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REVIEW OF LAND USE, LAND USE CHANGE AND FOREST SECTOR POTENTIAL FOR GREEN ECONOMY IN ANGLOPHONE WEST AFRICAN COUNTRIES



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Cover photos (L-R): Firewood and charcoal ready for the market; Example of an urban green areas in Nigeria (credit: Labode Popoola)

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Review of land use, land use change and forest sector potential for green economy in Anglophone West African countries

Labode Popoola (PhD)

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Acronyms and Abbreviations

AfDB	African Development Bank
AFF	African Forest Forum
CBFM	Community Based Forest Management
CCD	Convention to Combat Desertification
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
C&I	Criteria & Indicators
CO2	Carbon dioxide
COP	Conference of the Parties
DFID	Department for International Development
FAO	Food and Agriculture Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
FORMECU	Forestry Management Evaluation and Coordinating Unit
FOSA	Forestry Outlook Study for Africa
FPID	Forest Products Inspection Division
FRA	Forest Resources Assessment
FSD	Forestry Services Division
GDP	Gross Domestic Product
GE	Green Economy
GG	Green Growth
GHG	Green House Gases
GREC	Gambia Renewable Energy Centre
GSGDA	Ghana Shared Growth and Development Agenda
ICRAF	International Centre for Research in Agroforestry (World Agroforestry Centre)
ILO	International Labour Organizations
IUCN	International Union for Conservation of Nature
LCD	Low Carbon Development
LULUCF	Land Use and Land Use Changes and Forestry
MDGs	Millennium Development Goals
MOFEN	Ministry of Forestry and the Environment
NAFPP	National Accelerated Food Production Programme
NAMA	Nationally Appropriate Mitigation Activities
NGO	Non-Governmental Organization
NTFPs	Non-Timber Forest Products
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RIL	Reduced Impact Logging
SAP	Structural Adjustment Programme
SDGs	Sustainable Development Goals
SFM	Sustainable Forest Management
SMEs	Small Medium Enterprises
TEDD	Timber Export Development Division
TIDD	Timber Industry Development Division
UNDP	United Nations Development Projects

UNEP	United Nations Environmental Programme
UNESCO	United Nation Economic and Scientific Organization
UNFCCC	United Nations Framework Convention on Climate Change
WASCAL	West African Science Service Centre on Climate Change and Adapted Land Use
WAVES	Wealth Accounting and the Valuation of Ecosystem Services
WB	The World Bank
WD	Wildlife Division

Executive Summary

Contemporary development trajectories over the years have continued to advance human well-being through phenomenal growth and wealth, never witnessed before in human history. With these advances have emerged environmental impacts that continuously threaten the planet earth. Forests have suffered the most in the course of human development through deforestation for raw material, shelter, infrastructure and food to feed the ever-increasing human population. From all indications, the planet is gradually moving toward exceeding its boundaries.

Several initiatives have emerged to address the challenges that have emanated from the global development trajectories. For example, the last two decades have witnessed such initiatives as the Millennium Development Goals (MDGs) and several international forestry and climate processes. Agreements on the post 2015-development agenda, also known as the Sustainable Development Goals (SDGs) have been adopted. In all of these, the concept of green economy continues to feature as an approach that can result in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. The forest sector remains crucial to the attainment of the objectives of green economy.

This study investigates the forest sector potential for green economy growth, as well as some aspects of Land Use Land Use Change and Forestry (LULUCF) in Anglophone West African countries of Gambia, Ghana, Liberia, Nigeria and Sierra Leone using a combination of desk work and field studies. Observed drivers of LULUCF in the study area include population growth, agriculture, infrastructure development, uncontrolled and illegal logging. The study also identified some key elements within the forestry sector that contribute to green economy and LULUCF that leave minimal negative impacts on the ecological and social systems, as well as pathways that can enhance green economic growth. They include intensification of crop and livestock agriculture, adoption and strengthening of agroforestry practices, improvements in energy efficiency, improving efficiency in wood harvesting and processing, sustainable harvesting of other forest products, domestication of the supply of non-wood forest products, diversification of livelihood options, reforestation and afforestation initiatives and activities, as well as improved regulation of allocation of land for settlements and infrastructure.

Innovative approaches proffered to manage forests for contribution to green economy include: adoption and strengthening of community based forest management, advancing the practice of agroforestry, promotion of sustainable biotrade, promotion of carbon offset markets, adoption of payment for forest environmental services, as well as promotion of forest-based tourism, landscaping and beautification, in addition to adoption of reduced impact logging, and forest certification.

Recommendations are made for improving institutional and regulatory frameworks to facilitate forestry sector contribution to green growth. The key elements of these are improving forest governance and policy re-orientation, reviewing of extant forest laws, adoption of new forestry technologies and training, proper staffing of forestry institutions and agencies, building networks and collaborations with stakeholders, and cross-sectoral engagement. There is also the need to ensure forestry input into national planning. Practising sustainable forest management in order to secure the full range of forests' economic, social and environmental contributions is germane to success.

1.Introduction

The forest sector is strategic to the global discourse on climate change and sustainable development. It offers a pathway to resolving several issues associated with the drivers of negative climate scenarios. Trees remove CO_2 from the atmosphere and convert (sequester) carbon as wood. Deforestation worldwide contributes over 18% of all CO_2 emissions (Stern 2006). This is in the form of slash and burn agriculture, logging and other forms of extractions for livelihood sustenance. The rural poor, for example, survive in a flexible local economy, depending on multiple resources. It is the components of the natural vegetation, especially the non-timber-forest-products (NTFPs) that provide this flexibility and ensures the livelihood of the poor (Okali, 2011). Forests store a vast amount of carbon and therefore, have a unique ability to simultaneously reduce greenhouse gas emissions, capture carbon, and reduce the vulnerability of people and ecosystems to climate change. Conserving this store by positively leveraging on LULUCF could enhance the development of a green economy; and should therefore be prioritised in national development plans that are environmentally sensitive.

The concept of green economy originated from a pioneering report of a leading group of environmental economists entitled 'Blueprint for a Green Economy', which was prepared for the Government of the United Kingdom (Pearce et al, 1989). The UK Government had commissioned the report to advise if there was a consensus definition for 'sustainable development' and the implications of sustainable development for the measurement of economic progress and the appraisal of projects and policies (ibid).

A Green Economy (GE) can be defined as one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities (UNEP, 2011). In a green economy, growth in income and employment is driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services. More often than not, the term green economy is confused with green growth. Whereas both concepts hinge on the need for sustainable development, they are not necessarily the same. According to Ayuk (2013), Green Growth (GG) refers to an economic growth strategy based on the ecological restructuring of existing economic processes, creating jobs and income generating opportunities in new 'green' sectors of the economy, and at the same time minimizing costly environmental degradation, climate change and inefficient uses of natural resources. Significantly, however, the forest sector, and indeed sustainable forest management, remain key considerations in both concepts.

The World Bank's 'Inclusive Green Growth Report' of May 2012, critiques the neo-classical theory of growth (i.e. that growth in output – GDP – comes from increases in physical capital, labour and productivity) because it fails to recognize that economic production depends directly on the stock of natural resources and the quality of the environment. Their analytical framework considers how environmental policies can increase conventionally measured GDP through four channels linked to input efficiency, stimulus and innovation

effects. They stress that the ultimate test of green growth is welfare, not output: 'welfare can be assessed by viewing utility as depending on the current level of consumption and the direct effect of the environment (through its health effects and amenity value)'. In its 2012-2022 environment strategy, the World Bank prioritizes pathways that are 'green, inclusive, efficient and affordable' and stresses the role of the private sector in meeting those goals. More specifically, the World Bank has launched a global partnership for Wealth Accounting and the Valuation of Ecosystem Services (WAVES), which is supporting development of national environmental accounts and internationally agreed guidelines for ecosystem accounting. The WAVES has already worked with Botswana, Colombia, Costa Rica, Madagascar and Philippines.

According to Popoola (2014), the whole idea of a green economy can be viewed as an alternative vision for growth and development; one that can generate growth and improvements in people's lives in ways consistent with sustainable development. A green economy promotes a triple bottom line: sustaining and advancing economic, environmental and social well-being. The transition to a green economy takes time; however, several countries are demonstrating leadership by adopting national "green growth" or "low carbon" economic strategies. Some are even building "sustainable cities". Low carbon strategies, for example, will involve a shift from net global deforestation and land degradation to net reforestation and land rehabilitation with a huge potential to make the terrestrial biosphere a net carbon sink, rather than a source. There are many examples of successful, large-scale programmes that increase growth or productivity and do so in a sustainable manner, including some from the Republic of Korea, Mexico City, China and Namibia.

The Earth Summit of 2012 outlined the following as concepts/elements of a green economy:

- Equitable distribution of wealth
- Economic equity and fairness
- Intergenerational equity
- Precautionary approach
- The right to development
- Internalization of externalities
- International cooperation
- International liability
- Information, participation and accountability
- Sustainable consumption and production
- Strategic, coordinated and integrated planning to deliver sustainable development, the green economy and poverty alleviation
- Just transition
- Redefine well-being
- Gender equality
- Safeguard biodiversity and prevent pollution of any part of the environment

Land use, land-use change and forestry (LULUCF) is defined by the United Nations Climate Change Secretariat as "A greenhouse gas inventory sector that covers emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities. LULUCF has impacts on the global carbon cycle and as

such, these activities can add or remove carbon dioxide (or, more generally, carbon) from the atmosphere, influencing climate" (Wikipedia (2014). The centrality of forests to a green economy cannot be over-emphasized. According to UNEP (2011), forests are a critical link in the transition to a green economy – one that promotes sustainable development and poverty eradication as the world moves towards a low-carbon and more equitable future. Biologically rich forest ecosystems provide shelter, food, jobs, water, medicine and security to more than one billion people, as well as regulate the global climate.

The two concepts (green economy and LULUCF), have a significant nexus, that is reflective of the purpose of the work of the African Forest Forum on green economy and LULUCF that guided the study whose results are presented in this report. The study sought to examine aspects of land use, land use change and forestry (LULUCF) potential for developing a green economy in Anglophone West African countries, and with minimal negative impacts on the ecological and social systems. Specific gaps that this report attempts to address are:

- The extent and the different pathways of forest contribution to green economy;
- The needed change(s) in forest management to optimize forest contribution to green economy;
- Enabling conditions and regulatory frameworks that will facilitate forest sector role in the green economy;
- Information gaps in LULUCF in relation to livelihoods and actions to address them;
- Models/approaches that may be developed and shared for livelihood support in different forest ecosystems;
- Potential and conditions for synergies and conflicts related to mitigation and adaptation issues in LULUCF; and
- Present and potential for an integrated system of strategies for green economy and LULUCF practices in different eco-regions including different forest types such as Sahel parklands, woodlands and savannah, dry forests and moist forests.

2. Study approach

2.1 Study area

The study covered the five Anglophone countries of West Africa (Figure 1). However, only three countries: The Gambia, Ghana and Nigeria were covered through field studies. The other countries are Liberia and Sierra Leone.

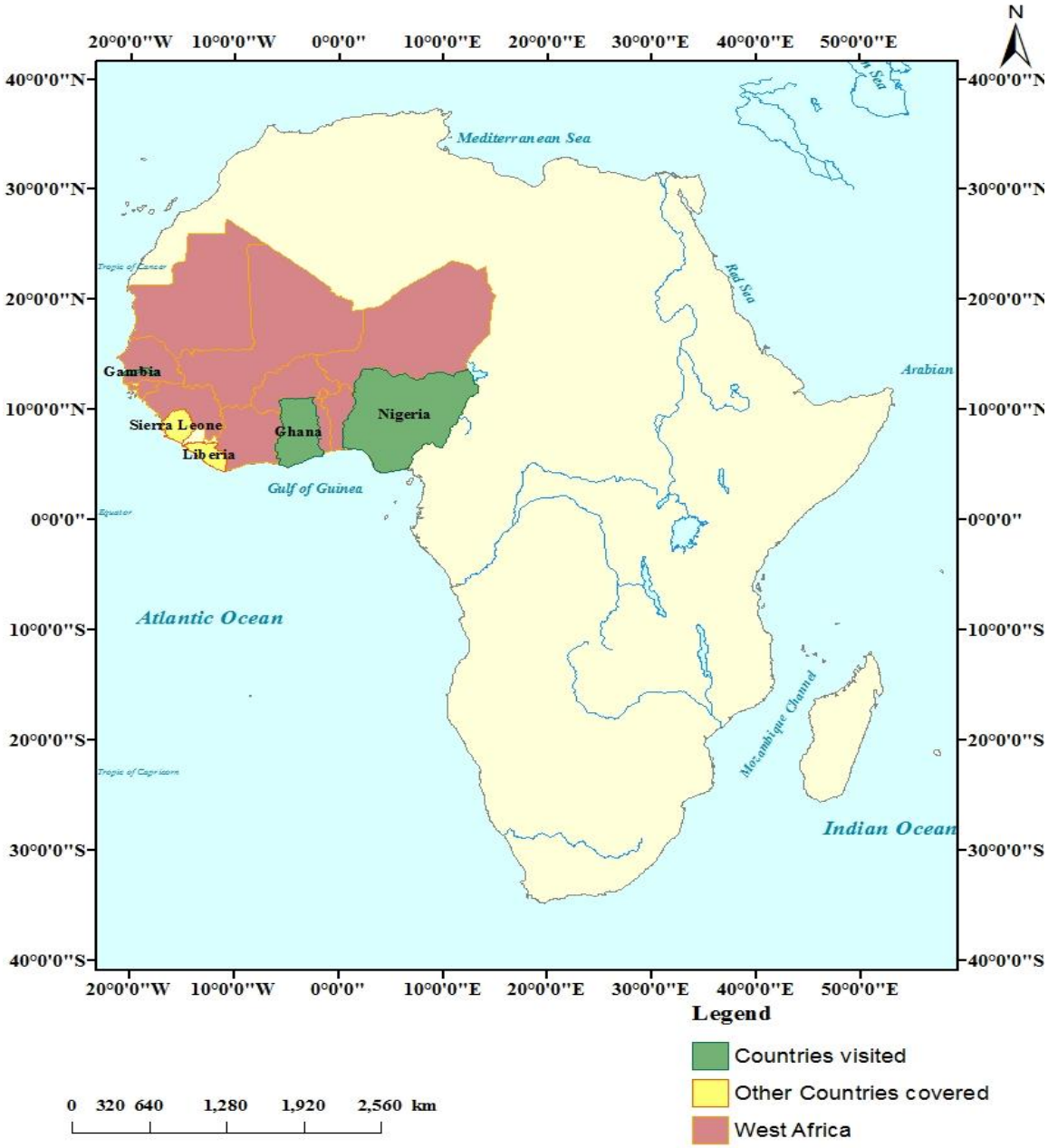

Figure 1: Map of Africa showing the West African Countries studied

In each of the countries visited, information was gathered from across the different ecological zones of the sub-region. The different ecological zones and forest formations in the study area have been described in detail by FAO (2011) and WASCAL (as adapted from White (1983) (Figure 2)

Figure 2: The vegetation of West Africa.
Source: White (1983)

2.2 Methodology

The study was a combination of desk work and an extensive survey through in-depth discussions with individuals and institutions involved in activities, projects and programmes with potential for green business and green development opportunities.

The survey, which was largely purposive in nature, was carried out using questionnaires in the major agro-ecological zones of the three countries, namely, moist forest, Savanna and the Sahel. The survey investigated approaches to such issues as resource efficiency, productivity and resilience, ecosystem services, as well as institutions and governance.

A shift from net global deforestation and land degradation to net reforestation, afforestation and land rehabilitation, making the terrestrial biosphere a net carbon sink rather than source would enhance de-carbonization, and thus green economy. Therefore, key issues in the forest sector that have potential to impact green economy and LULUCF were studied intensively, critically analyzed and measures to improve their continued relevance and advances along the lines of the specific tasks as outlined earlier. In this regard, on-going initiatives and/or programmes, targeting avoidance of deforestation and forest degradation, which have potential to enhance green economy were reviewed; from which useful lessons were drawn for policy purposes. Relevant reports from agencies and organizations such as the African Development Bank (AfDB), the World Bank (WB), the International Labour Organization (ILO), the World Agroforestry Centre (ICRAF), the Food and Agriculture Organization (FAO) and the United Nations Environmental Programme (UNEP) were consulted.

3. Results

3.1 Status of sustainable forest management in the study area

There are many reports on the status of sustainable forest management in all the study countries. This section summarises highlights from these reports on each country.

3.1.1 On Nigeria

Nigeria has a long history of forest management and the formal goal is to achieve self-sufficiency in all aspects of forest production. However, the chronology of forest management in Nigeria is one of increasing "un-regulation". The country, once a significant exporter, is now a net importer of primary forest products. FAO (2014) reports that Nigeria has about 10 million ha of forest, and this represents about 10% of the total land area. The forest area is comprised of 445 gazetted reserves that are distributed over five main ecological zones namely fresh water/mangrove, the lowland rainforest, the derived savanna and the sahel/sudan savanna, and with about 75% of which are located in the savannah zone (FAO, 2003). About 975 000 ha of forest reserves are productive and another 2.3 million ha of off-reserve forests which are located on privately owned or community lands are partially productive (FAO, 2011).

In Nigeria, State Governments have authority over forest resources management and utilization in both forest reserves and off-reserve forests but are expected to comply with national forest policy and legislation. A forest policy addressing issues of trade, tariffs and certification that could enhance sustainable forest management was approved in 2006 but is yet to be passed into law by the country's parliamentary houses. Consequently, the forest sector continues to be riddled with weaknesses. State forestry authorities are focused almost entirely on revenue collection and are undertaking virtually no forest management. Enforcement is almost non-existent or completely ineffective because of widespread corruption. Forestry officials used to conduct monitoring of timber off-take from stump, but then moved monitoring to the forest-gate before abandoning virtually all attempts at control. Traditionally, management of the forests was done by allocation of concessions granted to timber industries, but the concession system collapsed since the 1980s when local communities were allowed access to the forests and companies lost control.

Concession management is no longer operational and much of the logging is undertaken by uncontrolled chainsaw gangs, with felled trees wastefully processed *in-situ* to produce rough-sawn planks for manual extraction to the road-side or rafted as logs to point of sale. This trade is illegal or is given quasi-legal status through issue of waybills by forestry officials. Some revenue is collected by this means but much is lost through corruption that is reported to be rampant. Charcoal production is now widespread, and it is a another activity being undertaken by rural dwellers; with the produce transported to urban centres for local sale or export. Since there is no control, charcoal production utilises all wood in the vicinity of the production area, thereby, completely destroying surrounding forests. The extent and

volume of this business is unknown and hardly enters the national accounting system; however, it is thought to be substantial.

To meet the imperatives of sustainable forest management in the country, community forest management was attempted in the 1990s in Cross River State with support from the United Kingdom Department for International Development (DFID), and continues to be supported by NGOs, such as Concern Universal. The approach has government recognition, and the intended procedure is that the state, subject to the consent of a landowner or community, controls harvesting by issue of logging permits. However, control has been reported to be weak and even if regulations are complied with, it is thought that up to 60% of community logging is illegal and that there is no way of verifying that the other 40% is legal. There are several obstacles to sustainable forest management in Nigeria. These include the discretionary power of government to de-reserve or harvest the forests, the lack of a coherent forest policy, the prevalence of illegal logging and harvesting of non-wood forest products in most of the high-forest states, chronic under-resourcing of forestry programmes and forest management; overlapping responsibilities among federal, state and local governments and excessive bureaucracy; the lack of inter-sectoral coordination, and the overall absence of reliable data on which to base forestry planning and development.

3.1.2 On Ghana

In Ghana, the forest area is classified based on ecological conditions into a high-forest zone in the south, accounting for about one-third of the land area (8 million hectares); a savannah zone (14.7 million hectares), mostly in the north; and a transition zone (1.1 million hectares). FAO (2010) estimated that Ghana had 4.68 million hectares of natural forest in 2010, which is about 20% of the land area. In the high forest zone, which is further sub-divided into nine forest types: wet evergreen; moist evergreen; moist semi-deciduous (southeast); moist semi-deciduous (northwest); dry semi-deciduous (inner zone); dry semi-deciduous fire zone; upland evergreen; southern marginal; and southern outlier, the semi-deciduous and evergreen forests constitute the main timber-producing areas.

As in Nigeria, Ghana's forests also comprise the forest reserves and 'off-reserve' areas. There are about 266 forest (production) reserves with 216 occurring in the high-forest zone, and the remainder in the savannah. The forest reserves were originally established by the state to promote ecological stability while seeking to guarantee the flow of goods and services for socio-economic development (Bird *et al.* 2006). Ghana's permanent forest estate is estimated at 1.43 million hectares, which is the area of forest in forest reserves plus the area of planted forests and the area of forest in protected areas.

Forestry and timber industries are of major importance to Ghana's economy (VPA, 2005). As indicated by Blackett and Gardette (2008), timber products have consistently been the third highest value export commodity after cocoa and gold. The public sector of the forest industry has undergone considerable reform in the past few years. The Ministry of Lands and Forestry is responsible for policy development while the executive agency is the Forestry Commission. The latter comprises three divisions: The Forestry Services Division (FSD), the Timber Industry Development Division (TIDD) (formerly comprising the Forest

Products Inspection Division (FPID) and the Timber Export Development Division (TEDD)), in addition to the Wildlife Division (WD). Institutional development has been taking place for many years with donor support and a range of institutional structures are in place. The three divisions of the Forestry Commission are funded largely by royalty payments and a 2% levy on the value of exports.

In recent times, Ghana has adopted a new emphasis on plantation development and a more market-based approach to the allocation of concessions. The Management Act (Act 547) is the main piece of legislation that governs the use of forest resources. Although forest policy dates back to 1994, it is still regarded as broadly valid. However, strategies to deliver a forest policy are being changed; progress continues to be made in legislation, for example to allow more transparent bidding for timber concessions. Traditional chiefs, who are advised by their traditional councils, own most of the land in Ghana. There is a network of forest reserves, dating from colonial times, managed on the chiefs' behalf by the Forestry Commission. Timber is harvested from both inside and outside forest reserves. Outside the forest reserves, the chiefs control the allocation of trees for harvesting, and although an inventory process is required of the trees to be cut, it is often rudimentary. Inside the forest reserves, harvesting is better controlled, and trees are individually marked for harvest after a stock inventory process controlled by the Forestry Commission. Enforcement of forest regulations is the responsibility of the Forestry Commission through the Forest Services Division (FSD) and the Timber Industry Development Division (TIDD). The Forest Services Division is responsible for management, inventory and harvesting of the resource, including measuring trees after they have been felled and monitoring how much royalty should be paid. Royalties are calculated on the whole volume of the harvested trees, irrespective of how much is extracted. The TIDD monitors the transport and utilisation of logs and other wood products and exports of processed wood. They mount road checkpoints and send teams into log yards to check that logs are correctly marked and have not been transported illegally.

Ghana has a good policy and institutional framework under which a wide range of instruments have been set up. A programme to develop certification was set up in the late 1990s. However, if Ghana's forests is to continue to feed domestic and regional markets, in addition to supply the needs of a substantial export industry at current levels, further depletion of the forest resource is inevitable (Blackett and Gardette, 2008; Development Brief, 2008). Some of the challenges facing sustainable forest management in Ghana include implementation of policy and the enforcement of regulations in the forest (Development Brief, 2008; Hansen, 2008; Hansen and Treue, 2008; Mayers *et al*., 2008). In addition, the chainsaw ban does not work; rural communities continue to take short-term returns from their assets; use of illegal logs by the industrial sector is not controlled; rates of royalty collection are extremely poor; and there is insufficient capacity to enforce regulations in the face of corruption: forest officers have low salaries and are poorly trained and supported.

3.1.3 The Gambia

In Gambia, the forest area is 26.6 % of the country's landscape. More than 53.2 % is deciduous while 30 % is semi- deciduous and only 4.5 % is evergreen. Mangroves

constitute 12 % of total land area while less than 10 % is palm. However, a comparison of the forest inventory initiatives conducted reveals a declining forest cover. The 1981/82 inventory indicated a forest area of 505 300 ha while the 2009/2010 inventory indicated a total area of 423 000 hectares. Correspondingly, the average wood volume of forest per hectare was 46.1m^3 in 1997/98 and in 2009/2010 it had decliened to 34.2m^3 per ha. The density of the forest has also declined from 106 trees per hectare as was in the 1997/98 inventory to 42 trees per hectare as indicated by the 2009/2010 inventory (UNDP, 2012).

The decrease in the forest cover has been attributed to frequent bushfire incidences which are experienced by 79 % of the population at least once or more times per year; clearing and conversion of forest and other wooded lands to mechanized agricultural production; harvesting of fuel wood by communities and individuals; harvesting industrial roundwood by government and private institutions; extent of grazing and browsing; drought; settlement encroachment due to population pressure by farmers and settlers to land adjacent to the forest; and construction of highways and feeder roads; all have combined to take their toll on forest land. The Ministry of Forestry and the Environment (MOFEN) was created in 1976, though it has a history in the Gambian forestry sector going back to around 1939. MOFEN is a governmental institution attached to the President's Office and is in charge of any actions necessary to ensure the sustainable use and protection of all forests in Gambia, excluding private forest plantations. In addition, it is responsible for co-operating and liaising with national and international organizations and bodies all over the world on forestry matters. It is has the responsibility to carry out national forest inventories, which are supposed to be taken once every ten years. The MOFEN is also supposed to establish a management plan for each forest. The 2006-2016 Forest Policy acknowledges the government's decentralization programme by encouraging community participation in sustainable forest management and empowering local communities and the private sector to manage their own forestry programmes. The Government of The Gambia has ratified the United Nations Convention to Combat Desertification (UNCCD), the UN Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD) of the United Nations. Nevertheless, the pace of deforestation in Gambia is still increasing, and it is steadily reducing the biological and economic productivity and viability of the Gambian forest ecosystems.

According to a Forestry Outlook Study for Africa (FOSA)undertaken by FAO, the forestry sector in the Gambia is reported to contribute about 1% to GDP. This figure, however, does not seem to include the other services such as the informal trade in minor forest produce, medicinal uses of the forest produce, and other environmental and social functions which are often not valued monetarily. It is estimated that there has been a steady increase in the demand for forest products because of the increase in population. The report further states that, fuelwood still remains the primary source for domestic energy in the country, with the natural forests providing up to 85% of the primary domestic energy for more than 90% of the population. By nature, Gambia's forests do not provide much timber since the wood of only a few species can be sawn (the most prominent are *Khaya senegalensis* and *Pterocarpus erinaceus)* and logs are often crooked, twisted or otherwise damaged resulting to low conversion rates (FAO, 2005). The forest products market also has furniture produced with local materials by the handcraft's enterprises. However, forests still play key

role in the flourishing tourism industry in the Gambia. Other West African countries have scenarios similar to those in Nigeria, The Gambia and Ghana.

3.2 Land use, land use change and forestry in the study area

Land use in all the study countries has to do with land tenure systems and changes to land use as affected by different factors: demographic, biophysical and socio-economic. These include overpopulation, drought, migrations, increased commercialised farming as well as conflicts and war. Other factors include land swapping; urbanization and infrastructural development and political expediency.

The forest estate in the three countries in focus have undergone tremendous land use changes driven mostly by population growth, agriculture and infrastructure development, among others. For example, the current population figures and population densities, respectively, as obtained from Encyclopaedia Wikipedia, are: Gambia (2.2 million in 2018 and 176.1/km^2), Ghana (30.2 million in 2019 and 127.52/km^2), Liberia (4.94 in 2019 million and 51.0/km^2), Nigeria (200.96 million in 2019 and 217.55/km^2) and Sierra Leone (7.65 million in 2019 and 108.0/km^2). The reported percentage land use change in land area for the respective countries are Gambia: 22%, Ghana: 48%, Liberia: 45%, Nigeria:10% and Sierra Leone: 38%. These statistics are reflective of the status of LULUCF in the study area. Figures 3 show the distribution of the land and forest areas while Fig.4 show the land area covered with water. The sections below outline the LULUCF in Gambia, Ghana and Nigeria.

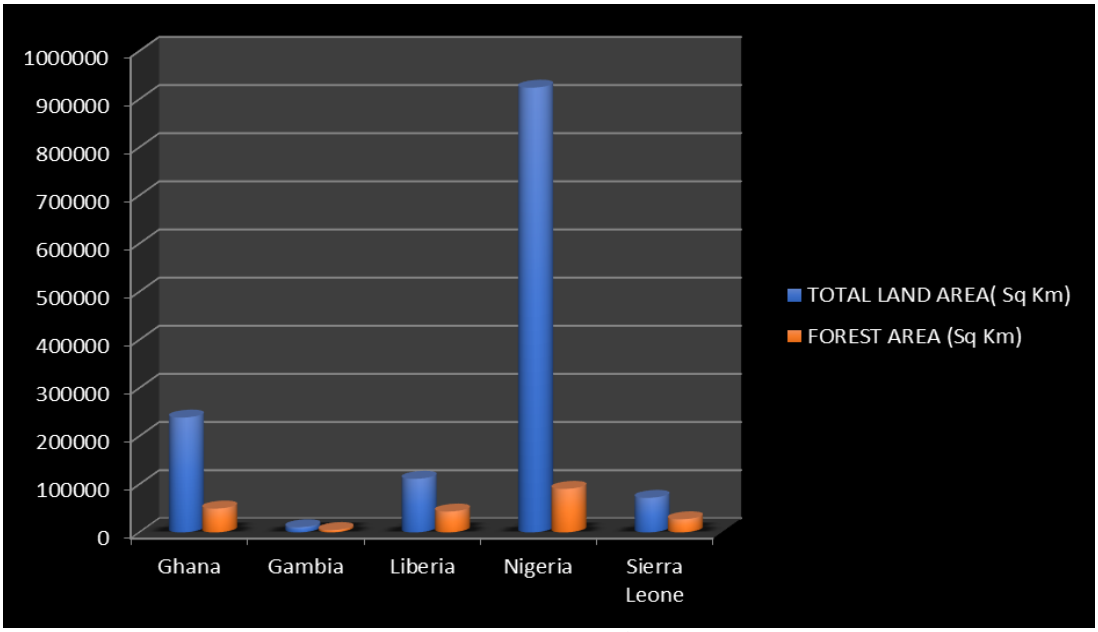

Figure 3: Total land area versus forest area (km^2) in Anglophone West African countries

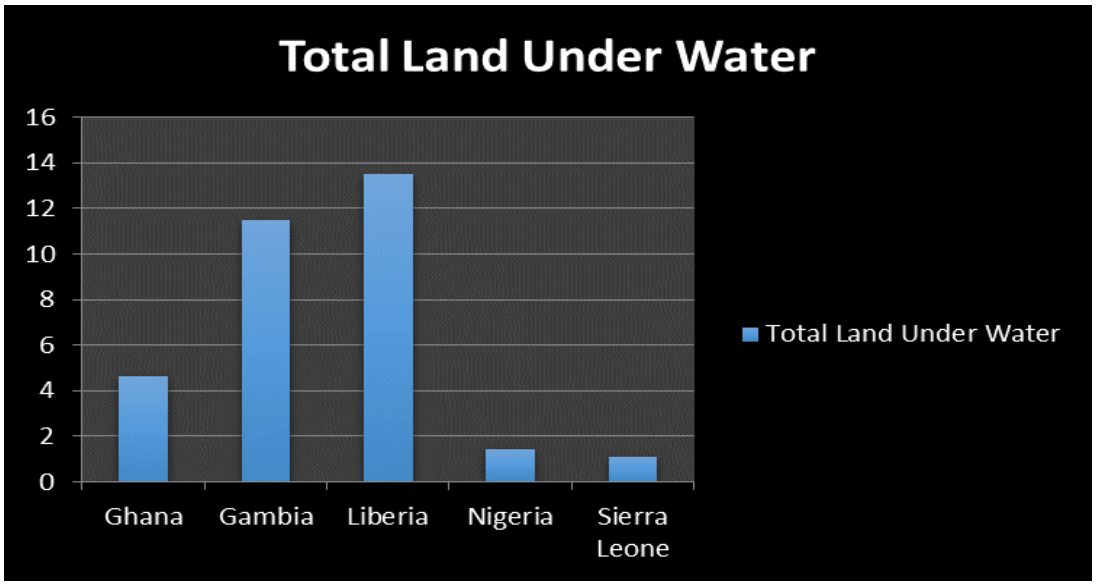

Figure 4: Total Land Area under Water in Anglophone West African countries

3.2.1 The Gambia

The National Forest Assessment of The Gambia (NFA,2010) indicates that the country is classified into four global land use classes based on the internationally agreed classification system and the one used by FAO Forest Resources Assessment (FRA) scheme. However, country specific land use classes were also taken into consideration and included in the global classification system (NFA, 2010). According to the National Environment Agency (NFA, 2010), the Gambia has a total area of 1,130,000 hectares composed of 26.6% of forest, 10.9% other wooded land, 52.1% other land, and 10.5% inland water as shown in Table 1:

Table 1: Area of major land use classes in The Gambia

Major land uses	Area'000 ha	% of total area	Error % (se)
Forest	300	26.6	11.4
Other wooded land	123	10.9	18.2
Other land	589	52.1	6.5
Inland water	118	10.5	22.7

Source: NFA (The Gambia), 2010

According to NFA (2010), about 53.2% of the forest is deciduous while almost 30% is semi-deciduous and only 4.5% is evergreen. Mangroves make up almost 12% of total forest area while less than 1% is palm (Fig.6). Other wooded land is primarily constituted by shrubs (45.9%) and wooded grassland (43%). Annual crops constitute the vast majority of other land (63.6%) while all other categories contribute to smaller fractions of area. Area of other land use classes are indicated in Figure 7.

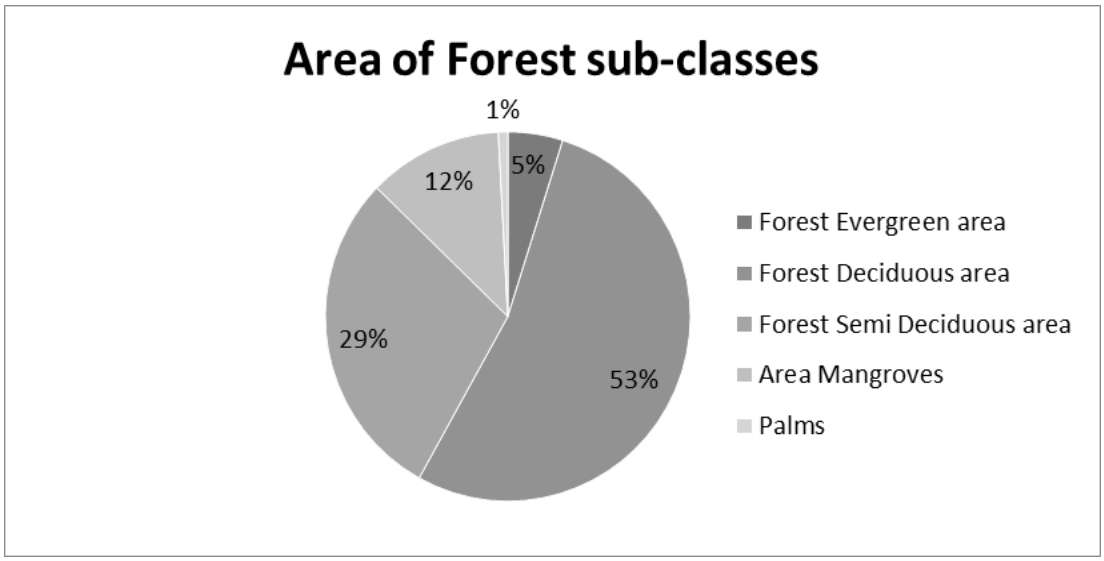

Figure 5: Area of Forest sub-classes in Gambia
Source: NFA (2010)

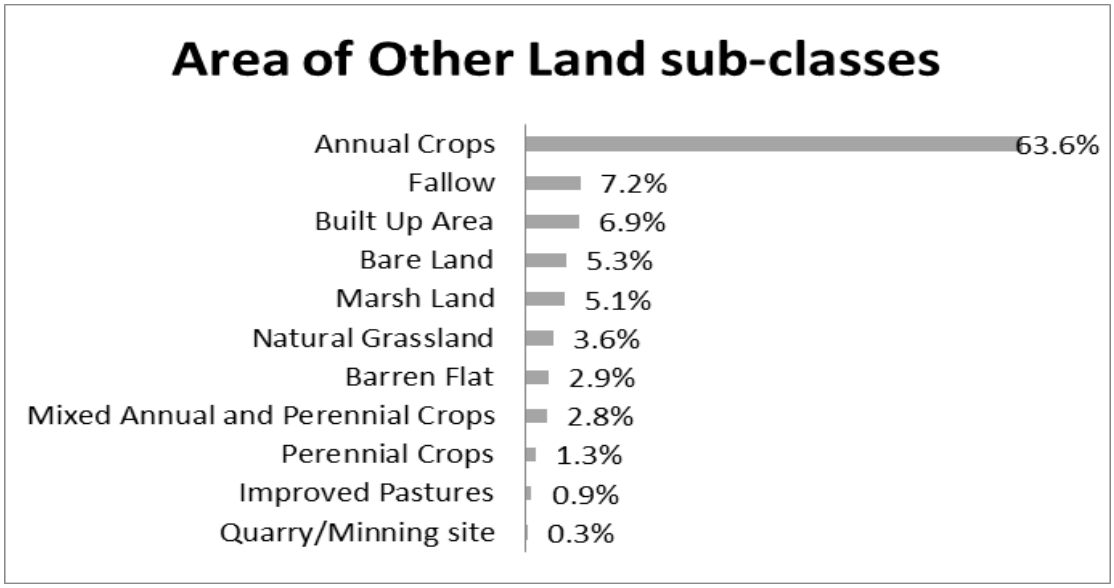

Figure 6: Area of Other Land sub-classes in Gambia
Source: NFA (2010)

3.2.2 Ghana

According to IUCN Ghana (2014), deforestation due to agriculture and LULUCF together accounts for 49 per cent of emissions in Ghana. Market failures largely resulting from under-valuation of forests and failure of policy to correct market failures have contributed to the lack of incentives among forest users, particularly the forest dependent to conserve the resource. Cocoa expansion, over-dependence on wood fuels and illegal mining are identified as key drivers of deforestation and forest degradation. Ghana's REDD Readiness Preparation Proposal seeks to address these drivers in order to contribute to reducing GHG emissions.

3.2.3 Nigeria

According to Popoola (2014), Nigeria is endowed with a large expanse of land covering 923 678 km^2 , an area equivalent to that reported by FAO (2014) of about 10 million ha of forest, and this represents about 10% of the total land area. The forest area is comprised of 445 gazetted reserves with about 975 000 ha of forest reserves as productive forests, and another 2.3 million ha of off-reserve forests which are located on privately owned or community lands that are partially productive (FAO, 2011). According to Popoola and Akinwumi (2003), available statistics in Nigeria indicate that some 400 000 hectares of forest are lost annually through shifting cultivation. Also, the rapid creation of states from 12 in 1967 to 37 in 1996 (including Abuja, the Federal Capital Territory) with several new state capitals accounted for some forest depletion mainly because some of new state capitals were semi-urban settlements before their new status, and therefore created heavy demand for wood for construction and other purposes This in turn encouraged logging, which hither-to facilitated large-scale deforestation.

Nigeria being among the world's poorest countries and with high level of adult illiteracy makes her more than 80 percent of urban dwellers and the rural poor heavily dependent on forest products for sustenance. Most of the highly valued indigenous species such as *Milicia excelsa* (iroko), *Cordia millenii* (omo*), Afzelia africana* (apa*), Entandrophragma utile* (ijebo*), Khaya ivorensis* (oganwo*), Khaya grandifoliola* (gedu), *Lophira alata* (eki) *Terminalia spp* (afara), among several others which were common some four decades back in the forest reserves, have now become rare. The FORMECU (1996) has indicated that in all categories of land and land use there have been changes that in most cases have led to loss of vegetation.

3.2.4 An overview on West Africa

According to FAO (2011) West Africa experienced net loss of forest cover of -1.10% and -1.12% respectively for the periods 1999 to 2000 and 2000 to 2010 respectively (Table 2).

Table 2: Forest area and changes in West Africa (1999-2010)

Forest type	Area (1000ha)			Annual change (1000ha)		Annual change rate (%)	
	1990	2000	2010	1999-2000	2000-2010	1999-2010	2000-2010
Area of planted forest	888	1,348	2,494	46	115	4.26	6.35
Area of forest designated primarily for conservation of biodiversity	14,672	14,972	15,328	30	36	0.20	0.24
Area of forest designated primarily for protection of water and soil	2,297	2,529	2,417	23	-11	0.97	-0.45
Area of forest designated primarily for production	33,164	33,898	28,208	73	-569	0.22	-1.82
Total forest area	**91,589**	**81,979**	**73,234**	**-961**	**-875**	**-1.10**	**-1.12**

Source: Compiled from FAO (2011)

Country specific outlook indicated that for Anglophone West Africa, only Gambia had a net gain in forest area during the same period (Table 3)

Table 3: Change in forest area in Anglophone West Africa

Country	1990-2000	2000-2010
	% change	% change
Gambia	0.4	0.4
Ghana	-2.0	-2.1
Liberia	-0.6	-0.7
Nigeria	-2.7	-3.7
Sierra Leone	-0.6	-0.7

Source: Compiled from FAO (2011)

A cursory look at the data for the West African sub-region indicates the at area of *planted forest* and area of forest *designated primarily for conservation of biodiversity* had modest net increases over the period 1990 to 2010, while area of forest designated primarily for protection of water and soil and area of forest designated primarily for production had net losses, with the latter being higher. These scenarios tend to support the need for plantation establishment and conservation of forests as tools for sustainable management of forests.

Though production forests are key to income generation and livelihood sustenance, it is becoming increasingly clear that unless efficiency is introduced into production forestry, forest losses may not abate. According to FAO (2014), though several countries have established measures to increase production efficiency by revising market rules and mechanisms guiding sales and auctions, very few countries make explicit reference to waste reduction or recycling in their reports to international bodies, despite the potential importance of these topics for promoting SFM and circular economies. This situation is even worse in West Africa and constrains the exploitation of the potential of the forest sector to contribute to green economy.

3.3 Extent and pathways of forest contribution to green economy in Anglophone West Africa

According to UNEP (2011), forests are a critical link in the transition to a green economy – one that promotes sustainable development and poverty eradication as countries move towards a low-carbon and more equitable future. Furthermore, forests contribute optimally to a green economy when, in particular, their full range of private and societal benefits are realized; and growth in income and employment is driven by public and private investments. These investments should target to reduce carbon emissions, enhance resource efficiency, and prevent the loss of forest-based biodiversity and ecosystem goods and services.

The key issues germane to green economy with links to the forest sector in the study area which have potential to deepen de-carbonization include:

- Intensification of crop and livestock agriculture
- Agroforestry
- Improvements in energy efficiency
- Improvements in efficiency in wood harvesting and processing
- Sustainable harvesting of other forest products
- Domestication of forest plants for supply of non-wood forest products
- Diversification of livelihood options
- Reforestation and afforestation
- Improved regulation of allocation of land for settlements and infrastructure

3.3.1 Crop and livestock agriculture

Agriculture is one of the most important sectors in all the study countries, especially when it comes to employment. A predominant share of the population – between 60 % in Nigeria and up to 75 % in the Gambia – depends largely on agriculture as a source of livelihood. However, the sector's contribution to GDP in all the countries has been modest. In Gambia, agriculture's contribution to GDP is 30 % and up to 42 % in Nigeria. Its contribution to Ghana's GDP is gradually waning, with a decline from 7.4 % in 2008 to 0.8 % in 2011 (UNEP, 2013).

Nevertheless, agriculture remains an extremely important sector. The crop and livestock sector is generally characterised by low productivity; the dominance of small-scale producers cultivating small landholdings; low technology use and the reliance on human labour; underdeveloped infrastructure; low degree of industrialization; weak linkages to the industry and service sectors; and low competitiveness. However, there are still good opportunities in the sector for improving employment opportunities and income generation; productivity potential; competitiveness and innovation; enhancement of gender, youth and vulnerable groups' capabilities; human security and resilience building; and leadership and governance.

At present, the preferred pathway for agricultural development in each of the countries is still contentious. For instance, in Nigeria, the rural economy is heavily dependent on smallholder producers, whose primary need is household subsistence. They produce little marketable surplus. Since 1972, the target group of the National Accelerated Food Production Programme (NAFPP) has been this category of farmers. The aim has been to help them raise output, productivity, income and thus break out of a cycle of poverty. On the other hand, the contemporary policy thrust on crop and livestock production focuses on a transformation of the agricultural sector through the promotion of agribusiness along the value chain.

In Ghana, several policies and strategies have been developed to stimulate the growth of the agriculture sector, including those on cocoa and fisheries sub-sectors. Key policies and strategies include The Medium-Term National Development Policy Framework and Ghana Shared Growth and Development Agenda, 2009-2015 (GSGDA). The country's medium-term development strategy focuses on the modernisation of the agriculture sector with cocoa as one of the priority cash crops. Development strategies for cocoa include encouraging the promotion of organic cocoa, and introducing incentives to stimulate

investments in local processing. The promotion of fisheries development for food security and income generation is also an objective of the GSGDA. Specific measures for the fisheries sector focus on preventing over-exploitation of fish stocks; promoting responsible fishery; establishing co-management mechanisms with local communities; effective monitoring, control and surveillance systems; enforcing applicable laws and regulations; strengthening capacities of extension officers and farmer associations; improving infrastructures for storage, processing and exports; diversifying livelihoods; supporting private sector investments in aquaculture; and enhancing fish species management.

In Gambia, the agriculture sector's output and growth are being accelerated by increasing government budgetary resources and donor support for the implementation of an FAO-sponsored strategy for Agricultural Development Horizon 2010 in pursuit of the objectives of the World Food Summit and the Agricultural Transformation Program 1999-2020. The Gambia Government launched an Agriculture and National Resource Policy in May 2012. The Sustainable Farm Management Program under the Gambia Agricultural Investment Plan 2010-2015 aimed to further deepen the 'greening' of agricultural production through integrated soil fertility management techniques ranging from multiple tree-pure stand and farm boundary planting, crop residue and compost management, technology for soil fertility in cereal/ legume rotation systems, native tree and shrub biomass management, integrated water-shed management, liming and use of phosphogypsum, judicious use of in-organic fertilizer and adoption of organic fertilizers to soil conservation practices.

Enhancing agriculture and food security through crop and livestock production would have important implications for the forest sector, and therefore, for Green Economy and LULUCF in the study areas. For an agricultural sector that is predominantly low carbon, resource efficient and socially inclusive; a key feature in the Green Economy and LULUCF, there is need for more sustainable agricultural practices that protect the soil and use fewer external inputs. However, it remains to be seen how resource use efficiency can be increased significantly in crop and livestock production without further adverse environmental consequences including deforestation and forest degradation.

Despite the existing regulations, land preparation and use practices entail deforestation and bush burning (slash and burn agriculture). The use of heavy duty land clearing and tilling machines has also continually led to deforestation, land compacting and erosion because of the need to embark on large scale food production. Grazing on farm and forest lands has also been quite extensive, leading to loss of crops and forests as well as conflicts. All these contribute to GHG emissions. Currently, no comprehensive annual assessment is made of the sources and volume of these greenhouse gas emissions. In the light of this, there is a need to assess the environmental footprint of crop and livestock production and its greenhouse gas emissions, water use and soil management continuously. There is also the need to guarantee security of land rights for the forest sector. Some examples of specific measures to encourage the greening of the agricultural sector in order to bring greater socio-economic and environmental benefits to all the countries include: conservation agriculture; value addition and value chain development and; green agriculture finance and fiscal instruments.

3.3.2 Agroforestry

Agroforestry in the study areas ranges from subsistence livestock silvo-pastoral systems to home gardens, on-farm timber production, tree crops of all types integrated with other crops, and biomass plantations within a wide diversity of biophysical conditions and socio-ecological characteristics. The taungya system and fodder crops and scattered tree plantations are very much dominant. In Nigeria, under the taungya system, the Forestry Department provides technical direction and demarcates forest reserve lands, supplies pegs and seedlings, while the farmers provide all the labour involved in site-clearing, pegging, planting, maintenance and fire protection. Farmers are permitted to cultivate their food crops, which are inter-planted with tree crops over a certain period. Home gardens have also been found to be prevalent in the southeast and south south and some parts of the southwest zones of Nigeria.

Agroforestry systems in Ghana are mainly incorporated into home gardens and perennial plantations. Home gardens are important for additional food supply (cassava, plantain), fruits (mango, orange, guava), medicinal uses (konkroma - *Morinda lucida*), fuelwood (*Acacia*), fodder for livestock (*Acacia*), shading and ornamental or fencing function. The most common perennial plantations in the country are cocoa and oil palm plantations. Cocoa plantations are combined with shade trees, whereas oil palm does not have provision for trees at all. However, farmers revealed that during the first three years of the oil palm plantation establishment, mixed cropping with food crops is possible. The taungya system is also widely practised.

In the same way, agroforestry techniques in Gambia include: fruit tree planting; boundary planting; soil fertility maintenance; tree/crop interaction; contour planting; fuelwood production; live fencing; orchard plantations; alley cropping and fodder production. In Gambia some are of the view that beekeeping as a component of agroforestry minimizes illegal felling and bushfires and also mitigates the effect of greenhouse emissions. Gambian honey continues to attract the international market but still the demand cannot be met. The enterprise guarantees human security and resilience building and all over the country guarantees protection of the forest thus improving socio-economic status of the forest dependent communities. It also stabilises the rural –local economy through continuous flow of household income. This perhaps partly explains why Gambia is the only Anglophone country in West Africa with net gain in forest area.

There are considerable opportunities for improving employment and income generation, productivity improvement potential, competitiveness and innovation, enhancement of gender, youth and vulnerable groups' capabilities, human security and resilience building, leadership and governance in agroforestry practices in all the three countries. In fact, people's dependence on agroforestry greatly exceeds that in the formal forest sector. However, government remains the major driver of this initiative in all the three countries.

Several studies (Popoola and Enabor (1993a and b), Popoola *et al* (1996), Aiyelaagbe *et al* (1997, 1998a, 1998b), Adeola *et al* (1998), Azeez *et al* (2005), Azeez *et al* (2011), Amusa *et al* (2013), have demonstrated the viability and profitability of agroforestry. Using three production systems for maize and cassava, Popoola and Enabor (1993 a and b)

demonstrated performance of agroforestry practices (Tables 4 and 5) and (Figures 9 and 10).

Table 4: Cassava performances under different production options on a marginal land

Production alternatives	Mean tuber yield (Tonne)/ha*	Mean revenue (Naira)/ha**	NPV (Naira) at 18%	Benefit cost ratio
Without fertilizer	11.40	3, 978.94	8,914.22	3.2
With inorganic fertilizer	20.44	7, 894.03	17,082.35	4.1
Agroforestry (alley cropping)	19.10	7, 590.91	1 6,435.06	4.5

Source: Popoola and Enabor (1993)
**Mean tuber yields are over three cropping seasons*
**Mean revenues are over three cropping seasons*

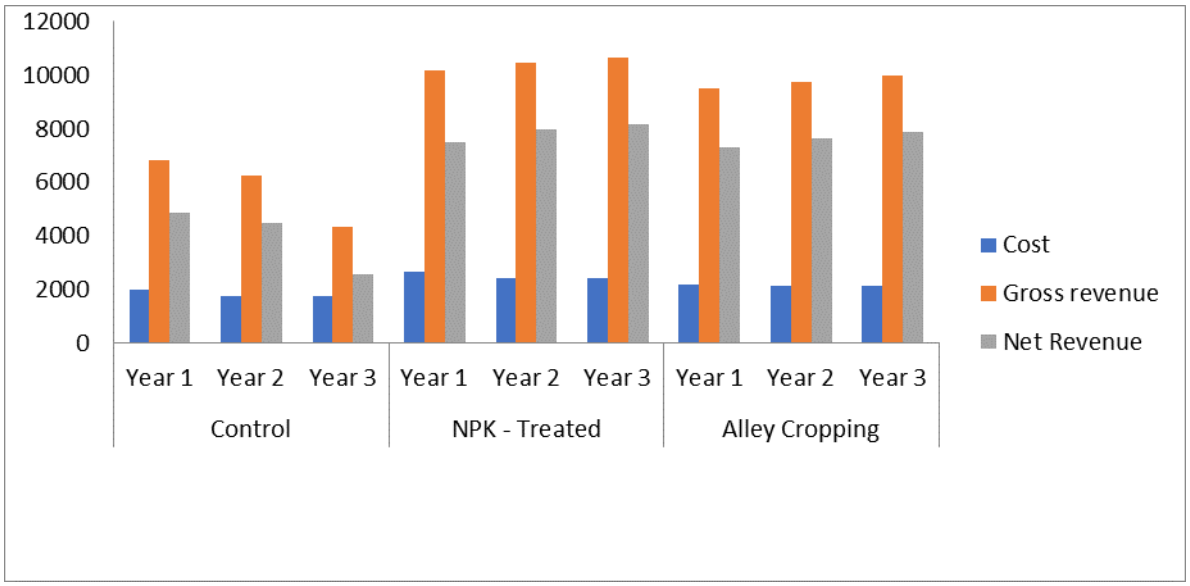

Figure 5: Net investment returns from cassava tuber production under different production alternatives
Source: Popoola and Enabor (1993)

Table 5: Maize performance under different production options on a marginal land

Production alternatives	Mean dry grain yield (Tonne)/ha*	Mean Revenue (N)/ha**	NPV (N) at 18%	Benefit cost ratio
Without fertilizer	0.770	2,310.00	2,058.69	1.67
With inorganic fertilizer	1.224	3,660.00	3,908.09	1.93
Agroforestry (Alley cropping)	1.178	3,534.00	3,942.30	2.06

Source: Popoola and Enabor (1993)
**Mean dry grain yields are over three cropping seasons*
**Mean revenues are over three cropping seasons*

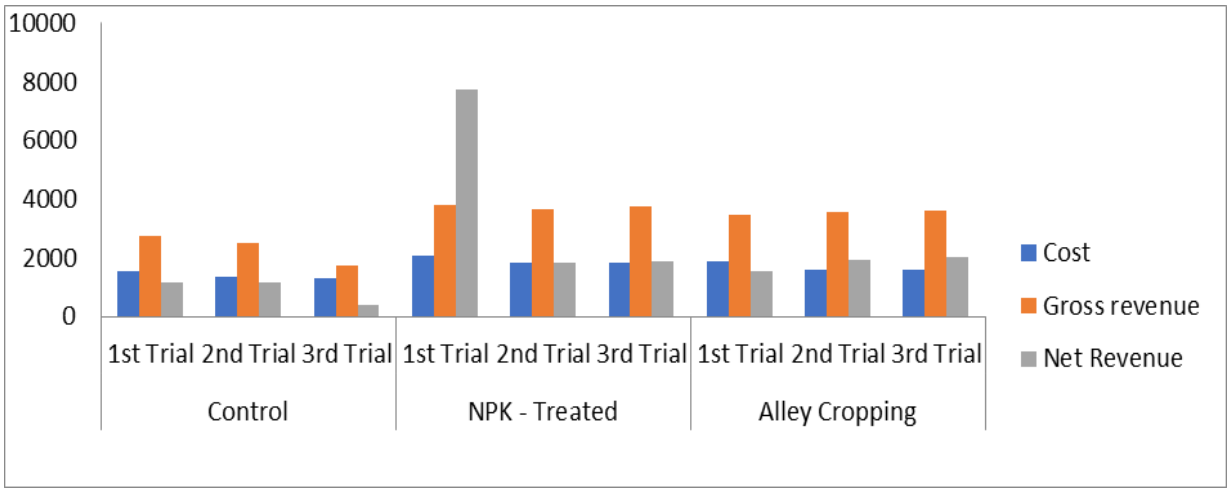

Figure 6: Net investment returns from maize production under different production alternatives
Source: Popoola and Enabor (1993)

According to West (2014) in many parts of the tropics livestock such as cattle, pigs, and chicken are important sources of both food and income. However, the nutritional requirements of these animals often cannot be met by the marginal pastureland available. Typically, farmers make up the difference by purchasing bags of concentrated animal feed that contain grain, protein, and various necessary minerals and nutrients. The feed is expensive, though, which can lead farmers to overuse their pasture, causing the soil to erode and compact. As pastures become less productive, farmers then cut down trees to create new pasture, which leads in turn to further deforestation. The scenario is very critical in the savannah region of the study area, which represents the food basket of the region As observed by West (2014) integrated diversified farming systems (that agroforestry offers), which aim to create a more efficient on-farm nutrient cycle and reduce off-farm inputs, provide a basket of potential solutions to this problem. One, fodder banking (Figure 11), has the potential to enable greater control over the livestock production process while also increasing the ecological resilience of the system as a whole.

Figure 7: A freshly harvested mulberry fodder bank is already re-sprouting,
El Guayabo, Costa Rica. Photo credit: West, 2014

The experience of Costa Rica can be replicated in West Africa, because of some ecological similarities. However, this will require policies that will facilitate its local introduction, acceptance and sustenance.

A number of projects and programmes have promoted wider adoption of agroforestry on the basis of its significant on-site and off-site environmental benefits (UNEP, 2011). Generally, agroforestry has potential to be both beneficial to farmers and to provide off-site benefits in the form of carbon sequestration, reduced sedimentation in surface water, and maintenance of a wider basis of biodiversity than agriculture. However, farmers need both financial assistance and technical assistance in making the transition to modern forms of agroforestry. Investment in incentive schemes combined with longer-term technical support can be effective in promoting its expansion.

3.3.3 Improvement in energy efficiency

Access to energy is one of the major challenges in all the study countries. The proportion of the population without access to electricity and similar modern energy varies between 85 % in Gambia and 45 % in Ghana (GIZ, 2011). The demand for fuelwood is thus a major driver of forest degradation and the release of greenhouse gas (GHG) emissions (UNEP, 2013). Reducing the demand for fuelwood as a low carbon development (LCD) measure is, therefore, an important strategy to reduce drivers of deforestation and forest degradation to mitigate climate change, while generating financial flows from forest carbon activities under the Clean Development Mechanism, REDD+ (Reducing Emissions from Deforestation and Forest Degradation), and Nationally Appropriate Mitigation Activities (NAMAs).

However, there are a series of programmes for promoting renewable energies (especially in the area of solar and biomass) as well as biofuels (bioethanol through jatropha) have been developed in the three countries since those measures are especially suitable for providing off-grid energy solutions to remote communities. Nevertheless, these programmes are still underdeveloped, and much could be done to promote their potential for green economy.

Nigeria has developed a renewable energy policy with action plans and targets, including plans for feed-in tariffs, subsidies and tax breaks. However, implementation is slow. At the same time, Nigeria aims to create a domestic market by integrating the energy and agricultural markets of the country. It intends to establish a home-grown biofuel industry, bringing economic empowerment to rural communities and reducing its dependence on fossil fuels while participating in the Clean Development Mechanism (CDM) programme. The potential negative aspects of biofuel production, especially in relation to food security and food prices have to be taken into account when promoting biofuel production on a large scale. Other vast renewable energy resources remain untapped including wind and solar energy. Presently, about 80 million cubic metres, equivalent to 43.4×10^9 kg (or 43.4 billion tonnes) of fuel wood with an average daily consumption ranging from 0.5-1.0 kg of dry fuel wood per person is being consumed in the country annually for cooking and other domestic purposes (Ohunakin, 2010).

In Ghana, the drive towards renewable energy continues to be slow, with no clear policies guiding the promotion of green economy. Interest thrived briefly when a long dry period led to serious energy shortages due to Ghana's large dependency on hydro energy. However, with the recovery of rainfall and the recent discovery of oil, the issue seems to be largely off the agenda. Ghana's bulk of energy consumption is based on fuelwood, and 90 % is obtained directly from natural forests.

Ghana's efforts at harnessing renewable energy resources have mainly targeted activities like renewable resource assessments and mapping, pilot projects on energy efficiency and programmes aimed at retrofitting existing buildings. A major challenge is the up-scaling of the outcomes of the pilots as well as providing incentives for the private sector to participate. Innovative policies could be undertaken to develop the sector, including the development of infrastructure for the generation, transmission and distribution of energy; investing in financing schemes that will help lower the high initial fixed costs of renewable energy technologies; providing finance and support for renewable energy service companies; expanding the assessment and mapping of renewable resources; developing renewable energy markets through subsidies and insurance; providing funding for research and development of renewable energy technologies; and investing in human and institutional capacity development.

In Gambia, biomass, including fuelwood, accounts for about 60 % of the country's energy supply and more than 90 % of household energy consumption, while petroleum products (liquefied petroleum gas for cooking; diesel and heavy fuel oil for generating electricity) account for 36 %, and electricity for about 4 % of energy supply. The standing stock of fuelwood would not be enough to meet future demand. In 2005 the technical potential for sustainable fuelwood production was about 209 000 tonnes/year for an aggregated demand of 734 400 tonnes/ year resulting in a huge gap of about 535 000 tonnes/year (Jarju, 2008). This has led to overexploitation and degradation of native forests, as well as fuel imports from Senegal, largely in the form of charcoal.

The Gambia's 2005 Energy Policy has highlighted the significance of energy efficiency in the country. The government has also taken a number of steps by establishing the Gambia Renewable Energy Centre (GREC) and; adopting a policy of zero import duty on Renewable Energy/Energy-Efficiency technologies. However, these efforts are being constrained by inadequate financial, human and institutional resources, which remain major challenges.

Access to energy increases the quality of life in rural communities and, at the same time, creates employment and provides opportunities for the development of green and inclusive business models. On the one hand, jobs could be directly created through the installation and maintenance of renewable energy systems in remote areas. On the other hand, they can also be created indirectly through the fact that access to energy increases the diversification potential for local communities. For instance, farmers would be enabled to further process or store products, if they had access to energy. Additionally, jobs that depend on access to electricity (for example recharging of mobile phones, ability to diversify or process certain agricultural products etc.) can be created and there is a potential to

increase productivity (e.g. through new production techniques that require energy or through the fact that shops can also be open at night due to lighting, etc.) with existing jobs and business opportunities.

Regarding these different initiatives and examples, it appears that carbon markets and emissions-reducing initiatives will play an increasing role in Sub-Saharan Africa in the years to come. They are great drivers for greening the economy since they hold significant potential for fostering energy efficiency, renewable energy solutions, reforestation, etc. while providing employment for a wide range of the population. This also includes the poorest segments, as in the case of community-based reforestation projects or power generation from renewable energy. Nevertheless, the complexity of the CDM mechanisms or programmes such as REDD+ remain a barrier for many countries and there is a great need for capacity building so that all the potential for mitigation can be fully harnessed in Sub-Saharan Africa.

Energy efficiency improvements will help cut fuel costs, increase competitiveness, lessen exposure to fuel price volatility, and improved consumer welfare. It also delivers on environmental benefits by reducing greenhouse gas emissions and local air pollution. Efficiency gains can also boost energy security by decreasing reliance on imported fossil fuels. The programmes on establishment of fuel-woodlots and production and adoption of energy saving stoves are crucial for the forest sector.

In all the study countries, the use of firewood and charcoal (Figure 12) is on the increase, for which reason woodlots have become very important, particularly in the derived savannah, semi-arid and arid areas of Ghana and Nigeria. Sustainable forest management therefore, becomes key, in the energy equation and economics of the study areas. The large expanses of under-utilized marginal lands in Liberia, Sierra Leone, Gambia, Ghana and Nigeria can readily serve the purpose of raising large scale commercial woodlots that will create employment, mitigate climate change and serve as energy banks.

Figure 8: Firewood and charcoal ready for the market

3.3.4 Improving the efficiency of wood harvesting and processing

The practice of continuous extraction of only the main boles from felled trees to meet high demand for timber is one major cause of deforestation in the study areas. However, merchantable residues (branchwood and stem off-cuts) left un-extracted can be utilized to increase efficient wood utilization to conserve the forests and the entire ecological system, thus contributing to building a circular economy. Except the regulation on use of power saws and flitching activities, there are limited programmes on improving the efficiency of wood harvesting and processing in all the study countries. The state of technology for wood processing in all these countries is very low. This is traceable to obsolete equipment. In Ghana, Nigeria, Benin, Togo, Liberia, Ivory Coast and Sierra Leone, the impact of the Structural Adjustment Programme (SAP) of the 1980s through the 1990s resulted in the near collapse of the forest industries (Popoola, 2014). At the moment, wood recovery remains abysmally low, hardly ever up to 60%, with huge generation of residue.

Residues generated from wood harvesting and processing are a valuable source of energy. Logging and wood processing residues including off-cuts, sawdust and discarded logs can be utilized for power and heat production at the existing sawmills. In 2008 there were 720,000 m^3 (360,000 tons) of logging residues and an additional 256,000 m^3 (128,250 tons) of wood processing residues in Ghana (UNEP, 2013). It is estimated that over 50% of the waste is used off-site, for purposes such as charcoal production and firewood. This leaves a potential 244,125 tons of residues for energy production. A tonne of wood residue contains approximately 15 GJ of energy. This would amount to an energy potential of 3,661,875 GJ. With a generation efficiency of 30%, this would translate to an energy output of 1,098,563 GJ, or 305,180 MWh, and, therefore, potential emission reductions of 305,180 MWh * 0.565 CO2/MWh = 172,400 tCO2e.

The development of more products made from wood residues such as sawdust briquettes, flooring parquets, broomsticks, mirror frames, toys and reconstituted wood products such as chipboard and blockboard could help improve wood processing and enhance the value of the residues, which are currently not commercialized. The application of finger-jointing and other woodcraft and value-adding technologies to solid residues could also facilitate their more efficient utilization, thereby contributing total revenue accruable from the forest and job creation. In addition, these wood products serve as carbon sinks, and hence, contribute to green economy. Currently, several wood craft products are streaming into the market-place. They include trays, cloth hangers, brush backs, key holders, toys etc. (Figure 13).

Figure 9: Some wooden handicraft and souvenirs used in offices and homes

3.3.5 Sustainable harvesting of other forest products

Several other forest products, otherwise referred to as non-timber forest products (NTFPs), play important roles in the economy of all these countries through their supporting of rural livelihoods. In Ghana, aggregate employment generation in NTFP activities has been estimated to be growing at 6.9 % per year (Townson, 1995). These products contribute significantly to household food security, nutrition, health, and income, especially during the lean seasons. It is estimated that 20 per cent of the economically active population derive income from NTFPs and 38 % of the household in Ghana trade in NTFPs (Townson, 1995). In a similar study covering households in villages around the large market centre of Kumasi, Falconer (1994) found that 68 % of the households surveyed were involved in supplying NTFPs to the market.

Among persons generating some income from forest products activities in households surveyed in southern Ghana, 72% identified this income to be important either in absolute terms, or in meeting particular needs, or because of its timing (Townson, 1995). NTFPs are also used by people in Ghana to cure various diseases (Abbiw, 1990; Ahenkan & Boon, 2008). Rural people particularly depend very much on traditional medicinal sources for their health. Trade and use of plant products have assumed a wider dimension with more plant medicinal products being traded in the local markets.

However, there are no programmes on sustainable harvesting of NTFPs except in few cases. For instance, in some parts of northern Nigeria, there is a plan on sustainable harvesting of gum arabic (from Acacia species) through regulatory harvesting. While the exporting potentials is taken full advantage of, other aspects like the employment and income generation, productivity improvement potential, competitiveness and innovation, enhancement of gender, youth and vulnerable groups' capabilities, human security and resilience building, leadership and governance are not given the required attention. Sustainable harvesting of other forest products is recognized as having the potential to achieve dual conservation and development goals by increasing the value of forest resources to local communities (Angelsen and Wunder, 2003). Consequently, extractive reserves for the sustainable harvest of marketable NTFPs have the potential to achieve

economic and conservation goals by promoting nature protection while maximizing long-term economic returns per unit area.

Generally, harvesting, processing and marketing of NTFPs are associated with major institutional problems in the study countries. For example, NTFPs harvesters use unsustainable harvesting methods. Building the capacity of farmers and collectors in efficient harvesting and processing skills will significantly help to improve the supply chain of NTFPs in all the countries. It is important that processing facilities are provided to add value to the NTFPs, eventually promoting their commercialisation and creating more sustainable employment and income-generation opportunities that could enhance food security and improve the livelihoods of producers, their families and communities. Therefore, national governments could provide incentives that could facilitate the establishment of local food processing companies to process NTFPs, for example by assisting farmers to procure NTFP processing equipment such as honey extractors.

3.3.6 Domestication of non-timber forest products

The domestication of forest plants that produce NTFPs, for example through their cultivation in multi-strata agroforestry systems is one of the ways to reduce harvest pressure on such plants in natural forests. However, there are no comprehensive programmes on domestication of such plants in the three countries. While many NTFPs are valuable sources of nutrition, with important health benefits, the integration of their plant species within existing farming systems can also provide environmental benefits. There is therefor need for greater emphasis on the cultivation and domestication of these overlooked "Cinderella species" in the context of building green economies in these countries and also in the framework of addressing some LULUCF aspects.

Creating or improving NTFPs value chains can improve forest conservation and local income opportunities. Supporting small and medium enterprises (SMEs) in this regard will help provide opportunities for the forest sector to contribute to greening the economies of these countries. sector. A major pathway in this respect is to move from traditional approaches that concentrate on the supply side to facilitating a market system development by intervening on both supply and demand. This can be done in several ways, such as through process upgrading (increasing production efficiency), product upgrading (qualitative improvements), functional upgrading (intermediaries), and channel upgrading (product diversification).

In Ghana, the integration of "Sonkyi" *Allanblackia spp* into cocoa farming systems has been initiated in the southern part of the country. Currently, it is a collection activity although its domestication is being championed by Unilever R&D Netherlands in collaboration with the Forestry Research Institute of Ghana. Feasibility studies suggest that the venture is viable for farmers if the financial support assurances by Unilever would be sustained. Other considerations include improvements in employment and income generation; productivity potential; competitiveness and innovation; enhancement of gender, youth and vulnerable groups' capabilities; human security and resilience building, in addition to improving leadership and governance.

3.3.7 Diversification of livelihood options

The forest sector provides many options for diversification of livelihoods. This potential is being tapped by the forestry departments in some parts of Nigeria and Ghana. The forestry departments are involved in youth empowerment through training in forest-based enterprises such as bee-keeping for honey production, NTFP processing, as well as nursery techniques for raising seedlings for sale. The importance of diversification of employment options linked to the forest sector and the enhancement of entrepreneurship associated with the different resources and services provided by forests offer considerable potential for building a green economy and addressing some LULUCF aspects. As previously noted, there is need, in these livelihood options provided by forests, to improve employment and income generation capacity, their productivity potential, competitiveness and innovation, as well as need to enhance gender, youth and vulnerable groups' capabilities, in addition to building human security and resilience, and improving leadership and governance.

3.3.8 Regulation of land allocation for settlements and infrastructure

In Nigeria, the government has absolute powers for regulation of land allocation for settlements and infrastructure. There is a national land law, which became operational in 1978 vesting ownership of all lands in the government. There are no sub-national land laws or regulations, except oversight responsibilities exercised by traditional institutions.

In Ghana, until 1999, land had been managed through various legal instruments, customary practices, judicial pronouncements and cabinet decisions. There are now more than 86 legal instruments affecting access to land and land management, forestry and wildlife, water management, pollution control, human settlements and land administration institutions. In addition, there are about 80 subsidiary legislations. This approach to land management does not provide an overall direction for policy development on land, and therefore does not provide a robust enough basis for monitoring, evaluation and change where necessary. Land management has, at times, been done on *ad hoc* basis based on decisions and some of statutes enacted to deal with specific land-related issues at a particular time.

In Gambia, two main types of land tenure systems can be identified: informal and formal. Informal land tenure is based on traditional customs and practices. The customary laws states that where an original piece of land is cleared by a Kabilo (a collection of families) the ownership of land is vested in the head of the Kabilo. According to this system the village head or Alkalo has the right to allocate land in his area. This is the base of the customary land tenure system that exists mainly in rural areas and has evolved over time.

The formal land tenure system on the other hand, comprises leaseholds and freehold tenures. In leasehold land tenure the ownership rights are granted by the State for a term generally 99 years. The right is only legalised through registration of the property, and this leads to the production of a formal title deed or lease document, which is subsequently registered at the Attorney General's Chambers. On the other hand, freehold land tenure gives no time limit to the ownership of land. The owner of a freehold property can do whatever he/she feels over his property as long as in doing so, this does not interfere with

the right of third parties. Freehold properties are very few in numbers and are mainly found in Banjul and few parts of Bakau.

Generally, the traditional land use system and land use practices do not favour the identification of permanent forested lands, as they are considered an obstacle to sustainable farm and village development. On the other hand, the system is flexible enough to allow the conclusion of land tenure agreements provided that all the concerned stakeholders are involved. Local authorities play a key role in facilitating such agreements and in acting as arbiter in the case of disputes and conflicts. The concept of community participation in forest and wildlife management provides the opportunity for gaining forest ownership. This is an incentive strong enough to motivate local communities in forest protection and controlled management even in the absence of immediate direct benefits.

3.3.9 Avoidance of deforestation and forest degradation

Employment of forest guards and sensitisation and awareness campaign on the imperatives of sustainable forest management are the key approaches employed to reduce deforestation and forest degradation in the study countries. Should rate of deforestation continue at the current rate, all the countries would be in danger of flipping from being a net sequester of CO_2 associated with GHG emission to a net emitter of the same because the carbon sink will reduce in size because of deforestation.

However, *Reducing Emissions from Deforestation and forest Degradation* (REDD +) is a mechanism that could help compensate for the reduction in emissions by avoided deforestation and degradation through sustainable management. Avoided deforestation can generate multiple benefits in terms of biodiversity conservation, water flow regulation and soil conservation. The REDD+ scheme has been established to cater for other forest-based carbon projects such as forest conservation, which are not eligible under the CDM scheme. In the last 25 years, these five countries have steadily increased areas under biodiversity conservation as well as forest area within protected areas (with the exception of Nigeria where data is questionable) (Table 6). If this trend continues, it will enhance REDD+ as well as increase the potential for forest sector contribution to the green economy in those countries.

Table 6: Conservation and protected forest area 1990-2015

Forest area in (1000ha)

Area for conservation of biodiversity						Forest area within protected area				
Country	1990	2000	2005	2010	2015	1990	2000	2005	2010	2015
Liberia	175	175	198	198	198	175	175	198	198	198
Sierra Leone	1	112	112	187	243	1	112	112	187	243
Ghana	43	43	130	130	130	43	43	130	130	130
Nigeria	2,509	2,509	2,509	2,509	2,509	2,509	2,509	2,509	2,509	2,509
Gambia	36	36	42	43	44	36	36	42	43	44

Source: Global Forest Resource Assessment 2015

REDD+ presents an excellent opportunity for developing countries like Nigeria, Ghana and Gambia to protect forests by containing deforestation and forest degradation, making available a wider range of forest ecosystem benefits to those who depend on these resources, and enhance the forestry sector contribution to green economy. There are clear links exist between REDD+ and green economy objectives, and this calls for measures to explore such opportunities in order to benefit society as a whole and stop the loss of the natural capital, the forests.

3.3.10 Reforestation and afforestation

Annual tree planting carried out on farms, around markets and in urban centres, as well as enrichment planting in forest reserves are ways these countries have been increasing tree and forest cover through these reforestation and afforestation activities. In Ghana, the government enforces tree planting by those businesses that exploit forest resources, albeit with limited success.

The Clean Development Mechanism (CDM), established under the Kyoto Protocol, provides for financing emission reductions through afforestation and reforestation in developing countries, initially until 2012. However, the Paris Agreement has extended this period, in addition to providing for REDD+.

The CDM provides an opportunity to attract and increase public and private investment in the forestry sector and reward sustainable forest management. Dahiru (2011) estimates that consistent implementation of forest based CDM projects such as afforestation and reforestation could reduce Nigeria's deforestation rate (which currently represents 3.5%) by at least 80%. Moreover, the additional benefits associated with forest-based CDM projects such as attraction of foreign investment, development of forest industries, provision of employment, rural development and biodiversity conservation will help the country to fulfil her commitment to climate change mitigation and adaptation while at the same time attaining sustainable development.

The forest carbon market should ideally serve as an incentive for the forestry sector the study countries to embrace the CDM scheme. UNEP (2011) noted that the value of global transactions of carbon credits derived from forestry projects rose by 34 % year on- year to US$ 237 million in 2011, a period when the prices were high. Currently, Africa has not been significantly involved in such carbon markets. Sukhdev *et al*. (2013) noted that carbon markets may provide developing countries with trade opportunities and act as catalyst for transition of the forest sector towards a green economy. Carbon markets can facilitate creation of jobs as well as contribute to poverty reduction (Smith, 2002 and Sukhdev *et al.,* 2013).

3.4 Approaches for increasing the contribution of forests to green economy

The following are some identified changes in managing forest resources and innovative approaches to managing forests in order to enhance their contribution to green economy:

3.4.1 Community based forest management:

Community Based Forest Management (CBFM) is an increasingly popular approach for ensuring sound management of forest resources while providing income and employment for the poorest segments of the population. CBFM allows local communities to manage forest resources in order to provide for their own livelihoods. The respective community acquires the legal rights over local forest, is responsible for their sustainable management and receives the economic benefits that accrue. The approach empowers local communities and provides the potential to increase their incomes, while simultaneously enhancing forest conservation in rural areas, thus greening their countries.

3.4.2 Advancing the practice of agroforestry:

Agroforestry encompasses a wide range of practices as demonstrated in a definition given by Zomer *et al*. (2009). The term has come to include the role of trees in landscape level interactions, such as nutrient flows from forest to farm, or community reliance on fuel, timber, or biomass available within the agricultural landscape. The Food and Agriculture Organization of the United Nations' review of the benefits of agroforestry (FAO, 2005) cited a number of positive impacts for farmers. These include an additional source of cash income, provision of products such as fodder for livestock, fuelwood and fertiliser in the form of nitrogen-fixing trees, that the farmer would otherwise have to buy, decreased risk because of the wider range of products on the farm, and the ability to earn income throughout the year and accrue benefits at different times, over the short, medium and long term. The practice of agroforestry needs to be advanced in all the study countries as an important means to increase tree cover and eventually contributing to green economy.

3.4.3 Sustainable bio-trade:

'Trade in Biodiversity-based businesses or bio-trade refers to those activities of collection, production, transformation, and commercialisation of goods and services derived from native biodiversity under the criteria of environmental, social and economic sustainability' (UNEP, 2013). In most countries, the potential for the development of bio-trade for indigenous crops, which can be used for medical and industrial applications, biofuels or food supply, has been identified as the most interesting and promising opportunity. The rich biodiversity in all the study countries and the accumulated knowledge of it could result increasing products for commercialisation and export that could originate from or comprise wildlife, indigenous crops and vegetables, timber and non-timber forest products, indigenous fisheries and other indigenous natural products. However, compared to its potential, bio-trade appears underdeveloped in most of the study countries. The promotion of bio-trade will necessitate increased production, protection and better management of the resources that yield the traded products, such as forests and trees outside forests, with the consequence of greening the environment, and contributing to green economic development.

3.4.4 Promotion of offset markets:

The promotion of trade in forest carbon could also be tapped into in the study countries. For example, Nigeria and Ghana, in partnership with the World Bank's Forest Carbon Partnership Facility (FCPF), have been involved in the REDD Readiness Preparation Proposal (R-PP). The R-PP is a plan that lays out what needs to be done in order to comprehensively prepare a country for utilising the opportunities for implementation of REDD+ that has good potential for contributing to greening the economy.

3.4.5 Payment for forest environmental services:

The immense value of services provided by forests t are not recognized in the marketplace. Therefore, improved resource pricing is needed as part of key changes to managing forests, in order to increase their establishment and protection, both of which contribute to green economy. At the same time, valuation of the resource and the rights regime governing benefit sharing – including the policy and the institutions aligned to it - needs to be addressed in order to remove perverse incentives that work against forest conservation. Payment for forest environmental services hold potential to also create opportunities for both direct and indirect employment.

3.4.6 Promotion of forest-based tourism:

Forest-based tourism could serve as another innovative approach to managing forests to contribute to green economy if the forests and trees in the wildlife areas are better managed and protected. Many wildlife parks and game reserves are forest areas that have wildlife management as the primary activity. Tourism is already an important source of income for many African countries. Some countries have been able to build up a lucrative nature-based tourism industry, which has brought in foreign exchange and generated employment as well as enhancing sustainable environment. For example, Costa Rica, where protected areas received more than 1 million visitors per year in the five years up to 2006, generated entrance-fee revenue of over US$ 5 million in 2005 and directly employed 500 people. Mexican protected areas recorded 14 million visitors per year and 25,000 jobs (Robalino et al. 2010). This is possible in Anglophone West Africa where promoting sustainable forest-based tourism or eco-tourism will also provide suitable solutions to environmental degradation. Further, when such tourism takes place on community-based forest-wildlife projects it can provide additional income to the rural people through the new economic opportunities, while preserving the environment through raising awareness on forest protection. This will further contribute to greening the economy.

3.4.7 Landscaping and beautification

Landscaping and beautification have potential to increase the amount and quality of green spaces, including forests. In all the study countries, national governments are increasingly encouraging urban renewal through re-introduction of trees and increasing green areas (Figure 14). However, these efforts are concentrated in urban areas. Observed urban green resources/spaces as reported by Popoola (2014) include:

- ✓ Street trees and road plantations
- ✓ Public green areas such as parks, gardens, cemeteries
- ✓ Semi-private spaces, such as green spaces in residential areas and in industrial or specially designated parks
- ✓ Public and private tree plantations on vacant lots, in green belts, woodlands, rangeland, and forests close to urban areas
- ✓ Natural forests for urban uses, such as nature reserves, national parks, forests for eco-tourism
- ✓ Urban agricultural land, such as orchards, allotments, *Fadamas* etc.

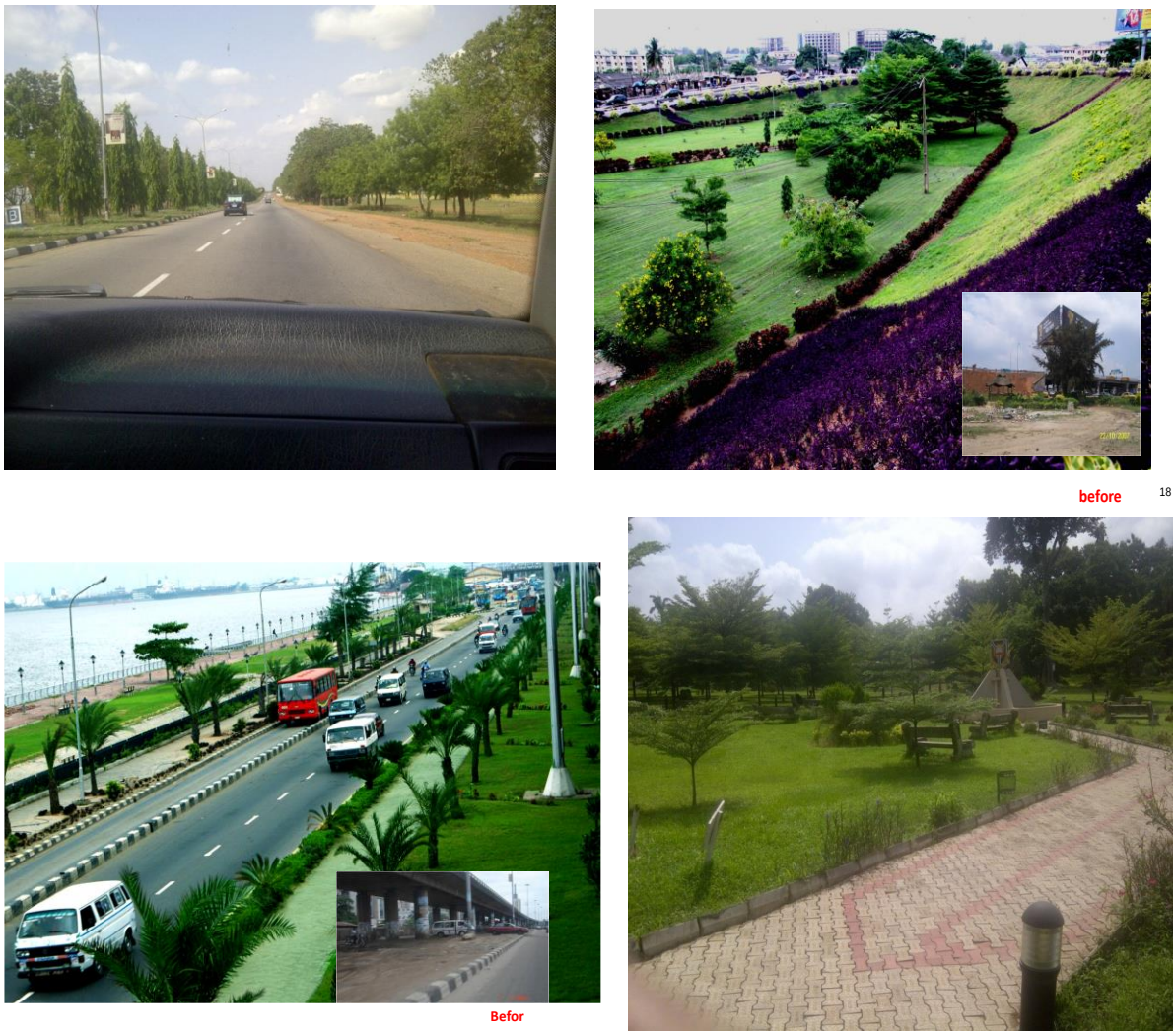

Figure 10: Examples of urban green areas in Abuja, Lagos, and Ibadan in Nigeria

Apart from the potential for greening and its attendant advantages, landscaping and beautification can create, and have also created, employment through special *adhoc* development schemes by governments. This is one area that public and private sector organisations could explore further. Even in the urban and peri-urban areas, forest and tree based employment is becoming increasingly important.

According to FAO (2015), employment in forestry contributes to society's economic, environmental and social welfare. This is particularly so, since forestry activities are carried out in rural areas where there are often few alternative sources of employment. nt. Unfortunately, the employment potential in the sector is often not adequately accounted for. The FAO (2015) reported direct employment in forestry over a period of 20 years (1990-2010) for three of the five study countries (Table 7). The statistics are indicative of the potential the forest sector has to contribute to employment, and by extension to national income. National governments could create enabling environment that could facilitate exploitation of these potentials.

Table 7: Direct employment in forestry 1990-2010

Country	Employment (1000 Full Time Equivalent-FTE)			
	1990	2000	2005	2010
Liberia	5	4	2	12
Sierra Leone	-	-	-	-
Ghana	3	2	3	4
Nigeria	9	10	10	12
Gambia	-	-	-	-

Source: Global Forest Resources Assessment 2015

3.4.8 Reduced impact logging:

Reduced Impact Logging (RIL) is a systematic approach to planning, implementing, monitoring and evaluating forest harvesting with the ultimate aim to reduce adverse impact of logging and therefore contribute to better forest protection when harvesting and logging. It has been developed and refined over several decades and new practices and thinking continue to emerge. While various timber-producing countries have recognized the substantial potential of RIL in advancing sustainable forest management, attitudes and practices on the ground need to change for enhanced forest sector contribution to green economy in the study countries.

3.4.9 Forest certification:

Forest certification schemes are important mechanisms for regulating forest management and forest products exploitation and trade. They act as a major driver in creating trade opportunities in sustainable forestry. Certifications are essential in ensuring effectiveness of green investment initiatives. Therefore, embracing certification scheme in forest management in the study countries could secure the sustainable management of the forest resources as well as their utilization.

4. Conclusion and recommendations

4.1 Conclusion

Human development will continue to remain a global priority, and with it will remain the impact of contemporary development trajectories on the environment. Forests remain crucial to attaining sustainable development since they affect the social, economic and environmental spheres of sustainable development. Together with the challenges facing the forest sector, there are also opportunities for greening the sector. They include among others: investing in improved forest management and certification, investing in planted forest, agroforestry and protected forest. All these options have the potential to restore forest landscapes; provide ecosystem services, sustainable energy in rural, peri-urban and urban areas; as well as create green jobs. There are challenges in achieving these in the study countries, as well as opportunities. Overcoming the challenges and optimizing the opportunities will require legal and institutional strengthening, instituting good governance, capacity building and development in many areas.

4. 2 Recommendations

The development or improvement of following institutional and regulatory frameworks to facilitate the forest sector contribution to green economy are recommended.

4.2.1 Forest governance

An overarching requirement towards enabling forestry sector contribution to green economy is to ensure that good forest governance is in place at the national levels in all countries. At an operational level, good forest governance should include good forest management principles, and a related hierarchy of criteria, indicators and standards that will support progress from mere legality to sustainable forest management. It should also include a capacity-developing, stepwise approach, helping stakeholders to continually improve forest management.

4.2.2 Policy options

Encouragement of private sector participation

The participation of all stakeholders in forest management and conservation should be further encouraged and strengthened through joint management agreements and the promotion of private sector development and ownership of plantations by reducing bureaucracy in the acquisition of forest land, permits and licenses for investment in afforestation. Joint agreements with other actors in the sector should result in clear and attractive benefits to the private sector (e.g. 50–50 benefit sharing of the income from product sales). All the areas under joint management agreements must include production zones from which an adequate and regular income can be raised. Private sector involvement in sustainable forestry could be facilitated by improving infrastructure and providing tax incentives, price concessions, soft credit facilities for investments and joint ventures, technology transfer, good revenue collection systems and defined property rights.

Expansion into international markets
Expansion into international markets would require efficient value-adding activities that result into quality and affordable products, as well as effective the promotion of sustainable biotrade. Concomitant to this is the liberalization of trade in the various products being promoted.

Facilitation of the policy of devolution and empowerment to local governments
The forest sector is a key source of revenue for most local governments. Therefore, local authorities need to be facilitated in building the capacity of their human and financial resources within the forestry sector. Through effective policy of devolution and empowerment to local governments, it would be possible to create local institutions at the grassroots level for local community participation in forest management in order to foster rapid sustainable social and economic development.

Promotion of gender balance and addressing of inequality across all frontiers
Within a gender and environmental framework, programmes and projects should be designed to address such issues as sustainable ecological and economic development, poverty alleviation, improved quality of life and, above all, harmonized natural resource management. Women, youth and marginalised groups should be involved in forestry-related decision-making, development and ownership of forest resources and getting a fair share from such resources. This must be emphasized as an important part of community participation in forestry.

4.2.3 Institutional arrangements

Implementing the national forest policy and legislation
The national forest policies and legislations in all the countries ought to be passed by appropriate legislative bodies and implemented to the letter. The roles of different stakeholders must be recognised and supported, including the allocation of management responsibilities, rights and duties. Compliance with international SFM initiatives and the implementation of international conventions and agreements related to forestry should also be given priority. Constraints facing the forestry sector including the fragmentation of forest administration; inadequate funding; inadequate forest research and underutilization of trained staff; uncoordinated development and management plans, from the village to the

national level; and poor forest extension services resulting from the fragmentation of forest administration must be addressed.

Development of national criteria and indicators for sustainable forest management
Criteria and indicators (C&I) for SFM are operational tools for monitoring and measuring trends in SFM over time at the national and sub-national levels. C&I can also be used as a tool for promoting sustainable management at various levels, as defined by existing the national forest policy, and for SFM into action through the national forestry programmes, plans and activities. C&I can serve as an early warning system and help to identify gaps in and threats to SFM, which should be addressed in forest policy. C&I also enable national, sub-national and global comparability, forming a relevant basis for forest certification criteria. Largely, enabling forestry sector contributions to Green Economy means creating a context in which economic activity within the sector increases human well-being and social equity, and significantly reduces environmental risks and ecological scarcities. Changing the economic environment in this way is an ambitious undertaking, which requires a holistic set of policies to overcome a broad range of barriers across the investment landscape. This underlines the critical role for governments to correct the currently unsustainable forestry practices and to alter investment landscapes in the short to medium-term within the sector.

4.2.4 Information gaps in Land Use, Land Use Change and Forestry (LULUCF) in relation to livelihoods

There is currently no comprehensive annual assessments of the sources and volume greenhouse gas emissions in relation to livelihoods within the forestry sector in all the study countries. The carbon sequestration potentials of forest cover are also not known. There is also information gap on the area of land that could benefit from selling forest carbon in offset markets. There is thus a great need for capacity building so that all the potential for mitigation and adaptation to climate change can be known and made full use of the study countries, and by extension Sub-Saharan Africa.

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