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Are Modern Institutions effective in the Conservation of the Forest flora of Gbele resource reserve in the upper west region of Ghana?

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Abstract

Besides traditional institutions, modern institutions such as Environmental Protection Agency, Forestry Commission, and Ghana National Fire Service are instrumental in diverse ways in trying to conserve the forest flora of Gbele resource reserve in the Upper West region of Ghana. However their efforts are considered as an exercise in futility because they have been ineffective in conserving the Gbele resource reserve. The paper evaluates the effectiveness of the roles of modern institutions in the conservation of the forest flora of Gbele resource reserve. Primary as well as secondary sources of data were resorted to in the study. Besides observation, face to face and key informant interviews for data collection, the study relied on purposive and simple random sampling techniques in the selection of respondents. Apart from content analysis of qualitative data, the study utilized a tool of SPSS known as descriptive statistics for the analysis quantitative data. The study relied on tables and charts for data presentation. The paper reveals that apart from herbs and shrubs, the dominant trees in the Gbele resource reserve are Khaya Senegalensis (African Mahogany), Vitellaria Paradoxa (Shea tree), Adonsonia Digitata (Boabab tree), Parkia Biglobosa (Dawadawa tree), Ceiba Pentandra (Kapok tree), magnifera indica (mango tree), Anacardium Occidentale (cashew tree) and Tectona Grandis (Teak Tree). The paper concludes that modern institutions by means of providing training for forest guards and environmental education on conservation of flora species in the Gbele resource reserve have been ineffective in trying to accomplish the goal of nature conservation. However, it is recommended that, support to modern institutions by Ghana Government should be intensified in order to make their roles effective in conserving the forest flora of Gbele, so as to promote Sustainable Development.

Keywords: Modern Institutions, Effective, Forest Flora, Conservation, Resource Reserve.

Introduction

The important roles played by institutions in the context of resource governance are increasingly being recognized in development studies[1]. The effectiveness of natural resource management institutional arrangements and organizations have been emphasized by discourse among research scholars in the mid 1980's.[1] Modern institutions in this study refers to centralized institutions.

Scholars and policy makers have been forced to reconsider the role of community in resource use and conservation as a result of intrusive resource management strategies and planned development emanating from poor conservation outcomes. Hitherto, literature considered the role of communities in development as a hindrance to progressive social change. However writings in contemporary times champion the role of community in bringing about decentralization, meaningful participation and conservation[2]. This suggests that, traditional institutions alone cannot sustainably manage forest resources. As such sustainable forest resources management requires a collaborative effort of traditional and modern institutions.

Government institutions have been developed alongside existing community institutions to manage public forest often allowing for little or no community participation or recognition in decision making. The developed government agencies are forest departments, state forest enterprises and watershed boards [3]. In recent years, the diverse roles played by communities as forest protectors and production managers have been prioritized. It is also noted that, traditional and emerging management institutions have been relied on by local communities in the management of a significant number of the world's forest. The communities' roles may range from passive engagement to active participation in goal identification, objective setting, controlling, implementation, and assessing results.

Also, granted legal autonomy or simple isolation ensures comprehensiveness in authority and community involvement in forest management. Clearly defined community involvement in forest management ranges from conditions in participatory decision making and access to resumed legal authority for management control[3]. It is argued that, unilateral centralized state control models were highlighted in forest management systems during the 19th century colonial era. Currently, sole legal rights to virtually manage all natural forests are still

possessed by most governments. Forest agencies entrusted with the protection of forested lands are faced by human resource and capital constraints during economic restructuring[3]. The ongoing failure to curb forest degradation in many nations is an indication that forest departments alone are simply incapable of such an unrealistic mandate. With the rapid expansion of human populations and the transformation of national politics and economies, the world has changed dramatically[3]. In other words, besides traditional institutions, a collaborative effort of some other modern institutions is essential in ensuring sustainable forest management. State dominance in the conservation of flora species is preferred because it resolves the issue of conflict of interest in resource exploitation on the part of conserving communities.

According to the Validation of Legal Timber Program Discussion Paper 4 [4] on a review of the current taxation system relevant to forest sector in Ghana, the Forestry Department of the Gold Coast Colony was established irrespective of the fact that the ultimate title to the high forest zones remained with the traditional land holding tribal groups. Over the past century, however, the government vested in the forest department the right to manage all timber and allocate concessions on behalf of communities. The discussion paper[4] noted that, the Forestry Commission has essentially retained a traditional forestry control system. Although the Forest Services Division (FSD) and the Timber Industry Development Division (TIDD) have been downsized by 45% and 75% respectively but, over the past decade, there has been relatively less shedding of functions. More so, the discussion paper stated that, Forestry Services Division has maintained its multiple roles of regulating, managing and monitoring the forest resource, as well as collecting and distributing revenue, while Timber Industry Development Division operates a partially relaxed regulatory framework in trade, commerce, industrial development and overseas market intelligence service.

Ghana's forest plays a vital role in the country's economy. Timber export is a key medium of foreign exchange and many people in Ghana depend on the forest for their livelihoods [5.] The forestry sector currently contributes 6% to Ghana's GDP and accounts for about 12% of foreign exchange earnings. Unfortunately, these forest resources are being lost at an alarming rate over the years. Since 2003, about US$12.8 million of forest revenues are lost annually through illegal chainsaw operation activities[5]. As a consequence, loss of biological diversity, soil erosion and climate change has been on the rise[5]. Ghana's mean annual rate of deforestation between 1990 and 2000 was 1.7%, which is above the regional rate of 0.8% and far above Asia´s rate of 0.1% and South America´s rate of 0.4%. Ghana has lost more than 90% of its high forest[5].

As elaborated by Garret Hardin, in his theory of Tragedy of the Commons in 1968, commercial timber loggers get their raw materials from the forest which they consider s common-property resource for their selfish economic satisfaction[6]. In actual fact, repercussions from the use of the forest as common property resources are suffered by society at large while benefit accrue to the individual user of the forest.

The paper sought to examine the effectiveness of the roles of modern institutions in the conservation of the forest flora of Gbele Resource Reserve in the Upper West region of Ghana in trying to provide answers to the following research questions: What are the types and importance of flora species in the Gbele resource reserve?; how can the flora species be described scientifically?; what is the perception of community members on the effectiveness role of modern institutions/organizations in the conservation of Gbele resource reserve; what is the perception of modern institutions on their effective discharge of duties'; are there some challenges inhibiting the performance of modern institutions in the discharge of their duties?

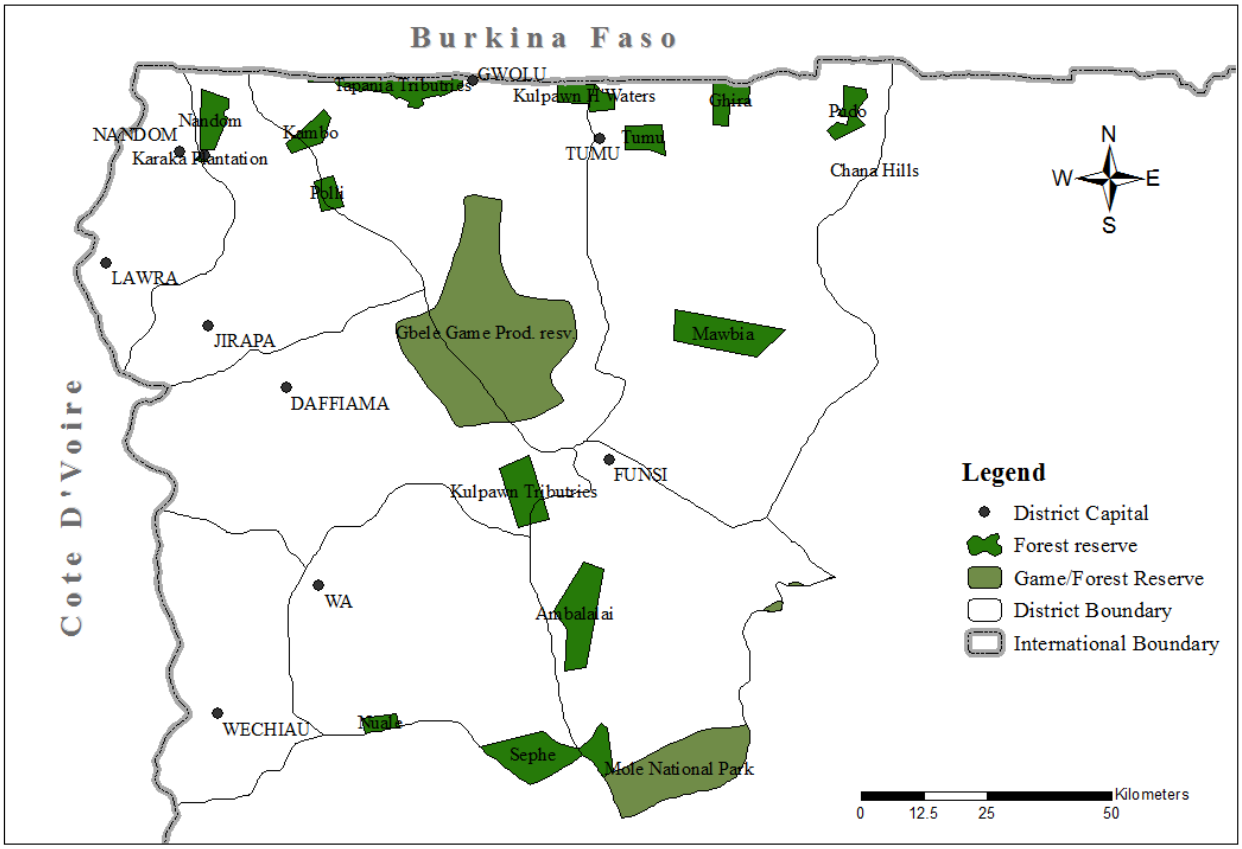
Researches in contemporary times are focused on the role of traditional institutions in forest resources management as well as community participation in forest resources management to the neglect of the efforts of modern institutions in forest resources management. Examples of such researches are as follows: Yahaya[7] researched into indigenous knowledge in the management of a community-based forest reserve in the Wa west district of Ghana. Agrawal and Gibson[1] looked at Enchantment and Disenchantment: The role of community in natural resource management. On the other hand Ghate and Ghate[8] focused on conservative attitudes of dwelling communities; hope for joint forest management to succeed; evidence from repeated field experiments in central India. This is just to mention a few. The paper in question aims at filling the knowledge gap on the roles of modern institutions in the conservation of forest resources by focusing on Gbele resource reserve in the Upper West region of Ghana.

Methodology

Study Area: The location, size and ecology as well as map of the study area are presented as follows:

Location, Size and Ecology: The Gbele reserve which covers an area of 565 Square Kilometers lies partly in areas of Wa, Nadowli, and Tumu and is 61 kilometers from Tumu and 89 Kilometers from Wa in the Upper West region. It is within the Guinea Savannah vegetation and was created in 1975 by Tumu District Assembly (now Sissala East District Assembly) in collaboration with the Wildlife Division and the Forestry Commission to protect plant and animal species within the Gbele catchment area. Geographically, the landform of the reserve is low lying but gently rolling at altitude approximately between 200 meters and 350 meters above sea level[7]. Conventionally, traditional institutions are supported by modern institutions in the sustainable conservation of the forest flora of the Gbele Resource Reserve. It is 61 kilometers from Tumu and 89 kilometers from Wa in the Upper West region[9].

Maps of Study Area: Map of the study area is presented in Figure-1.



Source: Constructed from Arc GIS

Figure-1
Map of Upper West Region indicating Gbele Resource Reserve and other Forest Reserves

Methodology: The study blended quantitative and quantitative techniques in data collection, analysis and presentation. Besides purposive sampling for the choice of key informants such as opinion leaders and officials of modern institutions who are stakeholders in conserving the forest flora of Gbele resource reserve, simple random sampling was used to choose 83 household heads from the Gbele community who are custodians of the resource reserve. This ensured that household heads were given an equal chance of becoming part of the final sample size. Key informants were purposively chosen by virtue of the fact that they are very knowledgeable on the subject matter Apart from observation and key informant interviews, face to face interviews were resorted to in the data collection process. Besides content analysis of qualitative data a tool of SPSS known as descriptive statistics was used for the analysis of quantitative data. Charts and tables were used to present data.

Sample Size Determination: According to the 2010 population and housing census in Ghana, the total household of Gbele was (490) [10]. Based on this figure the formula of Miller and Brewer was used to obtain the sample size to be interviewed. With a given confidence Interval of 90%, margin of error is; 10% (0.1) using the formula of Miller and Brewer[11] in the determination of sample size.

$$X = \frac{n}{1+n(e)^2}$$

Where: X = sample size, n= total households and e= sample error, x = 490/5.9 = 83, X = 83.

Results and Discussion

Results as well as discussion of results are presented as follows:

Forest Flora of Gbele Resource Reserve: The forest flora of Gbele resource reserve is classified into herbs, shrubs and trees. They include the following:

From Table-1 it is obvious that the forest flora of Gbele is classified into herbs, shrubs and trees. Herbs in the reserve include spear grass and elephant grass. Shrubs in the resource reserve include Calatropis and neem, whereas trees include Khaya Senegalensis (African Mahogany), Vitellaria paradoxa (shea tree), Adansonia Digitata (Baobab tree), Parkia Biglobosa (Dawadawa tree), Ceiba Pentandra (Kapok tree), magnifera indica (mango) cashew, and teak.

Table-1
Forest Flora of Gbele Resource Reserve

Herbs	Spear grass Elephant grass
Shrubs	Calatropis Azadirachta Indica (Neem)
Trees	Khaya Senegalensis (African Mahogany) Vitellaria Paradoxa (Shea tree) Adansonia Digitata (Boabab tree) Parkia Biglobosa (Dawadawa tree) Ceiba Pentandra (Kapok tree) Magnifera Indica (Mango) Anarcadium Occidentale (Cashew) Teak (Tectona Grandis)

Source: Field Survey, July 2015

Botanical/Scientific Description of the Forest Flora of Gbele Resource Reserve: A botanical/ scientific description of the forest species of Gbele Resource Reserve are as follows:

Khaya Senegalensis (African Mahogany Tree): It is a deciduous evergreen tree with a tap root system. Its stem is upright but woody. It is 15-30 meters high in terms of height with a diameter of 1 meter. The bark of the stem is dark grey in colour. The leaves of the tree are compound. In terms of phyllotaxy, the leaves alternate with petioles of 3.5 centimeters long. Each petiole has a minimum of 3-4 leaves and a maximum of 7 leaves usually in opposite pairs with a pale green color. The shape of its leaves is oblong to narrowly oblong-elliptic with a total surface area of 4-12 centimeters by 2-5 centimeters. The apex of the leaves is acute to shortly acuminate with a rounded base. The leaves margin is entire. The inflorescence of Khaya Senegalensis is a lax and much branched 17 centimeters long axillary panicle. The flowers are tetramous monocious with a pale green calyx which is lobed to the base. The petals of the flowers are imbricate in terms of aestivation. The fruits of Khaya Senegalensis are upright and spherical in shape with a diameter of 4-6 cm (Field Survey, July 2015).

Vitellaria Paradoxa (Shea Tree): It is deciduous but medium-sized tree with a tap root system. The minimum height of the tree ranges from 7-15 meters with a maximum height of 25 meters. The tree has an upright but cylindrically shaped stem with a diameter of 0.3 to 1 meter. The bark of the stem is conspicuously thick with corky and horizontally deep fissures. The colour of the stem is slash pale pink with a white latex secretion. The leaves of Vitellaria paradoxa are simple with oblong shape. Bearing of leaves is cauline and ramal. Attachment of leaves is petiolate with petioles of 5-15 centimeters long. Leaves are glabrous with dark green colour. Juvenile leaves are rust-red in color but pubescent and later coriaceous. The surface area of leaves is 12-15 by 4-7 centimeters. The margin of leaves is wavy and bent. Inflorescence of Vitellaria Paradoxa is dense fascicle of 5-7.5 centimeters in diameter at the flowering twig. Each dense contains a minimum of 30-40 flowers and a maximum of 80-100 flowers. The flowers of the tree develop in the axils of scale leaves. The colour of individual flowers ranges from white to creamy white with a diameter of 1.5 centimeters. The flowers of the tree are normally abscised before flower opening are subtended by scarious, brown, ovate or lanceolate bracteoles. The fruit of the tree which is 5-8 centimeters long and 3-4 centimeters wide are elliptic in shape with a colour ranging from yellow-green to yellow butter. The fruits contain a mucous pericarp which is generally oval or round with a red brown colour (the shea nut) Field Survey, July 2015).

Adansonia Digitata (Baobab Tree): It is a deciduous large swollen trunk, canopied tree with a tap root system. The height of Adansonia Digitata is about 10-25 meters. It has an upright stem with a soft, smooth and fibrous bark. The color of the bark ranges from reddish-brown to greyish-brown or purplish-brown. It has a green layer below the outer which is waxy but very instrumental in photosynthesis when the tree has shed its leaves. The leaves of Adansonia Digitata which consist of 3-9 foliate are oblong to ovate in shape but alternate in terms of phyllotaxy. The colour of leaves is dark green with a surface area of 5-15 centimeters by 3-7 centimeters. The margin of leaves is entire with a tapering apex and base. Attachments of leaves which are characterized by short and soft hairs are petiolate with petiole of up to 12 centimeters long. Inflorescence of Adansonia Digitata is axillary solitary with waxy white bisexual flowers up to a diameter of 20 centimeters. The calyx of the flowers are deeply lobed with an internal silky and white hair. The petals of its flowers are large and the ovary is superior with 5-10 chambers. The shape of the fruits of Adansonia Digitata is ovoid with a length of 12 cm or more covered by a hard woody shell and yellowish-grey velvety hairs. The fruits are indehiscent with smooth pods embedded in a whitish powdery pulp which contains little or no endosperm (Field Survey, July 2015).

Magnifera Indica (Mango Tree): It is a large evergreen tree with a tap root system. It has a height of up to 20 meters with an upright and cylindrical stem. The bark of its stem is brown with fissures but smooth, darker, rough and scaly. Its inner bark is light brown and bitter with pale green and glabrous branchless. It has simple leaves which are leathery in texture and alternate in terms of phyllotaxy. The shape of its leaves is oblong-lanceolate with a surface area of 16-30 centimeters by 3-7 centimeters. Young leaves are red but change to shiny dark green at the apex and lighter the base when matured. The leaves of magnifera Indica are petiolate with 4.5 centimeters long petioles, which are striate and swollen at the bottom. Inflorescence of magnifera indica tree is branched panicle which consists of very small greenish white or pinkish flowers. Its flowers are symmetrical in arrangement with each flower having

five spreading petals of 3-5 millimeters long and imbricate in terms of aestivation. In terms of reproductive whorls the flowers of magnifera indica tree are partly male and partly bisexual. It has a very short yellowish green calyx which consists of five sepals. Each sepal has a length of 22.5millimeters and a width of 1-1.5 millimeters. The colour of sepals is green with whitish margin or yellowish green. It has an egg shaped fruit with a slightly compressed fleshy drupe of 8-30 centimeters long. The skin of the fruit is smooth, greenish yellow and sometimes tinged with red (Field Survey, July 2015.)

Calotropis: It is a small tree or shrub with a tap root system. The shrub has a minimum height of 2.5 meters and a maximum height of 6 meters. Its stem is woody at the base with a corky and fissured bark. Its branches are somewhat succulent and exude white latex when cut or broken. The leaves of calotropis are simple but decussate opposite in terms of phyllotaxy with a leave blade of oblong-obovate to broadly obovate. The apex of its leaves have a surface area of 30 centimeters by 2.5-15.5 centimeters. The apex is also acuminate to apiculate. The base of its leaves is cordate. The margin of leaves is entire with a glaucous texture. Inflorescence of calotropis is umbellate cyme arising from the nodes and arising axillary or terminal. In terms of reproduction the flowers are bisexual (hermaphrodite). Attachment of flowers is pedicellate with a length of each pedicel ranging from 1-3 centimeters long. The calyx of each flower is 5- lobed and shortly united at the base. The fruits are simple and fleshy but obliquely-ovoid in shape with a diameter of up to 10 centimeters or more (Field Survey, July 2015).

Elephant Grass: It is a 10 feet tall grass with a tap root system which grows along rivers and lake beds with rich soil fertility. Its stem is herbaceous in terms of habit with a cylindrical shape and a fistula interior. The stem of elephant grass is hairy and yellowish or purple in colour. In terms of length the leaves ranges from 2-3 feet with pointed ends and razor-sharp edges. It has a dense seed heads of about 9 inches tufted plumes which are usually tawny and purple in colour. It reproduces sexually through its rhizomes, with very small seeds which do not germinate well. It is adaptive to tropical weather and can easily become moribund as a result of frost (Field Survey, July 2015).

Ceiba Pentandra (Kapok Tree): This is a tall deciduous tree with a tap root system and an upright (erect) stem. Its trunk and branches are characterized by short and sharp prickles and basal pronounced buttresses. The leaves are multi-foliate compound with 5, 7 or 9 leaflets which are glabrous on their surface. In terms of phyllotaxy, the leaves alternate as well as petiolate in terms of attachment. The leaves are short pointed at the base and apex and are without toothed edges. The colour of its leaves is bright to dark green at the apex and dull green at the base. Flowers are arranged in lateral clusters near the ends of twigs. Calyx of the tree is cup-shaped, with 5-10 shallow teeth. Petals of flowers are five with a colours ranging from white to rose. The petals are silky and densely hairy on the outer surface. The pistil of flowers contains a 5 celled ovary with a long style curved near the apex and an enlarged stigma. The fruits of ceiba pentandra are leathery, ellipsoid and pendulous capsule of 10-30 centimeters long (Field Survey, July 2015).

Tectona Grandis (Teak Tree): It is a large deciduous tree of 30 meters in height with a superficial tap root system. Its stem is upright (erect) with a brown bark characterized by shallow longitudinal fissures. Its leaves are simple but shiny above and hairy below. Bearing of leaves is cauline and ramal whereas leaves attachment is petiolate. The tree shed its leaves for 3-4 months during the latter half of the dry season. Inflorescence is capitulum (head) with flowering heads of about 45 cm long found on the topmost branches. A fruit of tectona grandis is drupe with four chambers. The fruit is round, hard and woody enclosed in a bladder -like covering. The fruit is pale green when immature but brown at maturity (Field Survey, July 2015).

Anacardium Occidentale (Cashew Tree): It is medium-sized evergreen tree with a tap root system. It grows up to a height of 12 meters and has an upright stem with a cylindrical shape and a filled interior. The stem of anacardium occidentale is woody in terms of habit. Its leaves are simple, glabrous but obovate in shape with a pale green colour or reddish when young and dark green when mature. Bearing of leaves is cauline and ramal and attachment of leaves is petiolate. Inflorescence of cashew tree is terminal panicle-like cluster which bears male and bisexual flowers. It normally comes into flowering in 3-5 years. The nut which dries and does not split open is the true fruit which consist of a large curved seed of nearly 2.5 centimeters long in a poisonous shell (Field Survey, July 2015).

Parkia Biglobosa (Dawadawa Tree): It is a perennial deciduous tree with a tap root system. Its height ranges from 7-20 meters, but can reach 30 meters in exceptional cases. It has an erect and woody stem with a dark grey brown, thick and fissured bark. The leaves of Parkia Biglobosa are dark green and bipinnately compound with alternate phyllotaxy. The pinnae of the leaves are up to 17 pairs with 13-60 pairs of leaflets which are held on a long rachis. Inflorescence of Parkia Biglobosa is capitulum of 4.5-7 centimeters long and 3.5-6 centimeters in diameter and peduncles of 10-35 centimeters long. It terms of reproduction, the inflorescence of Parkia Biglobosa is hermaphrodite with a red or orange colour. Calyx of its flower is 10-13 millimeters long as well as a corolla of 10-14 millimeters long. The pods of Parkia Biglobosa which are about 45 centimeters long and 2 centimeters wide are pink brown to dark brown when mature. Each pod of Dawadawa tree consists of a yellow pericarp which may contain up to 30 seeds (Field Survey, July 2015).

Benefits and Importance of the Gbele Resource Reserve: In order to establish the importance of the Gbele resource reserve to the community members, the study first sought to identify how the community members benefits from the forest. This helped in determining the extent to which the people see the

forest as an important community resource and the need to at all-times preserve it. The benefits were categorized into various forms including Socio-economic, Environmental and cultural benefits. These are presented in the ensuing discussions as follows.

Socio-Economic Benefits of the Gbele Resource Reserve: Socio-economically, all respondents agreed that the Gbele resource reserve is beneficial; however they differ in their responses. Was in the sentence has been changed to is. There is also a comma after beneficial. Many of them (48%) see the forest as a source of food to them in a sense that they farm on the fringes of the forest. Also, edible fruits such as mangoes, shea nuts and cashew are gotten from the forest. 6% of the respondents also argued the forest is a source of income to them because it contains economic trees such as teak which is felled and sold to the Volta River Authority to be used for electric poles and shea nuts which the community members goes to pick and sell. This must however be regulated as it could have serious repercussions on the survival of the forest. Additionally, about 18% of the respondents also see the forest as a source of fuel wood. This notion was rather common among the female respondents. 28% of the respondents also asserted that the forest added some aesthetical value to the community. This revelation confirms the views of Food and Agriculture Organization, that Non-Timber forest Products (NTFPs) can be grouped into the three categories. The first is made up of items that significantly contribute to the subsistence of local communities. A second category comprises items that are traded on the local market, providing supplementary income[12]. In Ghana, items in these two categories are the same and include: foods (e. g. bush meat, snails, fruit, seeds, mushrooms)[12].

Environmental Benefits of the Gbele Resource Reserve: Forest plays an essential role in preserving the ambient quality of the environment and it also provides congenial atmosphere for the co-existence of the ecosystem. These suggest that there are environmental benefits of the Gbele resource reserve. The findings revealed that the forest serves as carbon sink for the community as about 14.5% of the respondents indicated this. Some of the respondents (36.1%) mostly the farmers were also of the view that the forest over the years has served as a check on erosion and they admitted that it has prevented the community from serious flooding. This finding supports the views of Oduro[13] that the forests also help to reduce soil erosion, and protect water bodies from drying up. Majority of them (constituting 49.4%) however alluded that the forest serves as a wind breaks for the community and that it has always protected the community against strong winds that has the potential of causing severe damage to the Gbele community.

Table-2
Socio-Economic Benefits of Gbele Resource Reserve

	Frequency	Percent	Valid Percent	Cumulative Percent
Source of food	40	48	48	48
Source of income	5	6	6	54
Source of fuel wood	15	18	18	72
Aesthetics	23	28	28	100.0
Total	83	100.0	100.0	

Source: Field Survey, July 2015

Table-3
Environmental Benefits of the Gbele Resource Reserve

	Frequency	Percent	Valid Percent	Cumulative Percent
Carbon sink	12	14.5	14.5	14.5
Checking erosion	30	36.1	36.1	50.6
Wind break	41	49.4	49.4	100.0
Total	83	100.0	100.0	

Source: Field Survey, July 2015

Cultural Benefits of the Gbele Resource Reserve: To the community members, the forest forms an integral part of their cultural values and systems because the forest has some spiritual significance to the community. It harbors the community ancestors and gods and also home to totems that are highly revered in the community. To buttress on this point, one respondent opined *"the forest is very dear to our hearts and the spiritual survival of us depends on this forest because it's the home to most of our gods"*. It is the medicinal hub for the community where in all forms of traditional herbs for curing various kinds of diseases can be found. See table 3.4 for more analysis on the issue. The findings buttresses Falconer's[14] when he wrote that forest provide intangible benefits, such as sacred sites (gods) and cultural symbols. In other words, forests are sites for traditional prayers and rituals.

From Table-4, 20.5%, 24.1%, and 55.4% indicated home to their gods, home for totems, and source of herbal medicine respectively.

The Importance of the Gbele Resource Reserve: The study sought to find out from the respondents based on afore discussed benefits, the extent to which they consider the forest as an important resource to the development of the community.

Inferring from the Table-5, all respondents unanimously agreed that the forest is an important asset to the community and the degree of their responses however differed considerably. For instance, 9.64% of the respondents indicated the forest was moderately important to the community given its benefits. Also 36.14% affirm the forest was an important asset to the community and as many as 45 respondents representing 54.22% confirmed that based on its attendant benefits, the forest to them is a very important asset and that as a community they must at all times strive to preserve it. It can be deduced from the analysis that the forest is considered by all of the respondents as an important asset that nature has given to them and it is their responsibility to conserve and preserve it for future generations.

Modern Institutions in the Conservation of the Gbele Resource Reserve: Modern institutions are usually established via forces external to a given community, and are characterized by functional and structural arrangement that is fairly standard[15]. They are generally state run institutions and have wide-ranging authority for natural resources management in the country. Based on this, such institutions play important roles in managing community-based forest reserves and must always work in close collaboration with community members to ensure effective management of forest resources. The research in a key informant interview with the deputy regional director for the forestry service division of Sissala East district revealed the following as some of the modern institutions in-charge of managing the Gbele resource reserve; the Forestry Commission under which they operate the Environmental Protection Agency, and Ghana National Fire Service. This findings is in line with that of Association of Zimbabwe Traditional Environmental Conservationists (AZTREC)[15], when they asserted that the responsible institutions for managing forest resources include specialized managerial agencies such as the Department of Game and Wildlife, the Forestry Commission, Environmental Protection Agency, Ghana National Fire Service, National Disaster Management Organization, and Associations with special interests of various kinds in forest resource management and local government bodies.

Table-4
Cultural Benefits of the Gbele Resource Reserve

	Frequency	Percent	Valid Percent	Cumulative Percent
Home to their gods	17	20.5	20.5	20.5
Home for totems	20	24.1	24.1	44.6
Herbal medicine	46	55.4	55.4	100.0
Total	83	100.0	100.0	

Source: Field Survey, July 2015

Table-5
Importance of the Gbele Resource Reserve

	Frequency	Percent	Valid Percent	Cumulative Percent
Very important	45	54.22	54.22	54.22
Important	30	36.14	36.14	90.36
Moderate	8	9.64	9.64	100.0
Total	83	100.0	100.0	

Source: Field Survey, July 2015

Community Awareness Level of Modern Institutions in Conserving the Forest Flora of Gbele Resource Reserve: The study sought to ascertain whether the community members were aware of the existence of such institutions created by law, and charged with the responsibility of ensuring the smooth conservation of these resources in the community.

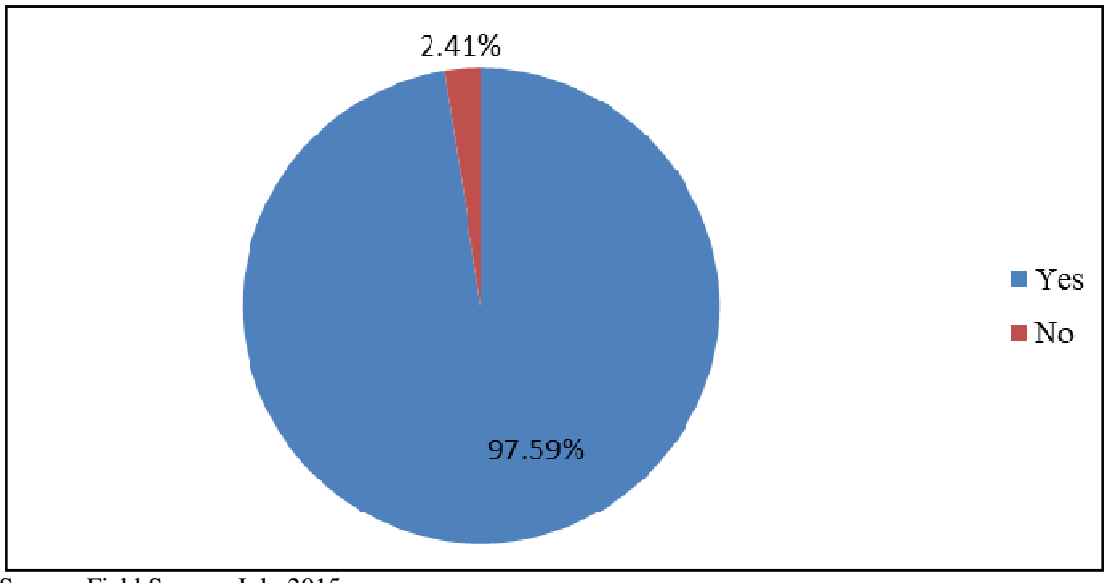
From Figure-2, 81 out of the 83 household heads contacted representing 97.6% asserted they are aware of the existence of these modern institutions charged with the mandate of managing the community forest reserve. Just as few as 3 (2.4%) indicated they were ignorant of the existence of these institutions in the region and the country at large. To confirm this assertion, respondents were asked to mention some of these institutions. The respondents mentioned the following as some of the modern institutions in-charge of managing forest reserves in the region and the country as a whole; The District Assemblies, Forestry Commission, Environmental Protection Agency, and Ghana National Fire Service. Reasonably, the respondents had a fair idea about what constitute modern institutions in the management of forest resources, and this common knowledge could augur well for effective community and institutional collaboration in managing the community's forest resources.

The Roles of the Modern Institutions in conserving the Forest Flora of Gbele Resource Reserve: The findings of the study reveal that, modern institutions play crucial role in the establishment and conservation of the Gbele resource reserve. The functions of three of these institutions are discussed as follows;

Functions of the Forestry Division (FSD) in Conserving the Forest Flora of Gbele Resource Reserve: The forestry division is a state own institution created by law to manage the forest reserves in the country and in fulfilling this mandate, it was revealed in a key informant interview with the deputy director of the forestry service division of Upper West region that it plays both Proactive and Reactive roles or functions in conserving the Gbele resource reserve. Proactively, the commission, before the establishment of the forest reserve in the community, regularly provided education programs to sensitize and educate the community members on the importance and the need to establish and conserve forest resources. It also plays the role of conscientizing the community members on the environmental benefits of the forest and the need to establish and preserve it.

Additionally, the commission also plays a Reactive role by conducting periodic monitoring of activities in the forest with the aim of preventing illegal activities such as unauthorized tree felling and encroachments by farmers.

These roles, the deputy director indicated are jointly carried out with the department staff and the community members especially the community forests guards and other opinion leaders to ensure effective community engagement in the commissions' activities. This is in line with the findings of the Forestry Commission[16], that the Forest Services Division is specifically responsible for protecting forest reserves through direct monitoring. Forests reserves are directly monitored by forest guards, who live with local farmers in the forest communities. The guards are supposed to arrest or report to the district forest manager people found harvesting forest resources illegally. As a way of supervising guards, Technical Officers are supposed to periodically visit them at their locations.



Source: Field Survey, July 2015

Figure-2
Community Awareness of Modern Institutions in Flora Conservation

Functions of the Ghana National Fire Service (GNFS) in conserving the forest flora of Gbele Resource Reserve: In a key informant interview with the District Fire Commander of Sissala East, the Ghana National Fire Service (GNFS) was fully aware of the establishment of the reserve. He confirmed that his outfit plays a major role in the management of the forest. The GNFS also plays both proactive and reactive roles. For the proactive role, they regularly sensitize the community members on the dangers of bush fires and how to prevent it. They also play a leading role in training the fire volunteers on how to make fire belts around the forest reserve as well as how to control wild fires around the forest reserve.

Also as a reactive function, the Ghana National Fire Service is always on a stand-by to quickly attend to any form of fire out-break be it their homes or at the reserve.

Functions/Roles of the Environmental Protection Agency (EPA) in conserving the Forest Flora of Gbele Resource Reserve: The Environmental Protection Agency was also identified as one of the key actors in managing the community forest reserve. The roles they played in establishing and conserving the forest are discussed below; during the establishment of the reserve, the agency provided the community with seedlings and protective equipment to help in protecting the seedlings. The agency also played a major role in ensuring the suitability of the site for the project.

The agency also conducts periodic monitoring of the site to prevent the threats of bush fires that could destroy the entire forest.

More so, after the establishment of the reserve, some farmers were displaced as their farm lands were converted for the establishment of the reserve; as such the EPA in collaboration with Global Environmental Facility innovatively supported affected farmers to venture in alternative livelihood activities like bee keeping, shea butter processing and soap making.

The agency also collaborates with other institutions in training community fire volunteer to build their capacity in preventing and controlling bushfires especially around the forest reserve.

Challenges of the Modern Institutions in Conserving the Forest Flora of Gbele Resource Reserve: The institutions like any other institutions in the country faces myriad of challenges in carrying out their functions. Given this, the study sought to find out some of the challenges these modern institutions face in their bid to properly conserve the Gbele resource reserve and the following intriguing challenges were very common among all the modern institutions interacted with;

Firstly, logistical constraints were the major challenge of all the institutions. For example both the Environmental Protection Agency and the Forestry Commission complained of not having vehicles and other logistics like computers to regularly monitor the site and also make proper analysis of data collected from the field. The two modern institutions indicated that the challenges are impediments to their efforts of effectively monitoring the activities of farmers and Hunters in and around the resource reserve. When they were asked how they have been coping with the challenges, they conceded that they regularly depend on the forest guards and fire volunteers for relevant information concerning the management of the forest.

Also, inadequate financial support from government and other donor agencies was identified as another challenge. For instance the director of the forestry commission of Upper West region and Sissala East district respectively bitterly complain of their meager budgetary allocation which they often receive intermittently and says it is responsible for their inability to regularly train forest guards and also monitor activities in the forest reserve.

Additionally, the institutions alluded to the fact that the activity of Fulani herdsmen around the forest belt is a major issue. As such, they indicated that if an immediate solution is not given the forest of Gbele could be destroyed.

High incidence of uncontrolled wild fires and indiscriminate felling of trees in the community is also a challenge to these institutions that are properly constituted and mandated to manage the reserve. For instance the district fire commander asserted that *"more needs to be done to solve this perennial bush fires in the community as it threatens the sustainability of the forest"*. The director of forestry commission of Sissala East District also affirms that *"the activities of hunters and fuel wood gatherers in the community are making our work more challenging"*.

Interestingly, the respondents were however quick to add that these were challenges that could easily be surmounted because of the effective co-operation between the modern institutions and the community members.

Households Views on the Roles of the Modern Institutions in Conserving the Forest Flora of Gbele Resource Reserve: To verify whether these roles are actually carried out to their highest degree, the households' heads were also interviewed to confirm or deny the assertions made by the various institutions concerning the roles they play in the establishment and conservation of the community forest reserve. The findings are shown as follows;

Table-6 is a presentation of the views of households on the extent to which they agree with the modern institutions in terms of how they effectively play their educational role in the establishment and conservation of the Gbele resource reserve. All the respondents agreed that the institutions carried out mass sensitization programs in the community during and even after the establishment of the reserve. 63 respondents representing 75.9% agreed with education as one of their major role in the

management of the reserve whilst 24.1% rather strongly agreed with them. This implies that the community members are key witnesses to the activities of these institutions regarding the conservation of the forest flora of Gbele resource reserve. Figure-5 is an illustration of respondents view on training of forest guards by modern institutions.

From Figure-3, on the issue of modern institutions providing training for the forest guards and the fire volunteers, 13.25 % of the respondents disagree to the notion that, modern institutions provide training for forest guards. However, 75.90% of the respondents agreed that modern institutions periodically organize training for the fire volunteers especially on how to make fire belts around the forest reserve. About 10.84% also strongly agreed that modern institutions are key partners in training and building the capacity of both the fire volunteers and the forest guards to effectively deal with any form of dangers that could threaten the sustainability of the community forest reserve.

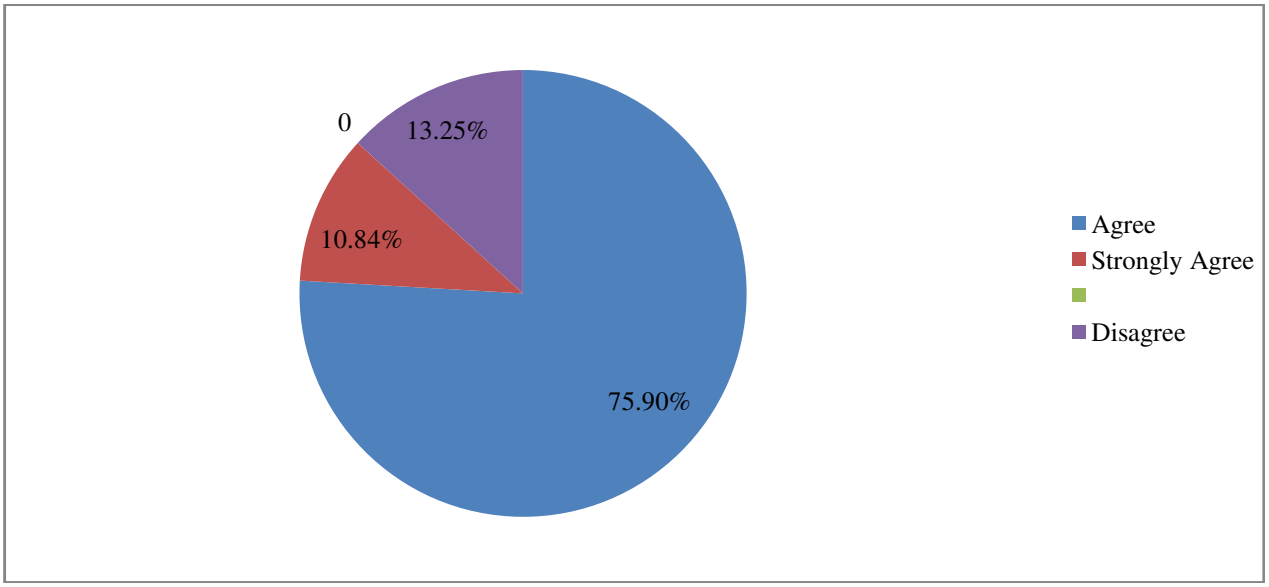
Respondents Perspectives on the effectiveness of modern institutions in the conservation of the Forest Flora of Gbele Resource Reserve: Eighty three (83) household heads were interacted with in an attempt to know how effective the institutions carry out their roles regarding the management of the Gbele Resource Reserve. The effectiveness of the roles of the respective modern institutions is as follows:

Effectiveness of Environmental Protection Agency (EPA): From Table-7, only 5 of the respondents (6.0%) indicated that EPA has been very effective in carrying out its roles in the management of the forest reserve while 32 (38.6%) of the respondents also alluded that the agency has been an effective institution in the management of the forest given the role it plays. On the contrary however, 46 respondents representing 55.4%were of the view EPA alone were ineffective. When asked to give reasons why they said EPA were ineffective some of them said EPA does not visit the community regularly. Also provision of logistics by EPA is not forthcoming.

Table-6
Respondents View on the Educational Role of the Modern Institutions in Conserving Gbele Resource Reserve

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	20	24.1	24.1	24.1
Agree	63	75.9	75.9	100.0
Total	83	100.0	100.0	

Source: Field Survey, July 2015



Source: Field Survey, July, 2015

Figure-3
Respondents View on the training of forest guards and volunteers by the Modern Institutions

Table-7
Effectiveness of Environmental Protection Agency

	Frequency	Percent
Very effective	5	6.0
Effective	32	38.6
Ineffective	46	55.4
Total	83	100.0

Source: Field Survey, July 2015

Effectiveness of Forestry Service Division (FSD): Table-8 is an indication that the forestry division has not been proactive in the community as 56 of the respondents constituting 67.47% said the division has been ineffective. However, about 27 respondents representing 32.53% were of the view that the Forestry Services Division is effective given the role the division play in training the forest guards.

Table-8
Effectiveness of Forestry Services Division

	Frequency	Percent
Effective	27	32.53
Ineffective	56	67.47
Very Effective	0	0
Total	83	100.0

Source: Field Survey, July 2015

Effectiveness of Ghana National Fire Service (GNFS): From Table-9, out of the 83 respondents, only 2 (2.4%) of the respondents indicated that the Ghana National Fire Service is an effective government institution in managing the resource reserve of Gbele, whilst about 26 representing 31.3% affirmed it was effective. However, 55 (66.3%) of the respondents said Ghana National Fire Service has not been an effective partner in managing the forest reserve given the role it plays.

Table-9
Effectiveness of Ghana National Fire Service

	Frequency	Percent
Very effective	2	2.4
Effective	26	31.3
Ineffective	55	66.3
Total	83	100.0

Source: Field Survey, July 2015

It can be deduced from the above discourse that the three modern institutions alone from the respondents' perspective have not been effective since the forest has not experienced any significant support after its establishment. One respondent asserted *"these institutions you are talking about normally visits the site but they will just come with their papers and move round the forest and go. So largely the management of the forest is done by us the community members without any compensation, what they always tell us is that do not encroach the forest as is a protected area, they give as certificates which is of no use, we need tangible reward"*.

To verify this perspective, the institutions were contacted and they could only blame their ineffectiveness on the challenges that they face in their operations.

Conclusion

The Gbele Resource Reserve is endowed with diverse species of herbs shrubs and herbs with benefits ranging from socio-economic and environmental to cultural. This suggests that the resource reserve of Gbele is very important. Also, modern institutions such as Environmental Protection Agency, Forestry Services Division, and Ghana National Fire Service are meant to be playing diverse roles on education and training in trying to ensure a sustainable conservation of the Gbele resource reserve. However, the modern institutions in question have been ineffective in their efforts as a result of logistical and transportation challenges.

The following recommendations are forwarded for policy considerations: Firstly, modern institutions must be supported logistically by the Government of Ghana in order to ensure an effective discharge of their duties in conserving the Gbele resource reserve.

Also, the Government of Ghana must institute a system of monitoring modern institutions in order to ensure an effective discharge of their duties.

More so, the Government of Ghana in collaboration with the Forestry Services Division must institute sanctions (including police arrest) for perpetrators of the Gbele resource reserve. Such perpetrators include Fulani Herdsmen.

Lastly, the Government of Ghana should come out with an incentive schemes for motivating the community member of Gbele for their effort in conserving the resource reserve.

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