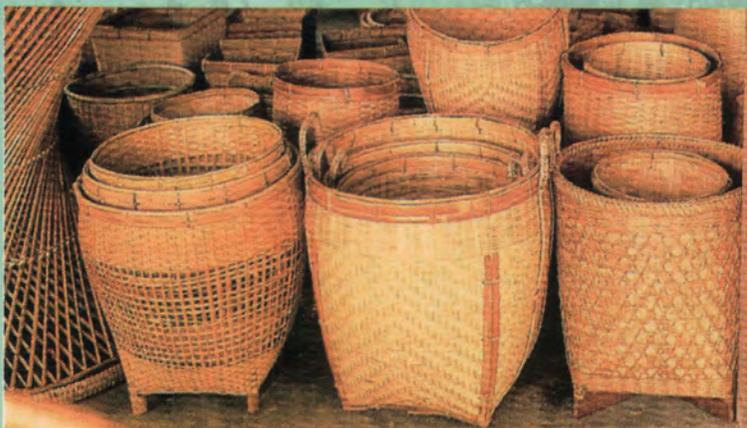


# Status of Bamboo Resources Development in Kenya



**KENYA FORESTRY RESEARCH  
INSTITUTE (KEFRI)**



# Status of Bamboo Resources Development in Kenya



## Contents

	<i>Page</i>
1.0 Introduction.....	2
2.0 Past Research and Development Activities.....	4
3.0 Recent Bamboo Development Initiatives.....	6
4.0 Initiatives by the Private Sector and NGOs.....	13
5.0 Constraints to Bamboo Development.....	15
6.0 References.....	16

## 1.0 Introduction

Most of the bamboo resources in Kenya comprise one indigenous species, *Yushania alpina*, which was formerly known as *Arundinaria alpina*. This species, which is commonly known as alpine bamboo, occurs naturally on the main mountains and highland ranges of Kenya and Eastern Africa.

The species is currently estimated to cover about 150,000 ha, located mainly at altitudes ranging from 2400 to 3400 meters above sea level. It thrives in the Aberdares ranges, Mt Elgon, Mt Kenya, Mau escarpment and Cheranganyi Hills. With the exception of a few clumps of the species left on farms by farmers living around forest areas in the highlands, very little cultivation of this species on farm has been done.

Among the most important minor forest products, bamboo has continued to gain recognition. Today it is considered as a multipurpose plant and as a valuable timber substitute. In Kenya, bamboo is much sought after for use in horticultural flower farming, handicraft, residential fencing and other minor cottage industry products like toothpicks, basket making and incense sticks.

From 1940 onward, hundreds of thousands of forest lands were cleared for conversion into agriculture. Unsustainable felling of forests also resulted in the disappearance of vast areas of alpine bamboo. By 1980 over-harvesting of indigenous timber and bamboo forests was having a detrimental environmental impact. Environmental strategies and conservation measures were urgently needed to deal with the situation.

In 1986, as an effort to curtail further destruction, the President issued a directive banning all cutting of indigenous bamboo. This was not followed by the setting of clear and definite or specific guidelines that would have formed the procedural follow-up for the implementation of such pronouncements. The ban on bamboo harvesting to date remains in place.

During the last twenty years, some research on species selection and investigations on their growth was done mainly by the Kenya Forestry Research Institute (KEFRI) in collaboration with several Asian research and development institutions. This research work has



*Clump of Yushania alpina*

introduced over twenty Asian bamboo species into the country. Half of these are successfully growing in the field under various ecological conditions.

The introduced species are more versatile and can be cultivated in areas where the local bamboo does not thrive. Farmers, horticultural flower farming companies, and Kenya Forest Service have expressed great interest in growing these bamboo species on their land, and harmonized methods are being introduced to ensure that projected outputs are successfully realized.

## 2.0 Past Research and Development Activities

Research and development (R&D) activities on bamboo have been ongoing at KEFRI since 1980s. KEFRI has the distinction of being one of very few institutes in Africa with a bamboo research program. It is arguably the one with the most prominent experts who have dedicated their career to bamboo research.

### Filling Knowledge Gaps on Bamboo

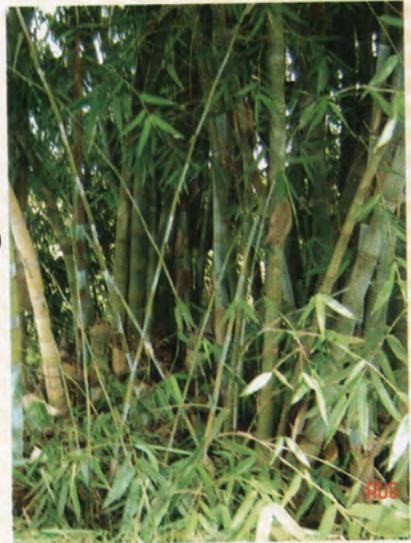
Following the ban on bamboo harvesting in 1986, KEFRI initiated a program to investigate the potential of bamboo and to develop strategies for its cultivation and utilization in Kenya. These research and findings are documented in various publications (Kigomo, 1988, Kigomo et al, 1994, Kigomo, 1995; Kigomo and Sigu, 1995, Kigomo, 2005).

### Introduction of Exotic Species

Bamboo species indigenous in various parts of Asia were introduced into Kenya in the late 1980s.

The introduced species are:

- *Bambusa bambos*
- *B. lako*
- *B. nutans*
- *B. tulda*
- *B. vulgaris*
- *B. vulgaris var. Vitatta*
- *Cephalostachyum pergracile*
- *Dendrocalamus asper* (Giant bamboo)
- *D. brandisii* (Giant bamboo)
- *D. giganteus* (Giant Bamboo)
- *D. hamiltonii*
- *D. membranaceus*
- *D. strictus* (semi-solid / drought resistant bamboo)
- *Oxytenanthera abyssinica* (semi-solid / drought resistant bamboo)
- *Phyllostachy nigra var. Henonis*
- *P. pubescens*
- *Shibataea kumasaka*
- *Thyrsostachys siamensis*



*D. giganteus* (Giant Bamboo)

### Trial Plantations

In 1988 KEFRI started establishing trial plantations of the above species in six sites as follows:

- Kakamega and Siaya in the Lake Region,
- Muguga and Penon in the Highlands, and
- Gede and Jilore in the coastal region

The trial plantations were established between 1988 and 1992 and an initial study showing the results of the trials was published by KEFRI in 1995. This study provides details of the characteristics of the planting sites, the form (i.e., seeds, rhizomes, offsets, or cuttings) and provenance of the germplasm, the species planted in each site, as well as success or failure, and growth performance of the species by sites.

### **Guidelines for Bamboo Plantations**

A booklet entitled *Guidelines for establishment and managing plantations of bamboo in Kenya* was published by KEFRI in 1995. The booklet addresses the information needs of foresters and entrepreneurs in Kenya. Its brevity and clarity makes it a good reference on the cultivation of tropical bamboos. The work focuses on the cultivation of clump forming (pachymorph) bamboos and promotes the development of bamboo plantations. In particular, the guidelines promote the cultivation and use of exotic Asian species in order to reduce pressure on natural forests. The booklet also provides useful knowledge, correct procedures, and practical tips for setting up and managing bamboo plantations.

### **Production-to-Consumption System Study**

In 1999 KEFRI undertook a case study on bamboo Production-to-Consumption System. This detailed study involved field research and market analysis throughout the country. It aimed to clearly define the raw material sources, production processes, markets and policies relevant to bamboo in the country. The study was based on direct interviews with stakeholders as well as secondary sources of information. Its comprehensive scope covers topics ranging from social and demographic factors of local communities, policy and legal issues, stakeholders analysis, constraints, employment and income opportunities from bamboo. The study particularly provided meticulous product and market information regarding the many uses of bamboo. Whilst the information of this study is now somewhat outdated, its value as the very first detailed record of Kenya's bamboo sector is indisputable. This pioneering study has been a focal point for understanding the development, evolution, and trends of Kenya's bamboo sector.

### **Tissue Culture Research**

KEFRI launched a program in 2004 to investigate the possibility of producing planting materials of bamboo by means of micro propagation or tissue culture in its laboratory at Muguga. Attempts to micro propagate species such as *Y.alpina*, *B.tulda*, and *D.giganteus* have had limited success. Some positive results in generating shoots have, however been obtained for *B. tulda* and *D. giganteus*. Bamboo is not an easy plant to micro propagates and different protocols are required for each species. Success in shoot development is certainly an achievement, but the real challenge is the successful development of roots in sterile media (Brias, 2006).

### 3.0 Recent Bamboo Development Initiatives

**K**EFRI is collaborating with the United Nations Industrial Development Organization (UNIDO) in the East African Bamboo Project (EABP). EABP involves bamboo development in Kenya and Ethiopia. The project is funded by the Common Fund for Commodities (CFC).

The project has the following components:

- Capacity building,
- Plantation feasibility studies,
- Policy analysis, and
- Market research and value addition in bamboo.

#### Capacity Building

The project has supported the revision of the Guidelines for establishment and managing plantations of bamboo in Kenya by KEFRI. The revised booklet has been updated with new information, illustrations and photographs and printed in 2007 bearing the title Guidelines for Growing Bamboo. The English version has been translated into Kiswahili. The objective is to make the booklet widely accessible to farmers and other stakeholders. This booklet is an invaluable resource material for training farmers.

Training of Trainers has been carried out under the project. The training program involved training extension workers who would in turn transfer the acquired skills and know-how to the low income farmers residing in the selected sites in Lari, Shinyalu and Olunguruone divisions.

Basic bamboo nurseries have been established and beneficiaries trained in bamboo cultivation by trained extension workers. Since the nurseries were established in 2006, thousands of bamboo plants have been propagated. The direct beneficiaries of these nurseries are local villages. The nurseries will provide planting materials for trial plantation established to demonstrate bamboo cultivation and farming.

Two technical staff members from the Forest Product Research Centre at Karura have participated in training workshop in Ethiopia. The training proved very successful and novel bamboo products, ranging from handicrafts to furniture items are now being developed at Karura. The training also increased awareness among KEFRI's staff regarding the need to develop original Kenyan designs.

Knowledge gained by the KEFRI Karura staff is being transferred to selected beneficiaries who already possess some skills in carpentry and

handicrafts. Basic training in product processing at the grassroots level aims to supplement the knowledge beneficiaries gain regarding bamboo cultivation by providing them with extra skills to process bamboo into value added products which can generate revenue. The rationale behind this activity is that farmers will only cultivate and tend crops that contribute to their livelihood. If the farmers see that they can generate income by producing bamboo handicrafts, then they will recognize the value of the crop and care for their bamboo stands. Grassroots training in processing bamboo will therefore support the objective of enhancing Kenya's bamboo resource base.

### **Plantation Feasibility Studies**

The project has completed studies on analyzing the trial bamboo plots in order to provide information for new plantation sites in Kenya. As mentioned above, KEFRI published a study in 1995 showing the initial results of the trial plantations established between 1988 to 1992. However, due to limitations of funds and resources, KEFRI was not able to adequately monitor the results of these field trials in subsequent years. Various sites were visited and a methodology devised for benchmarking the performance of exotic bamboo species in relation to standards of growth and potential yield in their native habitats. The results of this analysis provide indications on which species to plant in different regions of the country and serves as guide for propagation programs for selected species in KEFRI field stations around the country. The project prepared a general feasibility study for a 100 ha plantation using conservative assumptions based on observations of the growth of bamboo species in Kenya as well as on the current market prices of bamboo culms. The study shows that plantations of exotic species can certainly be a lucrative business especially in areas distant from the natural stands of bamboo. One important factor for bamboo in Kenya is that the resources are in the proximity to markets and/or production centres.

The project has introduced additional exotic bamboo species and varieties in the form of tissue culture plantlets and seeds to strengthen the Kenya's resource base and provide planting material. The species are: *D. asper*, *D. hamiltonii*, *Guadua amplexifolia*, *B. vulgaris*, *B. balcooa*, *B. tulda* and *B. oldhamii*.

### **Policy Analysis**

The legal status of the ban on bamboo harvesting has been reviewed. The findings reveal that the validity of the ban is questionable since the Presidential directive of 1986 has never been ratified into a law in accordance with State legislative procedures. Kenyan Constitutional

dispensation does not recognize unwritten sanction, be they Presidential orders, directives or decrees. It is the constitutional and a fundamental right of the citizen to be protected by the law, indicating that a citizen of this country cannot be convicted of an offence as long as that offence and its defined penalty are not provided for in a written law. Presidential decrees and other pronouncements require a Minister, in whose docket the decree has been made to gazette the decree in order for such a decree to be legally binding. This has never been the case with the bamboo ban, therefore upholding the ban is technically illegal and unconstitutional. This illegality should be brought to the attention of the relevant Minister, not to regularize the ban through gazette, but to initiate a progressive bamboo policy development process.

Considering the ecological significance and vast economic potential of bamboo in Kenya, the suggested aims and objectives of a new bamboo policy should include the following:

- Protection and preservation of mountain ecology and biodiversity; protecting the mountain slopes by affording protection to bamboo forests and bamboo regeneration areas for sustained productivity and environmental security for the people.
- Promotion of private bamboo plantation (individual and community owned) as the key thrust area for future economy of the adjacent communities.
- Sustainable development and improvement of bamboo productivity on farms and forest reserves through improved silvicultural practices thus making bamboo plantation a profitable and attractive economic enterprise for securing adequate return on investment.
- Promotion of bamboo based industries at small, medium and large scale levels with improved technology for utilizing the available resources in a sustainable way.
- Promotion of bamboo sector development as an essential component of rural development strategy linked with forestry and agribusiness sector promoting rural employment and enhancing household incomes.
- Promotion of enterprises manufacturing bamboo based products and wood substitutes thereby reducing pressure on forests and reducing the already high wood deficiency in the country.

### **Market Research and Value Addition**

One main activity of the project is to provide reliable information on the local market and to develop market strategies. The project hired a consultant to survey the market and to update the information

provided in KEFRI's case study on the production to consumption system of the bamboo sector in Kenya. The study was conducted from 2006 to 2007 and recommendations made with a view to market segments where Kenya could develop a greater competitive advantage both within the local and export market.

The structure of the Kenyan market becomes apparent when analysis is done on the value-chain range of activities involved in sourcing bamboo raw materials, transforming the materials into finished products, and selling them to end-users.

### **(i) Raw Materials**

Raw materials are traded in an informal sector, and suppliers do not officially declare their source. Fear of penalties that may be imposed on parties involved in the extraction of bamboo from forests has the effect of inhibiting a free and continuous flow of raw material supplies. The haphazard manner of harvesting (by persons who run the risk of penalties) results in the sale of the bamboo culms that are not mature and therefore of sub-optimal quality.

The price of bamboo culms taken from natural stands is not based on the real costs of maintaining the resource base. The cost components only include low wages to persons harvesting, the profit margin of the trader and/or middleman, and the cost of transport to the point of sale. The main beneficiaries from the sale of bamboo taken from State Forests are not the labourers who perform the difficult task of harvesting, but rather the traders and middlemen who deliver the raw materials to producers.

In effect, buyers of raw materials are paying an unrealistic but relatively low price for large quantities of bamboo culms that include many young culms that are not suitable for manufacturing products of a good quality. Farmers who sell bamboo from their private farms are forced into a situation of unfair competition whereby they have to offer their bamboos at prices comparable to those extracted from natural stands. Such a scenario does not encourage broad based bamboo plantation development, which involves investments and costs in the establishment, maintenance, harvesting, and management of plantations. A limited and/or irregular flow of raw materials is not conducive for the development of bamboo industries that rely on economy of scale to gain competitiveness.

### **(ii) Product Design and Development**

Despite being a country with vast bamboo resources and great potential for developing its raw material base, Kenya lags behind many other countries in the field of product design and development. The informal

sector of bamboo handicrafts and furniture lacks resources, know-how, and institutional support to upgrade skills. Established companies in the formal sector (e.g. KAPI Ltd.) have not placed sufficient efforts in developing new designs and are consequently losing their market share to imported products. There is a lack of confidence that R&D investments in local bamboo products can be recovered given the increasing power of foreign competition. Only very recently has attention been placed on designing and developing unique products that create added value through product differentiation and originality. Such efforts are mainly the initiatives of KEFRI Forest Products Research Centre in Karura, which has been reinforced through training activities and know-how transfer.

### **(iii) Processing and Transformation**

Very rudimentary products with minimal processing or no transformation whatsoever dominates the market. Bamboo culms sold in timber

yards in Nairobi are not processed or preserved, and the added value of such products is very low. Preservation techniques to increase the life of bamboo culms are however well known and widely utilized in Asia and South America.



*Bamboo chair*



*Bamboo mat*



*Bamboo bicycle*

Chemical and non-chemical means of preservation can add value to bamboo culms by improving their quality, durability, and suitability for construction applications. Bamboo culms that are properly treated and preserved have a strong potential in the local market with minimal risk of competition from exports. Since the transport costs of bamboo culms from abroad would greatly increase their price, the barrier to entry of such imported products in Kenya would be extremely high.

The informal sector of bamboo handicrafts and furniture lacks resources, know-how, and institutional support to upgrade their skills. The processing of local bamboo handicrafts is very rudimentary and productivity is low. Recently, EABP has introduced sets of tools especially designed for handcrafting bamboo. The distribution and utilization of these special tools is expected to have a positive effect in improving quality and increasing productivity.

Bamboo is well documented as a good source of biomass with an energetic capacity comparable to wood. Bamboo is widely used as a source of bioenergy in Asia. However, transformation of bamboo into bioenergy is not yet widespread in Kenya. Bamboo is suitable for charcoal and briquette production, as well as a source of energy for large tea estates. The transformation of bamboo into energy can represent a significant value addition to industries that need to comply with increasingly strict environmental regulations in Kenya.

#### **(iv) Marketing**

There are no established, formalized market outlets for bamboo products in Kenya. As such modern marketing and advertising strategies common in other sectors are absent in bamboo. Products are traded in a highly informal fashion and most merchants do not have marketing or promotional materials. In the few cases that marketing materials are used, such materials are very basic but useful enough to serve the seller's purpose. A few points are worthy of consideration in this regard.

Bamboo nurseries have started some basic marketing activities to create awareness about the plants they sell. For instance, The Bamboo and Tree Company in Nairobi has printed leaflet describing its core activities. The company has also started introducing colour printed labels with the botanical name, description, and species on sale. Bamboo Trading Company (BTC) promotes its handcrafted products by means of display in its own workshop. It also keeps a price list of products on sale.

Timber yards in Nairobi that supply bamboo do not engage in marketing since there is no certainty of supply and prices vary according to the

source. Their customers, mainly small family owned cottage industries, go to the timber yard to purchase the raw material needed for processing furniture, skewers, and other handicrafts. Bamboo poles are also sold to carvers and flower farmers who come to buy timber at the yard. Private consumers also buy bamboo poles to erect TV aerials. The main seasons for the sales of bamboo culms are December (the festive season) and the hot season (production of ice cream sticks).

Some traders of furniture in street markets in Nairobi have recognized the need to carry along very basic self-made catalogues with prices and photographs of the items that they sell. This facilitates taking of orders from customers are looking for a piece of furniture that is not "in display" or "in stock" at that moment. The marketing of handicraft items produced by family owned cottage industries is usually done by "word of mouth." Handicrafts are usually sold at the doorstep of producer's home and satisfied customers spread the word about where the products can be obtained. Handicraft producers rarely reach out to the market. Rather it is the market that comes to them.

Skewers and toothpicks are generally sold upon order of a middleman who places orders with 1-2 weeks of prior notice and comes to collect them. Only small stocks are kept by the producer to meet demands of occasional buyers.

### **(v) Prices of Local Bamboo Products**

Prices of bamboo products vary from seller to seller and are partly determined by the cost of raw material. Prices of some bamboo products have been obtained in a very recent Marketing Study (Statz, 2007) and are listed below as indicative figures:

- Culms of alpine bamboo price at timber yards in Nairobi ranges from KSh. 100-150 per culm of 6 meters. The farm gate selling price from farms in Kinale is KSh 80 per piece with an average length of 6.5 meters.
- Culms of *D.giganteus* sell at KSh.1,400 per culm of 15 meters at The BTC in Thika.
- Bamboo plantlets/seedlings are sold at KSh. 150-300 per plant depending on the species and the size of the plant.

## 4.0 Initiatives by the Private Sector and NGOs

### Initiatives by NGOs

The International Centre for Research in Agroforestry (ICRAF) has been active in promoting bamboo in projects to control erosion along the banks of Lake Victoria and to stabilize the banks of River Nyando. In particular, ICRAF has promoted the planting of giant bamboo. The Greenbelt Movement is interested in bamboo for conservation purposes.

### Private Sector Initiatives

**Bamboo Trading Company (BTC)** produces bamboo seedlings for sale, acts as a wholesaler of bamboo poles and produces furniture and handicrafts in an on-farm workshop. Bamboo and Tree Company is by far the major supplier of bamboo plants. Numerous exotic bamboos are cultivated in the nursery, which covers four hectares in Nairobi. The company is involved in propagating and selling bamboo planting material and is currently in the process of establishing bamboo plantations. The company has received support from KEFRI and ICRAF in obtaining mother stocks of bamboo species.

**Trading Green** is a farm in Kisumu involved in the cultivation of giant bamboo. It has an outgrower scheme to motivate farmers to utilize and/or sell giant bamboo for the construction sector as an alternative to timber. However, little is currently known on what the company has achieved.

**KAPI Ltd.** is a Nakuru based manufacturer of pyrethrum based insecticides, incense sticks, as well as a range of other domestic products and handicrafts. KAPI has been utilizing bamboo for the production of incense sticks. Due to increased competition from abroad (China, India, Vietnam, etc) as well as difficulty in sourcing bamboo raw material locally, the company has been scaling down its production of bamboo products and limits its production to occasional export orders from Scandinavia and the Baltic states. In peak periods (i.e., when the company receives major orders) up to 50 workers are employed. But in the face of increasing competition by Asian producers, the company is currently operating below its full capacity.

**Rai-Ply** is a leading plywood producer in Kenya and is interested in developing bamboo panel and board products in Kenya, similar to those being produced in Ethiopia. However due to restrictions in obtaining raw materials, Rai-Ply plans to source pre-processed bamboo strips from Ethiopia in order to produce prototypes in Kenya. There are around 300

small to medium sized timber yards in Nairobi but only around 20 of them supply bamboo.

**Kenya's flower** industry has in the past, relied heavily on bamboo as a prop for flower production, especially around the Lake Naivasha region. Bamboo was also widely used for the production of runner beans. Although bamboo has been largely replaced by plastic props in flower production, it still plays a small but dwindling role in the cultivation of runner beans.

**The informal sector** of bamboo includes family owned cottage industries dedicated to the production of skewers, toothpicks and ice cream sticks. Production is manual and very rudimentary, but nevertheless provides a source of livelihood. In the production of these bamboo products, raw material is seldom wasted. In the case of skewers and toothpicks, the nodes of the bamboo culms that are left over are creatively used to produce items such as ashtrays and tooth pick holders.

**Unilever Tea, James Finlay and Williamson Tea** are interested in using bamboo as an alternative to Eucalyptus as a source of bioenergy for their tea production process. They recognize the environmental benefits of using bamboo and have been conducting tests on the growth, suitability, and economics of bamboo. Tea estates in Kenya are under increasing pressure to adhere to the environmental legislation and policies, especially with regard to preventing environmental degradation and safeguarding catchment areas. The use of bamboo as a fast growing source of biomass with relatively low water uptake represents an important sector that needs to be promoted and developed in Kenya.

## 5.0 Constraints to Bamboo Development

### The Image Problem of Bamboo

In Kenya, bamboo has a reputation of being a traditional and primitive material. People are generally unaware that high quality applications are possible with bamboo. Bamboo has not received adequate publicity to give it the image it rightly deserves, namely that of being a fast growing, multi-purpose and eco-friendly plant which has great potential of reducing pressure on forests.

### The Harvesting Ban

The existing ban on bamboo extraction has prevented the sector from developing.

This includes the following aspects of resource management:

- ❶ Production of seedlings
- ❷ Knowledge about silvicultural treatments and harvesting techniques
- ❸ Post-harvest treatment practices
- ❹ Industrial processing
- ❺ Marketing of bamboo products.

Developments in all these market segments have slowed down because bamboo has not been used and promoted in a planned and systematic fashion.

### Weakness of the Institutional Environment and Networking

There is no proper interdepartmental cooperation to formulate and implement a comprehensive bamboo promotion strategy. The stakeholders have also failed to organize an effective system of networking. As a result, cooperation among stakeholders and lobbying in the political arena is very deficient.

### Lack of Credit and Financing

Poor capital endowment and access to credits have prevented cottage industries from up-scaling their bamboo-related activities. Funding to upscale activities is not available from commercial banks, at least not at affordable rates. This lack of capital has prevented the sector from developing its full potential in the country, and it is likely to be a limiting factor even if the use of bamboo is legally sanctioned and politically promoted.

### Global Competition

Bamboo industries in Asia are rapidly developing and imported products are already threatening Kenyan bamboo manufacturers. In order to survive and thrive in the global arena, the local sector will have to become increasingly competitive. The availability and quality of local raw material resources will have to increase substantially and stakeholders will have to upgrade their skills, production processes, designs, and marketing techniques.

## 6.0 References

- Boa, E (2006). Bamboo Policies and Strategies. Eastern Africa Bamboo Project. UNIDO Technical Report.
- Brias, V (2006). Bamboo Plantations for the Eastern Africa Bamboo Project, Kenya With a Feasibility Study For a 100 Ha Plantation. UNIDO Report
- Kant, H, Kigomo, B.N, and Ndambiri, J.K (1992). Development of bamboos in Kenya. Kenya Forestry Master Plan. Forest Department; MENR, Nairobi, Kenya.
- Kigomo, B.N (1988). Distribution, cultivation and research status of bamboo in East Africa. KEFRI Ecological series, Monograph No.1, KEFRI, Nairobi, Kenya.
- Kigomo, B.N (1995). Guidelines for establishment and managing plantations of bamboo in Kenya. KEFRI Occasional Management Paper No.1, KEFRI, Nairobi, Kenya.
- Kigomo, B.N and Sigu, G.O (1996). Establishment and growth of field trials of exotic and indigenous bamboo species in Kenya. E. Afr. Agric. For. J. 61 (3), Nairobi. Kenya.
- Kigomo B. N (2005). An overview of Bamboo and Rattan Sector in Kenya. KEFRI, Nairobi, Kenya.
- Ongugo, P.O, Sigu, G. O, Kariuki J. G, Luvanda A. M and Kigomo B.N, (1999). Production-to-Consumption System: A case Study of the Bamboo Sector in Kenya
- Statz, J (2006). Bamboo Marketing for the Eastern Africa Bamboo Project Kenya and Ethiopia. UNIDO Report.



**KENYA FORESTRY RESEARCH INSTITUTE  
(KEFRI)**

P.O. Box 20412-00200 NAIROBI, Kenya

**Tel:** +254 20 2010651/2, +254 724 259781/2,  
+254 722 157414, +254 734 251888

**Email:** [director@kefri.org](mailto:director@kefri.org)

**Website:** [www.kefri.org](http://www.kefri.org)

© Kenya Forestry Research Institute, 2008

*This publication may be produced in whole or part and in any form only for education or non-profit uses, without permission of the copyright holder provided acknowledgement is made.*