Developing Country Studies
ISSN 2224-607X (Paper) ISSN 2225-0565 (Online)
Vol.3, No.3, 2013

Green Investments Required in the Forest Products Industry in Nigeria

Ogunwusi, A.A.
Raw Materials Research and Development Council, Plot 17, Aguiyi Ironsi Street, Maitama District, Abuja

Abstract
The high rate of deforestation has had negative effect on the development of the forest industry in Nigeria. It also has impact on biodiversity, water availability and downward movement of Sahara in the country. One of the major factors increasing the incidence of deforestation is the high rate of wood utilization for charcoal production and for direct domestic energy generation. These have substantially increased Nigeria's contribution to climate change phenomenon. To stem this tide and set forestry on a sustainable path, it has become imperative that emphases should be placed on utilization of wood wastes in place of solid wood. Investments should also be promoted in the areas of wood reuse, establishment of plantations of industrial indigenous and exotic wood species, enrichment planting, agro forestry practices, and improved management of old bamboo clumps and establishment of new bamboo plantations locally. The tapping of the abundant solar energy in Nigeria for electricity generation and domestic cooking purposes also have great potentials of reducing dependence on fossil fuels utilization in the country. These investments has great potential of reducing the current rate of deforestation by librating forests to play their traditional roles of environment amelioration, top soil protection, biodiversity conservation, maintenance of ecological balance, etc.
Keywords: briquettes, wood reuse, climate change, biodiversity, agro forestry

1.0 Introduction

Nigeria, in its vision 20:2020 document aspires to be one of the most dynamic and competitive economies on global basis by year 2020. A key factor for turning this strategy into reality is for the nation to imbibe the concept of sustainable development. The concept requires progress towards promoting industrial growth and jobs to be pursued alongside ensuring social cohesion and a better environment. According to Niskanen (2005), in small scale forestry, the demand to satisfy multiple objectives in the same forest area is increasing. This provides a challenge for countries where timber production is the main objective in forest management. The key questions in these areas are how to manage forests in the future to satisfy various demands in order to avoid the risk of losing potential for timber production. Promoting green investment in the forest industry in Nigeria will assist in stemming the current rate of deforestation, one of Nigeria's major contributions to the climate change phenomenon. This can be done in a number of ways. The could be by ensuring that the wood industry in Nigeria is committed to the principles of sustainable development through increased efficiency in wood conversion, wood reuse, reduction in the rate of wood conversion to charcoal and complimentary utilization of wood wastes in place of solid wood. Others may be to promote activities that will promote carbon sequestration such as plantation establishment, enrichment planting agroforestry, etc. These are important as the over exploitation of the wood resources in the country has impacted negatively on the development of the forest products industry. The problem is further compounded by the present public forest estate which embraces only 100,000 km or 11% of the total land area as against 25% recommended by FAO (Ogunwusi, 2009).

The nation's forest resources have been unmitigatedly exploited since the colonial era. As far back as 1899, the perspective planning for economic development was to exploit forest resources (Adeyoju, 1975). The export revenue from forestry grows at 4.1%, 8.0% and 28.8% between 1950-60, 1960-70 and 1970-80 respectively (Aribisala, 1993). Apart from these, most rural households in Nigeria depend on wood and charcoal for domestic energy generation. In Nigeria, approximately 120 million people rely on wood for heating and cooking. Coupled with this, lumber recovery is low as a result of old equipment. According to Olorunnisola (2000), the lumber recovery rate in the country is 40-60% while annual rate of return is between 15.2% and 44.3% as a result of the use of outdated technologies. Due to this, Omoluabi (1985), Oyegade (1997) and Larinde (2008) recommended that efforts should be geared towards having most of the wood industries integrated to enable the wood wastes of one to be channeled to the other that can process them.

In view of the high rate of deforestation, there have been changes in the structure of the forestry sector. The forest resource survey, 1996-1998, revealed that the forest cover has decreased by 20% over the preceding 18 years. According to Adeyoju (2001), the total forest estate which stood at 10% of the country's land area in 1996 is now less that 6%. Ola Adams and Iyamabo (1977) estimated that about 26,000 ha of forest land are destroyed annually

in the rainforest zone during the conversion of natural forests to plantation forests and other forms of land use. World Wildlife Fund also estimated that over 90% of the natural vegetation had been cleared and that over 350,000 ha of forest and natural vegetations are lost annually (WWF, 1989),

These developments have negative impact on the operations of the forest products industry leading to decline in the contribution of the industry to national industrial development. Studies by RMRDC (2009) indicated that the total volume of usable wood down to 30cm cutting diameter in the forest reserves is only 239,775,500cm$^{3.}$ This is not significantly different from 437,507,205.9m^3 reported by Akindele *et al* (2001) Various studies (Oriola, 2009, Olorunnisola, 2000; Ogunwusi, 2012a; Aribisala, 1993; RMRDC, 2003) have reported decline in the performance of the forest industry in Nigeria which is brought about principally by increasing demand for wood and contracting wood supply base. Thus, the forest industry in Nigeria needs re-strategizing. As a policy issue, efforts should be made to promote green private sector investments as well as discourage utilization of solid wood for domestic energy generation. It has also become imperative for the country to promote reuse of wood. . This paper examines the problems militating against sustainable development of forest products industry in Nigeria. It outlines the causes and extent of deforestation in Nigeria, the role of deforestation in climate change and the appropriate green investment required to promote sustainable development of forest industry in the country.

2.0 Deforestation and Climate Change

Globally, climate change is a widespread and growing concern that has led to extensive congressional and international discussions and negotiations. In view of the importance attached to climate change globally, evidences are showing that the phenomena will dictate the patterns of industrial development, transportation and energy generation in years to come. The current global change mitigation strategies have focused on reducing emissions of green house gases, especially, carbon dioxide whose major source is deforestation. Forests are carbon sinks in their natural state (Gorte and Sheik, 2010). Trees absorb carbon dioxide and convert them into leaves, stems and roots while releasing oxygen. Forests accounts for more than a quarter of the land area of the earth and store more than three quarters of the carbon in terrestrial plants and nearly 40% as soil carbon. Carbon sequestration and release vary by forest types although generalizations can be made about boreal, temperate and tropical forests. It has been stipulated that the rate of deforestation in tropical countries accounts for about 20% of the emission of greenhouse gases caused directly by human activities. Consequently, since the early 70s, there has been wide spread public concern about the rate at which tropical forests are being removed or destroyed (ITTO, 2005).

In Nigeria, FAO (2010) estimated that Nigeria lose about 3.7% of its forests per year and this has resulted in the highest net loss of forests from 2000 to 2010. According to FAO Forest Resources Assessment (2000), about 14.6 million hectares of natural forests were lost annually to deforestation. Of this, 1.5 milion hectares was converted into plantations aimed at increasing wood supply (Onefeli, 2011). FAO (2005) also reported that Nigeria has the highest rate of deforestation in the world. Between 2000 and 2005 the country lost about 55.7% of its primary forests. Between 1990 and 2005, in total, Nigeria lost 35.7% of its forest cover or 6, 145,000 hectares of forests. As a result of this, a lot of damage has been done to Nigeria's land through the processes of deforestation, notably, contributing to the overwhelming trend of desertification (Omofonmwan and Osa-Edoh, 2008).

The major effect of deforestation on climate change is mainly to increase atmospheric CO_2 and other trace gases, thereby, affecting climate as the concentration of carbon is higher in forests than in other land use which they are converted to (Woodwell et al, 1983; Dixon, 1995). The increase in CO_2 level and other greenhouse gas levels in the atmosphere leads to an increase in temperature , and eventually, a change in climate and weather in terms of weather patterns, sea levels, and other cycles that directly affects life on earth (GFF, 1998). A study conducted in Nigeria from 1901 to 2005, showed there was temperature increase in Nigeria of 1.1^{O}C, while global mean temperature was only 0.74^{o}C. The same study also indicated that during the same period, the amount of rainfall in the country decreased by 81mm. It was noticed that both trends simultaneously had sharp changes in the 70's (Odjugo, 2010). FAO (2000) concluded that the bulk of emissions from deforestation occurs when land is converted to agricultural production, particularly if forests were first cleared by burning. According to Akinbami (2003), the emissions from deforestation accounted for 87% of the total carbon emissions in Nigeria.

Apart from the above, deforestation has caused a loss of biological diversity in both the flora and fauna species. Although the rich diversity of Nigeria's flora and fauna species have been poorly documented, a country study by FEPA (1992) indicated that Nigeria possesses more than 5000 species of plants and 22,000 species of animals. The study identified 200 species of lower plants and over 5013 higher plants. With this number, Nigeria is said to

rank 11th in Africa in terms of plant diversity. About 205 of the plant species are endangered, representing the 9th highest in 42 African countries. Animal biodiversity in Nigeria included 247 mammalian species, 900 birds species, 135 reptalian species, 109 amphibian species, 77 mollusks and bivalves, 10 annelids, 648 fish species and 20,000 insect species. The study lists 1,489 species of microorganisms. Nigeria is also known to be a hotspot for primates, ranking 8th in the world for primate diversity with 23 species and 13 genera. Majority of the primates are found mainly in the gulf of guinea forest in Cross River State adjacent to Cameroon. Also the endangered gorilla (*Gorilla diehli*) is found only in a couple of protected areas near Nigeria- Cameroon border.

Gbile et al 1981 reported 484 plant species in 12 families of the 4600 plant species in the country to be endangered. About 205 of these species are endemic and their loss mean extinction from the earth. The inherent danger in species extinction is that between the root crops in the south and the grains in the north, there are over 300 edible plants in Nigeria (NEST, 1991). Only about 20 of these crops are handled in large tonnages (Okafor, 1993). The International Conservation of Nature (IUCN) red list of threatened species include 148 animals and 146 plant species found in Nigeria. Of these 26 animals are classified as endangered. Also, the numbers of rare Cross River gorilla have decreased to around 300 individuals because of poaching by locals and mass habitat destruction (Deutsch, 2007)

In addition to the above, climate change phenomenon is also manifested in persistent drought. The incidence of desert encroachment into Nigeria's savanna forests has been reported (Adegoke and Ogunsanwo, 2011). Likewise water stress situations have been reported in the Northern part of the country while rising sea levels and inundation of coastal waters by saltwater in the southern part is evidently on the increase (Ogunwusi and Jolaoso, 2012). Coupled with above, average daily minimum and maximum temperature, increasing floods and erosion are being experienced in the country. The observed change in weather pattern will have significant negative effect on the rain fed agriculture mostly practiced in Nigeria (Ogunwusi, 2011a). According to Jimoh *et al* (2012), land degradation has also assumed a definite pattern in Nigeria. For instance, erosion has ravaged much of the eastern parts of Nigeria. In the area, both active and inactive gullied surface areas range from 0.7km for Ohafia and 1.15km for Abiriba in Abia state. The width of the gulleys ranges from 2.4km for Abiriba and 0.4km for Ohafia. Furthermore, a minimum depth of 120km gullied surface has been recorded at Abiriba. Also, problems of widespread sheet wash erosion have resulted in the failure of agricultural activities. In the Northern and Western axis of Nigeria, erosion is equally serious, especially in places like Shendam and Western Pankshin of Plateau State, Efon Alaaye in Ondo state, Ankpa and Okene in Kogi state of Nigeria (Jimoh *et al,* 2012). Generally, the observation of the patterned nature of land degradation reveals that no part of Nigeria is spared from this wreckage (Asadu et al., 2004). In Abeokuta South and North local government areas of Ogun state, erosion has done much damage.

There is indication that the portion of Lake Chad in Nigeria has dried up. This has terminated the access of millions of people to means of livelihood interms of fishing, livestock and agricultural activities (Adegoke and Ogunsanwo, 2011). Sequel to the tremor in Abeokuta, Ogun State of Nigeria which affected major parts of the region (Muhammed, 2009), the National Space Research and Development Agency of Nigeria has warned of the possibility of an earthquake in Nigeria, especially in the South Western Region (Adegoke and Ogunsanwo, 2011).

3.0 Causes and Extent of Deforestation in Nigeria.

A number of human activities wittingly and unwittingly aided deforestation in the country. One of the major causes in the rural areas of Nigeria is poverty and pronounced deprivation (Adeniran et al, 2011). Among the attributes of poverty are low income and the inability to acquire the basic goods and services necessary for survival with dignity. Poverty also encompasses low access to basic medical facilities, education, clean water and sanitation, inadequate physical security, lack of voice and insufficient capacity and opportunity to better ones life. The forests provide income and employment for forest dwellers who engaged in forest products gathering, processing and marketing as their main source of livelihood or as supplementary source of household income (Etigale et al, 2011). According to Vyas (2006), the collection, processing and marketing of forest products as well as forest labour constitute important economic activities for many rural people. For instance in Cross River State, some school children and poor women in rural communities collect and sell Non Timber Forest Products to enable them pay school fees and meet up with other school demands (Anukwa, 2003). Such investments provide poor people an opportunity to escape from the cycle of poverty (FAO, 1989; Vyas, 2006). Endemic poverty and extensive corruption are general phenomena in most developing countries. High level of poverty coupled with high level of corruption which make it impossible for provision of basic necessities of life has resulted in extensive

dependence on wood for domestic energy generation in most parts of the country including the urban areas. According to FDF and FME (1999), over 90% of the rural/peri-urban population depends on fuel wood and charcoal to meet domestic energy requirements. The consumption of wood and charcoal in Nigeria is still generally based on the data by FAO as reported by EMRD (1991). This is based on a per capital charcoal consumption of 0.5t/cap/year and 0.2 t-charcoal/cap/year and projected from the 1991 population census projected at 2.8% growth rate per year. More recently, due to rising prices for fossil fuels, a massive shift from modern fuels such as kerosene and LPG back to and charcoal has been taking place. According to Adegoke and Ogunsanwo (2011), fuel wood consumption is currently about 1.4kg/head/day; or the energy equivalent in fossil fuels. The volume of consumption also varies considerably between states in the country. In Kano state, the fuel wood consumption has been reported to as high as 360kg/person/per year.

About 20% of deforestation in developing countries has been attributed to charcoal production (Adegoke and Ogunsanwo, 2011) This figure will be significantly higher if the direct use of wood for domestic energy generation is calculated and this has been reported to be responsible for 30% of the total deforestation in the country. Three major types of fuel wood are used in the Country. These are direct fuel woods which are woody materials that are directly removed from forests and other woodlands, indirect fuel wood which includes industrial bye products of wood processing industries and recovered fuel wood from socio economic activities outside the forests and wood processing sectors such as wastes from construction sites, demolition of buildings and containers (FAO, 2004).

Ogunwusi (2009) highlighted other major causes of deforestation in the Country to be as result of unmitigated and destructive exploitation since the colonial period. Commercial wood exploitation commenced in Nigeria with the introduction of the pit sawing method in 1782 and subsequent establishment of power sawmills in the Delta area in 1902. Wood export peaked in the 50's with log and sawn wood and subsequently veneer and plywood. By 1960's, wood export reached approximately 700,000m^3 per annum. This trend was maintained and sustained in the 70's. However, by mid 70's, the toll of intensive exploitation was already showing, and, wood export, which peaked at 700,000m^3 in 1964, decreased steadily to 290,000m^3 1970.

Although, these is no accurate data on the rate of deforestation in Nigeria, available information indicated that the process started slowly at the beginning of this century and became intensified after the Second World War when widespread logging opened a lot territories for the as farmlands for agricultural and tree crops for export (FORMECU, 1996). Deforestation also increased during the oil boom years in the 1970's and as a result of various large scale agricultural schemes such as Operation Feed the Nation (1977 – 1979), the Green Revolution (1980 - 1983), Directorate of Food, Road and Rural Infrastructure (DFFRI)(1986 – 1993) and National Agricultural Land Development Authority (NALDA) (1989 -1996).

Other causes of deforestation are population increase, poverty, farming systems, extensive grazing and uncontrolled forest fires, urbanization, land tenure system, inadequate forest policy and law (FORMECU, 1996). Also, since 1970, forest exploitation has not been related to working plan as the state departments of forestry have being unwillingly aiding the liquidation of forest capital as a result of political expediency (FORMECU, 1996). Roby (1991) reported the rate of deforestation for reserved and unreserved forests in different vegetation zones between 1976 and 1990 and arrived at a total deforestation rate of 400,000 ha per annum for the country. FAO (1992), using a logistic foundation linking deforestation to land area, forest area and population density, estimated population densities for 1980, 1985 and 1990, observed deforestation rates for the periods 1981 – 1985 and 1986 – 1990 as 3.48 and 3.57% respectively. FAO (1992) thus concluded that if these rates are maintained, the forest area of Nigeria would disappear within the next three decades. Coupled with the increasing role of deforestation in climate change, the unsustainability of forest estates in Nigeria has become a major concern to environmentalists, industrialists and policy makers.

According to TFAP (1990), constant struggle for additional cropland has become the largest single causal factor for tropical forest destruction. Although forest clearing is rarely completed, forest patches are disappearing fast under the pressure of human population growth, the integration of rural household into market economy, the breakdown of traditional patterns of forest use and government policies (Scheltas and Greenberg, 1996). Other factors include inequitable land tenure, loss of available arable land, large scale non agricultural projects coupled with low agricultural productivity (Afuwape, et al, 2002). Deliberate, unprescribed burning of the farmland cover to stimulate regrowth of forest forage, a common practice in northern guinea savanna area of Nigeria, also reinforces and accelerates the process of forest degradation (Hugret, 1983). The encroachment situation is

becoming increasingly desperate because the socio-economic needs of rural communities are derived from the forests on a daily basis (Osemeobor, 1993).

Ineffective legislative system, coupled with poor legislative framework, have also gone a long way in encouraging removal (often illegally) of trees. The present level of concessions for logging, particularly in Southern Nigeria are too generous when compared with value of natural timber resources, years needed for regeneration and profit made by the sawmillers (Afuwape et al, 2003).

The situation is worse in states dominated by savanna vegetation in the northern part of the country where the bulk of the revenue from the state (s) forest is being generated from the sale of non timber forest products (e.g. poles, fuelwood, etc) (Ajayi and Omoluabi 1993). Nnena (1999), submitted that under normal circumstances three or four tones of logs are being removed weekly from Bayelsa, Rivers, Delta, Edo, Ogun and Lagos States for about 6 (six) months per year. According to Afuwape et al (2003); the procedures used include log lifting, rafting and eventual towing to Lagos through the use of tugs. The extent of trees removed in this manner is considered significant in view of the fact that each of the tugs carries about 3,000 logs (Nnena, 1999).

At the current rate of deforestation and considering the need to maintain a viable wood products sector, there is need for policy makers to re-strategize by introducing investment options that will discourage utilization of wood as a source of domestic energy generation while at the same time promoting reuse of wood in the sector. Some of the green investment opportunities that are germane in the sector are subsequently highlighted.

4.0 Appropriate green investments required in the forest industry

From the foregoing, the need to reduce the extent of deforestation is highly imperative. For this to be feasible, there is need to promote investment and acceptability of fuel wood alternatives, reuse of wood, improved wood preservation treatment and trees replacement. Among the advantages of these initiatives is reduction in the rate of deforestation, increased lifespan of wood in service leading to reduction in the rate of deforestation. The various investment options are subsequently discussed.

4.1 Wood waste utilization

According to the United States Environmental Protection Agency, over six million tones of wood wastes were created in 2003. This accounted for the largest portion of the residential waste stream into the nation's landfills. In Nigeria, more than 1.5 million tones of wood wastes are generated annually inform of saw dusts, flakes, slabs and flooring, planks in construction sites, etc (Ogunwusi, 2009). Most of these wastes are burnt off, constituting hazards to the environment. The proportion of a tree converted into products varies widely, and depends on the size (diameter) and form (taper and branching) of trees as well as the particular species. The purposes for which trees are cut also influence utilization and volume of wastes generated. Harvesting pulpwood for paper production uses a higher percentage of the woody biomass than harvesting veneer bolts for plywood or sawlogs for lumber. Cutting to clear a site for agricultural yields much more waste, as the woody mass is mostly burnt off to prepare the site for crop or pasture production.

In Nigeria, the availability of energy for domestic use poses a great challenge as aresult of the high cost of kerosene, cooking gas and environmental harzards. Hakilla and and Parikka (2002) reported that wood residue accounts for between 15 and 60% by volume in sawmills and between 40-70% by volume in plywood industries most of which are in form of slabs, barks, sawdust, cutoffs, etc. These residues can be used for domestic heat generation. In developed countries, most of the wood wastes are available as an economic attractive source of energy in wood industries. This has necessitated the need to improve on biomass waste and agricultural residues (Fapetu, 2000a). The residues generate heat of which about 84% of fuel briquets produced from agricultural land and wood wastes are consumed in the United States by domestic and industrial applications (Fapetu, 2000b; USDA, 2002.)

The role of fuel briquettes to domestic energy generation in Nigeria is becoming more and more relevant as a result of decreasing availability of wood. Recent studies have shown that agricultural residues can be processed along with wood wastes to produce high calorific value briquettes. A number of nongovernmental organizations have come up with well defined production processes and equipment for fuel briquette production in rustic environments. Fuel briquettes can be made from readily available raw materials. In urban areas, this can be

sawdust and shredded paper while in the villages and rural areas; they can be made from leaves, grass, risk husks and many other agricultural wastes in many combinations.

Fuel briquettes projects have been started in many countries in Africa, South East Asia, South and Central America by non governmental agencies and efforts are still being made to promote its wide acceptability as commercial outfits for poverty alleviation and as alternative to fuelwood. Commercial pressure preses are available. Geographically, appropriate presses can easily be modified to accommodate available raw materials and levels of sophistication in rustic and urban environments (Stanley, 2003). An enterprise making use of fuel briquettes production can be very profitable for small businesses and communities consuming bio fuels such as charcoals and firewood that are increasingly scarce and very expensive in many parts of Nigeria. Oladeji (2010) concluded that briquettes have positive attributes such as ease of transportation and of storage. The physical and combustion properties of briquettes greatly influence quality in terms of durability, rating and heating values (Sotande et al ,2010a). Appreciable number of studies have indicated potential usefulness of wood wastes and other agricultural waste products such as sawdust and wheat straw (Wamukanja and Jenkins (1995), Maize cub (Wilaipon, 2007) , groundnut and melon shells (Oladeji, et al 2009), and waste paper and admixture of coconut husk (Olorunnisola, 2007) among others.

4.2 Wood reuse

The industrial use of wood is highly dependent on its type and quality (Waste Online, 2012). High quality wood species in terms of density, heartwood proportion and mechanical properties, etc are used in a variety of ways from furniture to joinery. Tropical hardwoods are chosen for their physical and aesthetic qualities and their fine grained defect free appearance makes them ideal for machining and crafting. Wood wastes generated from households come mainly from furniture, fencing, floorboards, kitchen items, etc. Although figures are not available in Nigeria, Environment Resources Management (2012) estimated that the United Kingdom produces about 7.5 million tones of municipal, industrial and commercial wood wastes in addition to construction and demolition wastes annually. Only about 16-20 % of the wood wastes are being reused, recycled, or channeled for energy recovery. .

Currently, more than 12 million tones of wood wastes are used in landfill every year. This is dangerous for several reasons. One of the major reasons is that landfills contribute significantly to land water and air pollution. The second is that the demand for wood is on the increase globally and large areas of primary forests are cut down to meet the rising demand for timber. This is leading to large scale deforestation which is responsible for a significant part of the present climate change problems (ITTO, 2005).

Wood reuse and recycling are becoming important in view of their roles in stemming climate change. Currently a number of organizations such as Recycling Services in the United Kingdom accept all grades of non hazardous used wood for reprocessing (RS, 2012). The organization accepts all soft and hardwoods, pallets, off cuts, boxes and packaging cases, floor boards, chipboards and OSB, plywood, melamine and laminates, MDF and hardboard (Hadfield, 2010).

The economic viability of deconstruction depends on generating sufficient revenue from the sale of salvaged materials to offset labor costs. As there are many potential uses for salvaged lumber, it has the potential to generate significant revenue. While emphasis is mostly placed on wood without preservative treatment, the high proportion of treated wood in the wood wastes generated globally is necessitating incursions into treated wood reuse. For instance in a study carried out by Zimms and Barrett (1996) on the management of industrial wood wastes in the United States, it was reported that the percentages of pallets being land filled has dropped to 28% compared to 60% four years earlier. The study also indicated that pallets are reused nine times by the same pallet user. For pallets that have passed the point of reuse, 41% were used for fuel, while just over 38% were being processed for mulch, compost particleboard material or other use. However, since the study was completed, the pressure treated lumber industry has come under fire in Florida as well as other areas regarding the health risks of cetain applications of arsenic treated wood. New emphases are also being made of the possibility of treated wood to leach into the groundwater.

Nevertheless, the Environmental Protection Agency (EPA) has evaluated the use of treated wood in playgrounds and applications with the conclusions that it does not pose an acute or chronic health hazard. Consequently, since the beginning of 2001 the American Wood Preservers Institute (AWPI) began working closely with the EPA to enhance their consumer awareness programme and disseminate information to businesses and individuals about

the proper handling of treated wood products. In 2002, many wood preservative manufacturers decided to seek and amend their respective regulations with the EPA to transform CCA to a new generation of wood preservatives for use in consumer and residential treated wood markets.

4.3 Plantation establishment

Increase in human population has exerted pressure on Nigeria fragile natural forests. These are in terms of expansion in agricultural production, urban development, roads construction, etc. This has also led to increase in the release of green house gases into the atmosphere (Nwafor, 2006). Evans (1992) stressed the need for forest plantation establishment in Nigeria to reduce the amount of GHG in the atmosphere. As Nigeria's forest resources have been abused through deforestation it has become important that plantation of selected industrial wood species be established in the country by private sector investors either as individuals or as cooperatives. Ogunwusi (2009) highlighted the need for government to support assiduous establishment of forest plantations in Nigeria with adequate incentives. In line with Oyun (2005), Ogunwusi (2009) defined plantation forest as forest stands established by planting and or seeding in the process of afforestation or regeneration. Forest plantations are usually established for specific objectives. In an effort to boost the supply of raw materials to the wood products industry, the objective of plantation establishment will be to produce indigenous or exotic industrial wood species for use in the sector. Among the advantages of this initiative is that apart from making the wood products sector self sufficient, it will also assist in offsetting the carbon emission occurring as a result of other activities (ITTO, 2OO5; Ogunwusi, 2009; Ogazi et al, 1995).

4.4 Enrichment planting.

According to Aniah and Okpiliya (2002), tropical rainforest ecosystem is the most complex in structure and richest in species composition. The report observed that about 5000 direct benefits of commercial forest products could be obtained from the forests worldwide. About 80% of human food supply is obtained from just about 20 types of plants (Myers, 1990). The high utilization potentials of these natures' resources has led to intense pressure to which they have been subjected to for centuries. The long term effect of this high dependence has led to their destruction in terms of quality and quantity. Onyekwelu and Afuwape (2008) pointed out that Nigeria's tropical rainforest has been heavily exploited, seriously degraded and fragmented, leaving about 5% of the country's rainforest ecosystem undisturbed. As forest degradation is usually accompanied by reduction in species diversity, decrease in primary productivity, change in forest structure and depletion in soil nutrients (Abubakar, 2010), the species diversity of the Nigerian rainforest ecosystem has decreased substantially. One strategy for combating forest degradation and enhancing the value of forests is to increase the concentration of economically important indigenous tree species by planting seeds in degraded forests (enrichment planting) for future harvest (Brown et al 2003; Dawkins and Philips 1998; Motaginni and Jordan 2005; Lawal and Adekunle, 2011). Consequently enrichment planting can lead to restoration of biodiversity of degraded tropical forests (Adekunle, 2006). Thus the need to intervene in most forests in Nigeria has necessitated that investment should be promoted in this area.

Agroforestry Practices

Agroforestry is the practice of growing trees and agricultural products on the same plot at the same time. It helps farmers create more integrated, diverse, productive, profitable, healthy and sustainable land use systems (Wombo et al, 2008). It also provides environmental, economic and social benefits to land owners, and/or producers (Kort and Turnock, 1998). Agroforestry encompasses a very large and diverse set of practices ranging from cropland in which a minimum tree component is added to complex forest production that has been integrated into an existing forest structure.

A major advantage of agroforestry practices is that it sequester carbon. Kort and Turnock (1998) reported that the amount of carbon sequester by trees in an agroforestry set up is directly proportional to the rate of growth and size of the mature tree or shrub. The report further reiterated that properly planned field shelterbelts trap snow, reduce evapo transpiration, provide wildlife habitat and protect adjacent soil from crops and wind. Watson et al (2000) maintained that the greatest potential for carbon uptake is through conversion of previously degraded lands into well managed agroforestry systems. In temperate systems, agroforestry systems have been shown to store large amounts of carbon (Kort and Turlock, 1999). Potential carbon storage from agroforestry systems in temperate regions has been estimated to range from 15-198 C/ha with a modal value of 34 tonnes C/ha (Dixon, 1995). Nair and Nair (2003), estimated the carbon sequestration potential through agroforestry practices in the United States by 2025 as 90.3mt C/ha/yr. In the tropics Palm et al (1999) reported that agroforestry system helped in regaining 35% of the original carbon stock of the cleared forest compared to only 12% by croplands and pastures. Fay et al (1998) reported that agroforestry has the potential to offset immediate greenhouse gas emissions associated with

deforestation and subsequent shifting cultivation. In Nigeria, the change from subsistence agriculture and monoculture farming to agroforestry has great potentials for improving agricultural production and productivity.

4.6 Solar Energy Tapping and Utilization

Industrial and domestic utilization has been touted as one of the major options for mitigating deforestation globally. In Nigeria, Bala et al (2000) reported that average daily sunshine is 6.25 hours. This ranges between 3.5 hours in the coastal areas to 9.0 hours at the far northern boundary. The average daily solar radiation has also been reported to be about 5.25 kw/m^2/day by Bala et al. (2000). The daily solar radiation varies between 3.5kw/m^2/ day at the coastal area and 7.0 kw/m^2/ day at the northern boundary. According to Adegoke et al. (2011), Nigeria receives $4.851x10^{12}$ of energy per day from the sun. This is equivalent to about 1.082 million tones of oil equivalent (mtoe). This is about 4000 times than current daily crude oil production and about 13,000 times that of natural gas production based on energy unit. The annual solar energy insolation value is about 27 times the total conventional energy resources and over 117,000 times amount of electric power generated in the country in 1998 (Chendo, 2002). Based on the average land area of the 924 x 10 km^3 , for the country, only about 3.7% of the total land area is needed to be utilized in order to collect from the sun and amount of energy equal to the nation's energy conventional reserve. Production of electric power from solar energy is not a new technology. It has been domesticated in some tertiary institutions in Nigeria and inadequacy can be perfected and upgraded. Thus, this can be a virile investment for private sector operatives locally with adequate policy initiative and guidelines locally.

4.7 Maintenance of Bamboo Grooves and Establishment of New Bamboo Forests

The roles of bamboo in climate change amelioration and in industrial development have been extensively discussed (Ogunwusi, 2011a; 2011b, 2012a, 2012b). Bamboo provides food and raw materials for consumers in both developed and developing countries. It regulates water flow, reduces water erosion on slopes and along riverbanks, can be used to treat waste water, and can act as windbreaks in shelterbelts, offering protection against rainstorms.

Bamboo, a non wood forest product, is available in 23 states of the federation. Until recently, bamboo forests have remained largely untapped in the country despite its numerous and well known industrial potentials. In Nigeria, bamboo is an important part of many natural and agricultural ecosystems, providing a number of crucial ecosystem services. As poor people will be more adversely affected by climate change, the UNFCCC (2007) advocated the need for action plans for adaptation need to be tailored to their situation. Consequently, using bamboo forests as part of a comprehensive approach to rehabilitating degraded hillsides, catchment areas and riverbanks has shown promising and quick results (Fu and Banik, 1995; Fashina et al, 2011). Thus, the potential of bamboo to be used in adaptation measures to alleviate threats imposed by local changes in climate on vulnerable populations is very high. Another major advantage of bamboo that will endear it to small scale investors in the Nigeria is its ability to grow organically. Bamboo does not require pesticide to aid its growth. It also has a growth rate potential that is higher that most plants on global basis (Alfonzo, 1987), thereby guarantying faster and higher return on investment. As bamboo can be grown on degraded lands that cannot accommodate agricultural production, the problem of land ownership with respect to bamboo plantation establishment will not be as acute as for similar investments in crop production (Ogunwusi, 2011b).

5.0 Conclusion

Climate change is fast becoming a phenomenon that is dictating patterns of investment, industrial development, production processes and lifestyle globally. In Nigeria, the influence of climate change is already being felt in nearly all the states of the federation. In 2012, unprecedented flood occur in nearly all the states of the federation, displacing hundreds of people and destroying properties that worth millions of dollars. This occurrence has necessitated that Nigeria should put in place plans and strategies that will reduce her contribution to climate change and at the same promote the growth of its wood industry. The challenges to small scale forestry in Nigeria include low profitability and low technological development. This has resulted in relatively low levels of investments and too few innovations in the production. The resultant effect is high level of waste and high rate of deforestation. The SME's in Nigeria suffer from weak networking between enterprises and research institutes as well as between enterprises. A number of innovations have been carried out on green investments in the forest industry in Nigeria by the tertiary institutions and the research institutes. The private sector in Nigeria should be motivated through appropriate policies and guidelines to change their current lifestyles that are aiding deforestation and tap into available, expanding and developing technologies in the institutes and universities. This is important as the southward movement of the Sahara desert has continued unabated and most of the places

formerly regarded as being in the forest zone are experiencing acute savanna indices. The projects highlighted in this study will substantially reduce the current rate of deforestation by librating the forests to serve its traditional role of environment amelioration, erosion control, top soil protection and other important functions. This, however can only be achieved if the political will can be marshaled by relevant authorities.

References

Abubakar. H.T. (2010). Many species, one planet, one future. A keynote address. In Ofoezie,I. E. , .A.Awotoye , OO and Adewole, M. B. (eds). Proceedings of the third annual conference of thje Institute of Ecology and Environmental Studies. OAU, Ile Ife Nigeria. June 15th -17th , 2010.

Adegoke, A.I and Ogunsanwo, A.Y. (2011)Impact of charcoal production on environmental sustainability in the derived savanna belt of South Western Nigeria In L. Popoola, K Ogunsanwo and F. Idumah (eds) Foresrty in the next millennium and development goals. Proceedings of the 34th Forestry Association of Nigeria, Osogbo, Osun State Nigeria, pp 453-460.

Adegoke, I.A., Adejoba, O.R., Ogunsanwo, O.I. and Ayodele, O.O. (2011). Contribution of renewable energy in ensuring environmental sustainability in Nigeria. . In L. Popoola, K Ogunsanwo and F. Idumah (eds) Foresrty in the next millennium and development goals. Proceedings of the 34th Forestry Association of Nigeria, Osogbo, Osun State Nigeria. Pp 315-321.

Adekunle, V.A.J. (2006). Conservation of tree species diversity in tropical ecosystem of south west Nigeria. Journal of Tropical Forest Science. 18(2): 91-101

Adeniran, O.A., Famuyide, O.O., Adebayo., and Olugbire, O.O. (2011). Contribution of non timber forest products to poverty and hunger reduction in Nigeria. In L. Popoola, K Ogunsanwo and F. Idumah (eds) Foresrty in the next millennium and development goals. Proceedings of the 34th Forestry Association of Nigeria, Osogbo, Osun State Nigeria. Pp 161-167

Adeyoju, S. K (2001) Forestry and Natural development. A critique of Nigeria Situation. In Popoola, L; J.E. Abu, and P.I. Oni (ed). Proceedings of the 27th Annual Conference of the Forestry Association of Nigeria, held in Abuja, FCT, 17 – 21st Sept, 2001.pp 55-68

Adeyoju, S. K. (1975). Forestry and the Nigerian Economy. Ibadan University Press, Nigeria, 308pp.
Afuwape, A, M.; A, O. Amosun,; J. A. Fagbenro; L. O.Ojo and C.O. Adeofun (2002). Towards Eradicating Deforestation; What Option for Nigeria. Nig. Jour For. 32 (1&2)).pp 95- 103.

Ajayi S.T and A.C . Omoluabi (1993). An approval of the Nigerian Forest Revenue System and Proposals for Restructuring In: Forest Revenue System Development in Nigeria. Okojie, J.A. ed Benin City, Nigeria, 10-11th Nov. 1993 pp 29-38.

Akindele, S.O, Dyck.J.,Akindunmi, F.F,Papka, P.M, and Olaleye, O.A. (2001) Estimate of Nigeria`s Timber Resources. In L Popoola, J.E. Abu and P.I Oni (ed.) Proceedings of the 27th Annual Conference of the Forestry Association of Nigeria, Abuja FCT. Pp1-11

Alfonzo, D.J., (1987). Let's plant bamboo. Agribusiness Weekly, 1 (19):25
Aniah, E.J., and Okpiliya, F.I. (2002). Paradigms in population, resources and environmental management. Adevelopmetal perspective. 71-84

Anukwa, F.A. (2003). Community forestry for improved rural livelihoods: Experience from Cross River State Nigeria. In Akindele, S.O. and Popoola, L. (eds). Community forestry and Stakeholders participation in sustainable development. Proceedings of the 29th Annual Conference of the Forestry Association of Nigeria, Calabar, 6th -11th, October, 2003. Pp 22-29.

Aribisala, A. O. (1993): Raw Materials Revolution and Impact on Industrialisation in Nigeria. Mednet Publications Ltd. (1993). ISBN 978 – 024 – 000 – 4

Asadu, C.L.A, P.I Ezeaku and G.U Nnaji (2004). Land use and soil management situations in Nigeria: An analytical review of changes. J. Outlook Agric USA., 33:27-37

Brown, N., Jennings , S and Clements, T., (2003). The ecology,silviculture and biogeography of Mahogany (Swietenia macrophyla: a critical rewiev of the evidence. Perspectives in plant ecology, Evolution and Systematics6: 39-49.

Chendo, M.A.C. (2002). Factors militating against the growth of the Solars-PV industry in Nigeria and their removal. Nigerian Journal of Renewable Energy 8(1&2): 151-158.

Dawkins, H.C and Phillips, M.S. (1998). Tropical moist silviculture and management. History of success and failure. CAB International, New York.

Deutsch, J. (2007). Regional action plan for conservation of the Cross River Gorilla. Environment News Service, New York, June 21.

Dixon, R.K. (1995)Agroforestry systems:Sources or sinks of green house gases?. Agroforestry Systems31: 99-116

Environmental Resources Management (ERM) (2012). Wood Waste Facts. http://www.woodrecycling.org.uk/info_woodfacts.html. Assessed November 7, 2012.

Etigale, E.B., Uduofia, S.I and Olajide, O. (2011). Economic consequences of deforestation on forest dwellers in Nigeria. In L. Popoola, K Ogunsanwo and F. Idumah (eds) Foresrty in the next millennium and development goals. Proceedings of the 34th Forestry Association of Nigeria, Osogbo, Osun State Nigeria. Pp 434-444

Evans, K. (1992). Towards sustainable charcoal production and use: A Systems Approach. African Centre for Tecnology Studies, Nairobi.

FAO (1989). Forestry and Food security. FAO Forestry Paper No. 90 Rome. Pp 1-74 Houghton, R.A. (1990). The global effects of tropical deforestation . Environment, Science and Technology. 24(4)414-421
FAO (1992). Country Notes on Forest Plantation Areas. Forest Resources Assessment 1990-1992. Tropical Forest plantation Resources. FAO Document Repository.

FAO (2000). The Global Forest Assessment. 2000. Summary Report. Report No. 2001/INF.5., Committee on Forestry, FAO, Rome, Italy

FAO (2004). Proceedings: FAO Advisory Committee on Paper and Wood Products. FAO Rome, Italy. 166pp.

FAO (2005). www.mongabay.com visited on 1oth February, 2011

FAO (2010) Global Forest Assesmant Report 2010. Main Report, FAO Forestry Paper. 163. Pp 378
Fapetu, O.P. (2000b). Production of charcoal from tropical biomass for industrial and metallurgical process. Nigerian Journal of Engineering Management. 1(2): 34-37

Fapetu, O.P. (2000a). Management of energy and tropical biomass. Nigerian Journal of Engineering Management. (1): 14-19.

Fashina, A.Y., Oyetunji, D.O., Banjo, A.A. and Odefadehan, O.O (2011). Contributions and potentials of bamboo forests in environmental sustainability. In L. Popoola, K Ogunsanwo and F. Idumah (eds) Foresrty in the next millennium and development goals. Proceedings of the 34th Forestry Association of Nigeria, Osogbo, Osun State Nigeria. pp 354-359.

Fay, C., H. Deforeya., M. Sarait and T.P. Tomich (1998). A policy breakthrough for Indonesian farmers in the Krui Dammer . Agroferesters Today. 10(2):25-26.
Federal Department of Forestry (FDF) And Federal Ministry of Environment (FME) (1999). Approved Forestry Development Plan. FDF&FME: 27-53.

Federal Environmental Protection Agency (FEPA). (1992). Transition to susutainable development in Nigeria. In our hands. Reports for the United Nations Conference on Environment and Development. Rio de Janairo, Brazil:3-14 June, 1992: 1-7

FEPA (1992). Country study report for Nigeria on costs benefits and unmet needs of biodiversity conservation sponsored by United Nations Environmenta Programme. National Biodiversity Unit, Abuja, Nigeria. 53p

FORMECU (1996). Nigerian Forest Action Programme. Volume II, Main Report. February,1996.
GFF (1998). Deforestation, Cuses, Implications and Solutions http//www/global.ff.org/Feature_articles/Prevoius_Articles/pre-defo.htm

Hadfield (2010). Recycling services. http://www.hadfield.co.uk/services Accessed November 15, 2010.
Hakkila, P. and Parikka, M. (2002). Fuel resources from forest . In: Bioenergy from Sustainable Forestry: Guiding Principles and Practice (eds) J. Richadson, R. Bjorheden, P Hakkila, A.T. Lowe and C.T Smith. Kluwer Press, The Netherlands

IPCC (2000). Land use, land use change and forestry. Special Report. Cambridge University Press, Cambridge.

ITTO (2005). Status of Tropical Forest Management 2005. ITTO Technical Series No.2 4.

Jimoh, H.I., O.D. Ajewole, S.I. Onotu and R.O. Ibrahim (2012). Implications of land degradation, reclamation and utilizations in the oil producing areas of Nigeria; perspectives on environmental sustainability and development. Environmental Research Journal 6(2): 100-105.

Kort., J. and Turlock R. (1999). Carbon reservoir and biomass in Canadian Priere shelterbelts. Agroforestry syatems. 44:175-189
Larinde S.L (2010) Secondary processing and the Nigerian saw mill industry: Issues, challenges and opportunities. In S.Kolade Adeyoju and S.O Bada (eds) Readings in sustainanble tropical forest Management. Pp 277-291

Lawal, A. and V.A. J. Adekunle (2011). Impact of enrichment planting on biodiversity restoration in degraded forest. In L. Popoola, K Ogunsanwo and F. Idumah (eds) Forestry in the next millennium and development goals. Proceedings of the 34th Forestry Association of Nigeria, Osogbo, Osun State Nigeria. Pp 558-571.

Meyers, N. (1991). Tropical forests: present status and future outlook. Climate Change. Vol. 19 pp 3-32.
Montagini, F. and Jordan, C.F. (2005). Tropical forest ecology: the basis for conservation and management. Springer, New York. 295 pp

Muhammed, H. (2009). NARSDA hints of possible earthquake in Nigeria. Daily Trust October 2, 2009.
Niskanen, A. (2005). Forest sector entrepreneurship in Europe- summary of country studies of COST Action E3O. Acta Silv. Lign. Special Edition (2005) 7-15.

Nwafor, J. C. (2006). Tropical Silviculture: Principles and Techniques. Ibadan University Press, Ibadan. Pp 1-20.

Odjugo, P.A (2010). General overview of climate changeimpacts in Nigeria. Journal of Human Ecology.29(1):45-55. EBSCO.

Ogazi, P.O., U.A. Hassan and A.A. Ogunwusi (1997). Boosting the supply of agricultural raw materials for industrial use. Raw Materials Research and Development Council Publication. Pp 233

Ogunwusi A.A. and M.A Jolaoso. (2012). Bamboo, Conservation of environment and sustainable development in Nigeria. Advances in Arts, Social Sciences and Education 2(9):346-358.

Ogunwusi, A.A. (2010). Strategies for Promoting Private Sector Investment in Plantation Establishment in Nigeria. *Nig. Jour. For*. 40 (1 & 2): 8-16. (Nigeria)

Ogunwusi, A.A. (2011a). Potentials of bamboo in Nigeria's Industrial Sector. *Journal of Research in Industrial Development* 9(2): 136-146.

Ogunwusi, A.A. (2011b). Indicative inventory of Bamboo availability and Utilization in Nigeria *Jornal of Research in Industrial Development* 9(2): 1-9.

Ogunwusi, A.A. (2012). Forest Products Industry in Nigeria. A*frican Research Review.* 6(4): 191-205.

Ogunwusi, A.A. (2012). Imperatives and Guidelines for Bamboo Development Policy in Nigeria. *Journal of Research in Industrial Development* 10(2b): 348-357

Ogunwusi, A.A. (2012). Imperatives and Guidelines for Bamboo Development Policy in Nigeria. *Journal of Research in Industrial Development* 10(2b): 348-357.

Okafor, J.C. (1993). Strategies for development of forest trees and non timber forest products in Nigeria In E.A. Oduwaye (ed) Forestry for Urban and Rural Development in Nigeria Proceedings of the Conference of the Forestry Association of Nigeria, 1993.

Ola-Adams, B.A. and Iyamabo D.E. (1977) Conservation of Natural Vegetation of Nigeria: Environment Conservation 4(3): 217-226.

Oladeji, J.T,. Enweremadu, C.C and Olafimihan, E.O. (2009). Conversion of Agricultural residues into biomass briquettes. JAAAR 5(2):116-123.

Oladeji, J.T. (2010). Fuel characterization of briquettes produced from corncob and rice husk residues. Pacific Journal of Science and Technoligy.11 (1)101-106.

Olajide, O and Eniang, E.A. (2000). Unguided forest resources exploitation and destruction in Nigeria: Socio-Ecological Impacts. International Journal of Environment and Development 4(1): 39-43.

Olorunisola. A. O., (2007). Production of fuel briquettes from waste paper and coconut husk admixtures. Agicultural Engineering International. The CIGR E Journal, Manuscript EE 06 006 Vol IX.

Olorunnisola, A.O (2000): Workshop Structure in the small Scale Furniture Industry in Ibadan metropolis. Journal of Tropical Forest Resources 16(1):46-57.

Omofonmwan, S.I. and Osa-Edoh, G.I. (2008). The challenges of environmental problems in Nigeria. Journal of Human Ecology 23(1):53-67

Omoluabi, A.C (1985). Development of the Nigerian Particle Board Industry. Ph.D Thesis Department of Forest Resources Management, University of Ibadan. 317 pp.

Onafeli O.A. (2011). Forest contributions to rural livelihood and threats to their sustainability in Nigeria. In L. Popoola, K Ogunsanwo and F. Idumah (eds) Foresrty in the next millennium and development goals. Proceedings of the 34th Forestry Association of Nigeria, Osogbo, Osun State Nigeria, pp 271-276

Onyekwelu, J.C and Fuwape, J.A. (2008). Conservation and restoration of degraded forest landscapes in rainforest zone of Nigeria through reforestation projects. Forests and Forest Products Journal. 20(3):193-204

Oriola E.O (2009). Forestry for Sustainable Development In Nigeria. International Journal of African Studies. ISSN 1451-213X Issue 1 pp 11-16.

Osemeobor J.G.J. (1993) An Input Assessment of Agricultural Land Use Practices on the Nigerian Environment In. Proceedings of 23rd Annual Conference of Forestry Association of Nigeria, Ikeja, Lagos State. 29th Nov. -3rd December, 1993.

Oyagade, A. (1997). Nigeria Rainforest Conservation: The Challenge to the wood-base Sector. Proceedings of 25th Annual Conference of Forestry Association of Nigeria. pp 299-304.

Palm, C.A, Vosti, S.A, Sanchez, P.a. and Ericksen, P.J. (eds.) (2005). Slash and Burn: The serach for alternatives. A collaborative publication by the alternatives to slash and burn consortium, the World Agroforestry Centre. The Earth Institute of Columbia University and Centre for Natural Resources Policy Analysis at the University of California, Davis, Columbia Univesity Press. New York.

Palm, E.S. (1999). Roles of agriculture in helping to achieve sustainable forest management. In Ruark, G.A, M.M. Schoeneberger and Nair, P.K.R (eds). Roles of Agriculture in helping to achieve sustainable forest management UNFF International Experts Meeting, 24-30th March, 2003, New Zealand.

RMRDC (2003). Multi-Disciplinary Task Force Report of the Techno Economic Survey on Wood and Wood Products. Raw Materials Research and Development Council Publications, 2003.

RMRDC (2009) Multi-Disciplinary Task Force Report of the Techno-Economic Survey on Wood and Wood Products. Raw Materials Research and Development Council Publications, 2009.

Roby A.J. (1991). The Supply of Forest Products in Nigeria (TFAP Nigeria: First Step Sector Analysis, Annex 5). Natural Resources Institue, Chatam, Kent, United Kingdom.

Schelhas J. and R. Greenberg (1996). Forest Patches in Tropical Landscape. In Compass Newsletter No. 2 October, 1999 p43. Island Press, U.S.A.

Sotannde, O.A,. A.O. Oluyege and G. B Abah (2010). Physical and combustion properties of briquettes from sawdusts Azidiracta indica. Journal of Forestry Research.21(1);63-67.
TFAP (1990). The Tropical Forestry Action Plan (TFAP) handbook,pp13.
the development of solar-PV Sub Sector in Nigeria. Nigerian Journal of Renewable

USDA(2002). Successful Approached to Recycling Urban Wood Waste. Report FPL-GTR-133. Madison,WI,USA.

Vyas, G.D.P. (2006). Community Forestry. Agrobios (India), Jodhpur. Pp 1-111

Wamukanja, I. and Jenkins, B. (1995). Durability and relaxation of sawdust and wheat straw briquettes as possible fuels in Kenya. Biomass and Bio-energy.8(3):175-179.

Waste Online (2012). Wood recycling information sheet. http://dl.dropbox.com/u/21130258/resources/information/Sheets/Wood.htm. Accessed February 2, 2013.

Watson, T.R, I.R Noble, B.bolin, H.H Rauindranath, J.D. Verarda and D.J. Dokken (2000). Land use, land use change and forestry. IPCCSpecial Report. Cambridge University Press, Cambridge. 388 pp.

Wilaipon, P. (2007). The effect of moderate die pressure on cob briquettes: A case study in Phitsanulok, Thailand.

Wombo, T. A., Dagba, B.I. and Dera, B.A. (2008). Green house gas emission and agroforestry. In L. Popoola (eds.) Climate change and sustainable natural resources management. Proceedings of the 32nd Annual Conference of the Forestry Association of Nigeria, Umuahia, Abia State, 20-24th October, 2008. Pp 306-313.

Woodwell G.M., Hobbie, J.E, R.A. Melill, J.M. Moore, B. Peterson and Slaver, G. R. (1983). Global deforestation: Contributions to atmospheric carbon Dioxide. Science .222: 1081-1086

WWF (1989). Cross River National Park. Oban Division. Plan for Developing the Park and its support zone. World Wildlife Fund (WWF Goldaming)

Zimms, M., and Barret, S. (1996). Managing industrial wastes: sumter county wood reuse and exchange centre. Managing Industrial Wastes, building blocks to proper disposal. Kessler Consulting Inc. Tampa, Florida, USA. 5pp

This academic article was published by The International Institute for Science, Technology and Education (IISTE). The IISTE is a pioneer in the Open Access Publishing service based in the U.S. and Europe. The aim of the institute is Accelerating Global Knowledge Sharing.

More information about the publisher can be found in the IISTE's homepage: http://www.iiste.org

CALL FOR PAPERS

The IISTE is currently hosting more than 30 peer-reviewed academic journals and collaborating with academic institutions around the world. There's no deadline for submission. **Prospective authors of IISTE journals can find the submission instruction on the following page:** http://www.iiste.org/Journals/

The IISTE editorial team promises to the review and publish all the qualified submissions in a **fast** manner. All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Printed version of the journals is also available upon request of readers and authors.

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar