forest products are mainly derived from the forests as livelihood outcomes?

22. How does the exploitation of forest resources (TFPs and NTFPs) **most importantly** contribute to households' livelihood outcomes?

a) Household energy

b) Foodstuffs

- c) Materials for shelter
- d) Local craft materials
- e) Other, please specify

23. In which way does the process of deforestation **most** particularly lead to income generation in this community?

- a) Taxes
- b) Personal income
- c) Royalties
- d) Other, please specify

24. Do you agree that Non- timber forest products (NTFPs) contribute more importantly to households' income than Timber forest products (TFPs)?

- a) Strongly agree
- b) Agree
- c) Disagree
- d) Strongly disagree

25. What is your average monthly income derived from engaging in forest resource exploitation (whether TFPs or NTFPs)?

- a) Below GHc 100
- b) GHc 110- GHc 200
- c) GHc 210- GHc 300
- d) GHc 310- GHc 400
- e) GHc 410- GHc 500
- f) GHc 510 and above

26a. Does personal income accrued from the process of deforestation differ in a gender perspective (between male and female), with males receiving more income than females?

a) Yes

b) No

26b. If yes, what are your reasons.....

26c. If no, what are your reasons

27. Which of the following is the most predominant employment opportunity created through the process of deforestation?

a) Wood fuel production

b) Hunting

c) Chainsaw operation

d) Craft and wood processing

e) Other, please specify

28. How does the employment opportunities created from the process of deforestation differ amongst the male and female populations?
.....

29. Has the exploitation of forest resources led to the development of cooperation between national or private institutions and this community for development?

a) Yes

b) No

30. If yes, what are some of the known social amenities derived from such cooperation?

Negative effects of Deforestation (3rd Objective)

31a. The negative effects of deforestation evidenced in this community can broadly be categorized into? i) Global warming ii) Soil degradation iii) Loss of biodiversity iv) Loss of livelihood assets

a) I only

b) II only

- c) III only
- d) IV only
- e) I and II only
- f) I and III only
- g) I and IV only
- h) II and III only
- i) II and IV only
- j) III and IV only
- k) I, II, III, and IV
- l) Others, please specify.....

31b. What is the reason for the choice of your answer above?

32. What are the manifestations of the impact of global warming as a negative effect of deforestation? i) Warmer temperatures ii) Increased drought and dryness of land iii) Changes in rainfall patterns

- a) I only
- b) II only
- c) III only
- d) I and II only
- e) I and III only
- f) II and III only
- g) I, II, and III
- h) Others, please specify

33. Which of the following forest livelihood activities will suffer most from the impact of global warming?

- a) Agriculture
- b) Wood fuel production
- c) Hunting
- d) Chainsaw operation
- e) Craft processing
- f) Other, please specify

34. What is the main manifestation of the soil degradation as an effect of deforestation? i) Reduced soil fertility ii) Increased soil erosion

- a) I only

- b) II only
- c) I and II only
- d) Others, please specify

35. In which way how soil degradation **most importantly** affected agriculture, the predominant livelihood in this community?

- a) Increased expenditure on chemical fertilizers
- b) Reduced crop yields
- c) Loss of farmland or arable land
- d) Other, please

Strategies of sustainable forest management (4th Objective)

36. What is your understanding of sustainable forest management?

37a. Do you think there are criteria and indicators that should be used to explain the concept of sustainable forest management?

- a) Yes
- b) No

37b. If no, what are your reasons

37c. If yes, which of the following is the most predominant factor used in defining sustainable forest management?

- a) Productive functions of forest resources
- b) Protective functions of forest resources
- c) Legal, policy and institutional framework
- d) Other, please specify

38a. What are the main legal and institutional policies to ensure the productive and protective functions of forests in this community?

38b. What do you know about the Forestry Services Division (FSD)?

38c. How often do they come to this community?

- a) Very often

b) Often

c) Rare

d) Not at all

39a. Are you personally involved in any reforestation programmes of the FSD in this community?

a) Yes

b) No

39b. If No, what are your reasons?

.....

39c. If yes, which of the following are you most involved?

a) Modified Taungya System (MTS)

b) Industrial plantation

c) Release of degraded land to private individuals

d) Other please specify

39d. Why do you engaged in the type of activity you chose in question above?

.....

40. Apart from the FSD which other institutions of forest management are available in this community?

41. Do you agree these strategies have been effective in promoting sustainable forest management in this community?

a) Strongly disagree

b) Disagree

c) Agree

d) Strongly disagree

42. What personal efforts have you made to promote sustainable management of forest resources and how effective are these?

.....

Appendix II

Target: Traditional rulers

Data Collection Technique: Semi-structured interviewing **Sampling:** Purposive

Name of Interviewer:

(Compulsory)

Name of Respondent:

(Optional)

Date: **Code:**..... **Name of Community:**

Perception, Extent and Causes of deforestation (1st Objective)

1. Which of the following criteria will you use to describe your understanding of forest?
2. How will you classify the forest type present in your community?
3. To what extent has deforestation been witnessed in this community?
4. How will you categorize the major processes accounting for the loss of forest resources in your community?
5. Which of the following broad elements are known to be the source of anthropogenic deforestation?
6. Which livelihood activities may be described as the major driver of deforestation in this community and what is the reason for your answer above?
7. Which natural factors account for the process of deforestation in this community?

Socio-economic benefits of deforestation (2nd Objective)

8. Which are the major products mostly extracted from the forests in this community?
9. What are the socio-economic benefits that influence the exploitation of forest resources?

Negative effects of Deforestation (3rd Objective)

10. Which negative effects of deforestation have been witnessed in this community?
11. How are the manifestations of these effects and the impacts on livelihood activities in this community?

12. In which way does deforestation enhance poverty as a negative effect in this locality and what is the manifestation between male and female population?

Strategies of sustainable forest management (4th Objective)

13. What is your understanding of sustainable forest management?

14. What the known strategies used to ensure sustainable management of the forests in this community?

15. What do you know about the Forestry Services Division (FSD)?

16. Apart from the FSD which other institutions do you foster with to promote sustainable forest management in this community?

17. How effective are the strategies adopted to promote sustainable forest management in this community?

Appendix III

Target: Forest Services Division (FSD)

Data Collection Technique: Interview guide

Sampling: Purposive

Name of Interviewer:

(Compulsory)

Name of Interviewee:

(Optional)

Managerial Level of Interviewee...

Date:

Interview Code

Perception, Extent and Causes of deforestation (1st Objective)

1. Which of the following criteria will you use to describe your understanding of forest?
- 2a. How will you classify the forest type present in your community?
- 2b. What is the reason for your choice of the answer in 2a above?
3. How will you describe the rate and extent of deforestation in this community?
5. Which of the following broad elements are known to be the source of anthropogenic deforestation?
6. Which livelihood activities may be described as the major drivers of deforestation?
7. Which natural factors are noted to account for deforestation in this community?

Socio-economic benefits of deforestation (2nd Objective)

8. Which are the major products exploited from forests in this locality?
9. Which category of forest resources **most importantly** contributes to household livelihood development and what is your reason?
10. In which way does the process of deforestation lead to income generation for the communities?
- 11a. Do you agree that Non- timber forest products (NTFPs) contribute more importantly to households' income than Timber forest products (TFPs) and what are your reasons?
12. How do the socio-economic benefits derived from the process of deforestation differ in a gender perspective (between male and female)?

Negative effects of Deforestation (3rd Objective)

13. Which are the observable negative effects of deforestation evidenced in this locality and what are the manifestations?

14. Which forest livelihood activities are mostly likely to suffer the negative effects of deforestation and how?

15. In which way does deforestation enhance poverty as a negative effect in this locality and what is the manifestation between male and female population?

16. Which are the main coping strategies to reduce the negative effects of deforestation on their livelihood?

Strategies of sustainable forest management (4th Objective)

17. What is your working definition of sustainable forest management?

18. Which of the known international criteria and indicators for explaining sustainable forest management?

19. What are actual strategies you adopt to promote sustainable forest management in this locality?

20. What kind of collaboration do you have with other stakeholders in promoting sustainable forest management?

21. How effective have these strategies been in ensuring sustainable management of forests in the two communities?

24. What are the known challenges that you limit sustainable management of forests in this locality?