

Bamboo resources, enterprises and trade development opportunities for livelihood development and poverty reduction in Mozambique

JEEVANANDHANDURASAMY*

Food and Agriculture Organization of the United Nations (FAO), FAO Representation in Mozambique and Swaziland, Rua António Bocarro 202, Maputo, Mozambique

Abstract—Mozambique is one of the poorest countries in the world with an area of 799 390 km² and 17 million inhabitants. The country has vast land, water resources and good forest cover. Forests play an important role in livelihoods and economic development of the country. Food, shelter and energy needs of people in many rural areas are met from forests. Timber industries in the country contribute to the economic development by exploiting and trading valuable timber resources. Overexploitation of commercial timber species, charcoal production, shifting cultivation, forest fires, predatory hunting and illegal logging are threats of the sector. In this scenario bamboo, a vastly available resource in the north and central parts of the country could be used as an alternative to meet the emerging demands in a sustainable way.

Bamboo is traditionally used in housing and agriculture. Trade of bamboo is informal in rural, urban markets and along roadsides. Many entrepreneurs have small enterprises selling raw bamboo, utilitarian items and furniture. This informal sector is growing rapidly and has the required potentials for formalizing and enhancing capacities of people and industrializing. The country is located at the Indian Ocean and already has trade links with southern and middle hinterland African countries. The power generation is rather surplus though poorly distributed and the road infrastructure is rapidly developing. The land tenure system is pro-poor, pro-private for long-term leasing. Present bamboo flowering provides an opportunity for reforestation and natural regeneration of the resource. Therefore, international agencies working in Mozambique and INBAR should play a vital role in initiating resource assessment and development of a 'Bamboo vision' for Mozambique. Participatory pilot process projects may be formulated to transfer capacities, research knowledge and appropriate technology to achieve the global goals of poverty reduction and environment development. Bamboo resources, enterprises and trade development could thereby lead to an economical and environmental 'win-win' situation for the poor and the government.

Key words: Resource management and development; flowering; bamboo charcoal; enterprises and trade; livelihood development; poverty reduction.

*E-mail: jeeva.duraisamy@tv cabo.comz or jduraisamy@map.gov.mz

INTRODUCTION

Poverty is the most serious problem in Mozambique, where average per capita income is about US\$ 134 per year [1], amongst the 10 lowest in the world. In this scenario, natural resources are inevitable to fight poverty. A challenge for the government, the local communities, the private investors and the civil society as a whole, is how to make rational use of existing natural resources — soil, water, forests and wildlife — to contribute to the improvement of present livelihoods without compromising the benefits for future generations.

Around 70% of the 17 million inhabitants live in rural areas [2]. Most of them reside in the neighbourhood of natural forests, from where many of their basic needs are met. In some cases, forest products represent up to 93% of their average yearly income. Forestry is one of the key areas where existing natural resources could be utilized to generate income for rural communities. Presently, the main threats of forestry are overexploitation of commercial timber species, charcoal production, shifting cultivation, forest fires, predatory hunting and illegal logging.

The Government of Mozambique is committed to reduce absolute poverty in rural areas and is using all available means to overcome this. The Community Management Unit (UMC) has been established at the National Directorate of Forests and Wildlife (DNFFB) in the Ministry of Agriculture and Rural Development (MADER) at national and provincial levels. They focus on assisting communities to develop business plans and establish community based enterprises for forest products using Market Analysis And Development (MA&D) [3] methodology. Bamboo is one among the most important non-wood forest produce (NWFP) used by rural people to meet their needs in housing, utilitarian items for home and farm providing additional income through trade. In absence of systematic inventory on bamboo resources and non-inclusion of bamboo in forest inventories or NWFP studies makes scientific quantification of bamboo impossible. Most of the information for this paper is based on observations from field, discussions with forest officers and the FAO literature on NWFP and timber. This paper is an attempt to demonstrate the hidden potential of bamboo and its possible roles in livelihood development and poverty reduction in Mozambique.

FOREST RESOURCES OF MOZAMBIQUE

Almost 78% of Mozambique is covered by natural vegetation [4], distributed over high forests (0.8%), low forests (13.7%), thickets (43.3%), wooded grasslands (19.4%) and mangroves (0.5%). Forests and wildlife resources are the property of the State, which recognizes traditional rights, uses and guarantee local communities to utilize natural resources for their subsistence. The new land tenure law is pro-poor and pro-private to encourage communities and companies to make rational use of existing resources of land and forests. Approximately 48 million ha, or 60% of the country, has good potential for forest and wildlife development and

Table 1.

Forest cover [6].

	Land area '000 ha	Forest cover 2000 '000 ha	Forest cover change 1990–2000		Distribution of land cover/use % (1995)		
			'000 ha/year	%/year	Forest	Other wooded land	Other land
Mozambique	78 409	30 601	−64	−0.21	39	53.8	6.8
Africa	3 090 228	649 866	−5264	−0.78	21	15.5	61.6
World	13 139 618	3 869 453	−9319	−0.24	29.4	11.2	58.6

management [5]. Around 19 million ha (39.6% of the forests) can be classified as valuable forests (Table 1, from Ref. [6]) for timber production of which 12 million ha have potential to be used for logging concessions.

TIMBER PRODUCTS AND TRADE

The forestry sector plays an important economic and environmental role in the country by contributing 18% of the GDP and supplying about 80% of the energy demands [7]. Large volumes of timber are exported and modest volumes of forest products are imported by Mozambique. Mozambique has established industrial plantations of *Pinus*, *Eucalyptus* and *Casuarina* in Manica Province and non-industrial plantations are located near three urban areas; Maputo, Beira and Nampula [8]. Industrial plantations in Manica Province started in the early 1980s with a purpose of substituting cheap softwood timber from plantations for domestic market and saving valuable hardwood timber for export.

NON-WOOD FOREST PRODUCTS

Non-Wood Forest Products (NWFP) are confined to the subsistence sector [9]. Information on the level of production and to what extent these products are used is not available [10]. Important non-wood forest products in Mozambique are bush meat, grass, bamboo, reed, medicinal plants and a variety of wild edible plants [11]. Other important NWFP exploited in the country include honey, beeswax, mushrooms, edible fruits, etc. The UMC unit is promoting NWFP initiatives for income generation using the forest resources for communities and supporting communities to establish community based forest enterprises using the MA&D [12] process at a pilot scale.

NWFP MARKET

There is a wide range of NWFP produced and marketed by the rural communities in Mozambique. The most remarkable ones include medicinal plants, grass, bamboo,

reed and food, such as wild vegetables, fruits, tubers, etc. The degree to which these products are marketed depends on the distance from and infrastructure to markets. There are two types of markets for NWFP: the informal market, which is widely spread in the country, and the formal market, which is located in villages or towns. Trade in bamboo and palm products is chiefly concentrated in urban areas, particularly in Maputo, Inhambane, Beira, Chimoio, Quelimane, Nampula, Tete and Pemba.

WHY BAMBOO?

Bamboo plays a vital role in the livelihoods of people in many ways. Bamboo is widespread in the central and northern provinces of the country. It is commonly used or traded in raw and value added forms, contributing to income generation. Bamboo is used in housing, granaries, pen for hens, ducks, guinea fowl, etc. Bamboo is used to produce utilitarian articles and handicrafts. In housing bamboo is used for truss, fencing, walls, and temporary structures such as stalls in roadside and markets. Areas where timber resources had exhausted people depend more on bamboo.

Bamboo can be utilized at all levels from a small household enterprise, community-based enterprise to a modern highly integrated industrial activity. Bamboo and bamboo fibre could be used to produce a wide range of products, from simple artisan articles to high-tech fibre-based products. Bamboo products have an important role in alleviating poverty amongst the most deprived members of the society and it has also a continuing role in providing products as standards of living rise. Versatility of the resource would suit the emerging trends of development in the country providing much needed rural employment and income generation with environmental development.

BAMBOO RESOURCES OF MOZAMBIQUE

Bamboo resources can be classified in two broad areas; the largest and the most wide-spread are the naturally occurring native bamboos; the second, a limited amount of homestead bamboos. A detailed resource inventory is essential to identify and validate the species occurring in the interior areas, different agro ecological regions and homesteads.

Native bamboos

The North and Central provinces are rich in natural bamboo resources occurring as pure brakes, thickets, mixed vegetation and sometimes as undergrowth. Literature from Zimbabwe mentions that *Oxytenanthera spp.* is widespread in Africa to the extent that the genus is known as African Bamboo [13]. *O. abyssinica* is present in Kenya, Malawi, Mozambique, Uganda, Tanzania, Zambia and Zimbabwe [14].

This thick walled, thin, tufted, closed clumped bamboo has thin holes in the upper nodes and is used by the locals in housing, granaries, etc. Another bamboo which is commonly observed is an open clumped, hallow, thin walled bamboo, comparatively longer than the other bamboo species and more abundant in the province of Cabo Delgado. In addition to this, another thin, profusely branching, short and tufted bamboo is observed in Niassa province. Taxonomical identification and validation of these species are essential for resource management of native bamboos.

Homestead bamboos

Homestead bamboos are limited to ornamental stands in homesteads and a few bamboo clumps planted closer to streams or ponds in private farms. The yellow *Bambusa vulgaris striata* is the most commonly spread bamboo through out the country followed by green *Bambusa vulgaris*. Apart from this, *Dendrocalamus hamiltonii*, an exotic in Mozambique native to Himalayas, has been observed in few private farms around the country, which has to be taxonomically validated.

Bamboo flowering

One species of bamboo is sporadically flowering in Sofala province; it was informed that people are collecting seeds for consumption. The flowering occurred between Dondo and Beira city along the roadsides. A few dead clumps were noticed from last years flowering. There were few regenerated seedlings around one of the observation site. Around a few other dead clumps, weeds hindered the regeneration of new seedlings. One part of a clump of *Dendrocalamus hamiltonii* bamboo had flowered last year in Joao center in Manica district of Manica province. However, no new seedlings were noticed around the clump. This species bamboo flowered in Tamenglong district of Manipur state and in Palampur district of Himachal Pradesh in India during the same time.

COMMERCIALISED BAMBOO PRODUCTS

Various bamboo products like baskets, chairs, animal pens, shelves, sofas, etc., are sold in markets in villages, towns and cities mostly in North and Central provinces. The urban markets encase good volumes of products made of bamboo such as chairs tables, winnows, baskets etc. Raw bamboos are sold along roadsides and are used for housing, fencing, temporary structures and shops in urban areas. Mozambican artisans have good bamboo interlacing skills and they produce finely crafted products for various household uses and agriculture purposes. However, the production and trade of bamboo products is limited to informal, unorganised sector or produced on individual basis exploiting the resources closer to habitations without any management.

ISSUES AFFECTING FORESTRY

Forestry in Mozambique is undergoing a paradigm shift from pure timber exploitation mode to a sustainable management, utilisation and conservation. The following issues are affecting the forestry presently are,

- Communities use forest to meet their energy needs. Inadequate institutional arrangements at district and community levels make it almost impossible in regulating the use of timber species for firewood and charcoal production on a sustainable basis. The ever-increasing demand for charcoal production from timber contributes to rapid degradation of forest and loss of green cover due to overexploitation. Woodlots and other forests closer to big towns, cities and either sides of highways are hugely depleted and denuded.
- Shifting cultivation, though a sustainable mode of agriculture in sparsely populated areas, areas closer to roads and markets are frequently cultivated due to lack of infrastructure. Hence, these areas degrade rapidly leading to unsustainability. Peasants are forced to move to alternate fertile areas along the roads to create new machambas (farm areas). Preparation of machambas is believed to be one of the contributing factors for man-made forest fires due to uncontrolled burning.
- Bamboo flowering is sporadic and the probable gregarious flowering would affect large bamboo brakes creating dead stands, which are potentially prone for frequenting forest fires. Forest fires would hinder the natural regeneration of the resource in addition to weed domination and grazing. Spread of fire from the dead stands to other areas would also adversely affect forestry and timber production.
- Unscientific harvesting practices, sale of untreated raw bamboo, artisan mode of value addition, lack of uniformity in production and finishing, lack of treatment of finished products and use of traditional tools are the issues affecting the production. Huge market entry taxes and arbitrary pricing of products are some of the issues that affect bamboo trade. This influences the bamboo handicraft development and expansion of potential consumer base.
- Lack of affordable low-cost building materials hinders housing and social infrastructure development of the country. Traditional housing uses enormous amounts of untreated timber and round wood from forests for construction purpose, which do not last long. This continuous demand leads to ineffective use of valuable timber resources.

INTEGRATED APPROACHES FOR MANAGEMENT AND RESOURCE DEVELOPMENT

- Introduction of appropriate management practices of native bamboos in the northern and central provinces and introduction of new bamboo species would be the main areas of focus in resource management and development. The resource management and development would address the problems of forestry sector

and could amalgamate the emerging 'sustainable forest vision' on reforestation, woodlots, energy plantations, private investments, etc.

- Identifying spread of natural bamboo resource base through a resource inventory would be the entry point into the sector. Recent advances in resource inventory using remote sensing and ground truthing reduces the time for a detailed field assessment to quantify the resources [15]. In addition, it would be cost effective alternate for a resource base inventory. Interpreting the results in a Geographical Information System (GIS) facilitates monitoring and evaluation mechanism for an effective resource management and in decision making to plan, implement and develop the sector.
- Mapping the present uses and identification of other potential uses of the existing bamboo resources is primary for selection of appropriate management practices. Charcoal production, poles, shoots, bamboo corrugated roofing sheets, improved hand made bamboo utilitarian products, reconstituted bamboo wood (RBW), etc., are some of the potential technologies where existing resources could be used immediately.
- Introduction of new bamboos could be beneficial for meeting the demand of round wood needs. The 'Bamboo world atlas' can function as an instrument for site selection and identification of probable species that could adapt locally. Few suitable species could be tried on a medium scale in plantations based on the results, the successful species could be expanded to other areas.
- Bamboo, being a short gestation and rhizomous grass, would grow in a variety of geo climatic situations. This versatility could be logically used to benefit the resource development by integrating it as vegetative component in various natural resource development projects such as watersheds, agroforestry, silvi-pastoral development, wood lots, integrated silviculture, wind brakes, flood protection structures, river trainers, small gabions, with timber species, bio-engineering projects, erosion control, etc.

ENTERPRISE DEVELOPMENT AND TRADE

The present focus of the private sector in the country is on exploiting valuable timber resources available in the country. Mozambique has yet to formulate an investor friendly bamboo policy to promote private sector to invest and motivate communities to take up bamboo plantations and establish enterprises. Bamboo enterprises development and trade could benefit communities since bamboo based enterprises are more human intensive and would benefit the skilled, semiskilled and unskilled. The forest department is already encouraging the private sector to take up plantations. The present bamboo flowering has initiated the interest and the possibilities of making charcoal from bamboo have fuelled the enthusiasm. Bamboo is an appropriate raw material for establishing micro, small, medium and large enterprises. Organizing, formalizing and institutionalising the management

of bamboo resources and technology transfer would result in trade development. Initial focus could concentrate on the following areas:

- Charcoal production using the existing natural bamboo resources could be organized in community based enterprise mode to meet the demand and reduce stress on timber species. Using the MA&D methodology, community-based micro-enterprises could be established for production of charcoal from bamboo. Harvesting, production, transportation and market entry taxes on bamboo charcoal may be reduced, whereas the taxation of timber-based charcoal could be increased where bamboo is available for charcoal production. This would motivate communities to take up bamboo charcoal for production, trade and utilisation.
- Identifying skilled bamboo artisans and organise them to adapt the process flow mode or division of labour mode to increase production with standard qualities and quantities. Design development and design diversification would result in an increased product range of marketable goods.
- Areas abandoned after shifting cultivation and degraded lands can be made productive by bamboo plantations for edible shoots, bamboo charcoal and bamboo poles, which would be closer to the roads for transportation, processing and marketing.
- Communities living close to bamboo forests and thickets should be sensitised about the added uses of bamboo and impacts of flowering. By providing incentives communities could take up appropriate measures to avoid and manage fires on dead clumps to facilitate natural regeneration of bamboo seedlings after flowering.
- The integrated bamboo housing technology and bamboo mat board corrugated roofing sheets would fulfil the emerging demand for low-cost housing and social infrastructure building materials. There is an enormous potential for exploitation of this market in whole of Africa, particularly among the landlocked hinterland countries with poor natural resources in the Southern African region.

As information on demand and supply production, and processing of bamboo products is not known, it is high time to identify the potential market for this within the country and the region. The present expected demand is on charcoal and building materials, which has to be assessed through a detailed market study. The existing legal policy framework for trade promotion should be analysed and appropriate measures for promotion of bamboo trade may be suggested to the Government. An enabling bamboo policy is imperative for the management, utilization, processing and trading the resource. Government should take favourable steps to promote this sector, which is a cost-effective mode of biomass production with shorter gestation compared to any other fast growing timber species. This is a 'win-win' situation, providing employment, economic returns and environmental protection.

SUGGESTIONS AND RECOMMENDATIONS

1. Resource base identification, assessment and quantification of resource using satellite imagery and ground truthing on a GIS platform for management and development of the sector would be entry point to the sector.
2. Mozambique should carry out a taxonomical identification of bamboo species.
3. Sporadically flowering clumps should be identified, seeds should be collected and nurseries may be established at national and provincial levels. A bambusetum may be established with local and exotic species from the world for field trails, research and academic purposes. Additionally, seeds from present flowering can be shared with other countries. A strategic plan should be developed with international experts to address gregarious bamboo flowering and management of the same.
4. A detailed socio-economic study should be conducted on the communities who are producing the bamboo products. This study would map the present supply chain of resource flow from resource base via market to the consumers with costs involved at each stage. This would result in identification of appropriate technologies and trainings required to improve the sector through an integrated pilot process project.
5. Field trials may be conducted on production of bamboo charcoal using traditional and advanced methods to establish scientific properties and could be compared with timber charcoal properties for viability.
6. Product library may be established with the present bamboo products to document the traditional skills, design patterns of interlacing (weaving) used, tools, dyes, preservation techniques, etc.
7. Activities like capacity building and skill development of artisans for design diversification, introduction of division of labour mode, improvement or introduction of simple tools, development of jigs and fixtures to standardise production with quality and quantity should be identified and carried out.
8. The native bamboos for shoot should be tested for palatability, nutritional values to see suitability for shoots production.
9. Suitable exotic species may be identified for establishment of nursery, plantations, management, harvesting, processing, etc.
10. A mission team of professionals from national and international agencies should conduct a detailed mission to identify all potentials of bamboo-based livelihood development and implementable projects for poverty reduction.
11. A Mozambique bamboo strategic vision in line with DNFFB's forest policies should be developed.
12. Awareness should be created through travel exhibition displaying products made of bamboo with technology demonstration about simple value addition of the resource to enthuse people and private sector to participate.

13. Local markets should be identified using the MA&D process to establish community-based enterprises for bamboo products.
14. A national, regional and international market study for bamboo products of Mozambique has to be carried out.
15. National and provincial level interest groups shall be identified to build capacities and train them in bamboo technologies, and establish a focal point at the DNFFB, UMC, CEF, etc., to carry out bamboo development projects in the country and provide technical support in implementation, monitoring and evaluation.
16. Participatory process mode pilot projects may be developed for bamboo-based livelihood development integrating the local livelihoods needs of the communities and the forestry sector.
17. Other potential community-based natural resource management projects like watershed projects and agroforestry could use bamboo for resource base development and bio-engineering.

CONCLUSIONS

The paper illustrates that bamboo is a viable option that could address the emerging concerns of deforestation caused by charcoal production, forest fires, shifting cultivation and degradation of forests in the country. People who depend on forests for livelihoods and other needs will benefit from this vastly available resource. It emerges as an environmentally sustainable and economically beneficial 'win-win' situation benefiting forests and communities. The sector could be tailor made to provide adequate employment and income generation through a number of different ways. Sustainable bamboo based development would be instrumental in providing better livelihoods for communities who have access to the resource through generation of employment, income generation to fuel the much needed economic development to overcome poverty.

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