

## **BAMBOO: VEHICLE FOR POVERTY ALLEVIATION IN WEST AFRICA.**

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### **ABSTRACT**

The Economic Community of West African States (ECOWAS) is a regional group that was originally made up of fifteen West African countries. As of today, the group is now made up of only thirteen countries. The original fifteen countries are: Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. About twenty percent of the 13 ECOWAS

countries forests fall into the tropical rainforest area. These forests consist of various flora and fauna on which over eighty percent of our rural population depend for their livelihoods. Bamboo and rattan are non-wood forest products available in these Nigerian rain forests and remained for a longtime as untapped natural resources.

The economic changes taking place in the 13 ECOWAS countries in transition towards market economies are among the most important development at present. This has brought about awareness of the resources on their socio economic impacts to the countries as they are now catalyst between communities, government services, academia, policy makers and inter-governmental organizations.

This paper examines the situation of the resource base production and cultivation, processing and utilization of bamboo and rattan, marketing as well as the socio-economic characteristics of the species to date. The paper also observes two countries as case studies, these are Nigeria, and Ghana. Policy and legislation to back the full development of the species for sustainable management were also proposed while the constraints in the sub- sector were outlined. The needs for strategic research in the country on the two species were highlighted. The paper concluded and recommended among other things international financial assistance, research and development in the management of the species in the natural forests and plantations. Research is also advocated into the Biology, phenology and medicinal values of Bamboo and rattan in the country.

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## **1.0 INTRODUCTION**

Forest resources are experiencing increasing pressures due to the growing world population and improving living standards. Bamboo is the most important non-wood forest product and in India is known as the 'poor man's timber'. In China, it is the valuable raw material for the booming bamboo industry. During the last 15–20 years, bamboo has developed as an exceptionally valuable and often superior substitute for wood. Bamboo-based tiles, panels and boards are hard and durable and may successfully substitute for hardwood products. Bamboo may replace wood in many industrial applications and thereby contribute to the saving and restoration of the world's forests. Bamboo is a major construction material in many countries, particularly in rural areas. It can be used for almost all parts of houses, including posts, roofs, walls, floors, beams,

trusses and fences. People also use bamboo to produce mats, baskets, tools, handles, hats, traditional toys, musical instruments and furniture. In the food sector, bamboo shoots are becoming more popular. Bamboo has a tremendous potential for economic and environmental development and international trade. Bamboo raw materials Bamboo is a non-durable resource. Its use in exposed conditions requires prior treatment (Liese and Kumar, 2003), while its use can be further enhanced through the application of modern engineering techniques. Bamboo can be processed into modern products (engineered bamboo) that may successfully compete with wood products in prices and performances. Use of bamboo in composite panels and boards overcomes differences in quality related to the culms and allows the production of homogeneous products. Engineered bamboo may well replace wood, steel and concrete in many uses.

2.0 The ECOWAS West African forests consist of various flora and fauna typical of most tropical countries of the world. These forest resources of the country are major sources of subsistence especially to the local populace. They are seen as free gift of nature which could be exploited freely at will. Bamboo and Rattan are regarded as non wood forest products. The growing awareness of these two resources in recent times and the socio-economics associated with them have contributed to the increasing recognition. There is now a growing awareness of the benefits of non wood resources to the rural communities especially within the developing countries. Over the years, the level of the importance these non wood resources to the rural communities are not fully appreciated. Some of the reasons for this include: lack of acknowledgement in the protective and productive aspects of traditional forest practices, lack of information regarding the available yield, qualities, preparations and utilization as well as lack of consideration of their potential value to the national economy. Attention is now being given to these resources because of population increases, severe natural resource depletion, worsening economic climate and the inability of developing countries to afford imports.

Bamboo and Rattan exploitation and utilization have yielded direct and immediate micro level benefits to economically disadvantages of rural communities in many Asian, South and East African countries. In Kenya, Tanzania, Ethiopia, Bamboo has been employed as a veritable poverty fighter , replacing timber wood, iron, plastics, increasing wealth in rural livelihoods and even for exports, and most particularly contributing to decrease environmental footprints in carbon sequestration.

In West African forests there are two varieties of Sympodial bamboos that predominates, viz: *Bambusa Vulgaris* and ***Oxytenanthera abyssinica***. The former attains a height of

between 14 - 20 meter at maturity with a girth of about 20cm. The later reaches between 8 - 12 meter at maturity. The two varieties grow naturally in the forests especially along the flood plains of Rivers Niger and Benue and their numerous tributaries, in all the 13 countries, a substantial part of the bamboo area is found as narrow belts along rivers and in small stands not classified as forest. with Nigeria having about 1.7million hectares of native bamboo as compared to Ghana 0.6million hectares. Rattan commonly called cane in the country was identified in 1968 by Hutchinson as Calamus deerratus. This species has two varieties one with large diameter which is referred to as 'big cane' by cane product makers while the other is known as small cane. The former ranges from 2-3cm in diameter, while the later ranges from 0.2 - 1.5cm in diameter, researchers identified two other cane species as Eremospatha and Lacosperma Secondiflora.

### 3.0 NIGERIA

Adoption of the 1997 Kyoto protocol under the United Nations Framework Convention on Climate Change (UNFCCC) indicated increased recognition of forests as a carbon sink. Vigorous growth makes bamboo a particularly attractive plant for carbon sequestration. An INBAR study summarized the information available on bamboo biomass, including available methodologies and experiments (Hunter and Wu Junqi, 2002). Scarce information makes it difficult to draw any general conclusions on the comparative advantages of bamboo regarding the biomass and carbon issues. In 2001, Jebba paper Mill (Nigeria) Ltd tried to raise bamboo trees in plantation for fibre production. The effort was aborted due to financial difficulty of the company. In Obowo LGA of Imo State, Nigeria, there exist a local Community Based Organisation (CBO) that specialized in using Bamboo and other local resources to check soil erosion in their locality. The vulnerability of their agricultural lands to soil erosion has propelled them to develop initiatives towards addressing the problem. Today, their efforts are being emulated by other communities around the Eastern parts of Nigeria. Bamboo still grows in the wild mostly around river courses. In Nigeria, there is no plantation of bamboo yet established in the country. The Nigeria paper Mill in Jebba tried to establish the species for fiber production, but due to financial situation of the company then, the idea was abandoned. There are two bamboo processing factories established by indigenous investors utilizing native bamboos as raw materials one in Edo State, Auchi with machinery supplied by Chin Fu of Taiwan and a local bamboo charcoal factory in Minna, Niger State run Federal Ministry of Environment. There are small pockets of bamboo plantations in the South South but of no commercial

value to any significant extent Rattan grows in the virgin and secondary forests. The climber exists in about twenty states of the Federal Republic of Nigeria. No plantation of rattan presently exists in the country.

Bamboo mostly grow in clumps. Matured ones are cut down at the base and branches removed to the required utilizable length. The species is used for scaffolding in the building industry which has greatly reduced pressure on wood from natural forests and plantations. Nigerian farmers used it for yam staking. In the urban areas, few restaurant are usually constructed with bamboo to enhance its aesthetic beauty. Bamboo is also used as ornaments in big hotels like, Sheraton, TRANSCORP HILTON in Abuja, Nigeria. In the south-eastern part of Nigeria where soil erosion has become a menace, bamboos are usually planted or used as fences to check or reduce the rate of water flow on the vulnerable landscape. Thus, they are commonly used for environmental improvement. A bamboo Steering Committee called NBARDEP ( Nigerian Bamboo and Rattan Development Programme) was formed to coordinate Bamboo development in Nigeria and just recently the World Bamboo Day was celebrated by Bamboo Development Network, BDN, in Abuja, Nigeria for the first time in Africa bringing officials of the Government and private sectors of the economy. Prior to this , a Bamboo for Bio Electricity Seminar Workshop was held in Dubai, UAE, in 7-9 AUG, 2009, by Cloud7 Strategies Company of Nigeria. This event was attended by global dignitaries including ministers, governors and UAE officials

#### 4.0 GHANA

Locally, seven (7) species of bamboo have been identified in Ghana. They include:

- *Bambusa multiplex*
- *Bambusa vulgaris* (the green type)
- *Bambusa arundinacea* or *Bambusa bambos*
- *Bambusa pervariabilis*
- *Bambusa vulgaris* var *vitata* (the yellow type)
- *Oxythenanthera abyssinica*
- *Dendrocalamus strictus*

Bambusa multiplex is the only bamboo species that is identified as indigenous though and Bambusa vulgaris that was introduced several decades in the country is now considered an indigenous species. The remaining five (5) species were all introduced species.

Other introduced species;

In 2003, the BARADEP Secretariat facilitated the distribution of eighteen (18) exotic bamboo species imported from Hawaii into the country by the Opportunity Industrialisation Centre (OIC). The species were distributed to some selected institutions and non-governmental organizations to multiply and monitor their growth conditions and adaptability in Ghana. It was also aimed at providing adequate planting materials for private and commercial bamboo plantation developers in Ghana.

The exotic species currently found in selected sites in the country and their uses are:

<i>Gigantochloa albociliata</i>	<i>Shoot and Weaving (can be bent like rattan)</i>
<i>Bambusa edulis</i> <i>purling</i>	<i>Weaving, Boards, Furniture, Shoots, Roof</i>
<i>Dendrocalamus brandisii</i>	<i>Construction</i>
<i>Bambusa oldhamii</i>	<i>Furniture, Shoots, Construction, Windbreak</i>
<i>Dendrocalamus asper</i>	<i>Shoots, Furniture, Panel</i>
<i>Guadua angustifolia</i>	<i>Construction</i>
<i>Dendrocalamus strictus</i> <i>purling</i>	<i>Weaving, Boards, Furniture, Shoots, Roof</i>
<i>Guadua chacoensis</i>	<i>Construction</i>
<i>Dendrocalamus membrenaceous</i>	<i>Furniture, Paper pulp, Construction light</i>
<i>Thyrosostachis siamensis</i>	<i>Weaving, Handicraft, Shoots, Paper pulp</i>

*Dendrocalamus latiflorus*

*Weaving, Shoots, Furniture, Boards*

*Bambusa textilis*

*Weaving, Shoots*

*Bambusa ventricosa*

*Ornamental*

*Bambusa burmanica*

*Construction (light)*

### Potential Applications

<b>Broad Use</b>	<b>Applications</b>	<b>Specific Applications/Examples</b>
Environmental	Ecological restoration	Soil stabilization Rehabilitation of degraded lands Soil erosion control Soil temperature stabilization Protection of water bodies Improvement of micro climatic conditions
	Ecological landscaping Ornamental	Foliage plant Urban landscaping Ecological landscaping Hedges
	Reforestation	Regreening of marginal lands
Socio-economic	Employment Income generation Industry development Food Meeting household energy requirements Foreign exchange earner	

Medicinal	e.g. Charcoal for curing gastrointestinal problems, particularly that of liver and kidney	
Raw materials	Wood industries	<b>Small scale/Rural industries</b> E.g. weaving, carving, furniture household wares, scaffoldings road construction pillar guides
		<b>Industrial scale</b> laminated bamboo boards, panels for flooring, ply-bamboo
	Food industry	edible shoots, forage and fodder bamboo beer
	Paper industry	Pulp and paper, rayon
	Pharmaceutical Industry Biochemical industry Chemical industry Water treatment industry	Activated bamboo charcoal, Vinegar

Industrial manufacturing techniques can produce a wide range of long lasting, strong and inexpensive goods from bamboo. The many products of various bamboo species include:

- \* Durable materials for structural building, flooring, trim, and plybamboo (similar to plywood)
- \* Light and strong materials for crafts, handicrafts and furniture.
- \* Fiber for woven goods such as paneling and baskets
- \* Pulp for paper and other fiber products
- \* Raw materials for agricultural uses such as fencing, tools, rafts, trellises, water pipes, etc.
- \* Fodder for domestic animals such as cattle, sheep and goats
- \* Edible shoots for food
- \* Medicine
- \* Ornament in the landscape or as cut foliage



Examples of integrated agroforestry systems using bamboo:

- \* Erosion control
- \* Stream and pond bank stabilization
- \* Hedge, screen and windbreak
- \* Wastewater treatment
- \* Livestock fodder systems
- \* Wildlife habitat

### **Current Application of Bamboo in Ghana**

- \* Raw materials for agricultural uses such as fencing, tools, rafts, trellises, water pipes
- \* Wildlife habitat
- \* Stream and river bank stabilization
- \* Ornament in the landscape or as cut foliage
- \* Light and strong materials for crafts, handicrafts and furniture

Ghana has better Bamboo development resources than Nigeria either plantations and processing centers. These may explain why the INBAR- International Network for Bamboo and Rattan's regional office was established in Accra. Many foreign investors have taken advantage of this and we have a dozen large scale plantations and processing centers in Ghana. One the most successful initiatives is the ECOPLANET Bamboo ,With its vision as a bamboo plantation and processing company that focuses on the provision of a secure and certified source of fiber for timber manufacturing industries and markets globally. EcoPlanet strives to reduce further pressure on the planets forests following global commitment to restore 150 million hectares of degraded and deforested land by the UN in 2020. Grown on degraded land EcoPLANet s bamboo plantations provides secure and sustainable raw resource for raw materials for industries, companies and consumers alike. EcoPlanet has very large plantations and factories that are operational throughout the year with abundant raw materials. EcoPlanet Bamboo has global benchmarks for sustainability in regards to the commercial production of bamboo. EcoPlanet Bamboo's plantations have Forest Stewardship Council® (FSC®) Forest Management certification. Purchasing FSC certified bamboo allows certified clients to label their products accordingly, and ensure a responsible supply of timber from well managed sustainable bamboo plantations that provide environmental, social and economic benefits. These plantations are also verified under the Verified Carbon Standard (VCS) and have received

gold level Climate, Community, Biodiversity Alliance CCBA certification. Darlow Enterprises is another bamboo company of importance. With headquarters in Belize and Philippines, Darlow focuses on the bamboo charcoal energy processing. The species of bamboo selected for energy crop plantations is from the Bambusa Balcooa family of grasses. After 10 years of breeding and fertilization programs, this species bamboo is now cultivated from tissue culture and then micro propagated. By the end of year four, the bamboo is mechanically harvested and produce on average, up to 100 tonnes per hectare per annum, with a lifespan of up to 50 years. Bamboo wood chips have an estimated 4200 calorific value and low ash and sulphur content. The wood chips are a source of biomass for power generation as well as other forms of bioenergy such as pellets and biocrude. On the plantations, Darlow interplants with commercial intercrops. There are two main arguments for Inter-cropping: It can provide additional short term income and can help the bamboo plant to grow. It can also generate income in the first year whereas the bamboo is only harvested after year three. There are various crops suitable for inter-cropping are banana, beans, ginger, tapio and groment. Banana intercropped between the bamboo plants is quite common and has the effect of providing shadow to the plant and having a fast growing banana plant which provides the young bamboo plant nice shadow to grow better.

Intercropping with perennial grasses can improve the soil quality and increase its organic content. Perennial energy crops need considerably less fertilizer, pesticide, herbicide, and fungicide than annual row crops. Miscanthus is one of the most promising herbaceous perennial grasses. It produces high yields and can be harvested annually for several years before replanting. There are many other private bamboo initiatives ranging from small, cottage to large enterprises including Global bamboo products in Ayinam, Kumasi, Ghana, , KWAMOKWA Bamboo plantations, , **Greater Accra Bamboo and Rattan Handicrafts Association** , Brotherhood Cane/Rattan Weavers Association., Links Handicrafts Association., New Vision Handicrafts Association, Pioneer Bamboo Manufacturing Co. Ltd., Assin Foso, T-Tom Bamboo Toothpick Processing Company, Tandan, In 2006, Dr. David Ho and Dr. John Mutter at the Columbia University Earth Institute and Craig Calfee at Calfee Design collaborated on the original concept and design of the bamboo bicycle and traveled to Ghana with funding provided from the Earth Institute. The team received positive feedback on a prototype of a bamboo bicycle, which was made in the United States and left in Ghana with the Bamboo and Rattan

Development Programme (BARADEP) Secretariat for three months for rural inhabitants to try out. Based on this experience, the team hopes to stimulate the production of bamboo bicycles using the local work force and the bamboo that is currently grown in and around Kumasi. The Ghana Bamboo Bikes Initiative is a social enterprise that addresses climate change, poverty, rural-urban migration and youth unemployment by creating jobs for young people, especially women, through the building of high quality bamboo bicycles. It offers multipurpose second generation bamboo bikes that are suitable for the high terrain and rough roads for local and international needs using native bamboo. Business opportunities exist in all the areas of Ghana and are committed to improving the standard of living of young Ghanaians through the creation of sustainable social enterprises and hopes to export this model to all parts of Africa.

After many years of negotiations, the Chinese Government has agreed to fund a 5-year Bamboo and Rattan Development project. This is a US\$2 million project that seeks to support Ghana government's plan to develop bamboo/rattan resources and processing industries. Three training centres will be established in Kumasi, Accra and Takoradi to train the youth to venture into bamboo and rattan based small and medium scale businesses.

## **5.0 POLICY AND LEGISLATION RELEVANT TO BAMBOO**

In the Agricultural policy for Nigeria in which Forestry is a subsector, there are strategies for implementation. The relevant portion for Forestry States "The supply of such non wood products as gum arabic, tannin, medicinal plants and other important products which are derived directly and indirectly from Forests must be sustainably managed". The demand for bamboo and rattan which are non wood products is growing with the increasing population of the country. There is no doubt that policy and legislation that will promote the sustainable production of raw materials for the industries will be put in place in accordance with Antalya Declaration of 1997. The followings are regarded as some of the constraints in the bamboo and rattan sub-sector.

- (i) Lack of inventory data on the raw materials base
- (ii) Wastage in the processing of the materials
- (iii) Lack of up to date information on the contribution of the sector to employment.
- (iv) The technical know how of people in the sector has not been studied, therefore improvement could not be provided.

- (v) There is no proper government policy and legislation on the sector and therefore control of it's development is difficult.
- (vi) Contribution to National GDP is not known
- (vii) The importance of the sector in the socio economic development of the country is yet to be known and acknowledged.
- (viii) The yield, qualities and silvicultural requirements of the resources are not fully known.
- (ix)

## 6.0 NEEDS FOR STRATEGIC RESEARCH

There is urgent need for strategic research on bamboo and rattan in Nigeria along these lines.

- (i) Inventory of the species in the country.
- (ii) Silviculture of the species in the nursery and plantations
- (iii) Agroforestry option using bamboo or rattan or both
- (iv) Plantations of the species either as pure or mixed.
- (v) Identifications of rattan and bamboo species in the country and the introduction of exotic ones.
- (vi) Socio economic impacts of the species on the rural communities

In Nigeria, bamboo plant has long been recognized as an economically important used in the building industry for scaffolding and for yam staking by farmers. The species also assist to stabilize river bank and protect the shore especially in fresh water areas. Cane on the other hand is increasingly being used all over the country for furniture and other household materials. The development efforts on these species need a great boost by international organization to prevent further destruction of the remaining tropical forests in Nigeria.

7.0 Currently, there is an on-going Forest Resources Study in Nigeria. The outcome of the study will enable us know the species richness of forests. However records exists that some Forests Reserves are no longer productive. In view of the ecosystem where these Forest Reserve exist, rattan plantation can be established in them as an enrichment planting programs to improve the quality of the reserves. However, international support will be needed in this area because of its novelty in Nigeria.

The Federal Government of Nigeria put in place agricultural policy in 1988. This is being reviewed. A new National law and policy in Forestry and Wildlife is being prepared. The new documents will adequately address the issues of non wood forest products where bamboo and rattan belong.

## **8.0 Conclusion and recommendations**

At present, bamboo production and utilization in Nigeria is largely uncoordinated with many untapped potentials. The production of value-added products from bamboo culms is almost negligible as the technology is either absent or at sub-optimal level. In an attempt to upgrade the bamboo economy and accord it a strategic role in the national industrialization strategy, rural development and poverty reduction, the following recommendations should be adhered to by mandated authorities.

**Taxonomic characterization of existing bamboo species**

The first step in the development of Nigeria's bamboo resources is to embark on a proper taxonomic characterization of the existing bamboo species in the country. Available literature indicated that only one species exist in Nigeria. This should be verified through an ecological survey of the bamboo habitat and identification of the bamboo species. Since different species have specific uses to which they are best suited, this step is fundamental to determining the appropriate use for the Nigerian-grown bamboo. Detailed inventory of the bamboo resources

There should be a detailed inventory and quantitative assessment of bamboo clumps in Nigeria. This could be combined with the taxonomic characterization. As elaborate fieldwork will be impracticable in some cases due to inaccessibility of some areas consequently, remote sensing and Geographic Information System (GIS) could be used. It is only when the available stock is assessed and quantified that planning can be meaningful. Adequate knowledge of the magnitude and distribution of these resources is a necessary precursor to planning and implementing their conservation and sustainable management.

**Testing of properties of existing bamboo species**

It is necessary to know the industrial potentials of existing bamboo species in Nigeria. This can be done through laboratory tests of samples of the species. The anatomical features, and the physical and chemical properties should be determined. This will assist in determining the suitability of the existing bamboo species for various uses. This step can be carried out immediately after the taxonomic characterization while the detailed inventory is still going on. Species trials of new bamboo species in plantations

From the results of the detailed inventory, desirable bamboo species, which are not currently available in Nigeria, will be known.

These could be introduced from Southeast Asian countries where they grow naturally. Since bamboos generally have short gestation period, it will not be difficult to determine the species that can thrive well under the climatic conditions prevailing in Nigeria. The importance of this step is that having new bamboo species can expand the range of bamboo utilization in Nigeria. Bamboo plantation establishment There should be an integrated programme of increased bamboo production through plantation establishment and introduction of new bamboo species. To this end, the Federal Department of Forestry and all States Departments of Forestry should be mandated to include bamboo as one of the species to be established in plantations. In addition to this, private sector investors should be encouraged to go into bamboo plantation establishment. A number of farmers indicated interest in this in Ondo state during the course of this study. Promotion of access to modern bamboo processing technology Government should assist entrepreneurs interested in bamboo processing through mandated organisations to access modern technology for producing globally competitive new generation bamboo products. Advantage could be taken of existing technologies in Southeast Asia where bamboo processing with improved technology had been on going for a long time. The country through organisations such as the NBARDEP ( Nigerian Bamboo and Rattan Development Programme) can access the facilities available at INBAR, International Network for Bamboo and Rattan, CFC, GTZ, USAID, OXFAM, ProFOUND, CRBC, etc, to promote bamboo utilization locally. There is also the need for provision of relevant information on technologies, machinery and equipment for setting up bamboo products manufacturing units on commercial scale to investors by pivotal institutions such as the BDN, Raw Materials Research and Development Council (RMRDC), Nigeria Investment Promotion Council (NIPC) and the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN). There is also the need for the development of appropriate institutions created purposely for bamboo development and utilization in Nigeria. The requisite institutional aspects should consist of two specific and interrelated elements as stressed by FAO (2004) as follows: 1. The development of human resources through education and training at the professional, technical and vocational levels in all aspects of bamboo development and utilization. 2. The development of appropriate institutional structures and tools such as policy and planning, legislation, manpower planning extension and research. These two elements are important as had been demonstrated by economies where bamboo has become a veritable raw material. Nigeria is a country with an economy in transition. Over

80 percent of our population live in rural environment where their subsistence depends on the forests. The development, management and utilization of bamboo and rattan in the country will turn around rural economies if properly pursued. In this way, it will help to alleviate rural poverty.

9.0 It is hereby recommended that the International Communities assist the country to carry out:

- (i) Inventory of bamboo and rattan in terms of location, quantity and quality.
- (ii) Research and development in the establishment and management of the species in the natural forests and in plantations.
- (iii) Setting up cottage industries that will use the raw materials sustainably.
- (iv) Identify viable projects based on bamboo and rattan plantations to be implemented in forest reserves that have been classified as un-productive (in terms of timber resources), but whose productivity can be enhanced through enrichment plantings in specific places.
- (v) Research needs to be conducted into the biology, phenology and medicinal values of bamboo and rattan in Nigeria.

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