

UTILIZATION OF VAST NIGERIA'S BAMBOO RESOURCES FOR ECONOMIC GROWTH: A REVIEW

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ABSTRACT

Bamboo is recognized as an industrial raw material globally and has tremendous potentials for the economic development of the nations. This paper reviewed the potentials of the abundant Nigeria's bamboo resources used for house construction, household items, biofuel, charcoal, pulp and paper, irrigation and drainage pipes, textiles materials, chemical and pharmaceutical products. It also reviewed the challenges facing the development of the bamboo industries. The policy makers lack the general understanding of the industrial potentials of bamboo. Despite the vast bamboo resources and species in the nation, the Nigerian government has not fully recognized the importance of bamboo and its role as a substitute to wood in major applications and how it can boost the economy. Recommendations highlighted for the harnessing of the resources included National Bamboo Policy and Nigerian Bamboo Producers development. A bamboo inventory of quantity, quality, species and distribution across the nation must be provided. Government should also promote of bamboo tenure system and incentives to encourage its cultivation among local farmers.

Keywords: Bamboo, resources, industries, economic development,

INTRODUCTION

Bamboo is a term for members of a particular taxonomic group of large woody grasses that have a lignifying, perennial and branched stem (subfamily *Bambusoideae*, family *Andropogoneae/Poaceae*). Bamboo encompasses 1250 species within 75 genera. It is hard, strong, flexible and more importantly renewable. It grows fast and matures quickly. It is regarded as the fastest growing woody plant in the world as some species are reported to have a growth rate of about 1m per day (Scurlock *et al.*, 2000; Igbokwe *et al.*, 2016).

Bamboo species are seen as a good alternative to wood owing to their good qualities in physical and mechanical attributes (Li, 2004). Some bamboos could be as little as 10 cm and others as tall as 15-20m while and the largest known (*Dendrocalamus giganteus*) grow up to 40 m in height and 30 cm in culm (stem) diameter. The harvestable time for

bamboo is about 3-5 years in comparison to 10-20 years for most softwood (Scurlock *et al.*, 2000; Van der Lugt, *et al.*, 2009). Each plant can remain green to 75 years and can be managed on land that is unsuitable for agricultural crops (Okwori and Chado 2013).

World Bamboo Resources and Trade

Forest resources are experiencing increasing pressure due to the growing world population and improved standard of living. Bamboo is the most important non-wood forest product and in India it is known as the 'poor man's timber' while in China, it is the valuable raw material for the booming bamboo industry (FAO 2005).

Bamboo forests cover an estimated area of 37 million hectares (ha) worldwide, equivalent to almost 4% of the world's total forest coverage (FAO 2014). China has the largest bamboo

resources in the world, about 500 species where bamboo culms and shoots are the two mostly used parts (INBAR, 2015). Bamboo has a tremendous potential for economic and environmental development and international trade. It offers significant advantages to low-income rural communities with little access to investment capital or technology and alleviates poverty (Phimmachanh *et al.*, 2015).

Africa has about 43 species of bamboo covering about 1.5 million hectares (Xiaoli 2006, MCI2013). Forty of these species are primarily distributed in Madagascar while the remaining three species are found in mainland Africa. Ethiopia has over one million hectares of highland and lowland bamboo

resources which is about 86% of the African bamboo resource which serves as a subsistence material for rural communities (Kelbessa *et al.*, 2000; Tinsley 2014).

INBAR (2004) using the available United Nations data, revealed that the global export value of bamboo commodities increased to US\$ 4.3 billion in 2005, from US\$2.8 billion in 1995, with furniture export growing steadily from US\$1.3 billion to US\$2.4 billion. According to INBAR (2011), bamboo is mostly produced by Asia countries and China is the largest bamboo producer. MCI (2013) reported China as the largest exporter of bamboo globally in 2009 with 57.3% as shown in the Table 1 below.

Table1: Top 10 Exporters of Bamboo Globally, 2009

Country	Volume of Global Exports (%)
China	57.3
Indonesia	14.8
Vietnam	4.6
EU-27	3.0
USA	1.7
Philippines	1.6
Thailand	1.0
Singapore	1.0
Myanmar	0.8
Malaysia	0.8

Source: Millennium Cities Initiative (MCI 2013)

Bamboo has diverse wide range of anatomical, structural and chemical properties. It can substitute technologically and commercially not only wood, but also plastics, steel and cement and composite materials in structural and product applications. The scientific and engineering skills have improved bamboo use in many ways. It is envisaged that bamboo would be a significant means for a sustainable and widespread development, augmenting economic opportunity, income and employment, especially in relatively underdeveloped areas of the globe. It is also an eco-friendly alternative material easily processed by simple technologies (Phimmavong and Chanthavong (2007); INBAR,2015).

It plays a major role in the development of many countries with over 2.5 billion people globally depending on it for survival and livelihood

(INBAR, 2014). For example in 2012, the domestic market for bamboo and rattan products in major producing countries was estimated at US\$ 34.2 billion, with an additional US\$ 2.5 billion of international trade in bamboo and rattan products (INBAR 2015). Global export of bamboo and rattan products reached its record high of US\$ 2,557 million in 2008 but slumped sharply by about 25% in 2009 due to the financial crisis. In 2012, the world export of bamboo and rattan commodities was about US\$ 1,881 million, of which 29% was industrialized bamboo products and 25% was bamboo woven products (INBAR 2014; 2015).

Nigeria's Bamboo Resources

Bamboo is renewable and grows abundantly in the tropics, subtropics and temperate regions within latitude of 40° S and 40° N and average annual temperature of 15-20°C and annual precipitation of

1000-1500mm (Scurlock et al., 2000; Ogedengbe 2010). Nigeria falls into the above-described location and thus, account for the wide variety of bamboo found in the country. Despite the different varieties, the utilization of bamboo in Nigeria is low as compared with some countries like China, India and other part of Asia (Onilude 2005). Nigeria is not among the countries exporting bamboo while the nation is among the International Network for Bamboo and Rattan countries (INBAR 2011).

In Nigeria, there are five indigenous species (Raw Materials Research and Development Council (RMRDC), 2006). *Bambusa vulgaris* is one of the most common species of the bamboos in Nigeria. It is self-propagating plant that takes 2-6 years to mature. It is vast in the southern part of Nigeria (Azezet et al., 2016). Other common species of the bamboos in Nigeria are: *Bambusa arundinacea*, *Bambusa tulda*, *Dendrocalamus giganteus*, and *Oxyanthera abyssinica* (RMRDC 1996; Ogunlure and Uwajeh 2009). It has rapid growth rates, high annual re-growth after harvesting, and high biomass production (Sadiku and Oyerinde 2015). The species across Nigeria have similar morphological characteristics though there is variation in size, suggesting influence of age and perhaps the soil condition. Bamboo is particularly adapted in the rain forest belt of Nigeria where it is found in abundance along river banks and other relatively marshy areas (RMRDC 1996).

RMRDC (2004) reported that bamboo is widely distributed in the south and middle belt regions of Nigeria. According to the report, distribution of bamboo is related to ecological conditions with the rainforest areas having the most abundant. Bamboo is found in abundance in all the States of Southern Nigeria except Lagos and Bayelsa where the distribution is considered relatively less. The most endowed states in terms of bamboo occurrence are observed to be Ogun, Oyo, Osun, Ondo, Edo, Delta, Rivers, Akwa Ibom, Cross River, Abia, Ebonyi, Enugu, Anambra and Imo States. The report indicated that at least 10% of the natural vegetation in these states is dominated by bamboo, with existing bamboo clumps showing appreciable gregarious growth that is contiguous over large areas. In Lagos, Ekiti, Bayelsa, Kogi, Kwara, Benue

and Nasarawa States bamboo distribution was observed to be frequent, indicating that between 6.0 to 9.0% of the natural vegetation is occupied by bamboo.

Pockets of bamboo clumps were also reported in Niger, Taraba and Plateau States as well as within the Federal Capital Territory. There are 12 states where bamboo occurrence is rare. These are Adamawa, Bauchi, Borno, Gombe, Kano, Kaduna, Katsina, Kebbi, Sokoto, Jigawa, Yobe and Zamfara (RMRDC 2004).

Bamboo Uses in Nigeria

The traditional use of bamboo in Nigeria for scaffolding, shade houses, fencing, ladder, yam and vegetable stakes, slat chair do generates revenue. The quantity of revenue generated is far less than 0.01% of what is achievable if it is sustainably developed and its industrial potentials harnessed. The use of bamboo culms in the production industry is under-developed in Nigeria (RMRDC 2004). Also there is limited capacity building for the crafts men whose skill is limited to a number of simple items that cannot compete in the global market (RMRDC 2004). Other uses of bamboo in Nigeria includes the following:

i. Building Materials

Bamboo is an indispensable material for construction besides its traditional applications. Bamboo is used for structural members such as trusses, kingpost and purlin in modern buildings etc. Bamboos don't break easily and its original shape is regained when the load subjected to it is removed. It is good for reinforcing concrete.

ii. Bamboo Based Panel

China started producing bamboo panels in the early 19th century. At present more than twenty different types of panel are produced in Asia. Bamboo fiber is longer than wood fiber which gives bamboo some technological advantage. It is used for flooring, veneer, strip boards, mat boards, fiber boards, particle boards, medium density boards and so on (Jamatia 2012). Some modern buildings are completely made of bamboo in Asia which cannot be differentiated from wood in terms strength and durability.

- iii. **Furniture**
Bamboo is used for different kinds of furniture in Asia especially China. It is used for producing beds, cupboard, table, upholstery chairs. Laminated bamboo furniture is growing rapidly in the world especially Asia. When bamboo is laminated and used to produce furniture, it is difficult to differentiate it from wood.
- iv. **Paper and Pulp**
Countries such as China and India use bamboo for producing pulp and paper. Paper made from bamboo has the same quality with paper made from wood. Its brightness and optical properties remain stable while those paper make from wood may deteriorate over time. The morphological characteristics of bamboo fibers give paper made from bamboo a high tear index (Zing and Cheng 2012).

- v. **Charcoal**
Bamboo is used for charcoal as a substitute for wood charcoal or mineral coal and activated bamboo charcoal can be used for cleaning the environment, absorbing excess moisture (Jamatia 2012).
- vi. **Utensils**
Bamboo is used for producing utensils such as spoons, plates, cup and serving tray. It is also used for producing tooth pick.. The fiber of bamboo can be used for producing yarn and fabric. The shoots of bamboo also serve as food for some people in Asia. Bamboo is extensively used in some parts of the world. Bamboo is used in many ways industrially in some countries; some of which are listed in the Table 2 below.

Table 2: Bamboo Industries and Corresponding Products

Industries	Products
Wood products	Ply bamboo, laminated bamboo board (planed), mat ply bamboo, curtains ply bamboo, laminated wood strips, mat curtains ply bamboo, bamboo chipboard, floor tiles and composites
Houses	Prefabricated houses made of engineered bamboo
Pulp and Paper production	Paper products
Bamboo chemicals and Pharmaceuticals	Vitamins, amino acids, flavine, phenolic acids, polysaccharide, trace elements and steroids, beverage and beer, bamboo ethanol, and butanol, activated carbon
Energy generation	Biofuels, charcoal, briquettes, biomass feedstock,
Textiles	Fabrics, Yarns, Clothes, Socks
Utensils	Spoons, plates, cup and serving tray, tooth pick
Miscellaneous uses in the Industrial sector	Used extensively in the electrical, electronics and communications, industries for production of wrist watches, chains, fan blades,
Farming	Irrigation and drainage pipes, bamboo leaves incorporated into livestock feeds,

Sources: Ogunwusi and Onwualu (2013); Okwori and Chado (2013)

Bamboo Industry Development Challenges in Nigeria

According to Ogunwusi and Onwualu(2013) a number of problems are constraining industrial development of bamboo thereby impeding potentials of bamboo to generate income and alleviate poverty in developing countries, including Nigeria. Leonardo (2000) reported that there was

general lack of understanding of the industrial potentials of bamboo among policy makers. The national forest policy under which bamboo is incorporated gave little or no attention to its development. Therefore the bamboo sector in Nigeria is still part of the informal and backward rural economy. No concerted effort has been made to grab the large potential which has been

successfully demonstrated by the Chinese bamboo industry. Presently bamboo is found in abundance in Nigeria and it's underutilized. Hence, it has been impossible to develop bamboo to the level where it can contribute in any reasonable measure to raw materials supply or as a foreign exchange earner through export of bamboo products (Ogunwusi and Onwualu 2013).

Many problems have been outlined as constraining bamboo development and impeding its potential to generate income and alleviate poverty in Nigeria. A study reported by RMRDC (2004) however indicated that a number of farmers are willing to cultivate bamboo on private lands if economic outlets can be found for the culms. These farmers have more confidence in managing bamboo forest than timber forest, as bamboo forest need less input and have shorter rotations (Ogunwusi 2012). The Nigerian government has not fully recognized the importance of bamboo and its role as a substitute to wood in major applications. Thus there is need for serious enlightenment programmes to promote government interest in bamboo development in Nigeria (Ogunwusi 2013).

Recommendations for Developing Bamboo Resources and Industry in Nigeria

According to Ogunwusi (2013) Nigeria's bamboo sector is wrought with problems among which are unplanned harvesting, lack of large organized bamboo industries, prevalence of low cost low added bamboo products, lack of research and lack of inventory data for bamboo lands. The impediments to Nigeria's bamboo development are largely rooted in the country's overall problems with lack of secure forest tenure rights, poor government regulatory controls and disorganization. As bamboo utilization has been tested over time, it will be appropriate for policy makers to promote industrial utilization of bamboo in the country. For this to be feasible, the following recommendations have to be attended to:

- i. There is need for a national bamboo policy. The policy should spell out the objectives of bamboo development and provide detailed guidelines for implementation.
- ii. Nigeria needs a bamboo inventory. It is necessary to determine the quantity and

quality of bamboo that currently exists in Nigeria, their distribution, types of species and quality of stocks available. Many studies show the lack of reliable data on Nigeria's bamboo. This information gap needs to be filled before the country can develop a plan for bamboo development. This study can be carried out by the National Space Research and Development Agency in collaboration with the Federal Ministry of Environment.

- iii. Establish an Association of Nigerian Bamboo Producers which would collaborate with government agencies to formulate favourable bamboo manufacturing policies with regards to export and import regulations.
- iv. Government must promote bamboo tenure reforms. This could be done by giving farmers or groups who are committed to manage bamboo resources proper incentives. A bamboo cluster can be established to form the fulcrum for bamboo processing locally. A number of farmers have also shown interest in bamboo cultivation. These set of farmers should also be encouraged with adequate incentives. There is need for relevant agencies such as the Forestry Research Institute of Nigeria to partner with NGO's and donor agencies to transfer technology to local farmers and producers.

Furthermore, to promote industrial utilization of bamboo in Nigeria, Ogunwusi (2012) advocated the need for a bamboo development policy to specifically promote the management of existing bamboo resources and the setting up of bamboo based industries. The policy is expected to promote establishment of appropriate institutions, scientific management, linkage between production and utilization, establishment of industries, preferential treatment of bamboo, formulation and implementation of growers friendly rules and regulations on growing, management, harvesting, transportation of bamboo and products, etc. This is necessary as the bamboo sector needs a

comprehensive and long term support that only a national policy could provide.

CONCLUSION

Globally bamboo is being accepted as an industrial raw material. Nigeria's bamboo resources should be harnessed and developed to promote both national economic development and promotion of foreign

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