

Sustainable Management of Atiwa and Bobiri Forest Reserves of Ghana towards Rural development

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Abstract

There has been developing concern on the most proficient method to manage forest resources reasonably for the world's poorest subsistence group of people who live along forests. This has turned out to be essential due to the fact that research and policies on deforestation and forest degradation have regularly attested it as "malevolent". This is as a result of the long-haul environmental ramifications for sustainable development obvious in global warming, biodiversity loss and soil degradation. Nonetheless, it is likewise certain that forest debasement and deforestation have contributed enormously to the advancement of households' livelihoods, income and employment. The objective of the study is to analyze how sustainability of the Atiwa and Bobiri forest reserves can contribute to rural development. Secondary data were collected as discrete and continuous variables which was subsequently converted into categorical variables to satisfy the research's purpose and facilitate interpretation. The research identifies that agriculture is the main cause of declining forest resources in Ghana since the rural dwellers have limited sources of making a living. Over 60% of the population in the Atiwa district are farmers just as the population of people living around the Bobiri reserve make up to about 70%. Forest degradation has been rampant due to ineffectiveness of forestry institutions and improper education and support given to the rural dwellers.

Key words: agricultural practices, forest resources, livelihood, sustainability, utilization

Introduction

Sustainable forest management (SFM) has attracted a great deal of attention globally in recent years. Sustainable forest management ended up transcendent after its acknowledgment by the United Nations Conference on

Environment and Development (UNCED) in 1992, as the most substantial contribution towards sustainable development by the forestry and wood products industry of any given country (UNCED, 1992). This concern could be attributed to both the esteem and useful attributes of forest

related resources (timber and non-timber) which are highly depended on by a number of people for livelihoods and also accruing to the environmental effect of their utilization. Geologically, the tropical rainforests are the world's most vital vault of biodiversity, and are a natural repository of genetic diversity, which offers a rich wellspring of therapeutic plants, high return foods for daily consumption and a lot of other helpful products (Addai *et al.*, 2016). Forest resources are vital to numerous individuals all through the world. On a global scale, a large number of individuals who live in rural areas depend on products like, wild fruits, vegetables, nuts, edible roots, honey, palm leaves, medicinal plants, and bush meat which are derived from the forest to generate income and also for consumption in their households (Andel, 2006).

Additionally, it is apparent that the degradation of tropical forests in developing countries draws in considerably more attention today than comparative instances of forest pulverization in developed countries. This could be attributed to the fact that majority, if not all, of the people in developing countries depend either directly or indirectly on forest resources for income generation or consumption. Again, the danger is that forest degradation in these countries may worsen the problems of the poor people in forest periphery communities. In the course of recent years, the view of forestry and how it promotes and contributes to economic growth, rural development and poverty alleviation has changed remarkably (World Growth, 2009). It is presently broadly contended that more noteworthy economic incomes are available if forest management is basically geared towards environmentalism.

One aspect that has been the focal point of much research and activity is investigating the crossing point and permeation between poverty and environment (Street and Price, 2009). It is identified according to FAOSTAT (2019) that 44.7% of the population of Ghana live in the rural areas. In other words, majority of these people directly depend on the forests in one way or the other. Ghana is divided into three forest zones: the high forest zone in the south, covering approximately 8 million hectares, the savannah zone in the north covering close to 4.7 million hectares and a transition zone in the middle belt accounting for approximately 1.1 million hectares of land area (ITTO, 2005). These forests give out numerous goods and services that are highly profitable to society; from wood-based to non-wood based endeavours to be specific industrial wood (timber), fuel wood to non-timber forest products, for example, plant and animal products (bush meat, snails, mushrooms etc.). Eventually, communities that depend on forest resources in Ghana rely on these goods and service for their livelihoods particularly for survival amid occasions like dry seasons, floods and farm yield failures. These products are additionally advantageous of utmost importance to sectors that depend on forest and trees for their daily functionalities, for example, livestock, water, energy and farming, which is a crucial contributor when it comes to the overall national economic development. For instance, according to CARE International (2004), the forestry division contributes 6 percent, to the Gross

Domestic Product (GDP) of Ghana. It has additionally been evaluated by Marfo and Acheampong (2011) that chainsaw milling, and related activities have provided jobs to over 94,000 individuals in 2009 and still give work to numerous Ghanaians. As indicated by Ahenkan and Boon (2008), these products contribute critically to food security of households, health and wellbeing, nourishment, and income, particularly amid the lean cultivating seasons. Regardless of these benefits obtained from forest resources, Ghana's forest resource base faces retrogression due to poor sustainable management. According to the Ghanaian Ministry of Science and Environment as indicated by Ankomah (2012) announced that human exercises including illegal mining has caused deforestation in most Catchment Forest zones in Ghana. The report additionally stipulated that one of the other pulverizing factors that affects forest reserves is farming close to the forest which represents 29 percent, harvesting of firewood accounted for 21 percent, illegal lumbering constituted 18 percent, bushfires made up of 17 percent and other unspecified causes constituted 15 percent.

Ankomah (2012) presents that toward the beginning of the 1900's, 78,705 km² of Ghana's 238,500 km² land area was exhilarated by natural tropical forests. By 1989, about 17,315 km² of the natural tropical forest remained or that 61,389.9 km² of Ghana's tropical forests had vanished. The annihilation happened at 1.3% every year for the period 1981– 1985 (Wildlife Extra, 2007). This can be attributed to the unforgettable bushfire disasters in sub-Saharan Africa in the early 1980s. The fire that soaked up Ghana in 1983 and led to a severe hunger crisis has become the major reference point in the history of the country (Addai *et al.*, 2016).

According to this reason, it is evident that rural livelihoods in communities in forest areas for the most part rely on agrarian production and direct reliance on forest ecosystem services. It is therefore highly needful to maintain a harmony and equity between the competing demands to survive as forest dwellers on one hand, and the sustainability of forests and forest resources on the other hand (Aduse-Poku *et al.*, 2003). Vedeld *et al.* (2004) promulgate that the poor people rely on forests to maintain their wellbeing and in some cases as a source of income generation. Looking at it this way, it is necessary to consider the wellbeing of humans and forest covers as joint issues as a result of their causal connections.

Therefore, the main objective of the study is to expound on how sustainable management of Atiwa and Bobiri forest reserves can contribute to rural development.

Methodology

The study highlights some direct benefits of forests to surrounding communities as well as means to ensure that their dependence will not destroy the forests as their livelihoods are improved.

The two forest reserves were chosen as case studies due to their similarities (see Table 2 and Table 3). Secondary data were used throughout the study. The researcher used open access and published sources to

collect all the data that are related to the study to analyze and generate the results. The researchers also relied on a previous primary research conducted by a co-author (Akomaning) in the research area for further analysis.

Journal articles, reports, annual research and technical projects, working papers, governmental and international organizational documents regarding the essence and impact of sustainable forestry to the livelihood of the rural dwellers are comprehensively reviewed. All of these previous studies on sustainable forestry as well as rural development which utilized experimental and qualitative designs provide inspiration for modeling the present investigation.

The study is substantially evocative. Although qualitative method was employed to analyze the data obtained from the various sources. Graphs and tables are presented and based on the study objective, data was collected as discrete and continuous variables and subsequently converted into

categorical variables to satisfy the research's purpose and facilitate interpretation. The analyses comparatively revolve around forested areas in the country with specific reference to the Atiwa and Bobiri forest reserves in the Eastern and Ashanti regions, respectively. These two forest reserves have a lot of similarities and are located close to the two major and renowned cities- Accra and Kumasi, respectively. The authors, through thematic approach (Maguire and Delahunt, 2017) presented the results of the study as well as discussions under various appropriate themes. The researchers analyze the data closely to recognize popular trends – themes, concepts, and sense patterns that consistently appear in the data obtained. With the exception of coding which was not used since the study is not primary, all the steps involved (familiarization, generating themes, reviewing themes, defining and naming themes and writing up) in thematic method of analysis were used to get clearly defined topics to be treated in the study.

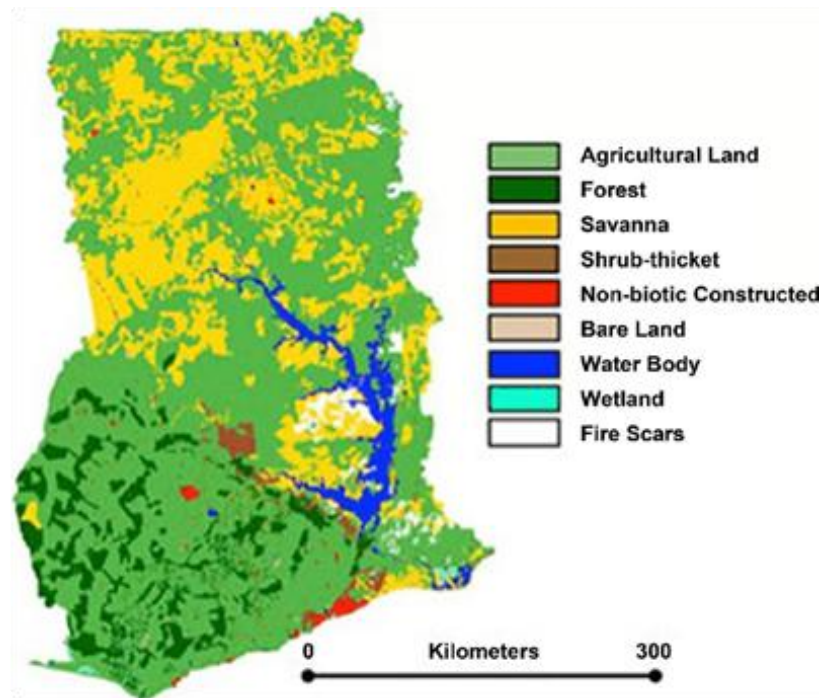


Figure 1: Vegetation map of Ghana
Source: Akomaning and Verter, 2018

Results and discussion

Ghana can boast of different major forest reserves. Table 1 presents major forest reserves and their sizes (Forestry Commission of Ghana, 2017).

Table 1: Major Forest reserves in Ghana by region

Region	Forest reserve	Size Km ²
Western	Ankasa	518.03
	Bia Tawya	481.74
	Krokosua Hills	481.74
	Subiri	587.93
	Sukusuku	678.58
Ashanti	Afram Headwaters	201.24
	Asenanyo River	227.92
	Mankrang	185.47
	Tano Offin	402.23
	Tinte Bepo (North, West, East)	115.51
	Bobiri	54.65
Brong Ahafo	Aboniyere	411.18
	Buru	302.25
	Esukese	264.96
	Mpameso	322.46
	Subin	238.28
	Tain II	509.19
Northern	Yakombo	1,210.95
	Yereda	424.81
	Nasia	314.69
	Kenikeni	515.98
	Gambaga South West II	222.22
Central	Assin Attandaso	153.59
	Bonsa Ben	155.40
	Bowiye	120.18
	Kakum	212.64
	Tonton	146.34
Eastern	Atiwa Range	232.32
	Esukawkaw	122.25
	Pra-Anum	123.28
	Southern Scarp I	154.62
	Southern Scarp II	146.75
Volta	Asuokoko River	116.03
	Chai River	182.36
	Kabo River	135.98
	Pra-Anum	123.28
	Togo Plateau	147.63
Upper East	Red Volta	217.60
	Red Volta West	261.59
	Sissili Central	155.67
	Tankwiddi	193.21
	Tankwiddi East	193.21
Greater Accra	Achimota	3.60

Sources: Forestry Commission of Ghana, 2017

Characteristics of Atiwa and Bobiri forests reserves and their contribution towards rural development

Forests in Ghana provide countless benefits to its populace. The Atiwa Forest Reserve, for example, is found in the South-eastern part of Ghana and it is considered to be the

largest rainforest in West Africa and serves as a habitation for numerous wildlife animals. Atiwa forest is located close to Accra, the capital city of Ghana and is the jewel in the crown of Ghana's named reserves. The benefits derived from the Atiwa Forest Reserve is grouped into four; regulatory, cultural and amenity services, provisioning, and

habitat. Provisioning services are those tangible materials the local people derive from the forest such as food (snails, mushrooms, bush meat, honey, and fruits), water, raw materials like timber, rattans, fuelwood and canes etc. (Eco - Fest Foundation at Atiwa Range, 2001). Water flowing from the Atiwa forest supply drinking water to about 5 million people (Akomaning, 2018).

At Atiwa, where the forest is located is blessed with many minerals and forest products and water bodies. The mineral resources located at Atiwa include gold, diamond, Kaolin and bauxite. The deposit of gold and bauxite are extracted from the Birim riverbanks, Abreponso, Kibi, Asikam, Enyiresi, Abekoase and Kwabeng. Kaolin is found in the Atiwa Ranges and manganese is found in the Asamama and Apapam parts (Wildlife Extra, 2007; Akomaning, 2018). The Forest itself is found at the Atiwa range covering about 158 square miles and have 25 square miles at Apedwa where timber is extracted from trees like Odum (*Milicia excelsa*), Mahogany (*Khaya ivorensis*), Wawa (*Triplochiton scleroxylon*) and Sapele (*Entandrophragma cylindricum*). The presence of streams and rivers provide the opportunity for fishing and irrigation activities. The municipality is also blessed with underground water with solid formation of

rocks. This helps to improve the quality of borehole water. The natural environment also attracts beautiful flies like butterfly hence they have established the butterfly sanctuary at Atiwa Forest Reserve and monumental reserves in the Kukurantumi forest (Wildlife Extra, 2007). Atiwa Forest Reserve remains the most extensive and unreservedly critical rainforest in West Africa serving as a source of food, water and others for millions of people and is a home for rare plants and animals. Irrespective of the natural resources in the shape of water, fresh air and plant products, the government of Ghana intends to exploit the bauxite found in the forest. Environmentalists are requesting that the Atiwa forest is turned into a national park. In recent times, the value of the Atiwa forest has increased and in a report in 2016 dubbed "The Economics of the Atiwa Forest Range", it was stated that using the forest as an ecosystem service will provide revenue in the unforeseen future. The most important services that are valued by most Ghanaians are the flow of water from the hills of Atiwa with over five million people depending on this water supply.

Table 2 presents the source of livelihood of the people living around the Atiwa forest reserve.

Table 2: Source of Livelihood

Variables	Percentage (%)
Farming	60.5
Teaching	7.7
Civil/public servant	6.2
Professional consultant	1.0
Trading/business	13.3
Unemployed	6.2
Artisanship	1.0
Any other	3.1
Non-response	1.0
Total	100.0

Source: Akomaning, 2018

A primary research by Akomaning (2018), indicated that over 60% of the people living around the Atiwa forest reserve are farmers. These farmers depend mostly on rainfall and water supply from the forest for irrigation. The necessity of sustainably managing the forest reserve has a huge impact on farmers' productivity. It was identified from the study that 45% of the population of the area believe that degradation of the forest has affected water systems of the area and over 32% confirmed that the impact of the degradation has affected their farming output/yield (see figure 2).

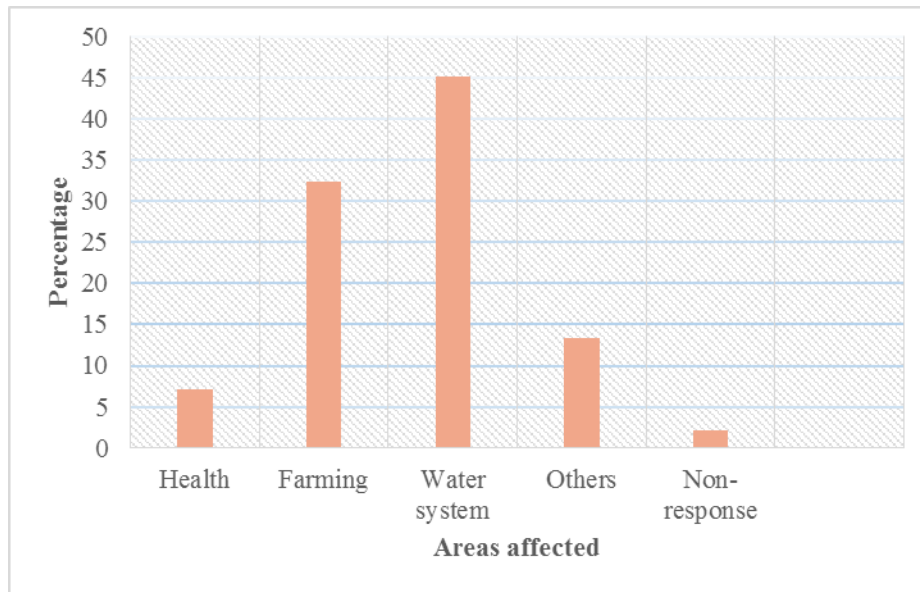


Figure 2: Areas Affected by Forest Degradation in the Communities.
Source: Akomaning, 2018

Degradation of the Atiwa forest go a long way to affect water availability of over 5 million Ghanaians.

Farmers in the area believe that recent rampant degrading activities in the forest that has reduced forest cover in the area has contributed to decrease in farm output/yield compared to the previous years. This is attributed to environmental issues like high temperatures, excessive

rainfall, pollution of water bodies and inadequate water for irrigation (Akomaning, 2018).

When farming activities decline in the rural areas due to environmental issues, there is a high tendency of rural-urban migration in search of different jobs, and it will affect the development of these areas.

Figure 3 is a pictorial map of Atiwa forest reserve indicating some major rivers and surrounding communities.

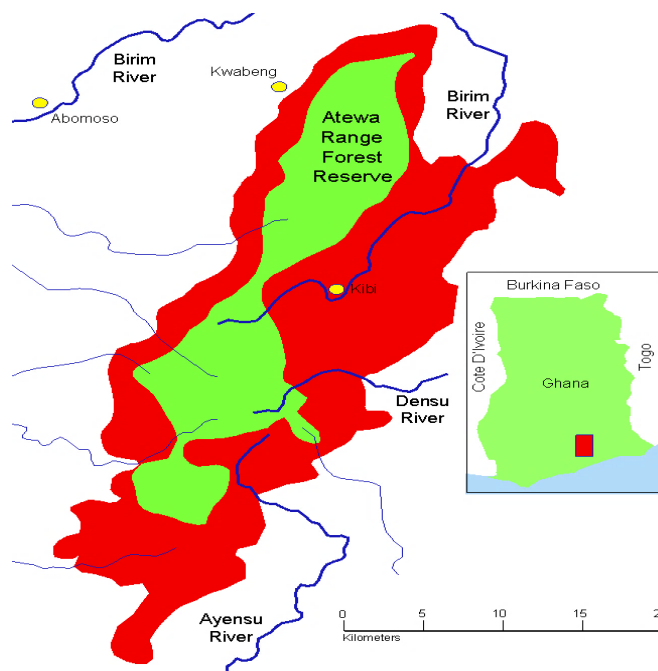


Figure 3: Map of Atiwa forest reserve
Source: Eco - Fest Foundation at Atiwa Range, 2001

The Bobiri forest reserve and butterfly sanctuary (BFRBS) in the Ashanti region of Ghana is equally renowned as Atiwa forest and thus plays imperative roles in families' livelihood strategies in the form of providing fuel wood, bush meat, therapeutic/medicinal and different plants, arts and craft materials as well as income (Antwi, 2009). BFRBS is one of Ghana's Forestry Research Institute (FORIG) designated ecotourism sites. Covering 54.6 sq. area. Km (21.1 sq. Miles), it is the largest total area reserve managed by FORIG and one of West Africa's most beautiful forest reserves. The reserve was created in 1939 in the Tropical Moist Semi-Deciduous Forest Zone when it was still an unexplored primary forest.

The forest reserve is considered a potential ecotourism site ahead of other forest reserves in the Ashanti region due to its fascinating features and proximity to Kumasi, the cultural hub of Ghana. These include various species of timber, twigs and insects, numerous birds and butterflies, and the forest's peaceful atmosphere. The Bobiri Forest

Reserve, just as the Atiwa forest reserve, is an essential sanctuary for about 500 different species of butterflies. It is evident that if the reserves' tourism potential is properly packaged with fringe communities in mind, it would bring tremendous improvement to people's livelihoods in fringe communities. Ecotourism is better for local communities as it is more labor intensive and offers better opportunities for small business (Scheyvens, 2007). The Forest has been seen as a valuable resource because it provides people with certain lifestyle necessities such as timber and non-timber forest products (NTFPs). According to Edusah (2018), people living around the Bobiri forest who are mostly farmers (see Table 3) argued that they were deprived of fertile farmland by the reserve and limited agricultural productivity in the area. This perception is supported by local argument that certain important economic resources, such as wood, are exploited from the forest by concessionaires who are foreigners to the disadvantage of the indigenous economy.

Table 3: Source of Livelihood

Occupation	Percentage (%)
Farming	70
Civil servants	13
Chainsaw operator	6.7
Traders	6.7
Unemployed	3.3
Total	100

Source: Edusah, 2018

From Edusah (2018), it was identified that most of the people living in fringed communities of the forest want to be allowed to use some of the reserve for farming due to lack of fertile lands. This pose questions to the farming practices in the area. The people as well lack more insight in the essence of ecotourism to rural development.

Figure 4 is a pictorial map of the Bobiri forest reserve with some of its surrounding villages as well as inserts of Map of Ghana and Ashanti region of Ghana.

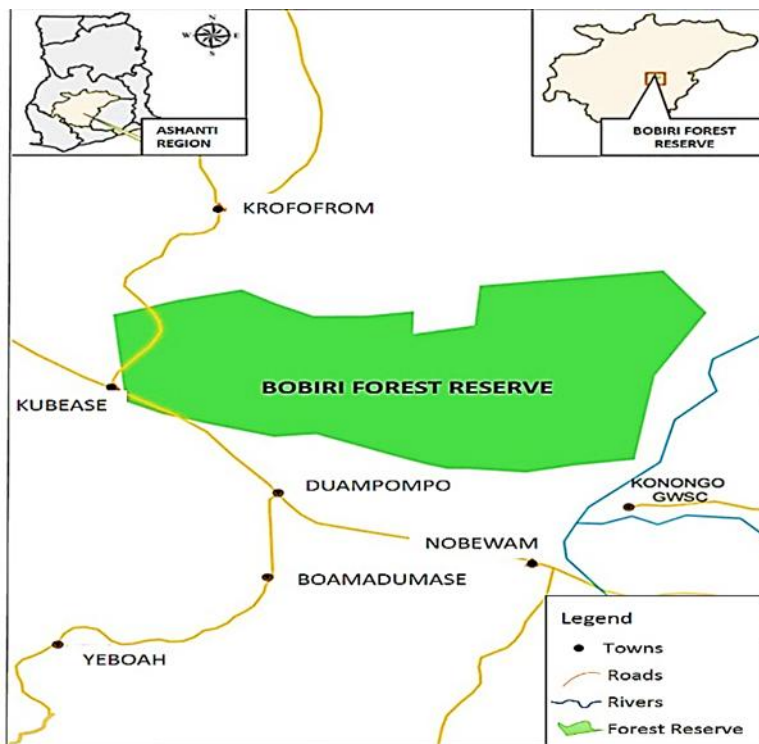


Figure 4: Map of Bobiri forest reserve
Source: Edusah, 2018

Declining forest resources in Ghana

The descriptions of agricultural practices of many farmers submit that their agricultural systems integrated some rudiments of shifting cultivation which includes slash-and-burn to prepare field within individual holdings. With this preparation, they develop shifting plots of short-cycle crops as well as long-cycle crops prompting the annihilation of forest tree species and related biodiversity (Appiah, 2007). This procedure of forest degradation through increasing agricultural activities to meet their subsistence needs clarified by the farmers in the forest areas is known to cause about half (50%) of deforestation in tropical forests (Barraclough and Ghimire 2000).

The constrained sources of work in the rural areas leave the settlers with less or no choices than to depend on or misuse the forests for their income generation. Since there are no other wage jobs in the rural areas, the only available means to make a living is to channel all their efforts and labour towards farming which leads to the clearance of more forests. Many researchers share a common view about this situation as presented by Geist and Lambin (2002), with specific reference to the assessment for a need to verify rural income by means of diversifying income generation activities.

Farming practices/ land preparation method used in the Atiwa district and Ghana in general, is a major cause of forest degradation (Akomaning, 2018). From the study, it revealed that 1.0% used ecological methods to prepare lands, 6.2% use tillage method to prepare their lands, 4.1% used other methods to prepare their land and 23.6% did not

indicate the method they used to prepare their lands. This is an implication that, farmers engage in slash and burn method more often which in turn is subject to clearance of forests and forest resources (see figure 5).

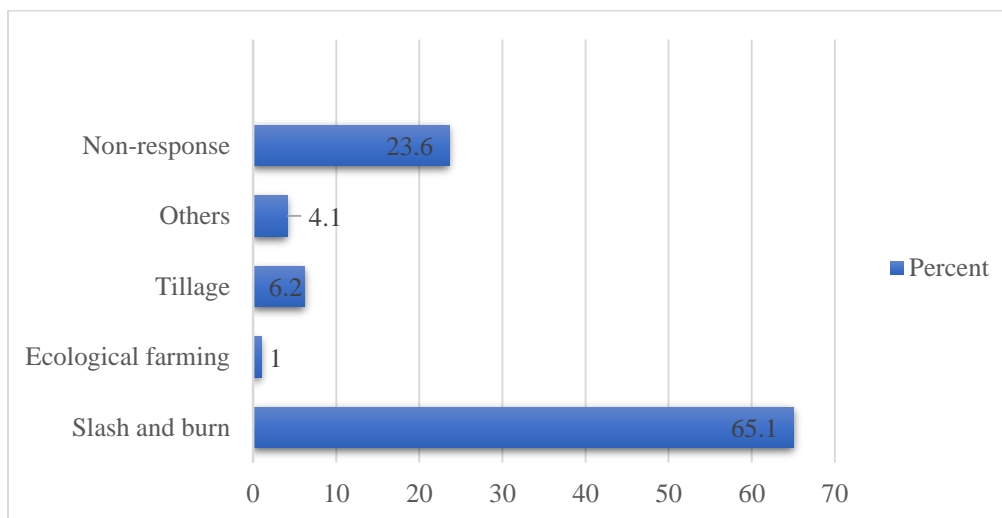


Figure 5: Land Preparation Methods used by farmers living around the Atiwa forest reserve
Source: Akomaning, 2018

It ought to be noticed that Forest neighboring communities with vast families and restricted sources to get income, food, and energy, would normally clear more forests to meet those fundamental prerequisites (Appiah *et al.*, 2009). By way of increase in needs for money, energy, food, and forest products amid increasing household members, it would be expedient either to upsurge the productivity of land currently under cultivation, or to increase the cultivated area. The fire outbreak that soaked up Ghana in 1983 and resulted in a severe hunger crisis has become the country's biggest reference point in history (Addai *et al.*, 2016).

Since there is less attention about environmental issues, poor rural dwellers continue to clear more forests for their daily upkeep and long-term livelihoods. Furthermore, forestry institutions had become dejected and inefficient due to continued underfunding (Donkor and Vlosky, 2003).

Mining operations have also made an enormous contribution to Ghana's decreasing forest resources. There are many (legally and illegally) mining activities going on around and sometimes within primary forests and forests reserves. Atiwa forest reserve, particularly, is endowed with different natural resources. Bauxite mining is one potential that awaits the forest but has not yet been licensed for this project. As in the last two decades, the trends in deforestation and forest degradation are high in the reserve that needs to be lower (Akomaning, 2018). Mining is a profitable development boom activity that can attract demographic growth with consequent deforestation (Hilson, 2002). Ghana's forests are concentrated in the High Forest Zone (HFZ), which largely includes the nations southern third. The HFZ has 216 state reserves spreading over 1.7 million hectares. Be that as it may, it is said that only 2 percent is in a superb situation, with about half being in a sensitive or better situation. For the most portion, the exceptional half is corrupted or more awful. There are about 0.4 million ha of off-forest reserve spreading over 5 million

ha of land, and it is in these regions that most deforestation and degradation has occurred. In addition to clearing forests and digging the soil for minerals, some small-scale mining organizations also use trees, some of which are planted under large-scale organizations' rehabilitation plans, to line up their own shafts (Hirons, 2013).

Sustainable management of forest resources in Ghana

Ghana turned out to be all the more environmentally concerned after the acknowledgment of forest as the biggest, most perplexing and self-propagating of all biological systems at the 1972 United Nations Conference on Sustainable Development (UNCSD) in Stockholm. The result of the conference stressed the requirement for sound land and forest utilization policies, continuous monitoring of the condition of the world's forests and the introduction of forest management planning (UNCSD, 2002). In the mid-1990s, Ghana's forests were unnecessarily misused by illegal chainsaw activities combined with the outright disregard of the recommended reaping methodology (Donkor and Vlosky, 2003; Unanaonwi, 2014). In the course of extensive farming, there should be collaborative efforts to manage forests resources and its reserves to ensure sustainability in agricultural activities which will thereby improve productivity and income among local farmers. To have well organized periods to harvest resources is an insightful method for controlling the exploitation of forest and lessen wastes which affect arming activities in a more sustainable manner. Farmers around the Atiwa and Bobiri forests are to be educated on the essence to consider the future in their farming methods. Crop rotation is another means to rejuvenate soil fertility. There is the need to blend the developing environmental practices with the extensive demands on forest lands. Sustainable forestry entails making amendments in forest resource usage, and markets

and industries should conform to world standards (Nasi and Frost, 2009).

Conclusion

Undoubtedly, rural dwellers in developing countries will continue to depend directly on forest resources (both timber and non-timber) for livelihoods so long as wage jobs and other sources of livelihood remain limited. From this point of view, the tendency of exploitation and improper utilization of forest resources is high due to increase in population and growth in the participation of agricultural practices.

The majority of people in the forest-fringe communities are not actively involved in almost all the activities of the project that go on in preserving the forests. There is therefore the need for government to ultimately involve communities in environmental protection activities to build the sense of ownership in them. The government can use this means to train interested rural dwellers to protect the forests which eventually will serve as alternative source of livelihood in the rural area other than relying on agriculture alone.

Even though, Ghana operates a decentralized economy, policies and activities are still cantered in the cities. More powers should be given to the local government to establish jobs and ensure its functionality in the rural area.

Most of forest reserves in Ghana are considered to be potential ecotourism sites however none as of now is confirmed as such. The apparent beautiful and endowed nature and characteristics of the Atiwa and Bobiri forest reserves should be well broadcasted and made accessible to attracts tourists from all parts of the world. The butterfly sanctuary in both forests makes them unique among the other reserves (both major and minor) in the country. The government, together with private organisations can commission these reserves into tourist sites which would bring tremendous improvement to people's livelihoods in fringe communities. New jobs would be created for the people living close-by.

Recent cases of illegal mining activities in Ghana are found in forests and forest reserves. The Atiwa forest reserve is a victim. Implementing a policy framework as an approach to enhancing environmental practices is therefore necessary. These strategies should concentrate on encouraging miners' moral accountability by educating, advertising, and using social pressure to bring about a shift in behaviour. Consequently, enforcement of current legislation, using forces such as police, will increase the policy implementation act. This strategy would ensure that small-scale miners extract minerals without destroying the environment by suitable means. Since farmers around Bobiri forest reserve are not in support of the reserve, proactive measures such as police and forestry commission forces should patrol the protected area frequently to prevent farmers from encroaching. These farmers should be educated to forgo known farming methods like slash and burn and employ ecological farming methods. Crop rotation farming method is to be considered to help rejuvenate soil fertility.

Declaration

The authors confirm that this manuscript has no conflict of interest attached and there is no significant financial support from anywhere that has influenced the results in any way. I declare as the corresponding author that all the named authors have read and approved submission of this manuscript.

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