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Bamboo for Community and Economic Development

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Preface

In most developing countries, bamboo is a resource material that is at people’s reach in the community. That being the case, it is still thought of only as a backyard plant for individual and community use. Few of the governments of developing countries realize the potential of bamboo as an appropriate vehicle for industrialization in their country-side despite China’s success in demonstrating to the world how it can be done.

In building its bamboo industry, China focused on one industrial product – bamboo floor boards which substituted for pine and oak floor boards in the West. China developed its floorboard technology with the help of Taiwan while planting bamboo over 16 million hectares of land and building the infrastructure needed to support the industry. Today, China supplies every corner of the world with bamboo floor boards amassing revenues of US $324 million in 2008. They have expanded to over 32 million hectares of plantations and have developed industrial uses for the whole bamboo culm including its leaves and branches.

While some developing countries have become excited over the potentials of bamboo in their countries, none have ventured to develop the industry as boldly as China has. Instead they have opted to develop their bamboo industry with focus on livelihood projects such as craft, giving the community additional income but not ensuring sustained employment as confirmed here by the paper of the State of Kerela. China has demonstrated that to create real wealth it is necessary that rural plantations must first be there and linked to the producers and the industrial plants that are globally competitive thereby ensuring sustained livelihood and income in the rural communities.

In Africa for example, Ghana may not only develop bicycles to transport their goods in the rural areas but develop factories to produce these bicycles to export to other African countries with similar needs. The same can be done with their school desks. Tanzania, on the other hand, could develop its bamboo industry using their bamboo wine for ethanol. In South East Asia, the Philippines for example, could develop their bamboo industry by linking their successful furniture and housing industry to the bamboo producers and plantations. But, as confirmed by the Philippine paper, the plantations are still not there.

It is exciting to see that many of the papers submitted for this conference emphasizes the need for bamboo plantations, bamboo gardens and bamboo groves. Equally exciting is the paper on Carbon Farming which most developing countries may adapt to sustain the production of bamboo. ITC’s paper is an example of how rural communities can be linked to large industries such as the incense stick industry assuring the rural communities of sustained employment. I am glad to see that efforts have even been made in the North East India states to standardize the equipment for the livestock and poultry industry and for artisans to use bamboo rhizomes for ART objects.
Crafting the development of the bamboo industry properly in developing countries cannot be over emphasized. It will translate to wealth creation in the rural communities - plucking them out of their poverty altogether.
Bamboo – A Renewable Natural Resource and Valuable Raw Material of Cottage Industries

* Dr. Th. Brojendro Singh
** Dr. Th. Sobita Devi
* Senior Lecturer, Chemistry Dept. Oriental College, Manipur, India.
** Senior Lecturer Botany Dept. D.M. College of Science, Manipur, India.

Abstract

Bamboo craft products are nowadays, used worldwide, Bamboo listed the highest craft products of all the natural resources. It has reported more than 1500 craft products till yet. The people of North Eastern India are highly experienced in designing and producing the different craft product in the traditional way as the hand-made products. The people inhabiting in this region are economically poor, Bamboo provides many facilities in earning as well as used in various practical applications of life, Manipur is one of the State of North East India. Bamboos are abundantly growing in this State. As the state is a hilly State the inhabitants used the rich resources for many purposes viz. in housing, fencing, furniture, designing containers, baskets of various designs and shapes and also as fire fuel. Manipuri’s are accustomed to the works of cottage industry. Among the cottage industry, craftworks is the most commonly practice done by many people at the organized and unorganized sectors. People used the different species of bamboo as the common raw material for the handicrafts. But the State has least development in industrial sectors. No mechanized sectors are established till yet even though there are many skilled and unskilled artisans and craftsman. For Bamboo, no part can be left unutilized i.e. the above ground and underground parts. The underground rhizome of Caespitose bamboos like *Bambusa tulda* and *Dendrocalamus giganteus*, and that of *Melocanna bambusoides* can be processed simply and designed for producing the fine craft productions. The presents study highlights the utilization of underground pachymorph rhizome of *Bambusa tulda* for making the artistic and fine craft products.

Introduction

Bamboo can be regarded as the gift of nature for the craftsmen. The plant has its natural habitat in the South East Asia. India is the 2nd largest producer of bamboo next to China more than half of the total bamboo standing crops are growing in the North Eastern region of the Country. The North Eastern part of the Country is geographically isolated from the mainstream of India. Many small hill ranges and hilly terrains are the general features of the topography of North East India. There are plain areas also surrounded by the hill ranges, so the climate is pleasant, rainfall is abundant and some areas are cool. The vegetation types available are here varied and rich. Among the vegetations, bamboos are specific and also of rich diversities. People living in the North – Eastern part of the country are mostly low income earners and utilize the natural resources as the raw material. Many people used bamboos of different species as the raw material for making the craft product at their homes.
for small earnings to meet the various household requirements. People of different age groups and sexes do perform the craft works. Some of the works are found to be very symbolic and innovative in designing. The present study has been made focusing on some specific product of bamboo craft made out of the rhizome of big sized bamboo. Rhizomes of bamboos can be utilized in home/cottage industries. The products are fine and long-lasting also. Not only that the products are designed and made by using very simple tools for cutting, smoothing and drilling etc.

Materials And Methods

The growth pattern and mode of vegetative propagation of Caespitose bamboo, Bambusa tulda Roxb has been thoroughly studied in the field. (Fig 1) A detailed study was conducted in the selected craft centre where the underground rhizomes were kept collected & processed to make the different craft products of special designs. The local skilled and innovative artisan was interviewed personally and the product types were examined regarding the fineness, longitivity, lightness, size, unbreakable, quality, cost-effectiveness etc. The tools used for the purpose were also observed and photograph shown in (Figure 2).

Result And Discussion

Materials : Underground Rhizome of Bambusa tulda, Roxb (Local name – Saneibi )
Type of Rhizome : Pachymorph Rhizome
Special characteristics : Long – lasting, More suitable, Mostly Unbreakable, Fine Texture, Highly Resistant to insect Infestation.
Seasoning Period : 5 to 6 months ( for complete Drying )
Size : Large 14 – 15 inches long, on average 6 - 14 inches long ; 3- 4 inches thick
Product type : Hand – made craft products, original colour : No polishing required ;
Designs : Many ; From miniatures to accountable size of the rhizome used.
% of Rhizome part Used : More than 90% ; sometimes 99%.
Availability : Quite Abundant.
Tools Used : Simple, Knifes for cutting & splitting, Tools used by the goldsmiths, Scrubbers, others designed by the artist himself like for drilling chopping etc. and Pins, Nails etc.
Working Style : Somewhat innovative with ideas.
Results and discussion

Some of the selected Craft products with creative ideas and conveying massages to the society were selected and studied. The products shown in Fig Nos. 3 and 4 can be discussed as follows.

Fig 3 – It is the photograph of a bullock-cart. In ancient times and till today, bullock-cart is being the only means of transportation and traveling from one region to another. It is used in transportation of paddy crops from the fields and other valuable goods. Till today, the transportation of bamboo culms in nos. of 50-100 and above from rural areas is done by this cart. Road transportation is the means of movement in rural areas. Signifying the value of bullock cart, the artisan designed this craft product by utilizing the different parts of Bambusa tulda, small iron rod and pieces of wood. The dimension recorded are given below:-

Total weight of the Cart & other creations = 1.2 kg.
Weight of the Cart alone = 1 kg.
Weight of the 2 bullock = 1.6 kg.
Total Length of the Car = 20 ¼ inches.
Height = 6 inches.
Breadth = 6 inches (back), 3 inches (front)
Weight of Father & Son on the Cart = 1.2 g.

Fig 4 – Shows the photograph of the product namely ‘THE HEAVEN’. The different features in the designated Craftwork includes- One Male posture, One Female posture, One Skeleton, One sitting boy, a pond with Lotus flowers and Fishes etc, very small Lady handbag, rose flower in the hand Syringes etc. All these miniatures are designed only from the cuttings of rhizome of Bambusa tulda.

No. of rhizome used = 4
Height of Male posture = 14 inches.
Height of Female posture = 13 ¼ inches.
Height of Skeleton = 13 ½ inches.
Total height of product including the based portion = 16 inches.
Length of the base plate form = 12 ¾ inches.

Breadth of the plate form = 8 ¾ inches.

Weight = 700 gm.

The total weight of the creations with base = 1.4 kg.

This product conveys the message that by injecting the heroine drugs, the life of the couples knew no bounds. But something in the form of Skeleton warns them to stop and think for the further danger in life. Seeing the odd characters of parents, the boy starts to lament and started to think about the origin, what, why and how etc. Sitting nearby pond with natural beauty but remain restless.

Regarding the different qualities of 3 different species of bamboos the artisans gave the following comparative comments –

<table>
<thead>
<tr>
<th>Quality</th>
<th>Melocanna bambusoides</th>
<th>Bambusa tulda</th>
<th>Dendrocalamus giganteus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lightness</td>
<td>Light</td>
<td>Heavy</td>
<td>Medium</td>
</tr>
<tr>
<td>2. Softness</td>
<td>Very soft</td>
<td>Hard</td>
<td>Hard</td>
</tr>
<tr>
<td>3. Colour</td>
<td>Light cream</td>
<td>Cream (dark)</td>
<td>Cream</td>
</tr>
<tr>
<td>4. Fibre content</td>
<td>Less</td>
<td>More</td>
<td>More</td>
</tr>
<tr>
<td>5. Size</td>
<td>Small</td>
<td>Large</td>
<td>Medium</td>
</tr>
<tr>
<td>6. Utility</td>
<td>Less</td>
<td>Highest</td>
<td>Medium</td>
</tr>
<tr>
<td>7. Insect Resistance</td>
<td>Less</td>
<td>Very high</td>
<td>High</td>
</tr>
<tr>
<td>8. Longevity</td>
<td>Less</td>
<td>More durable</td>
<td>Durable</td>
</tr>
</tbody>
</table>

From all the above studies made, it can be discussed that if there is proper technical input, the underground rhizomes will be widely applicable in cottage and village industries. It will surely help in uplifting the socio-economic condition of the rural poor.

The underground rhizomes of bamboo (Caespitose type) were mostly considered as waste materials. Mostly rhizomes are used as fire fuel and used to burn in the open air because of the release of heavy smokes. When completely dried and totally free from soil particles, the rhizomes can be utilized as the raw material for crafts. Craft products can be made from the rhizomes of Dendrocalamus species and Melocanna baccifera. But the rhizome size specially for Bambusa species are found to be of larger size than Dendrocalamus species and more convenient in utilization. The young rhizome growth at the time of vegetative propagation during rainy season of each year is harvested by the local people and used as food. Not only the fresh one but the fermented ones also tasty and delicious. The old rhizome stocks are good in fastening the soil particles and makes the soil less eroded by water. Bamboos are traditionally planted for fencing the boundaries of homelands, farm land etc. Bambosa tulda Roxb is clump forming bamboo with branches and hence used for plantation around the boundaries. The culms of these bamboo are used as poles in the construction of houses, splitted pieces for wall
fencing, roofing etc. In spite of these manifold uses, underground part are found to be cent per cent utilizable. The productivity of this bamboo, thus are many and has under application for human benefits.

Conclusion

Bamboos are the forest and non forest natural renewable resources of the North Eastern parts of India. Manipur is abundant with more than sixty (60) different species of bamboos. The hilly terrains and ranges of hills of different altitudes are the favourable natural habitat of bamboos. Since the time immemorial the people of North East India used bamboos for many purposes. People used bamboos in construction works, in fencing, in making musical instruments, in weaving, in waterways transportation, in making intervillage connectivity bridges, in crafts and also as food. Thus, bamboos help much in socio-economic up liftment of the region. People of this state are good artisans and craftsman. Every home is the work place of cottage industry. Hence handicraft is the encouraging area of cottage industry that can be anticipated and supported with technical inputs. The whole plant part of bamboos can be utilized in many ways thus becoming the highest economically potential plant of the region. People should protect the germplasm of different species of bamboos so as to make the sustainable utilization.
References


Singh, Dr. Tondon. Ophthalmologist surgeon, a skilled untrained artisan, a national Awardee owner of Tondon’s Crafts, Imphal, Manipur.

Fig.1 Rooting of Bambosa tulda
Fig. 2 Simple Tools used in Bamboo crafts
Fig. 3 An artistic bullock cart made up of bamboo and Rhizomes
Fig.4 The Heaven: Craft work related to HIV
Carbon Farming through Village Bamboos in Rural Landscape of Northeast India as Affected by Traditional Harvest Regimes

Arun Jyoti Nath* and Ashesh Kumar Das
Department of Ecology and Environmental Science, Assam University, Silchar, Assam, India

Abstract

Homegarden and bamboo grove in the rural landscape of Barak valley, northeast India are endowed with different bamboo species. Traditionally bamboo resources are utilised in household, craft and commercial sector. Two harvest regimes – selective harvest in homegarden and clear-felling harvest in bamboo grove could be identified based on the mode and season of felling. Smallholder farming systems throughout the world are believed to be a potential C sink to remove atmospheric CO$_2$ to compensate greenhouse gas emission. Village bamboos can be an important reservoir of C stock if managed judiciously. Biomass C stock in above ground vegetation of bamboo in homegarden varied from 7.60 to 10.76 Mg ha$^{-1}$ from 2003 to 2007. The corresponding value for bamboo grove was 6.93 to 40.58 Mg ha$^{-1}$. The rate of C accumulation in homegarden was 0.60-1.17 Mg ha$^{-1}$ yr$^{-1}$ with a mean of 0.79 Mg ha$^{-1}$ yr$^{-1}$. Mean rate of C accumulation in bamboo grove was 11.215 Mg ha$^{-1}$ yr$^{-1}$ from 2003 to 2006. Negative rate of biomass C accumulation was recognized in all the components in bamboo grove for the year 2006-2007. Subsequent to clear felling of bamboos from grove leaf, branch, culm and total biomass C loss for 2006-2007 were 1.378, 1.885, 32.781 and 36.044 Mg ha$^{-1}$ respectively. In homegarden under selective felling regime although the C stock and sequestration is low compared to bamboo grove and other agroforestry systems across the world, but nonetheless represents a permanent C stock as C export through harvesting of mature culms are balanced by C gain from new culms produced in the clump. Cost effective homegarden bamboo management as carbon farming is a feasible alternative to be considered under the CDM protocols. Furthermore, a shift in the utilization pattern of bamboos of bamboo grove from industrial utilization to craft sector through value addition and innovative marketing can make this land type a potential C sequestrating system.

Keywords: Homegarden, Bamboo grove, Management system, C sequestration, CDM protocol

Introduction

Homegardening is the oldest land use activity next only to shifting cultivation. It evolved through generations of gradual intensification of cropping in response to increasing human pressure and the corresponding shortage of arable lands (Kumar and Nair 2004). The rural lives in Assam are intricately linked with the bamboos of homegarden (Nath and Das 2008). Under traditional homegarden management system bamboo plantation development is the inherent ecological consistency of local farming practices. In homegardens, bamboo farmers
have developed the bamboo cultivation practices that make an optimal use of the soil for subsistence and commercial use. For practical purpose farmers have divided the homegarden system into different landforms depending on the suitability of the species for different land quality. Each land form varies by certain environmental factors and specific vegetation types. Mostly the farmers in these locations are subsistence-oriented and they maintain multistrata homegardens including trees, shrubs, and herbaceous plants. Bamboo is one of the more important components of the homegardens, which provides the villagers with a wide range of goods and services (Nath and Das 2008). Bamboos in the traditional homegardening system are grown at the poor land quality or degraded site of the holdings and are often managed in a separate zone or in the adjoining land parcels where bamboo is grown either in pure stands or mixed with dicot species like *Lagerstroemia*, *Bombax*, *Erythrina* and the like. The villagers manage these bamboo groves for commercial purposes whereas the homegarden bamboos are essentially for meeting the felt needs of the rural households (Nath et al. 2006). Due to its site specificity in the homegarden, bamboo builds up a complex interplay between soil and vegetation implying the prevalence of a different microclimate under bamboo canopy than the other parts of the homegarden.

Terrestrial ecosystems play an important role in global C cycle and biomass C from sustainably managed plantation may offer an opportunity to combat GHG emission in the atmosphere. C sequestration potential of bamboo in homegarden systems can be significant sinks of atmospheric C due to their fast growth and high productivity. Carbon management in vegetation through selective felling of bamboos as practiced in homegarden ensures minimal C export from the environment and further strengthens the ecological rationality of homegarden besides sustaining basic community needs. To mitigate the increasing concentration of GHGs in atmosphere cost effective methods for emission reduction has been emphasized. Finding low-cost methods to sequester carbon is emerging as a major international policy goal in the context of global climate change (Montagnini and Nair 2004). Role of agroforestry systems across the world has been prioritized in C sequestration while bamboos in particular remain unexplored. Bamboos form the imperative component of agrisilvicultural system of northeast India and have an important influence on the C balance of ecosystem through assimilating atmospheric CO₂. Bamboos have socio-economic and ecological values and its management can provide benefits on a local, national and global level through livelihood, economic and environmental security for many million of the rural people (Banik 2000; INBAR 2006). The International Panel on Climate Change has recommended a catalogue of remedial measures to mitigate increasing CO₂ emissions. Among these remedial measures, such as re-/ afforestation, the conversion of agricultural land into agrosilvicultural systems has also been included (IPCC 2001). We referred ‘carbon farming’ in the present paper as C storage in the vegetation of cultivated bamboo in rural landscape and its ability to sequesterate C under continuous yield and harvest. Furthermore, the sustainability of the C farming is measured from its permanency i.e. duration of retention of C in vegetation under villagers’ management system. Carbon farming through bamboos in rural landscape can meet the ecological and economic benefits to the rural life and also as an effective choice for climate change mitigation strategy. Only a few studies have demonstrated the potential of bamboos to function as carbon storage and carbon sinks (Isagi et al. 1997; Das and Chaturvedi 2006; Tian et al. 2007; Nath et al. 2008). Therefore, understanding of C storage and C sequestration potential of bamboos is crucial to evaluate the role of bamboo in rural landscape in environmental and economic sustainability. The paper combines the potential for small-holder carbon farming subject to traditional harvest regimes.
Methodology

Site selection

The present study was conducted in Irongmara and Dargakona village, in Cachar district of Barak Valley, Assam, northeast India and is situated between longitude 92°45’ East and latitude 24°41’ North. The study villages dates back from the British colonial rule and most of the inhabitant of villages are tea garden labourers. Socioeconomically the villagers are small-holders with paddy land as the major land use system and day labour as the primary occupation. Average number of people per family is 6.86 (range 2-20) with average number male 3.81(range 1-14) and female 3.06 (range 1-10). Community like Mala, Maal, and Pashi dominates the study villages.

Sampling strategy

Fifty homegardens were selected from the study site. Selection criteria for homegarden was its size (<1ha). Since majority of the homegarden owners were small-holders and large holders represents only a small fraction of the study village, sampling was done mostly for small-holders. 10 bamboo groves studied was the additional land use systems managed by the selected 50 homegarden owner. Therefore, the sampling size for homegarden was 50 and bamboo grove 10.

Climate

The climate of the study site is sub-tropical warm and humid with average annual rainfall of 2226 mm, most of which is received during the Southwest monsoon season (May to September). Southwest monsoon usually operates for a longer spell in the Northeastern region compared to the other parts of India. Average maximum and minimum temperatures were 30.5°C and 20.3°C respectively. The average relative humidity varied between 48 percent (January) to 97 percent (June).

Carbon content determination

Sub-samples of culm, branch and leaf from different culm ages for the three species were ground in a Wiley mill and analyzed for carbon content determination. A total of 50% of the ash free mass was calculated as the carbon (C) content. The ash content was determined by igniting 1 g of powdered litter sample at 550 °C for 6 hr in a muffle furnace (Allen 1989). The carbon storage in the different culm component was determined by multiplying the biomass with carbon content. Detailed of the biomass estimation is described in Nath et al. (2008). The total C storage in the above ground standing biomass was obtained by summing the C content values for leaf, branch and culm component and then expanded to hectare basis.
Result

**Traditional harvest regime of bamboo growers**

Two harvest regimes – selective harvest and clear-felling harvest could be identified on the mode and season of felling culms. Traditionally bamboo resources are utilised in household, craft and commercial sector. For household and craft sector selective felling is practised and for commercial sector clear-felling is practised. Selective felling is mainly practised in homegardens and clear-felling in bamboo groves. Under selective felling, the mature culms (>2 years) which constitute about 15-30 percent of the total culms per clump are harvested each year. Traditional bamboo growers prefer to harvest *B. cacharensis* under the selective felling system for its multipurpose household uses and *B. vulgaris* and *B. balcooa* under the clear-felling system for paper industry due to their higher green weight. Under the clear-felling system, 85-95 percent of the total culms per clump are harvested; leaving few current and one year old culms at a felling cycle of 5-6 yr. Clear-felling mode of harvest is practised both rainy and winter season. Bamboo growers prefer the clear-felling system during rainy season as the harvested culms are constructed into rafts and ferried through water to reduce the transportation cost. In the study villages 25 percent of the bamboo growers are involved in commercial utilization of bamboo resources and they resort to clear-felling. However, these growers also manage at least 3-5 bamboo clumps under the selective felling system for their household utilization.

**Growing stock of bamboos in homegarden and bamboo grove**

The detailed characteristic of homegarden and bamboo grove is provided in Table 1. In homegarden 53-55% of the total growing stock of bamboo is contributed by *B. cacharensis* followed by *B. vulgaris* (25-27%) and *B. balcooa* (16-18%). In bamboo grove *B. cacharensis* contributes 55-65% of total growing stock. The corresponding value for *B. vulgaris* was 20-24% and *B. balcooa* was 15-22%. Standing culm density for three species in homegarden and bamboo grove is depicted in Table 2.

**Biomass carbon stock in homegarden and bamboo grove**

Biomass C stock in homegarden ranged from 7.60 to 10.76 Mg ha$^{-1}$ from 2003 to 2007. The corresponding value for bamboo grove was 4.53 to 40.58 Mg ha$^{-1}$. Species wise comparison revealed *B. cacharensis* contributed 40-44% of the total C stock in homegarden. The corresponding figure for *B. vulgaris* and *B. balcooa* was 30-33% and 22-24%. In bamboo grove *B. cacharensis* contributed 50-56% of the total growing stock of C whereas *B. vulgaris* and *B. balcooa* contributed 25-26% and 18-23% respectively. Biomass C in different culm component for three bamboo species in homegarden and bamboo grove is depicted in Table 3. Total biomass C stock in different culm component in homegarden and bamboo grove was correlated with five year study period (Figure 1). Leaf, branch, culm and total biomass C increased over the study period in homegarden and the variables were strongly correlated ($R^2=0.9357-0.9705$). In bamboo grove leaf, branch, culm and total biomass C increased with study dates upto 2006 and then sharply declined in 2007. Development of correlation between biomass C stocks in different culm components with their respective time period over the study year revealed the existence of a weaker relationship ($R^2=0.0490-0.0555$).
**Rate of biomass carbon accumulation in homegarden and bamboo grove**

The rate of leaf biomass C accumulation in homegarden ranged from 0.017 to 0.089 Mg ha\(^{-1}\) yr\(^{-1}\). The corresponding rate of C accumulation in branch, culm and total biomass was 0.025 to 0.071, 0.391 to 1.018 and 0.432 to 1.178 Mg ha\(^{-1}\) yr\(^{-1}\) respectively (Figure 2). Comparison among the species showed rate of leaf biomass C accumulation was highest for *B. balcooa* (0.016 Mg ha\(^{-1}\) yr\(^{-1}\)) while branch (0.019 Mg ha\(^{-1}\) yr\(^{-1}\)), culm (0.295 Mg ha\(^{-1}\) yr\(^{-1}\)) and total (0.327 Mg ha\(^{-1}\) yr\(^{-1}\)) was highest for *B. cacharensis*. Negative rate of biomass C accumulation was recognized in all the components in bamboo grove for the year 2006-2007. The rate of leaf, branch, culm and total biomass C loss for 2006-2007 was 1.378, 1.885, 32.781 and 36.044 Mg ha\(^{-1}\) yr\(^{-1}\) respectively. The rate of loss of C for 2006-2007 in all the components was greater than the sum of the rate of C accumulation for all the components for the last three preceding year. The rate of loss of C was highest in *B. cacharensis* for all the components.

**Discussion**

Socioeconomically studied villagers are small-holders and they maintain bamboos in homegarden and bamboo grove to fulfill their diverse rural needs. Chandrashekara et al. (1997) reported the socio-economic and ecological aspects of developing bamboo resources in homesteads of Kerala, India. The traditional homegardens of the study site are rich in bamboo resources as also in the homegardens of elsewhere (Widjaja 1991). The traditional bamboo growers of the study site have prioritized three bamboo species viz. *B. cacharensis*, *B. vulgaris* and *B. balcooa* under 1 genus against 14 species under 5 genera from the rest of India (NMBA 2004). The major cause for development of bamboo cultivation practice in recent years is to fulfil the household and commercial needs from householder’s own holdings that otherwise was met from the forest resources which are gradually diminishing due to unsustainable harvest from increasing population pressure. During the study 4-9% of the farmers were found planting new bamboo offset every year to maintain long term sustainable production. Detailed discussion with these farmers, it was revealed that they do so thereby their future generation would get the benefit of this practice.

The consistent trend of increase in above ground C stock in homegarden might have resulted from the increase in culm density over the study period under the traditional management system. New culm production increased successively over the years and therefore the increase in culm density. The farmers in the study area fell less number of culms per clump than it produce new culms annually and that also contributed in increase in the culm density in homegarden. Standing culm density and C stock in bamboo grove is much higher than homegarden but former is constrained by huge quantity of C loss from the stand following clear felling strategy of harvest that followed at 5-6 yr cycle. Moreover, clear felled bamboos are subject to commercial utilization viz. paper industry and thereby diminishing the scope of sink measure of atmospheric CO\(_2\). Since the culm density of bamboo in homegarden is progressively consistent, C stock in them is increasingly stable. Estimated C stock of 4.87 and 14.62 Mg ha\(^{-1}\) in agricultural and agrihorticulture agroforestry systems in terai zone of India has been reported (Koul and Panwar 2008). C stock in agroforestry practices has been estimated as 9, 21, 50, and 63 Mg C ha\(^{-1}\) in semiarid, subhumid, humid, and temperate regions (Montagnini and Nair 2004). Biomass C stock ranged from 0.7 to 54.0 Mg C ha\(^{-1}\) in traditional and improved agroforestry systems in the West African Sahel.
Since bamboo is one of the components in multistrata mixed species homegardening system, bamboo farming system in homegarden had relatively smaller C stock than other agroforestry systems. Moreover, in comparison to other tree species bamboo is relatively low biomass plant that conversely reduces its ability to store more C. In bamboo the C sequestration potential is determined by the new culms produced annually. In homegarden under farmers’ management system new culms are restricted from felling and hence almost all C sequestered through it can be assumed as a net gain, that further demonstrates the small-holder bamboo farming systems can sequestrate C while also fulfilling basic rural needs from harvesting mature culms. Harvest of products, particularly in single-objective plantations, has a negative impact on the system’s C stock and raises concerns of ‘permanence’ (Roshetko et al. 2007) and the problem holds same in long term C storage for the farmers’ deliberate management system of clear felling of bamboo clumps for commercial purposes as observed in bamboo groves. In homegarden under selective felling system although the C stock is low, but represents a permanent C stock as C export through harvesting of mature culms are balanced by C gain from new culms produced in the clump. Long rotation systems such as agroforests and homegardens can sequester sizeable quantities of C in plant biomass and in long-lasting wood products (Albrecht and Kandji 2003) besides having other secondary environmental benefits (Pandey 2002) and important role in reclamation of marginal, sloping agricultural land and degraded land through bamboo plantation (Mertens et al. 2008). Lower C/N ratio in bamboo soil compared to pasture soil signifies higher availability of soil nutrients in the former (Tian et al. 2007) further strengthens the role of bamboo in soil reclamation. For smallholder agroforestry systems in the tropics, potential C sequestration rates range from 1.5 to 3.5 Mg C ha\(^{-1}\) yr\(^{-1}\) (Montagnini Nair 2004). C sequestration at abandoned agricultural land and degraded forest land sites in Central Himalayan region was 1.79-3.13 Mg ha\(^{-1}\) (Maikhuri et al. 2000). Although the amount of C sequestered is less in bamboo farming system of homegarden than any other agroforestry system, bamboo also meet the felt needs of rural household other than providing the villagers with wide range of economic and environmental services. Therefore, potentiality of homegarden bamboo offers a feasible alternative for rural land use management as Tian et al. (2007) emphasized benefits of bamboo in land use conversion from their study from Montane Ecuador.

Carbon farming through bamboos in homegarden can contribute towards a strategy for sustainable development than bamboo grove even though the later is characterized by greater standing stock of C and higher rate of C sequestration. Consistent standing stock of C in homegarden bamboo management may provide small-holder farmer an option of selling carbon credits under climate change agreement. However the study does not include the accounting of C sequestration. In 2005, the concentration of atmospheric CO\(_2\) reached nearly 380 ppm, an increase of ~35% above the preindustrial concentration (Houghton 2007). In December 2003, the 9th Conference of the Parties to the UNFCCC resolved to include small-scale forestry as an eligible activity under the Clean Development Mechanism (CDM) of the Kyoto Protocol. Carbon farming through bamboos in homegarden is cost effective in terms of carbon sequestered can be considered under the CDM protocols. Furthermore, a shift in utilization pattern of bamboos of bamboo grove from industrial utilization to craft sector through value addition and innovative marketing can make this land type a potential C sequestrating system. We also emphasize the need of the harvest protocol for village bamboos from government level for promotion of sustainable utilization of these village resources.
Acknowledgement

This work was supported by research grant from the G.B. Pant Institute of Himalayan Environment and Development, Almora sponsored project.
References


INBAR. 2006. The partnership for a better world - strategy to the year 2015. Beijing, China.


Table 1. Homegarden and bamboo groove in Irongmara and Dargakona village, Assam, northeast India

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Homegarden</th>
<th>Bamboo groove</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (ha)</td>
<td>0.28 (0.07-1.5)</td>
<td>0.45 (0.13-1.2)</td>
</tr>
<tr>
<td>No. of clumps</td>
<td>7 (2-27)</td>
<td>25 (14-96)</td>
</tr>
<tr>
<td>Harvest regime</td>
<td>Selective felling</td>
<td>Clear felling</td>
</tr>
<tr>
<td>Management system</td>
<td>Harvesting through out the year with higher intensity in winter season</td>
<td>Harvesting mainly in the rainy season</td>
</tr>
<tr>
<td>Management purpose</td>
<td>Household requirement, fencing, crafting</td>
<td>Selling in paper industry</td>
</tr>
</tbody>
</table>
Table 2. Culm density in homegarden and bamboo grove (No. ha$^{-1}$) in Irongmarla and Dargakona village, Assam, northeast India

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>$B. cacharensis$</th>
<th>$B. vulgaris$</th>
<th>$B. balcooa$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>820±48</td>
<td>455±39*</td>
<td>228±24</td>
<td>137±23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>735±45**</td>
<td>230±30</td>
<td>180±28</td>
</tr>
<tr>
<td></td>
<td>1145±46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>874±58</td>
<td>487±43</td>
<td>235±26</td>
<td>152±23</td>
</tr>
<tr>
<td></td>
<td>2145±48</td>
<td></td>
<td>485±21</td>
<td>340±27</td>
</tr>
<tr>
<td>2005</td>
<td>925±74</td>
<td>510±65</td>
<td>248±30</td>
<td>167±21</td>
</tr>
<tr>
<td></td>
<td>3295±76</td>
<td></td>
<td>743±35</td>
<td>567±40</td>
</tr>
<tr>
<td>2006</td>
<td>1062±68</td>
<td>598±41</td>
<td>278±31</td>
<td>186±20</td>
</tr>
<tr>
<td></td>
<td>5277±65</td>
<td></td>
<td>1142±38</td>
<td>985±37</td>
</tr>
<tr>
<td>2007</td>
<td>1160±62</td>
<td>642±45</td>
<td>306±27</td>
<td>212±21</td>
</tr>
<tr>
<td></td>
<td>1030±28</td>
<td></td>
<td>245±20</td>
<td>225±19</td>
</tr>
</tbody>
</table>

*homegarden **bamboo grove; values are Mean±S.E.
Table 3. Biomass C stock (Mg ha-1) in different culm component in (a) homegarden and (b) bamboo grove (Mg ha-1) in Irongmara and Dargakona village, Assam, northeast India

<table>
<thead>
<tr>
<th>Year</th>
<th>B. cacharensis</th>
<th>B. vulgaris</th>
<th>B. balcooa</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leaf</td>
<td>Branch</td>
<td>Culm</td>
<td>Total</td>
</tr>
<tr>
<td>2003</td>
<td>0.11</td>
<td>0.15</td>
<td>3.09</td>
<td>3.34*</td>
</tr>
<tr>
<td></td>
<td>0.11</td>
<td>0.20</td>
<td>3.57</td>
<td>3.88*</td>
</tr>
<tr>
<td>2004</td>
<td>0.12</td>
<td>0.17</td>
<td>3.28</td>
<td>3.56</td>
</tr>
<tr>
<td></td>
<td>0.31</td>
<td>0.44</td>
<td>7.82</td>
<td>8.57</td>
</tr>
<tr>
<td>2005</td>
<td>0.12</td>
<td>0.18</td>
<td>3.43</td>
<td>3.73</td>
</tr>
<tr>
<td></td>
<td>0.48</td>
<td>0.69</td>
<td>11.60</td>
<td>12.77</td>
</tr>
<tr>
<td>2006</td>
<td>0.15</td>
<td>0.21</td>
<td>3.98</td>
<td>4.34</td>
</tr>
<tr>
<td></td>
<td>0.79</td>
<td>1.12</td>
<td>18.51</td>
<td>20.42</td>
</tr>
<tr>
<td>2007</td>
<td>0.16</td>
<td>0.22</td>
<td>4.26</td>
<td>4.65</td>
</tr>
<tr>
<td></td>
<td>0.08</td>
<td>0.13</td>
<td>2.10</td>
<td>2.30</td>
</tr>
</tbody>
</table>
Bamboo - the Emerging Tool for Forest Management and Community Development in Assam, Northeast India

Authors: Sonali Ghosh¹, G.C.Basumatary², Rajendra P. Agarwalla³
¹DFO, Social Forestry Division, Kokrajhar, Assam, India
²Council Head of Department, Forests BTC Assam, India
³State Mission Director, National Bamboo Mission-Assam, India

Abstract

Legal moratorium on forestry practices including timber harvesting operations since 1996 has significantly impacted the revenue earnings of the forest rich states in northeast India. Alternatives to timber operations therefore need to be initiated urgently to bridge the gap between supply and demand and also to give a boost to forest based economies. While conservation policies imply that forest land availability for providing timber alternatives is limited to degraded forest areas, Bamboo which is abundantly available in the region has tremendous potential for its economic benefits and also for its low impact on biodiversity loss. A paradigm shift in forest management policy and the subsequent implementation of Joint forest management in Assam since 2000 has also left much to be desired in terms of long term sustainability by providing a sound economic base. While JFM has achieved success in mainland India, there have been a few apprehensions about its implementation in northeast India where the issue of land ownership and natural resource use are historically much more complex and inter-related. This paper examines the advantages of bamboo plantations carried out through forest development agencies in Assam and the road ahead.

Introduction

The state of Assam is situated in northeastern India between latitudes 24⁰44’ N to 27⁰45’ N and longitudes 89⁰41’ E to 96⁰02’E. The geographical area of Assam is 78,438 sq. km. (2.39% of the country) and it is the largest of the seven northeastern states. The state is blessed with fertile lands and suitable climate ideal for flora and fauna. The state primarily has an agrarian economy with 87% of the state’s population dependant on agriculture and allied activities while the dependency on forests and natural resources is also part of the socio-cultural milieu. Forest makes a significant contribution to the direct income to the households. The Tribal population and other households belonging to the most vulnerable section of the society derive a substantial part of their income directly from forest based economic activities. Preservation of Assam’s forests in good health and vigor is extremely important from the point of view of these people.

Assam has a total of 26,748 Sq. Km. of recorded forest area, i.e., 3.2% of the country’s forests cover. Percentage of forest cover to total geographical area of Assam is 24.58% (SFR, 2005). The major forest types of Assam are Tropical Wet Evergreen, Tropical Semi-Evergreen, Tropical Moist Deciduous, Sub-Tropical Broad Leaved Hill,
Sub-Tropical Pine, Littoral and Swamp Forests. The physiographic, climate and inaccessibility had contributed the richness of vegetation in Assam.

The forests of Assam have been legally classified in three parts namely Reserve Forests, Protected Forests (National Parks & Sanctuaries) and Unclassified State Forests. There are 312 no. of Reserve forests in Assam with a total area of 13,870 Sq. Km. (17.68% of state geographical area). There are 25 nos. of Protected Areas with an area of 3,925 Sq. Km. (5% of state geographical area). Apart from that 5,865 Sq. Km. area is under Unclassified State Forests and 3,103 Sq. Km. area is under Proposed Reserved Forests (145 nos.) category.

**Bamboo resources in the state**

Bamboos have gained considerable importance in the socio-economic life of people in Assam for the variety of uses they cater to. About 34 per cent (8213 sq km) of Assam’s total forest area is under bamboo. Over 42 species of bamboo have been recorded from the state and like the other states in northeast India, bamboo is entwined with the social, cultural and economic aspects of different communities in Assam (Anon, 2002). Some of the species such as Bhulka (*Bambusa balcooa*), Kako (*Dendrocalamus hamiltonii*) and Jati (*Bambusa tulda*) are most commonly available in forest areas and are of immense economic importance. Bamboo is also cultivated widely in Assam and most of the villagers have at least 1-2 bamboo clumps in his homestead to meet the household demands. Besides bamboo, the forest products of the state include tree-borne oilseeds, leaves of Sal for leaf plate making, hill-brooms, seeds and roots of medicinal and a wide variety of other non-timber forest products that contribute substantially to the income of the communities living in and around the forest areas of the state.

**Bamboo potential in the state**

Bamboo products provide promising linkage between the organised and unorganised sectors, between household activity and organised industry; edible bamboo shoots, processed for the market represent another promising area of economic activity. The Bamboo and Cane policy for Assam government has also been formulated in 2005 with an aim to encourage, promote support the development of the bamboo sector in a comprehensive manner through a multidisciplinary, multi-department and multi-dimensional integrated approach to provide economic benefits to the people of the state. The thrust areas of the policy have been on:

- Manufacture of value added products and applications such as wood and plywood substitutes, composite material, charcoal, activated carbon and energy.
- Low cost and earthquake resistant housing and constructional applications
- Processed edible bamboo shoot
- Craft and small enterprise
- Regeneration and conservation within and outside forest areas
- Capacity building and skill up-gradation and training
- Awareness
Market analysis and support

**Reasons for promoting bamboo through community forestry**

The decline in the availability of timber and the emergence of new technologies and product options has spurred interest in the field of wood substitutes and composites. Conservation oriented forest management practices including a moratorium on commercial felling are currently in vogue in India, therefore the main economic role of forests largely relates to the non-timber contributions. Recent studies carried out indicate the total yield potential for the state is around 7,57,263.31 (Metric Tonnes Air Dried) MTAD per annum (NEPPM, 2008). This yield represents annually 12.5% of the total harvestable bamboo growing stock. While the overwhelming industrial use of bamboo is still for pulp and paper. The paper mills in the state have an installed capacity of 8,00,000 MTAD per annum. This means that there is an annual shortfall of about 4,2737 MTAD alone in case it is used for the paper industry. Bamboo also supports a number of traditional cottage industries including production of handicrafts, incense sticks and related articles. This further adds on the demand for bamboo and therefore can be addressed only by taking up more bamboo plantations. Within forest areas, bamboo does not often occur in pure patches and also suffers from poor management, low productivity and over-exploitation. At present the yield of bamboo from plantation areas range between 3-4 tonnes / ha which means that an area of atleast 15000 ha will be required additionally to meet the current demands. The yield can also be further improved to 18-20 tonnes/ ha through use of quality planting material of select species and their intensive management (Fig 1), (Fig 2).

**Community forestry and advantages of bamboo over tree plantation in JFMC areas**

The Peoples’ participation in forest management in Assam is quite old but formally and legally started during 1998 with framing of the Assam Joint (Peoples’ Participation) Forestry Management Rules, 1998 and constitution of Forest Development Agency in the year 2002-03. There are 28 Forest Development Agencies (FDA) in Assam under National Afforestation Programme with over 700 J.F.M.Cs at present functioning under them. Out of these J.F.M.Cs, 90 are in forest villages and remaining 460 are in revenue villages. Till now more than 3,21,103 population and 57,341 households have been economically benefitted through the constitution of the JFMCs and a total plantation area of more than 30030 ha has already been achieved (SFR Assam, 2007).

While the forest fringe villagers have heartily welcomed the paradigm shift in management policy and the inclusion of community participation in the management of forests, there is a wide gap between the current supply and demand needs for timber and fuelwood needs that need to be bridged urgently to prevent any further degradation. The plantation taken up through JFMC has ensured any further encroachment of forest land however, the quality of plantation and survival percentage is definitely a cause of concern. Bamboo with its fast growing ability and multiple use characteristics can therefore help in mitigating this gap to a large extent.
Advantages of bamboo over tree plantation in Assam

- Bamboo is a fast growing, sturdy and versatile species that can be harvested between 4-5 years whereas tree species such as Teak (*Tectona grandis*) and Gamari (*Gmelina arborea*) take at least 30 years before they can be harvested. The JFM schemes are normally funded for 3-4 years and therefore do not assist in management of tree species till their maturity. The loss of economic incentive and a long gestation period for harvesting of produce can therefore result in loss of interest and negligence in the part of JFMC members. Bamboo on the other hand is harvestable during the project period and therefore continues to give the economic impetus for community management of forests.

- There are more than 42 species of bamboo that are recorded from Assam and each has their known economic uses with a market readily available at village level for primary processing. Bamboo is also socially more accepted and preferred by villagers as they are well aware about the multiple use of each.

- JFM was initially started with the concept of ‘Janata Fencing’ which means that the plantation will not be provided with any permanent fencing; instead the JFMC members shall be protecting the plantation on their own. However, it has been observed that grazing is one of the serious causes of concern for plantation and therefore fencing of semi-permanent nature is a must in the initial three years. The bamboo mission guidelines provide for three strand barbed wire fencing and this has helped the JFMC members to prevent any grazing in the plantation site.

Conclusion

Bamboo can be the best solution for implementing participatory schemes and also for targeting degraded forest areas. It acts as a barrier to prevent any further land encroachment and also provides quick economic incentives that convince the local people to be involved and participate in government funded schemes. It is therefore best suited for augmenting the forest revenue and implementing community forestry and JFM in the state.

References


Fig 1: Percentage outturn of different forest produce including bamboo from Reserved Forest Areas of Assam (2005-06) (Source: Assam Forest Department Annual Report)

Fig 2: Comparative chart of Revenue generated from Timber and Minor forest produce (including bamboo) in Assam since 1997-2006 (Source: Assam Forest Department Annual Report)
Vanishing Trade of Bamboo:  
A Case study of Traditional Artisans of Uttarakhand

Manju Sundriyal and R.C. Sundriyal  
G. B. Pant Institute of Himalayan Environment and Development  
Kosi-Katarmal, Almora, Uttarakhand, India

Abstract

Indian state Uttarakhand has a long tradition of using bamboo for making diverse utility items that are traded in villages. There are 5 genera and 8 species of bamboo in the state. *Arundinaria falcata* and *Thamnocalamus spathiflora, T. falconeri* and *Chemnobambusa jaunsarensis* are popularly called as ‘Ringal’ which are thin reed like bamboo that grow in mid and high hill areas, while four are of thick bamboo species (viz. *Dendrocalamus strictus, D. somdevii*, *Dendrocalamus patellaris* and *Bambusa bamboos*). A total of 62 bamboo and ringal items have been identified that are made from different bamboo species, which comprise large variety of baskets, mats, toys instruments, and other utility items for daily household needs. Socio-economically bamboo artisans are poor and they come from lower strata of the society, and lack land and other resources. The indigenous knowledge about the use of bamboo species is disappearing from younger generation due to low profit and lack of marketing avenues. Moreover because there was high exploitation of bamboo in past, the natural resource status is dwindling fast. Considering the regional and global markets of bamboo and the indigenous knowledge of local community, it is emphasized that value addition in products, a market oriented approach and capacity building of the craftsmen will help in improving the socioeconomic status of the community along with conservation of bamboo species.

Introduction

Bamboo is the fastest growing plant on the earth and characterized by woody, mostly hollow culms with internodes and branches at the culms nodes. India is the second richest country in terms of Bamboo genetic diversity with a total of 136 species under 75 genera (Rai et al. 1998, Biswas 2004). The country has over 8.96 million hectares area underneath bamboo that forms 12.8% of the total forest cover (Anonymous 2005a). Bamboo plays an important role in the livelihood of rural and tribal people and has been intimately associated with mankind since ancient time (Ram and Tondon 1997). However, the social situation of bamboo workers is quite bad as they are at the bottom of social hierarchy. The total number of cane, bamboo and basket weavers in 1981 was 8.2 lakhs, out of which 6.9 are in the rural areas (Saxena 2004). These families have the expertise and skills of processing bamboo, and make hats, baskets, and other utility items, however they are not able to get the full price for their labour because of various reasons (Sundriyal et al. 2002).
The Planning Commission has launched a National Mission on Bamboo Technology and Trade Development (NMBTTD) with a focus to adopt a holistic and integrated approach for using bamboo as an important vehicle for development of the country. It is, therefore strongly desirable to generate baseline data on resource status and socio-economic condition of bamboo artisans so that suitable strategies are developed for resource management and conservation as well as uplifting the status of bamboo-artisans. This study focuses on assuring bamboo based trade in the state and its role in the household subsistence economy, traditional uses, knowledge and management of bamboo and major trade challenges that the trade is facing.

Materials and methods

Uttarakhand is a newly formed state of India which is predominantly a hilly region with 53,483 sq km land area with an elevation between 300 to 7800 m asl. Administratively the state is divisible in 13 districts. The individual land holdings in the state is generally small (<1 ha), and such farmers need income diversification. Bamboo is found in Siwalik forests at low hill areas. At mid-hills, bamboo species are found in wastelands under individual ownership is small patches comprising 2-5 clumps. At high hills, only ringal-bamboo species are found that grow as middle forest strata in reserve or van-panchayat forests. Based on the large number of bamboo artisans, four districts of Uttarakhand (viz. Almora, Nainital, Bageshwar and Uttarkashi) were identified for the purpose of this investigation. Documentation of the community indigenous knowledge system (IKS) on bamboo artifact was done through standard questionnaire surveys and formal-informal interviews with the local people. Selection of the districts and villages were made with the help of discussion with the experts, NGOs, BFDB and other resource persons. Detailed information were gathered with reference to species used, areas and mode of collection, quantity of raw material used for different products, design used and finishing of the product, and mode of selling of the product. The cost-benefit analysis was done using all cost involved in material purchase, labour in collection, processing and product making and net sold prices for different items. The species used by the communities were collected and a herbarium was made. These species were subsequently identified with the help of experts and flora available with the Botanical Survey of India and Forest Research Institute, Dehradun. Value addition of the products and capacity building of the artisans was done by organizing two training programmes. Data on bamboo harvest and revenue generated was collected from Forest Corporation, Dehradun.

Results

1. Bamboo uses, trade and consumption

The bamboo is used in all 13 districts of Uttarakhand state. The gross commercial bamboo standing stock is estimated at 45,000 m$^3$ from the total growing area of 1394 km$^2$ for the state of Uttarakhand. Bamboo in the state is categorized into two groups, the bamboo and the ringal-bamboo. The four ringal species are Drepanostachyum falcatum, Himalayacalamus falconeri, Thamnocalamus spathiflorus, and Thamnocalamus jaunsarensis. Ringal species grow at mid and high hills mainly in temperate areas between 1500-3500 m elevations in Uttarakhand. Mostly ringal is used in making baskets, mats, toys, umbrella, agricultural tools and fish rod. Leaves of ringal and bamboo are considered good fodder as well.
Bamboo is thick, long and slender like plant. The most bamboo species are Dendrocalamus strictus, D. somdevii, Dendrocalamus patellaris and Bambusa bambos that grows between 300-1500 m elevation above sea level and cover 15,620 ha area. These species are mainly used for making diverse household items though in recent times also used in paper industry. In recent times, a large number of species are also planted in Civil Soyam and Van-panchayat forests for meeting pulp and other commercial needs. The bamboo-artisans are called ‘baruries’ while ringal-artisans as ‘rudias’. Based on the survey of traditional bamboo artisans/craftsman in 20 villages revealed that communities make a total of 62 items which comprised large variety of baskets, mats, toys, instruments, and other utility items. Most of these items are used for daily household needs. Selected families are totally dependent on selling of bamboo items. Despite of a huge knowledge base on making articles, only 14 items were recorded sold to the villages (Table 1).

<table>
<thead>
<tr>
<th>Items</th>
<th>Local name</th>
<th>Market cost</th>
<th>Local use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big basket</td>
<td>Tokri (Big)</td>
<td>45-50</td>
<td>Used for collection of fodder (grass, leaves) and for carrying manure in agricultural field</td>
</tr>
<tr>
<td>Winnowing tray</td>
<td>Supa</td>
<td>30.0</td>
<td>For winnowing food grains</td>
</tr>
<tr>
<td>Small basket</td>
<td>Dalia (small)</td>
<td>40-45</td>
<td>Childrens use for carrying Chirpine leaves, woods and manure</td>
</tr>
<tr>
<td>Big basket with handle</td>
<td>Kandi (Big)</td>
<td>40-50</td>
<td>For storage of vegetables</td>
</tr>
<tr>
<td>Small basket with handle</td>
<td>Kandi (small)</td>
<td>25-30</td>
<td>Used in marriage ceremony for puri and curd</td>
</tr>
<tr>
<td>Round basket</td>
<td>Chapri</td>
<td>25-30</td>
<td>For chapatti and for selling Butter and Khoya</td>
</tr>
<tr>
<td>Small round basket</td>
<td>Chapri ((small)</td>
<td>20-25</td>
<td>For sowing harela</td>
</tr>
<tr>
<td>Food grain storage basket</td>
<td>Topra</td>
<td>130-150</td>
<td>For storage of food grains</td>
</tr>
<tr>
<td>Round basket for sleeping small baby</td>
<td>Choura (Jhuger)</td>
<td>160-175</td>
<td>For sleeping of newly born baby</td>
</tr>
<tr>
<td>Carrying basket</td>
<td>Doka</td>
<td>125</td>
<td>For carrying grass and fodder</td>
</tr>
<tr>
<td>Carrying basket</td>
<td>Solta</td>
<td>100.0</td>
<td>, ,</td>
</tr>
<tr>
<td>Mat</td>
<td>Moste or Bishal</td>
<td>700-800</td>
<td>For drying and cleaning of rice</td>
</tr>
<tr>
<td>Hat</td>
<td>Topi</td>
<td>100.0</td>
<td>To cover head</td>
</tr>
<tr>
<td>Round umbrella</td>
<td>Chatura</td>
<td>200.0</td>
<td>Used in god pray and offer to god.</td>
</tr>
</tbody>
</table>
Most of the artisans live at mid and high hills, however bamboo is harvested from community land and ringal from forest areas. Local artisans travel long distances in search of harvesting adequate quantities of ringal. The entire trade is labour intensive from material procurement to processing to marketing. High labour requirement and dwindling raw material status are causing much pressure on the artisans to switch over to other seasonal labor for immediate cash. The bamboo is available in plenty in low hill forests that are under the control of Forest Department, who collects and auction it through selected depots. Unfortunately such material is not accessible and procured by artisans because of poor socioeconomic condition. The artisan required low volume of raw material in the form of green bamboo, which comes from a few bamboo growers in the villages. The artisans procure clumps from owners on a fixed price. Of late the artisans/craftsmen are facing the problem of availability of raw material; therefore prices of bamboo culms have registered substantial increase. The conservation status of most bamboo species was also discouraging, which indicates likely vulnerable trade. An analysis of total village level consumption of bamboo articles revealed that nearly 600-3000 bamboo/ringal articles are used per village depending upon the size of the village (Fig. 1).

![Village level use of bamboo articles](image)

**Fig. 1. Village level use of bamboo articles for selected items in Uttarakhand state, India**
Dalia (basket for carrying leaves, grain, and fodder) is used in maximum quantity (150-950/annum) followed by Supa (Winnowing tray for grains) (150-750/annum), Tokri (80-450/annum) (basket for carrying manure and grass), and Chapri (basket for keeping chapati) (80-450/annum).

2. Socio-economic status of artisans

An analysis of net income of bamboo artisans reveals that the overall socio-economic status is very poor, which mostly comprised highly marginalized families. Baruries live at low and mid hills whereas Rudias live at high hill areas. These communities sell bamboo-articles to villagers to earn their livelihoods. Such communities lack land and other resources for their livelihood, therefore dependent on this trade for centuries, which is run at subsistence level. A large number of such traders live in remote villages, unfortunately most of them are not in position to take the benefit of the government run schemes. In a study of 20 villages in present investigation the status of all the bamboo-artisans families (100%) was recorded as below poverty line schedule caste (BPL-SC). In case of ringal, however, 75% families were BPL (SC) while remaining 15% were APL families. Most articles are made for domestic use they are big in size and do not carry commercial values. The articles are sold either direct to rural folks either in cash or on bartered or made on order. Sometimes the items are sold in small towns but purchased by rural people only. Most artisans had >50 years of age and only few from younger generation, which showed that the later category is not interested in this tradition.

3. Management of bamboo resource

The major constraints of the bamboo-trade are that it is now restricted to remote village areas and highly marginalized communities of Baruries and Rudias are practicing it that have low socio-economic profile in the society. Despite of good skill for processing of bamboo, these communities do not own the resource and therefore dependent on others for raw materials. The artisans were not skilled for plantation of bamboo and they generally purchase the raw material from private growers. Ringal artisans collect the raw material from forests. Management of bamboo is also poor in villages. Usually bamboo clumps are found in open and wastelands areas, where they are not protected from grazing which affects growth of new shoots.

The study clearly depicts that the bamboo-trade is labour intensive and products are made in low volume that are sold in low prices, thus the trade is highly subsistence. As the cost of raw material is increasing day by day the communities are looking for the alternate source of income. Such a situation asks for more concerted efforts for survival of these communities. The traditional enterprise is home-based and consumption of the product occurs within village or walking distances or to a town that is just a bus ride away or in festivals in nearby areas. The benefit of government run schemes often do not yield positive results because of various reasons including lack of awareness, and organizational and risk taking capacities.

4. Value addition of the local products

In view of the depleting status of the bamboo in the state, it was utmost importance to use other materials with bamboo and ringal so that the quantity of raw material could be saved during product making. Therefore, an approach that promotes conservation of bamboo resource and increase income of artisans was adopted. A market survey was made to select products of common requirement, e.g. baskets (of different shapes & sizes),
flower pot, lamp shade, dust bin, hand bag, foot mat and other utility items were selected. Capacity of the artisans was developed through trainings for making such products and use other materials such as rope, fiber and cloth with bamboo and ringal. The trainings demonstrated that the approach significantly reduced use of raw materials and its cost, and also give better appearance and finishing to the products. The items were small in sizes, comprised local designs and cost-effective (Table 2). The trainings effectively demonstrated that the raw material could be saved by 40-60%, while income can be increased by 75-150%.

Table 2. Quantity of ringal-bamboo used for making articles, preparation time and selling cost of traditional and new products made in the training

<table>
<thead>
<tr>
<th>Products</th>
<th>Traditional products</th>
<th>New products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity of ringal (culms)</td>
<td>Preparation time</td>
</tr>
<tr>
<td>Big basket</td>
<td>50</td>
<td>4-6 hrs</td>
</tr>
<tr>
<td>Dala</td>
<td>30</td>
<td>3-5 hrs</td>
</tr>
<tr>
<td>Supa</td>
<td>10</td>
<td>2-3 hrs</td>
</tr>
<tr>
<td>Chatai (mat)</td>
<td>80</td>
<td>15-25 hrs</td>
</tr>
</tbody>
</table>

5. Bamboo harvest and revenue in the state

It is also worthwhile to have an assessment of the commercial bamboo harvesting in the state of Uttarakhand. The bamboo rich forests are located in the low-hills only. The State Forest Corporation is responsible for quantum of bamboo harvests and its auction. The commercial felling was started in 1987-88 in the region. Maximum felling and revenue was generated in 1987-90, the bamboo harvest declined subsequently that clearly shows lack of proper felling cycle and reduced the culms density of bamboos (Fig. 2).
Discussion

A detailed investigation of the resource status and socio-economic conditions of the artisans clearly showed that the bamboo trade is highly subsistence in the state that desired immediate attention. There is need to save this trade through proper strategies by the Govt. by which coming time would be more useful.

The product range is limited to various types of baskets for storing and carrying household items, and some other utility items. These articles are big in size with rough finish and sharp edges, poor in strength, non-uniform in texture and shape, and low in durability. A discussion with the baruree and rudia communities reveled that they demand for some advocacy for the trade along with building their skills for new products. Besides ensuring resource availability to the artisans, another major problem of the trade is increasing community linkages with the market. An important challenge is to mainstreaming the remotely located artisans who have resource but they are not aware of market demands, therefore trade is done in villages only. Value addition and resource conservation are required at equal footing for the bamboo-sector development. Market linkages, credits and transportation of finished goods are need to be planned and demonstrated to the craftsmen. There should be a common facility centre where artisan could sell there products. If artisans’ knowledge and experience could be upgraded for making new products, they are linked with markets and organized to form cooperatives, and benefit of government run schemes are extended to them, perhaps the low-status of these highly marginalized communities could be improved substantially. Artisans in remote areas cannot be left merely on training basis. They should get appropriate helps through NGO and SHG, and cooperative networks who can take responsibilities of marketing of their products. At present all artisans are above 50 years, which highlights the
need to motivate younger generations by associating them with appropriate schemes. If vast bamboo resource of the region could be developed scientifically, it would generate enough employment opportunities for the artisans, entrepreneurs and farmers of the state, which can revolutionize the socio-economic status of the rural people of Uttarakhand state.

Acknowledgements

The author is thankful to, Director, G. B. Pant Institute of Himalayan Environment and Development for providing facilities. Financial support from the Department of Science and Technology under women scientist scholarship scheme (Ref. No.- SSD/SS/024/2004) and CSIR, Senior Research Associateship (Pool scheme) (Ref. No.- 13(8231-A)/2008-Pool), New Delhi is acknowledged.

References

Bamboo Development in the Philippines: BambooPhil Strategies

Conrado S. Perreras, Dexter E. Quintana and Celso B. Lantican

1The authors are Chairman, Treasurer and President, respectively, Bamboo Network of the Philippines

Abstract

The paper discusses the different strategies that the Bamboo Network of the Philippines is employing to promote the widespread planting of bamboo and to strengthen the country’s bamboo industries. Presented in the paper are the following programs/projects: (1) Bamboo for People and the Environment, (2) Multipurpose Training Lab, (3) Bamboo Techno-Digest, (4) Adopt-A-Bamboo Project, (5) In-house newsletter, (6) Coffee Table Book on Philippine Bamboos, and (7) Database Development.

Introduction

The Bamboo Network of the Philippines, or BambooPhil, for short, was born in April, 2008 when a small group of bamboo scientists and advocates got together and decided to form an NGO that will work for the widespread planting of bamboo and the development of the country’s bamboo industries. The group felt strongly that a nationwide campaign for the planting of bamboo has to be undertaken for a number of important reasons:

- The current bamboo resource base of the Philippines is very small. It is only 53,000 hectares which accounts for only 0.18% of the country’s total land area.
- The natural stands of bamboo in the Philippines (34,000 out of the 53,000 hectares) no longer serve as sources of raw materials for manufacturers of different kinds of products because most of them are poorly stocked because of unabated illegal cutting.
- Existing bamboo plantations (about 19,000 hectares), are grossly inadequate to provide the raw material requirements of the country’s bamboo industries, which in 2003 was estimated to be around 50 million poles per year. Broadening the country’s bamboo resource base would ensure the industries of sustained raw material supply. The development of the industries would result in expanded employment and increased export of bamboo products.
- Deforestation has devastated the country’s forest resources, resulting in the acute shortage of wood for many types of wood products. Because bamboo can be used as a substitute raw material for many wood products and because bamboo is fast growing, its widespread planting can help alleviate the shortage while also reducing population pressure on the residual forest stands.
- It would greatly help reduce erosion, landslides and flooding and at the same time help in sequestering carbon dioxide from the air.

In a recent paper, Lantican and Perreras (2008) estimated that (1) at least 167,000 hectares of bamboo plantations would be needed to meet the country’s annual demand for poles for furniture and handicrafts, construction and fishpens, propping for fruit trees and others and (2) at least 5% of the country’s degraded forest lands (or about 400,000 hectares) should be planted to bamboo for environmental purposes, i.e. reforestation of poorly stocked watersheds, erosion- and landslide-prone mountainsides, riverbanks and grassland areas that are difficult to reforest with trees. The figures for future needed plantings concur with those mentioned in a recent publication by Midmore (2009).

During the organizational meeting, the group agreed that forming a national network on bamboo would help:

- Promote the complementation of activities among various groups rather than competition to avoid costly duplication of efforts and minimizing wastage of scarce resources.
- Facilitate the exchange of information, knowledge, materials and experiences for the mutual advantage of all concerned.
- Enhance the packaging and dissemination of technologies to intended beneficiaries.
- Facilitate the development of an effective training program to enhance manpower capacity in the production and utilization of bamboo
- Hasten the development of bamboo plantations and industries in the country.

**Objectives of BambooPhil**

Adopting the dictum of “harnessing the best of bamboo science and technology for people and the environment”, BambooPhil is committed to pursue several objectives:

1. Carry out a nationwide advocacy program promoting the use of bamboo for reforestation, plantation development and environmental protection.
2. Develop a database system which shall serve as an electronic repository of all known information about bamboo in the Philippines and other tropical countries.
3. Package and disseminate bamboo technologies generated by research agencies/institutions in the Philippines and other countries.
4. Design, develop and organize training courses to improve the skills of bamboo growers and processors in the Philippines.
5. Provide expert services to local government units (LGUs), peoples’ organizations (POs), NGOs and entrepreneurs requiring technical assistance on bamboo production and utilization.
The Bamboo for People and the Environment (BPE) Program

The BPE program is the current flagship program of BambooPhil. It was conceived to achieve three principal objectives:

1. Promote the planting of bamboo in idle, unproductive, understocked and erosion and landslide prone lands in all provinces of the country.
2. Build the capacity of local government units (provincial and municipal) to raise bamboo sustainably within their respective areas of jurisdiction.
3. Improve the skills of technicians and workers involved in bamboo processing.

Implementation Strategy

BambooPhil’s implementation strategy for the BPE program is to follow a province by province or cluster of provinces approach, enjoining as many municipal governments in each province or cluster of provinces to participate in the program (please see conceptual framework shown in Figure 1).

There are several reasons why BambooPhil is focusing on LGUs in the implementation of the program. Apart from the fact that every Filipino citizen resides in a place that is within the political jurisdiction of a local government unit, LGUs:

- Have the authority to decide whether planting bamboo would be in the best interest of their constituents.
- Have direct access and contacts with village leaders and owners of lands that can be developed into bamboo farms and plantations.
- Have agriculture and environment officers who, given the proper training, can actively participate in the execution of some project activities, particularly the training of constituents in the establishment and management of bamboo farms and plantations.

Moreover, it is generally easier for farmers to approach LGUs for help than government departments or bureaus.

For every province, BambooPhil plans to designate a partner to help coordinate the program activities within the province. The partner could be another NGO, an institution or an agency involved in bamboo development activities.

Although the program is only a few months old several provincial governments have already signified their interest to participate in the program.

Bamboo Planting Promotion

The BPE program promotes the planting of bamboo in provinces and municipalities in a number of ways:

1. Holding informal meetings with governors, mayors and other LGU officials.
2. Producing posters, stickers and brochures featuring the many benefits that can be derived from bamboo.

3. Establishing at least one nursery per province to supply the bamboo planting needs of different municipalities.

4. Putting up two or more bamboo demonstration farms in each province

5. Establishing linkages with the print and broadcast media and other NGOs

6. Organizing provincial bamboo expositions

7. Creating a website on bamboo

8. Encouraging governors to organize provincial bamboo development councils.

**Capacity Building**

One very important component of the BPE program is the capacity building component, which aims to improve the knowledge and skills of:

- Agriculture and environment officers of each municipality in bamboo propagation, plantation development, harvesting, marketing and bambusetum development.

- Technicians and workers of enterprises engaged in the manufacture of different kinds of bamboo products in primary processing, seasoning, preservation, gluing and machine care and maintenance.

**Other Components**

In addition to bamboo promotion and capacity building, BPE has 3 other important components:

- Establishment of at least one nursery in each province which shall serve as the province’s source of planting materials for its various municipalities.

- Setting up of two or more demonstration farms within each province. Such demonstration farms are expected to help increase people’s interest in planting bamboo.

- Development of a bambusetum in each province that wants to have one. The purpose of the bambusetum component is to educate the general public about different species of bamboo. The bambusetum would be an object of educational trips because people would be able to learn many things about bamboo identification, propagation and uses. Many Mayors in the province of Iloilo signified their interest in putting up a bambusetum in their municipalities because they realize that this could help enhance ecotourism which would provide their municipalities additional income.
**Funding scheme**

BambooPhil doesn’t have funds to implement the BPE program on its own. Some governors of provinces who have been approached, however, have indicated their willingness to raise the funds for specific components of BPE that they would like to implement in their respective provinces. The Governor of the province of Pampanga, for example, has secured the approval of the Provincial Board to earmark several million pesos for the implementation of the program in the province. BambooPhil anticipates that governors of other provinces would follow the Pampanga governor’s example.

**Multipurpose Training Lab**

Because BambooPhil foresees that it will be heavily involved in training, it has started to establish a training lab in a 1-hectare piece of land owned by its president. The lab, when completed, will consist of a nursery, a small bambusetum or orchard and a processing mill.

The nursery will serve as a facility for (1) demonstrating various techniques of vegetative propagation and (2) showcasing structures, equipment, tools and supplies and materials needed for the care and management of a nursery.

The small bambusetum, which shall be made up of different species of bamboo being grown in the Philippines, will be used to train participants in bamboo identification and silvicultural practices such as weeding, fertilization, branch clearing and culm harvesting. At present, BambooPhil has more than 20 species planted in the orchard.

The purpose of the processing mill is to train participants in primary processing, seasoning, preservation, gluing and finishing, etc. Because BambooPhil is still raising funds for the mill, it is temporarily using a privately-owned mill for the purpose.

**Bamboo Techno-Digest Project**

The Bamboo Techno-Digest (BTD) is a quarterly publication being put up by BambooPhil as a vehicle to disseminate technologies generated by researchers in the Philippines and abroad. As the name implies, the publication would contain digests of research outputs that are usually highly technical in content and difficult for laymen to understand. Articles in the Digest shall be written in popular style so that they will be easy to read and understand.

The first issue of BTD is expected to come out at the end of the second quarter of 2009. If BambooPhil succeeds in obtaining sufficient funds, the BTD will be printed on folded 8.5 x 17-inch sheets; if it fails the initial issue shall be in electronic form.
“Adopt-A-Bamboo” Project (ABP)

BambooPhil recently came up with a strategy that will lead to the establishment of bamboo groves in different municipalities with the support of people and organizations who wish to help improve the environment in the countryside. The strategy involves soliciting financial contributions from individuals, commercial establishments and NGOs to support the planting of bamboo in different localities. For every donation of 100 pesos (or US$2.00), BambooPhil shall plant 1 propagule in the name of the donor in designated areas for planting.

To make sure that the idea will work, BambooPhil members have been going around talking to municipal mayors to designate specific areas in their respective municipalities that can be used for planting. One mayor has responded very enthusiastically to the ABP and has in fact verbally committed a 10-hectare area in his municipality for the project.

Other Noteworthy Projects of BambooPhil

In-House Newsletter

Called BambooPhil UPDATE, the newsletter which comes out on a quarterly basis is BambooPhil’s way of keeping its members informed about what’s happening at the network headquarters and what its Board and Officers are doing. The 4-page newsletter written in PDF format is sent out to all members by email.

Coffee Table Book on Philippine Bamboos

This project is still waiting for somebody to fund. The idea is to prepare a pictorial cyclopedia of Philippine bamboos, highlighting their botanical characteristics, properties and uses. The project was actually prepared in response to a call for proposals from an NGO but the NGO has not taken action on it yet.

Database Development

The design of the database has been completed and data entry began when BambooPhil received a donation of a desktop computer from a businessman who is a bamboo advocate.

Concluding Statements

Although BambooPhil is just a year old, it has succeeded in formulating projects that have aroused the interest of government officials, businessmen and environmentalists in bamboo development. Businessmen in particular, because they believe in the cause being espoused by BambooPhil, have wholeheartedly donated many kinds of equipment to the network. We’re greatly inspired by the support we’re getting and we promise we’ll continue working hard to achieve the network objectives.
Reference


Figure 1. Conceptual framework of the BPE program.
About ITC Ltd (www.itcpotal.com)

ITC Ltd is one of India's foremost private sector companies with a market capitalisation of nearly US $ 19 billion* and a turnover of over US $ 5.1 Billion. ITC is rated among the World's Best Big Companies, Asia's 'Fab 50' and the World's Most Reputable Companies by Forbes magazine, among India's Most Respected Companies by BusinessWorld and among India's Most Valuable Companies by Business Today. ITC ranks among India's '10 Most Valuable (Company) Brands', in a study conducted by Brand Finance and published by the Economic Times. ITC also ranks among Asia's 50 best performing companies compiled by Business Week.

ITC has a diversified presence in Cigarettes, Hotels, Paperboards & Specialty Papers, Packaging, Agri-Business, Packaged Foods & Confectionery, Information Technology, Branded Apparel, Personal Care, Stationery, Safety Matches, Incense sticks and other FMCG products. While ITC is an outstanding market leader in its traditional businesses of Cigarettes, Hotels, Paperboards, Packaging and Agri-Exports, it is rapidly gaining market share even in its nascent businesses of Packaged Foods & Confectionery, Branded Apparel, Personal Care, Incense and Stationery.

About ITC’s Incense Business

Manufacturing of incense sticks is done by hand rolling Process process. The size of the industry is about Rs.1800 crore (USD 360 mn) per annum. There are various brands and labels available in the highly fragmented industry in India. Incense sticks are manufactured in several parts of India and distributed thro the wholesale channel. Brand Building activities are seldom carried out There are no BIS Standards for quality in this category.

ITC Ltd commenced marketing Mangaldeep Incense sticks in 2005. Mangaldeep today is the second largest National Incense Brand in India, over 225 million sticks are sold every month.

Periodic Brand building activities like mass media advertising, product sampling, Trade promotions are done.
Before commencing the manufacturing, the usage and attitude study along with complete analysis of best selling competitive brands was done. Post this exercise, set of specifications for Incense as well as packing was evolved by the Business. In addition to this, fragrance was selected based on Consumer Panel Tests.

Mangaldeep Incense sticks are sourced currently from Ten Small Scale/Cottage vendors across the Country.

In the last two years, Seven vendors out of the total Ten have received ISO 9001 – 2000 Certification. This achievement is for the first time in India.

One Vendor has also received the ISO 14001-2004 certification.

The above exercise was initiated by ITC and was enthusiastically followed up by the Vendors. This initiative has helped in standardizing the systems and procedures across Vendors.

Cottage industries, Unit of Sri Aurobindo Ashram, Pondicherry, India, our vendor for Mangaldeep Incense sticks, has been accredited with IFAT certification (Fair trade organization).

The Business conducts quarterly quality audits across all Vendor points and presents the comparative scores to the vendors announcing the “Quality Champion”. This has proved to be a good motivation point. The SBU has also introduced an in-process quality monitoring software which enables timely feedback and helps in quick corrective action.

As a part of helping the Small Scale Industries to follow the best practices in terms of safety and other statutory requirements, continuous feedback is given to the vendors.
Raw Incense (unperfumed) is a principle raw material for the process. ITC Managers impart training to NGOs and SHGs like Seva Munger, N-Logue Mayiladuthurai, etc.. They continuously supply raw Incense sticks to our vendors. This programe is called “ASHA” (Assistance in Social Habilitation thro Agarbattis)

The business works with the rural artisans in Andhra Pradesh and Tripura to help produce good quality bamboo sticks, which is used for Incense sticks.

MOU with EXIM Bank of India signed in 2006 to help in exports of ITC’s incense sticks manufactured by Small Scale Industries.

This Unique model of Marketing Incense sticks manufactured by Small Scale Industries has benefited the Bamboo stick and Incense producers focus on their core competencies (manufacturing) and insulating them from varying and tough market conditions.

**ITC’s Incense business is providing livelihood for over 8000 people in India through its association with the small scale and cottage sector**
Bamboo Handicraft Industry in Kerala State of India: Problems and Prospects

P.K. Muraleedharan, V. Anitha, P. Rugmini
Kerala Forest Research Institute, Peechi-Thrissur, Kerala, India

Abstract

Bamboo-based handicraft production in Kerala state of India is carried out both in the traditional and non-traditional sectors. In the traditional sector, production of mats and baskets is the major activity undertaken by traditional workers. The non-traditional sector mainly involves the production of other handicraft products which are produced by traditional and non-traditional workers. The bamboo handicraft industry in both the sectors is faced with a number of problems. Due to a variety of reasons traditional sources of supply of raw materials are declining. Institutional support for its development is inadequate. The potential of bamboo handicrafts has not been properly tapped; for instance export of some of these items to other countries and proper marketing within the country have not received adequate attention. Intermediaries still play an important role in the industry which often hinders its progress. Profitability in the manufacturing of handicraft products is very low due to a variety of reasons like low production rate and high cost of manufacturing. Technological progress is inadequate because of structural and financial constraints. The technical and financial capabilities of the new generation artisans to meet challenges in the industry in the context of globalization are limited. Unemployment and exploitation of labour in the industry are rampant. All these affect the livelihood of the bamboo workers. However, the improvement of their livelihood depends upon the development of this industry which calls for actions from government or appropriate agencies. The paper attempts to highlight some of the problems and prospects of the bamboo handicraft industry in Kerala.

Introduction

The co-existence of modern and traditional handcrafted production is one of the major features of Indian industrial scene. According to International Trade Centre (1999) handcrafted items are artisans’ products which are produced by artisans, either completely by hand or with the help of tools or even by mechanical means. However, the most substantial component of the finished products is the direct manual contribution of the artisans. The special nature of artisans’ products is attributable to their distinctive features which make them ‘utilitarian, aesthetic, artistic, creative, culturally attached, decorative, functional, traditional, religiously and socially symbolic and significant’. Most of the above features can be applied to bamboo handicraft production in Kerala State of India.

Kerala is wedged between the Arabian Sea and the Western Ghats. Lying between north latitudes 8°18' and 12°48' and east longitudes 74°52' and 72°22', it constitutes an area of 38863 sq. km, spreading over 14 districts.
with a population of 31.83 million. Kerala is one of the major diversity centres of bamboo in the country, where bamboo is available both from forests and homesteads (Muraleedharan et al. 2008). Viewed in a historical perspective, Kerala has remained as a land of crafts and rich craft heritage. Among different crafts, bamboo based handicraft production is one of the oldest. It plays an important role in the state’s economic development because of its labour intensive technology and employment potential. For instance, in Kerala, it is estimated that about 300,000 people, most of whom belonging to socially and economically weaker sections of the society, depend on bamboo for their livelihood (Nair and Muraleedharan, 1983). Interestingly, the majority of them are engaged in the handicraft production.

Bamboo-based handicraft production in Kerala is carried out both in the traditional and non-traditional sectors. In the traditional sector, production of mats and baskets is the major activity undertaken by traditional artisans/workers (Kavaras). Further, it largely remains a household industry. The non-traditional sector involves mainly the production of other handicraft products which are produced by traditional and non-traditional artisans/workers (members of all castes). In general the handicraft industry produces both premium as well as household utility products. One important feature of bamboo handicraft industry is that it employs a large number of people particularly women belonging to socially and economically weaker sections of the society. At present, the potential of bamboo handicraft sector is not adequately tapped because of a number of problems. The traditional sources of raw materials are dwindling due to shrinkage of forest areas and lack of cultivation of bamboo in homestead. The intermediaries play an important role in marketing and poor management makes the problem worse. The artisans lack capability to face new challenges of producing new products with new designs with low cost. The future of the handicraft industry depends on the resolution of these problems which requires policy and intuitional interventions among others. The paper attempts to delineate the major problems of bamboo handicraft industry, policy changes and the type and nature of intervention required for its development.

**Methodology**

The artisans of the traditional bamboo based production are workers of the Kerala State Bamboo Corporation Ltd., a government organization, which was established in 1971. Its main objectives are, to develop and promote industries based on bamboo, reed, cane and rattan, to undertake manufacture and trading of those products, and provide financial, technical, marketing or any other assistance and guidance among others. Traditional bamboo based production is largely spread over central Kerala. In order to study the problems of this sector, data were collected from 100 randomly selected households located in central Kerala.

The non-traditional bamboo handicraft sector in Kerala produces products such as table mats, bamboo curtain, flower baskets, bottle cover, furniture, notepads, among others. Survey method was used to collect data. The survey was conducted during 2005-06. There were 39 non-traditional bamboo handicraft units in Kerala and socioeconomic data covering profitability, cost of production, marketing and livelihood conditions of the workers were collected from all the units.
Bamboo Based Production in Traditional Sector

The traditional weaving community rely on their manual labour for all bamboo related activities. The traditional weavers have their own products such as *Kotta* (basket), *Muram* (Sifts) and *Panambu* (large mats), among others. Production is a time consuming laborious activity needing a lot of physical strength. Production is also a seasonal activity in the rural areas when there is a high seasonal demand for bamboo baskets and the like (mats, baskets). But due to the high cost of production and low price of the products the community remains backward and underpaid even during the peak period. The marketing condition of the workers of Bamboo Corporation is slightly better as they are able to sell their products to the Corporation. In the case of other workers in the traditional sector, once the products are ready they are usually stacked up for sale. These finished products cater to only local demand and are carried by head loads to distant markets (local) or to individual households for sale. A market analysis of the bamboo products highlights that the opportunity cost is greater than the earned benefit and the community is underpaid even during the peak period of sales (Table 1).

<table>
<thead>
<tr>
<th>Production stages</th>
<th>Earned benefit</th>
<th>Required labour days</th>
<th>Foregone benefit (in Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection</td>
<td>2-3 poles (30-35 slices)</td>
<td>5.5</td>
<td>275</td>
</tr>
<tr>
<td>Processing</td>
<td>390-396 slivers</td>
<td>12</td>
<td>600</td>
</tr>
<tr>
<td>Production</td>
<td>40 small baskets</td>
<td>4</td>
<td>200</td>
</tr>
<tr>
<td>Marketing</td>
<td>40 small baskets</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>Rs. 736</td>
<td>22.5</td>
<td>1125</td>
</tr>
</tbody>
</table>

*Primary data estimates*

Size and Ownership Pattern of Units in Non-traditional Sector

According to National Council of Applied Economic Research Surveys (NCAER) (1999; 2002), average number of artisans per production unit (average size of unit) was 2.37 in the rattan and bamboo sector. However, our survey indicated the average number to be 5 in bamboo handicraft units, excluding trainees and other part-time workers (the low size of the unit in NCAER surveys is due to the inclusion of rattan units as they generally fewer workers compared to bamboo units). If we include the latter categories of workers also, the average size of unit in handicraft sector increases to 15.65 (since many units employed trainees who constituted cheap labour, a means of increasing profit). About 80 per cent of the units were owned by individual proprietors and the rest were partnership units.
About 80 per cent units had their own land and building. A few units had machinery also. Fixed and working capital, two constituents of productive capital, employed per unit amounted to Rs 200,000 and 75,000 (1 USD = Rs. 45) respectively. The stock of raw material was found to be very low, amounting to Rs. 20,000. Cost of land accounted for 60 per cent of the fixed capital and building and machinery shared the rest. It was reported that borrowing both from the organized and unorganized sectors, was the major source of investment, accounting for 65 per cent of the productive capital. The investment-employment ratio was estimated as Rs 17,187, indicating that with low investment, this sector could generate more employment.

**Profitability of Selected Bamboo Handicraft Items**

The non-traditional sector produced a number of products at varying quantity based on demand and marketability. The profitability of four handicraft items, viz., bamboo curtain, table mat, lamp shade and oval basket is given in Table 2.
Table 2. Estimation of cost of production of selected handicraft products

<table>
<thead>
<tr>
<th></th>
<th>Bamboo curtain</th>
<th>Table mat</th>
<th>Lamp shade</th>
<th>Oval basket</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount (Rs)</td>
<td>Total</td>
<td>Amount (Rs)</td>
<td>Total</td>
</tr>
<tr>
<td>Direct cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw material (bamboo)</td>
<td>11.00 (36.70)</td>
<td>82500.00</td>
<td>3.00 (56.60)</td>
<td>52500.00</td>
</tr>
<tr>
<td>Chemicals</td>
<td>1.00 (3.34)</td>
<td>7500.00</td>
<td>0.25 (4.72)</td>
<td>4375.00</td>
</tr>
<tr>
<td>Dyes</td>
<td>2.16 (7.20)</td>
<td>16200.00</td>
<td>0.50 (9.43)</td>
<td>8750.00</td>
</tr>
<tr>
<td>Wages</td>
<td>13.00 (43.38)</td>
<td>97500.00</td>
<td>1.30 (24.53)</td>
<td>22750.00</td>
</tr>
<tr>
<td>Direct consumables used in the production process</td>
<td>2.50 (8.34)</td>
<td>18750.00</td>
<td>0.25 (4.72)</td>
<td>4375.00</td>
</tr>
<tr>
<td>Rentals</td>
<td>0.23 (0.77)</td>
<td>1725</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Indirect costs (allocated costs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilities (electricity, water, etc.)</td>
<td>0.08 (0.27)</td>
<td>600</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cost of production</td>
<td>29.97 (100)</td>
<td>224775.00</td>
<td>5.3 (100)</td>
<td>92750.00</td>
</tr>
<tr>
<td>Gross profit margin</td>
<td>5.03</td>
<td>37725.00</td>
<td>1.70</td>
<td>29750.00</td>
</tr>
<tr>
<td>Selling cost</td>
<td>35.00</td>
<td>262500.00</td>
<td>7.00</td>
<td>122500.00</td>
</tr>
</tbody>
</table>

USD1=Rs. 45
Values in parentheses are percentages
The cost of production of 0.09 m² (1 ft²) of bamboo curtain worked out to be Rs. 30 and selling price was Rs. 35. In the case of table mat, lamp shade and oval basket, the cost of production per unit worked out to Rs. 5.3, Rs. 80 and Rs. 27 and the selling prices to Rs. 7, Rs. 90 and Rs. 30 respectively. This indicates that production of handicraft items is profitable and the profit varies from product to product; for instance, the profit margin of bamboo curtain is 14 per cent, table mat 24 per cent, lamp shade 11 per cent and oval basket 10 per cent. Among the four items, table mat earned more profit mainly because the production units got orders both from within and outside the State. On the contrary, the bamboo curtain was less profitable as most of the production units were located along the National Highway and thus faced severe competition. Further, wages paid in the production of curtain were also very high; on an average, a worker got Rs. 325 per day and 15-20 days work per month (Table 2). There was only limited demand for lamp shade and oval basket that restricted earning higher profit.

The raw material cost and wages are the two major items of cost, accounting for 80 per cent. It was reported that there had been cost escalation during the last five years in the sector, accounting for 60 per cent. But the selling price increased by only 35 per cent during this period, resulting in low surplus generation. Further, payment of interest on borrowed capital also made the investment in this sector less attractive.

**Cost and Value Addition Ratios**

The value addition (value of production-cost of materials), cost ratio (cost of production as per cent of value of production) and value addition ratio (value added as per cent of value of production) for the handicraft sector are worked out (Table 3). The cost and value addition ratios of bamboo handicraft amounted to 84 and 16 per cent respectively. The cost ratio worked out for the handicraft sector was found to be very high probably due to higher paid-out cost for raw materials, interest, among others. Further, the value addition ratio estimated for the sector constituted only 16 per cent which is unfavourable for the growth of the industry. In other words, the value addition or surplus generation by manufacturing of bamboo handicrafts was very low in Kerala. This conclusion coincides with that of NCAER surveys carried out during 1999 and 2002 (Subrhamanian, 2004).
### Table 3. Production, cost and returns of selected handicraft products

<table>
<thead>
<tr>
<th></th>
<th>Bamboo curtain</th>
<th>Table mat</th>
<th>Lamp shade</th>
<th>Oval basket</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sq.ft (0.09 m²) produced per day</strong></td>
<td>375</td>
<td>875</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td><strong>Monthly production quantity</strong></td>
<td>7500</td>
<td>17500</td>
<td>100</td>
<td>400</td>
</tr>
<tr>
<td><strong>Cost of production/unit</strong></td>
<td>29.97</td>
<td>5.30</td>
<td>80</td>
<td>27</td>
</tr>
<tr>
<td><strong>Cost of production/month</strong></td>
<td>224775</td>
<td>92750</td>
<td>8000</td>
<td>10800</td>
</tr>
<tr>
<td><strong>Profit margin/product</strong></td>
<td>5.03</td>
<td>1.70</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td><strong>Selling rate (at the first point of sale at the production unit)</strong></td>
<td>35</td>
<td>7</td>
<td>90</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total sales value</strong></td>
<td>262500</td>
<td>122500</td>
<td>9000</td>
<td>12000</td>
</tr>
<tr>
<td><strong>Gross profit</strong></td>
<td>37725</td>
<td>29750</td>
<td>1000</td>
<td>1200</td>
</tr>
<tr>
<td><strong>Wages earned/person/day</strong></td>
<td>325</td>
<td>45.50</td>
<td>25</td>
<td>36</td>
</tr>
<tr>
<td><strong>Wages earned/month/person</strong></td>
<td>6500</td>
<td>910</td>
<td>500</td>
<td>720</td>
</tr>
</tbody>
</table>

**Production technology**

Primitive technology developed locally was used for the production of mats. Processing involved cutting of bamboo culms into short lengths, splitting, slivering, and weaving. The traditional tools used for these processes were bill hook and knives. In the handicraft sector also, the production was mostly labour intensive using primitive technology. There are several reasons for poor development of technology in this sector; the most important being scarcity of capital as this is carried out by socially and economically weaker sectors in the society.

Since the mid-1990’s, some bamboo handicraft units in the State have started using modern technology such as circular saw, planer, sanding machine, drilling machine, hacksaw, knife, hand drill and file. Handicrafts, over the last few years, have transformed their utility from mere decorative items to articles of daily use. It is thus the primary need of any seller to constantly update, develop and add his product profile (Anonymous, 2006). One of the problems in the production of bamboo products in Kerala is the lack of quality and homogeneity due to low mechanization. Keeping this in view, the Industrial Design Centre of Indian Institute of Technology, Bombay designed about 30 tools, aiming to produce ‘new generation craft products’ which could compete with plastic products (IDC, 2001). There is potential to use more machines in bamboo handicraft units to produce new generation products to meet the growing demand of modern societies.

One of the arguments against mechanization is that it is not acceptable from an employment point of view as this industry is considered as an avenue for providing employment in labour surplus economy (Jayasankar, 2004). This may be true in the case of mat and basket production in the traditional sector, but not in the case of handicraft production in the non-traditional sector. In the context of globalization, demand for products, to a
great extent, depends on their quality which can be achieved only through use of appropriate technology. This will not only reduce the cost of production but also boost up the demand and consequently, the profit.

The details on average product-wise cost of production, sale value, production time per unit, number of labour involved and tools used are presented in Table 4.

**Table 4. Product range, cost of production, time, labour and tools used in a bamboo handicrafts unit**

<table>
<thead>
<tr>
<th>Type of product</th>
<th>Cost of production and sale value (in Rs)</th>
<th>Production time/per unit</th>
<th>Labour involved</th>
<th>Tools used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost</td>
<td>Sales</td>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>Pen</td>
<td>27</td>
<td>35</td>
<td>90 min</td>
<td>1</td>
</tr>
<tr>
<td>Lamp shade</td>
<td>180</td>
<td>250</td>
<td>8-10 h</td>
<td>1</td>
</tr>
<tr>
<td>Pen cup</td>
<td>6</td>
<td>15</td>
<td>25 min</td>
<td>1</td>
</tr>
<tr>
<td>Puttu maker</td>
<td>25</td>
<td>40-50</td>
<td>30 min</td>
<td>1</td>
</tr>
<tr>
<td>Flower vase</td>
<td>20</td>
<td>28-30</td>
<td>1 h</td>
<td>1</td>
</tr>
<tr>
<td>Hair clip</td>
<td>6</td>
<td>10</td>
<td>30 min</td>
<td>1</td>
</tr>
<tr>
<td>Whistle</td>
<td>3.5</td>
<td>5-10</td>
<td>20 min</td>
<td>1</td>
</tr>
<tr>
<td>Wall hangings</td>
<td>70</td>
<td>100</td>
<td>90 min</td>
<td>1</td>
</tr>
<tr>
<td>Note pad</td>
<td>80</td>
<td>100-120</td>
<td>4 h</td>
<td>1</td>
</tr>
<tr>
<td>Bottles</td>
<td>120</td>
<td>180-200</td>
<td>8 h</td>
<td>1</td>
</tr>
<tr>
<td>Measures</td>
<td>10</td>
<td>15-20</td>
<td>90 min</td>
<td>1</td>
</tr>
<tr>
<td>Curtains</td>
<td>20</td>
<td>25-30</td>
<td>30 min (per 0.09 m²)</td>
<td>1</td>
</tr>
</tbody>
</table>

It is to be noted that most of the items shown in Table 4 can be made with the help of tools/machines. In other words, there should be proper mixing of labour and appropriate technology to produce quality handicraft products. An attempt was made to compare the number of workers and profit margins in units which use modern tools as against units which use traditional technology. For instance, it is reported that units which used looms in curtain making received about 30 per cent more profit than that of non-users, mainly due to improved quality of the products. At the same time, average number of workers employed by both the units was found to be more or less the same, indicating that use of appropriate tools does not replace labour in handicraft sector.
Market Imperfection and Consumer’s Surplus

The bamboo products of the bamboo artisans are yet to reach the larger markets and attract national as well global attention. The market features of these products (Box 1) made by artisans are not so encouraging and this calls for strategic initiatives for their improvement. Although bamboo is a natural, strong fibre, having aesthetic looks and the products are environment-friendly, the production rate is low and the cost of manufacturing is high. Competition with products such as plastics and other substitutes pose a severe threat. The utility of bamboo and plastic products are identical but there exists price difference between the two (Table 5).

Box 1. Market features of bamboo products of traditional bamboo artisans

- Seasonal demand
- Availability of large number of substitutes
- Small number of buyers & large number of producers
- High market price volatility among the sellers and markets
- Competitive market with buyers dominance
- Direct marketing with no advertisement
- Poor bargaining power
- Lower price elasticity of demand
- High transaction cost

Table 5. Bamboo products and their substitutes

<table>
<thead>
<tr>
<th>Market name</th>
<th>Plastic / Rubber</th>
<th>Bamboo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Price$^1$</td>
<td>Duration$^2$</td>
</tr>
<tr>
<td></td>
<td>(P$_p$)</td>
<td>(D$_p$)</td>
</tr>
<tr>
<td>Sift</td>
<td>65</td>
<td>2</td>
</tr>
<tr>
<td>Basket</td>
<td>40</td>
<td>2</td>
</tr>
</tbody>
</table>

$^1$Price in rupees, $^2$duration in years, and $^3$Relative Price ($R_p$)=$P_b$ [D$_p$ / D$_b$]

The market price and durability of a single unit of plastic product is higher than that of a single unit of bamboo product. However, the relative price reveals that the total economic cost over bamboo product is higher than that of plastic product for the same utility. In other words, the consumer surplus in case of the plastic product is higher than that of bamboo products, thus people prefer plastic products to bamboo without considering the social and environmental cost.

The demand curve of two bamboo products and their corresponding plastic substitute products is derived from the primary data collected from the sellers and the consumers of these products. The price elasticity of bamboo basket is equal to that of plastic basket (Table 6) while for sifting, the price elasticity of bamboo sifting is higher than that of plastic sifting. People prefer plastic to bamboo products because the consumer surplus of plastic product is higher than that of bamboo. Imposing a green tax equivalent to the difference in the consumer surplus of these
products will help to induce the substitution of environmental hazardous plastic products by the environment-friendly bamboo products to some extent. Since the price elasticity of the bamboo products is higher than one, the demand for the product is elastic in nature, thus the price is an important determinant factor in the market demand of these products. Thus, for making the sector more competitive adequate attention should be given to reduce the price and increase the quality of the products.

Table 6. Price elasticity of bamboo/plastic products

<table>
<thead>
<tr>
<th>Products</th>
<th>Consumer Surplus</th>
<th>Price Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bamboo basket</td>
<td>4.7</td>
<td>2.35</td>
</tr>
<tr>
<td>Plastic basket</td>
<td>5.7</td>
<td>2.35</td>
</tr>
<tr>
<td>Bamboo sift</td>
<td>3.3</td>
<td>2.95</td>
</tr>
<tr>
<td>Plastic sift</td>
<td>10</td>
<td>2.53</td>
</tr>
</tbody>
</table>

Towards an action plan

In spite of the immense opportunities and strengths, their inherent weaknesses and apparent threats do not permit adequate development of this sector. There are ample opportunities and with immense potential for product and technology diversity, and it is a good and cheaper substitute for wood. The strategy should be long-term market development process. Product-education and market development are essential to enhance the image of bamboo products as well as bringing a change in the mindset of the end-users. Technological, pricing, marketing and institutional constraints of the industry must be mitigated/minimised through some conventional actions. In addition, the implementation of the following non-conventional actions may also help to improve the condition of the industry.

i) Developing a Sustainable Livelihoods Framework for Bamboo Workers through Organization and Training

The livelihood security of the bamboo workers can be enhanced and improved through increased accessibility to raw material and market, employment opportunity, skill development and adequate sustainable institutional support. In order to ensure sustainable livelihood to bamboo workers, we have to break the diminishing circular flow of development by organizing the sector and production activities. The people may be organised through Self Help Groups (SHG), Non-Governmental Organization (NGOs), private sector and local bodies and provided with training and credit. The training imparted should be on the use of capital-intensive techniques of production which will bring about product diversification, division of labour and large-scale production. They can then enjoy various types of economies of scale like reduced raw material cost and increased efficiency. Thereby they can expand their market beyond the local level and generate higher income.

The livelihood potential of this sector will automatically increase, leading to further improvement in the quality and the market for the products. The government should ensure training, raw materials and marketing facilities
and encourage the financial institutions to provide credit to the sector. This organizational setup can ensure an expanding circular flow of development as a result of which livelihood strategies (Table 7) will facilitate the realization of sustainable livelihood outcomes.

**Table 7. Strategies for social and economic development of the bamboo workers**

<table>
<thead>
<tr>
<th>Short-term</th>
<th>Long-term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve social conditions (community infrastructure, human development index)</td>
<td>Long term market development programme (product education)</td>
</tr>
<tr>
<td>Increase income security through bamboo-based and other alternative employment opportunities</td>
<td>Impose Green Tax on environmentally hazardous product</td>
</tr>
<tr>
<td>Provide raw materials at low price</td>
<td>Publicize the long term benefits of environmentally friendly products</td>
</tr>
<tr>
<td>Provide training in the value addition process</td>
<td>Promote cluster development based on sustainable livelihood principles</td>
</tr>
<tr>
<td>Efficient use of available resources</td>
<td>Document and promote Indigenous Technology Knowledge (ITK) and identify which can be financially exploited</td>
</tr>
<tr>
<td>Life insurance of bamboo workers</td>
<td>Organize production &amp; encourage division of labour</td>
</tr>
<tr>
<td>Provide market information, marketing tools &amp; market support</td>
<td>R&amp;D for improving the quality of the product</td>
</tr>
<tr>
<td>Discourage child labour</td>
<td>Expand market size in national and international level</td>
</tr>
<tr>
<td>Encourage savings through SHGs</td>
<td></td>
</tr>
<tr>
<td>Encourage education among the children</td>
<td></td>
</tr>
<tr>
<td>Promote gender-based activities like tailoring, food processing, handicrafts, etc</td>
<td></td>
</tr>
</tbody>
</table>
Environmental Tax for Ensuring Sustainability of Nature and Humanity

Plastic and its products occupy importance in the day-to-day life of the people and these products pose great threats to the sustainability of the environment. Even though we cannot reject the sector altogether, we can encourage its substitution as far as possible by environment-friendly products. As all plastic products do not have perfect substitutes, the plastic industry should devote its resources for the production of those products, which have no environment-friendly substitutes. One of the benefits offered by the bamboo sector is its environment-friendly products but the market forces do not take into consideration this benefit in fixing the price. The relative difference in the market scenario of the two products highlights the high environment cost on the part of the plastic product. The market forces determine the price only by taking into account the private cost and benefit and not the social cost. The proposed green tax is a tax proposed to be imposed on the environmentally hazardous products for reducing their unnecessary consumption and encouraging the use of environment-friendly products. In order to encourage the substitution the governmental intervention may impose a tax on the plastic products equivalent to the total consumer surplus gained by these consumers. In other words, let the plastic consumers pay the maximum what they are actually willing to pay.

Conclusion

The bamboo handicraft industry of the State has immense economic potential. The investment in this sector is less attractive due to its small size, low surplus generation, cost escalation, low technological development, and payment of interest on borrowed capital. With these inherent weaknesses, this sector still supports a good fraction of the rural economy. Mechanisation will reduce the cost of production and improve the quality of the products, leading to boosting up the demand and consequently the profit. The livelihood security of the bamboo workers can be enhanced and improved through increased accessibility to raw material and market, employment opportunity, skill development and adequate sustainable institutional support.
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Scouting, Documentation and Standardization of use of Bamboo in Livestock and Poultry with Special Reference to Northeast India

Barbaruah M.I, Islam Monjul, Bora Kabyajyoti, Saikia Nitul, Das Mukut, Roy Sangita, Begum S
Organization: Fellowship for Agri Resource Management and Entrepreneurship Research (FARMER), Guwahati, India

Salam Kamesh, Saikia I.H, Goswami Anjal
Cane and Bamboo Technology Center (CBTC), Guwahati, India

Abstract

People of NE India are using bamboo in their day to day life traditionally since time immemorial. Small holder livestock and poultry farmers use bamboo in husbandry practice extensively to reduce cost on fixed expenditure on their farm operations. It has also stimulated innovative use of bamboo in livestock and poultry husbandry in different rural areas. Many rural innovations on bamboo use in husbandry practice vanish with time due to lack of organized effort to document and promote such innovations. There also exists a gap in information and technology updates amongst the rural people on the use of bamboo in livestock farming. The paper explains in detail the process undertaken in a project in this regard.

Varied use of bamboo in Northeast India, grass root innovations, challenges on durability, cost benefit, acceptability, adoption of modern technology in rural set up, skill up gradation, and scopes for alternative bamboo enterprise development etc are recorded through scouting in different parts of the region. A list of feasible ideas was prepared through a number of consultations and e-discussion. A total of six selected prototypes were developed through Participatory Technology Development where farmers, bamboo craftsmen, grass root innovator, design experts, market intermediaries, experts in livestock and poultry husbandry participated.

Final designs of selected items, standardization of developed designs, entrepreneurship development, cluster development, creation of wider market of the developed products are the ways to be explored under the project. The whole process prospects for new ideas continuously and the steps are linked and dependent on each other.

It is envisioned that enhanced use of bamboo items shall augment small holder livestock and poultry farming. This will also create alternative bamboo enterprise amongst the rural masses. Wider market of bamboo made animal husbandry items will encourage more bamboo plantations by farmers and craftsmen for environment friendly growth.
Introduction

Bamboo is used traditionally in many countries in construction of houses, household appliances, storage structures, livestock and poultry sheds and in various other forms in rural areas, since time immemorial. There is ample scope to popularize bamboo use in smallholder livestock / poultry farming, as these are locally available, durable and economical. Use of bamboo will not only reduce fixed capital cost but also permit smallholder farmers to expand / reduce the farm size / shift operations with limited investment. Use of modular bamboo items in husbandry practice will make small scale commercial farming e.g. layer farming with improved bird possible for both urban and rural poor, thus enhancing livelihood opportunity and quality nutrition. The designs, durability, mass production and market appeal of bamboo structures and items can also be improved to a great extent with modern scientific treatment, use of equipments and processing.

A model project was initiated in the later part of the year 2008 covering few North Eastern states of India for continuous scouting, documentation and standardization of innovative uses of bamboo in smallholder livestock and poultry farming.

Project conceptualization

The initial conceptualization of the project was made during a regular field visit of FARMER team to an egg production cluster in Assam (India). The trip report of the visit, clubbed with desktop research and in- house consultation was the basis for finalization of the following objectives of the project.

A. To scout and document use of bamboo in livestock and poultry farming in N.E. India.
B. To standardize selected developed items in the context of animal husbandry practices.
C. To augment enterprise / cluster development.

Linking with three broad segments of a typical technological innovation system\(^1\), the entire project is divided into three major steps viz. Birth Phase, Survival phase and Growth phase (figure 1). A number of sub steps are undertaken under each major step towards achievement of the ultimate objectives of the project. These steps are interlinked, open for new ideas and continuous.

During the project conceptualization, much importance was also accorded to sincere approaches related to participatory learning on challenges and scopes, Participatory Technology Development process and enhanced interaction amongst different stakeholders. This approach was in-built in the project so that same can strengthen innovation and adaptive capabilities of identified clusters.

The Birth Phase

Scouting

Cluster identification:
As decided during project inception discussion, two clusters were identified in the state of Assam, North east India viz.

(1) Small holder layer / broiler farming cluster in a place called Golaghat and

(2) Day-old-Chick carrying bamboo basket making cluster at a place called Bezera.

Situation analysis: To record different use of bamboo, extent of use, processes adopted, uniqueness of grass root innovation, technology adoption etc. a situational study was undertaken under the project using participatory technique. The study covered a total of 50 numbers of livestock and poultry farmers, five grass root level innovators and more than 20 bamboo craftsmen. Number of innovative uses of bamboo was recorded during the situation analysis. Most prominent amongst them were bamboo layer cage (figure 2) for layer farming and raised bamboo floor (figure 3) for broiler bird rearing. Current challenges faced by users and scope for further improvement was identified during the situational analysis process.

![Figure 2: Bamboo layer](image)

![Figure 3: Raised bamboo floor for rearing broiler chicken](image)

Major challenges identified from the point of view of farmers in use of bamboo made items are (1) Convenience – for use by the livestock and poultry farmers, for example easy cleaning and handling, meeting the standard husbandry norms etc. (2) Availability – on the nearest accessible source and / or cheapest source. (3) Cost – on purchase or cost- benefit. (4) Durability – in comparison to items made of other materials like plastic, etc. Other challenges were technology adoption in local context, skill up-gradation of local bamboo craftsmen and to identify cluster where prototypes could be developed.
**Consultation**

A number of brainstorming sessions with different stakeholders including an e-discussion at UNSE-FNS community ([http://www.solutionexchange-un.net.in/en/Food-&-Nutrition-Security/introduction.html](http://www.solutionexchange-un.net.in/en/Food-&-Nutrition-Security/introduction.html)) were organized to list out feasible ideas for improvement and to upscale the grass root level innovation. The e-discussion conducted highlighted other uses of bamboo e.g. as fodder besides number of challenges including that of the challenge of cleaning and disinfection of bamboo structures. Subsequently an action plan was drawn to further proceed towards remaining steps of the project.

**The Survival phase: Prototype Development – Participatory Technology Development**

**Orientation workshop:**

One cluster at Golaghat district of Assam was selected for first prototype (Prototype-I) development. Exposure to modern bamboo technology, validation of learning of situational analysis and consultation and introduction of grass root innovator was done in the orientation workshop. Grass root innovators shared ideas and processes undertaken during development of design with the participants. Grass root innovators, bamboo design experts, experts in animal husbandry practices and farmers interacted to evolve solutions in designing and adapting the bamboo items in husbandry practice (figure 4 and 5).

![Fig 4: Innovator explaining his innovation](image1.jpg)

![Fig 5: Design expert explaining the designs](image2.jpg)

**Training on technology:**

Hands on training on technology on bamboo treatment, joinery methods, use of tools was given to the participants (figure 6) and they could develop few selected prototypes using the knowledge gained.
After completion of the process of prototype-I development number of new challenges, like use of appropriate method for joineries, making the modular prototypes, treatment methods, use of right type of bamboo, requirement of skill up gradation, etc. emerged.

After completion of prototype-I, list of designs were selected for prototype-II development that were not included in the process of prototype-I development. These were:

1. Layer cage
2. Brooder
3. Chick guard
4. Egg laying nest
5. Live bird carrying cage
6. Modular bamboo net for side walls of livestock and poultry shed.
7. Table egg carrying basket
8. Egg collecting basket
9. Egg carrying tray

Amongst these, prototypes of Layer cage, Bamboo brooder, chick guard, egg laying nest, live bird carrying cage and modular bamboo net were developed at cluster-II at Bezera, Kamrup District (fig 7).
After completion of the prototype development a number of product wise challenges are identified which are to be addressed during development of the final designs at Cane and Bamboo Technology Center (CBTC), Guwahati tool room.

Meanwhile during the process of prototype development skill up-gradation need of the craftsmen, need of institution building, adaptive capacity building of the cluster and listing of infrastructure / input requirement for adaptive capacity of the cluster are initiated (figure 8). Dialogue with the clusters for institution building has also been initiated and few craftsmen are already selected for handhold training at the workshop of Cane and Bamboo Technology Centre (CBTC), Guwahati. It is also proposed to develop final design at the workshop of CBTC with participation of the innovators and craftsmen involved in the process. After skill up-gradation of selected participants, attempts will be undertaken to provide common facility for the cluster.
Figure 8. Plan map for cluster analysis developed by the project team.

Way forward under the survival phase

Field testing:

After development of the final design, field testing will be conducted on parameters of husbandry practices, suitability and acceptability etc.
**Value comparison:**

Value comparison of the developed design with that of conventional types shall be done in different levels where equipment manufacturers and large commercial farm holders will be involved.

**Market acceptability and trend analysis:**

Acceptability of the developed designs in the market and changing market scenario shall be examined and re-modeling of the prototypes and plans shall be undertaken continuously.

**Standardization**

Based on the input of the above steps, design standardization shall be done to make it ready for mass production and commercialization.

**Growth phase: Final product – Mass production technology:**

After standardization of the products number of initiatives shall be undertaken for commercialization of the products. These initiatives include skill up-gradation of craftsmen, institution building in the cluster, adaptive capacity building of the cluster and providing common facility for the cluster.

Upon successful completion of these initiatives, marketing assistance to the cluster, ancillary enterprise development for full utilization of bamboo and supply side intervention to ensure uninterrupted supply of bamboo in the cluster shall be undertaken under Initiative-II.

**Conclusion**

The project is augmenting economic and community development within two identified clusters primarily by building capacity of the beneficiaries to face challenges listed below.

For Cluster-I  Parts of Golaghat & Sibsagar District of Assam

Key Challenge that is being addressed:

- Effective Management of small scale layer farms raising genetically improved birds ----- Cage Vis a Vis Deep litter Method of rearing.
- Absence of appropriate farm equipment suppliers tailored to need of small layer / broiler farming units.
- Low Cash flow and market risk related challenges limiting investment on fixed assets.

For Cluster-II Village: Singimari, Bejera, Kamrup District Assam

Key Challenge that is being addressed:
Quality improvement & Product line diversification for:

----Addressing competition from printed paper boxes for carrying day-old-chick.

----Full utilization of bamboo

-- --Risk mitigation and increased revenue

Capacity to handle large demand (enhancing capacity for design, quality improvement and technology adoption for mass production)

References


Experience with Livelihood Development Projects
– A Case Study of Chhattisgarh, India

Diwakar Mishra *
*Chief Conservator of Forest, Forest Department, Government of Chhattisgarh, Raipur (C.G.)

Abstract

Bamboos are one of the versatile plant groups, offering great opportunities for meeting livelihood need of the people and increasing rural incomes. Bamboo artisans are very poor. The paper elucidates the potential of value addition of Bamboo in ensuring sustained employment and in providing an additional income. The paper also dwells upon the skill upgradation use of machines, preparation and marketing of quality value added Bamboo articles. More than fifty percent of the artisans are women and the additional income is used for welfare of family. With further training skill upgradation and marketing the increased income shall be used for providing better education, health care resulting in improved life style.

Bamboo is an enduring, versatile and highly renewable resource in the Indian socio-economic-cultural-ecological-climatic-functional context with 1,500 recorded uses. It has been estimated that in the world market of bamboo, the combined value of internal and commercial consumption of bamboo is to the tune of US $ 10 billion. The total revenue from bamboo and bamboo based products is estimated as Rs. 25,000 crores. Of this bamboo shoot accounts for Rs. 7,500 crores while other bamboo based products account for Rs. 17,500 crores (Anon, 2003)

Bamboo as a natural resource offers great opportunities for meeting livelihood needs of our people, increasing rural incomes and for development of eco-friendly technology. It also has religious sanctity because of its use in various customs. Value addition of Bamboo in Bamboo processing centres can be a effective tool in poverty reduction and providing additional income to bamboo artisans in remote areas of Chhattisgarh.

Introduction

The State of Chhattisgarh came into existence on 1st November, 2000 by separation of 16 (now 18) Districts of Chhattisgarh region from Madhya Pradesh. Chhattisgarh is situated between 170 46’ N to 240 6’ latitude and 800 15’ E to 840 51’ E longitude in Central Eastern part of India. The total geographical area of the State is 136.03 thousand sq. km and it is larger than 16 other Indian States.
Demographic Characteristics:

Total population of the State is about 20.79 million with 16.62 million people residing in rural area constituting more than 75% of the total population. The Scheduled Castes and Scheduled Tribe population constitutes more than 45% population of the State.

Bamboo Forests

In Chhattisgarh, Dendrocalamus strictus is the major species. Bamboos are found in Kanker, Jagdalpur, Raipur, Mahasamund, Dantewara, Bilaspur, Korba, Raigarh, Surguja, Koriya, Durg, Rajnandgaon and Kawardha Districts. In Bastar two species of Dendrocalamus (D. Strictus and D. longisphatus) are found naturally. In some areas of Bastar Oxytenanthera nigrocialata (Pani Bans), Cephalostachyum pergracile (balan Bans), Bambusa arundianacea (Kanta Bans) and Bambusa tulda area also found. The villagers, especially in Bastar and other areas have planted Bambusa vulgaris (Sunder Konya) and Bambusa polymorpha (Barha Bans) in their homestead and on field bunds. According to the available estimates, the area under Bamboo forests it about 6.56 lakh hectare. About 40% of this area is under Rehabilitation of Degraded Bamboo Forest Working Circle.
"Basods" And Rural Artisans

The Bamboo artisans, commonly known as "Basods" and "Kamars" have been recognized as a separate caste in the State and have been included in the list of scheduled castes. They prepare various Bamboo articles such as Dala, Soopa, Dalia, Jhal, Chick, Chatia (Local names) from Bamboo, and sell them in local markets in various parts of the State. Some of them also produce fancy items like lamp shades, furniture, wall panels etc. Thus the economic well being of the Basods is entirely dependent upon the availability of Bamboo. Besides Basods. Other primitive tribal groups like Birhor, Pahari Korva, Baiga, Pando, Kamars are also traditionally engaged in Bamboo crafts. Their socioeconomic condition is very poor. To improve their socioeconomic condition and provide sustained employment Bamboo Processing Centres are being established in the State.

Methodology

Bamboo forest of Chhattisgarh are located mostly in the southern part. Cluster based approach has been adopted for the establishment of Bamboo Processing Centres (BPC). These clusters are as under :-
The methodology involves the following steps -

(i) Establishment of self help groups (SHGS). Bamboo artisans have formed SHGS consisting of 10-12 members. These members work together as a team in BPC's. More than 50% of the members are women.

(ii) Training - Traditionally these artisans were preparing local bamboo articles like Jhaua, Tokna, Supa, Broom and other articles. For preparation of value added Bamboo furniture and other decorative articles the expertise of skilled artisans from Narayanpur centre under Industries Department and Tripura Bamboo Mission are utilized. Local artisans have been trained for varying duration from two to six months. This has improved their skills and the journey continues.
### Location of BPC in Chhattisgarh State

#### Table

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Forest Division</th>
<th>BPC Location Existing</th>
<th>Under Establishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Kanber</td>
<td>Charama</td>
<td></td>
</tr>
<tr>
<td></td>
<td>West Erantrapur</td>
<td>Bande</td>
<td></td>
</tr>
<tr>
<td></td>
<td>East Erantrapur</td>
<td></td>
<td>Antaghar</td>
</tr>
<tr>
<td>II</td>
<td>Bijapur</td>
<td>Bijapur</td>
<td>Kasoli</td>
</tr>
<tr>
<td></td>
<td>Dantewada</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sukna</td>
<td></td>
<td>Dornapal</td>
</tr>
<tr>
<td>III</td>
<td>Korba</td>
<td>Nonkirra</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Katghora</td>
<td>Donganala</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Katghora</td>
<td></td>
<td>Inf</td>
</tr>
<tr>
<td></td>
<td>Raigarh</td>
<td>Kosamara</td>
<td></td>
</tr>
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<td></td>
<td>Bilaspur</td>
<td>Ratapur</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marwahi</td>
<td></td>
<td>Dunkundh</td>
</tr>
<tr>
<td>IV</td>
<td>Rajnandgaon</td>
<td>Dongargaon</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kawardha</td>
<td>Lalpur</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>East Surguja</td>
<td>Aamgaon</td>
<td></td>
</tr>
<tr>
<td>VII</td>
<td>Rajpur</td>
<td></td>
<td>Amurba</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Number of BPCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>10</td>
</tr>
<tr>
<td>VII</td>
<td>7</td>
</tr>
</tbody>
</table>
(iii) Establishment of machines - following machines have been set up at the BPC'S. Crosscut, Auto splitter, Bamboo Slicing and inside knot remover, Bamboo polishing, Bamboo square stick, outer knot removal. Some other machines have been set up in a few BPC'S. The artisans were given a hands on training in the use of these machines.

(iv) Operation of the BPC'S - SHG'S work as a team and produce Bamboo articles. For purchase of material like fevicol, Varnish, nails, etc Rolling fund of about Rs. 20 to 50,000 has been deposited in each BPC. On request from the SHG'S the Range officer takes consent of the Divisional Forest Officer and with draws the amount from the bank and gives an advance to SHG'S. SHG'S get the amount for the articles prepared by them as per price fixed. Marketing of these products is done by a separate SHG. The advance taken for purchase of the material is re-deposited in the rolling fund.

(v) Participation in Fairs:– Six Bamboo artisans from the State participated in National Malabar Craft Mela held at Mallapuram, Kerala from 16.12.2008 to 30.12.2008. The Bamboo articles prepared by them were appreciated very much and Chhattisgarh State was awarded the second prize.

(vi) Marketing - Value added Bamboo articles have been prepared and marketed in various BPC's. The details are as under -
It is proposed to set up separate retail outlet for these articles, when the volume increases. Presently these articles are sold from the BPC’s and Sanjeevani—an outlet of Minor Forest Produce Federation Chhattisgarh, set up in all the forest Divisions.

<table>
<thead>
<tr>
<th>Name of BPC</th>
<th>Bamboo Articles prepared</th>
<th>Marketed</th>
<th>Balance</th>
<th>Articles</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bijapur</td>
<td>.70</td>
<td>.42</td>
<td>.26</td>
<td>Book rack, T.V. Stand, Stool</td>
<td>30.09.08</td>
</tr>
<tr>
<td>2. Charama (Kanker)</td>
<td>.10</td>
<td>.05</td>
<td>.05</td>
<td>Stool, Easy chair</td>
<td>From Jan. to April, 09</td>
</tr>
<tr>
<td>3. Bande (West Bhanupratapur)</td>
<td>.75</td>
<td>.45</td>
<td>.30</td>
<td>Sofa set, Tea table, Stool, Decorative article</td>
<td>Feb. to April, 09</td>
</tr>
<tr>
<td>4. Nonbirra (Korta)</td>
<td>2.50</td>
<td>1.6</td>
<td>.90</td>
<td>Easy chair, Stool, corner rack, Sofa set</td>
<td>2007</td>
</tr>
<tr>
<td>5. Kosanmara (Raigarh)</td>
<td>2.54</td>
<td>1.74</td>
<td>.80</td>
<td>Sofa set, Centre table, Decorative articles</td>
<td>April 2008</td>
</tr>
<tr>
<td>6. Dongergaon (Rajnandgaon)</td>
<td>1.5</td>
<td>.10</td>
<td>1.40</td>
<td>Decorative utility articles</td>
<td>April 2008</td>
</tr>
<tr>
<td>7. Lalpur (Kawardha)</td>
<td>.40</td>
<td>.23</td>
<td>.17</td>
<td>Sofa set, Tea table, Stool, Decorative article</td>
<td>December, 2008</td>
</tr>
<tr>
<td>8. Ratanpur (Bilaspur)</td>
<td>.83</td>
<td>.63</td>
<td>.20</td>
<td>Decorative utility articles</td>
<td>December, 2008</td>
</tr>
<tr>
<td>9. Aamgaon (East Surguja)</td>
<td>.05</td>
<td>.01</td>
<td>.04</td>
<td>Decorative article</td>
<td>April, 2009</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9.37</strong></td>
<td><strong>5.23</strong></td>
<td><strong>4.12</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Photographs of some of the articles produced in BPC's of Chhattisgarh,
Goal - It is proposed to set up 55 BPCs in Chhattisgarh in 8 clusters. Each cluster will have a Common Facility Centre (CFC) to look after forward and backward linkages. 25 Bamboo artisans will get sustainable additional income of Rs. 60-70 per day from each BPC from 2010-11.

Preservative and seasoning plants shall be established in each CFC.

New innovative designs and articles shall be prepared. Quality shall be given at most attention. While traditional products with modern design for use in villages and cities shall continue to be encouraged, focussed attention on making modern, utility products with innovative designs to cater to niche market. Awareness campaigns shall be undertaken in big way to popularize the products and to ensure that Bamboo becomes the real "Green Gold" for the Bamboo artisans of Chhattisgarh.

BPCs of Bijapur, Bande and proposed BPCs of Dornapal, Kasoli are in extremist affected area. It has been a challenge to form SHGs and provide sustained employment in these BPCs. BPC of Bijapur and Bande are functioning quite effectively with 42 and 15 beneficiaries.

Foresters of Chhattisgarh are working closely with the Bamboo artisans community to improve their socioeconomic condition.

References

Abstract

In a developing country like India there is a continuous search for sectors which can generate income and employment in an equitable way for people of all socio-economic strata. Besides, such sectors should also enable upliftment of backward regions which have been left behind in the development story of the country for various reasons. One such region is the Northeastern region (NER) with an abundance of natural resources, one of which is bamboo.

This study is a unique attempt to analyze the existing marketing scenario of bamboo products manufactured in the NER to identify the constraints and gaps present in the supply chain which would assist in designing an effective strategy for sustainable growth of the bamboo industry.

An indepth study of the major market functionaries consisting of traders, retailers and consumers was undertaken through a detailed primary survey in major consumption markets of Kolkata, New Delhi, Chandigarh, Mumbai and Pune. The study analyzes the existing market channel dynamics through a detailed value chain and product analysis along with consumer behaviour analysis. The survey reveals the channel dynamics through a detailed value chain and product analysis. The survey also brings out the existing consumer preferences through the consumer buying behaviour for bamboo products.

It also identifies a set of potential products and gaps in the existing supply chain network. In the current situation, the artisans and small and medium manufacturers are experiencing increasing difficulty to maintain financial viability of the bamboo business with the competing products occupying increasing market share with changing consumer perception.

The final part of the study focuses on charting out a strategy for developing an operational framework for improving the channel, market and product efficiency for specific bamboo products manufactured in North East India.
Introduction

Bamboo is quickly changing its image from the “poor man’s timber” to a more commercially viable product. Bamboo cultivation is becoming an increasingly important economic activity which has the potential to accentuate poverty eradication and economic and environmental development. The global bamboo market is estimated to be about USD 12 billion and is expected to grow to about USD 20 billion by 2015. This can mainly be attributed to the growing consumer awareness and acceptance of bamboo products as an eco-friendly and unique product differentiating itself from its major competing and substitute product categories.

India has the largest area and the second largest reserve of bamboo in the world. The NER (North Eastern Region) of India has the largest bamboo stock in the country and accounts for 54 per cent of the bamboo resources in India. The other most abundant bamboo growing areas are the Andaman and Nicobar Islands, the Himalayan foothills, Madhya Pradesh and Western Ghats. On the demand side, the domestic bamboo market size is estimated to be about USD 400 million\(^2\) and is estimated to be growing at an annual rate of 15 per cent.

However, despite huge potential the sector lacks competitiveness and focus mainly due to the absence of a well organised production, marketing and supply chain network. The supply chain is highly scattered both at the production and marketing ends giving rise to supply chain related issues such as demand-supply mismatch on one end and low market penetration on the other. Lack of proper marketing and promotion efforts contribute to a very low awareness of bamboo product among consumers.

The entry of the highly organised and competitive Chinese bamboo products also pose a major threat to the immature Indian industry both as a direct competitor and also through adversely affecting market perception of bamboo products in some categories such as home furniture due to poor quality of the Chinese products.

In view of the above, an attempt has been made to study the marketing and supply chain of bamboo products from Northeast India in major consumption markets of India with the following specific objectives:

1. To analyse the existing market channel dynamics through value chain and product analysis
2. To understand consumer buying behavior for the bamboo products
3. To identify gaps existing in the existing supply chain network and to understand critical factors for the success of bamboo products
4. To identify a list of potential products best suited to the current market requirement and consumer preference for immediate focus
5. To chart out strategy for developing operational framework for improving the channel, market and product efficiency for specific bamboo products manufactured in North East India

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\(^2\) Planning commission estimates
Research Methodology and Approach

The research methodology consisted of both primary and secondary research. A brief description of both methods is provided below:

**Primary Research:**

The primary research was undertaken by drawing representative samples of respondents from major consumption markets in North, West, East and North East India. Personalized opinion surveys were administered to these respondents consisting of 480 respondents including 250 customers, 130 retailers’ and 100 traders. The key objective of the primary research was to provide an insight into the consumer buying behaviour, market trends, trade practices, functioning and preference of channel members and supply chain dynamics of the Bamboo products.

**Secondary Research:**

The secondary research primarily focused on obtaining relevant information pertaining to demographic, socio-economical set up of the areas surveyed and to understand the historical data related to major consumption markets. The secondary research also focused on identifying successful marketing models for bamboo marketing and analyzing the relevant best practices suiting the requirements of North East Indian bamboo industry.

The overall approach of the research focused on identifying and developing sustainable institutional framework for popularization and promotion of North East Bamboo products in the major consumption market.

Results and Analysis

**I. Channel characteristic and behavior**

A conventional channel of bamboo products, which links the consumers to the manufacturer through traders and retailers, is the most commonly used by the organized bamboo market. Apart from this, distributors, fairs & exhibitions and agencies such as NGO’s are the other trade channels used for marketing of Bamboo products. During the study, each trade channel was analyzed with respect to its structure, merits & demerits, scalability potential, trade margins offered etc. to ascertain its suitability for different product types and changing market scenario. The analysis of trade channel reveals the following general characteristics:

- 75% of the traders surveyed have a turnover of greater than INR 5 lacs while only 25% of the traders surveyed have a turnover of less than INR 5 lacs
- Bamboo business contributes between 30-60% of the total annual turnover for 62 % of the traders surveyed in Western India
- Bamboo business contributes more than 75% of the total annual turnover for 60% of the traders surveyed in North and North East India
- The traders/wholesalers typically work on a margin of 25-40% of the end consumer price
- The retailers earn a better margins of around 35-40% of the end consumer price
- 60-80% of the retailers surveyed in North and West India stated high demand and profitability as the key reasons for taking up bamboo business
- Although there is strong recognition for bamboo of North East origin, there is no Geographical Indicators (GI) for the finished products
- 82% of the retailers from West India and 66% of retailers from North India rely on traders (wholesalers) as the key source for supply of bamboo products

The bamboo trade is mostly cash based business and takes place through personal network of the channel members. The current demand scenario is changing with customer gaining more purchase power and demanding more reliable and value added products. The study focuses on the need of having customized channel solutions based on the market, consumer and trade requirements. The following are some of the facts to be considered while developing channel strategy for North East based bamboo products:

- Identification of market segments such as school children, tourists, business organization and institutes etc. having low penetration of bamboo products
- Selection of right product mix for each target segment identified. For e.g. toys, gift items for children and customized order processing for institutional buyers etc.
- Identification of existing/alternate channel for each target segment
- Introduction of channel incentives for products having high growth potential
- Introduction and awareness of geographical indicator concept to popularize the bamboo products manufactured in the North East

Apart from the conventional channel, there are available alternate channels which can be adopted for different bamboo products. Some of the available alternate channel for different products are mentioned in Table 1.
Table 1: List of available alternate channels

<table>
<thead>
<tr>
<th>S.No</th>
<th>Product</th>
<th>Alternate Channel</th>
</tr>
</thead>
</table>
| 1    | Utility Products   | ▪ Khadigram Udyog Outlets  
▪ Postal and railway department  
▪ Rural retail outlets  
▪ Gram Panchayat  
▪ Urban and farmers cooperative |
|      | (mats, blinds)     |                                                                                  |
| 2    | Furniture          | ▪ Shopping malls  
▪ Lifestyle/ gift shops chains such as Fab India, Archies Gallery etc  
▪ Existing traders dealing in wooden furniture |
| 3    | Handicraft         | ▪ Hotels and Resorts at major tourist destination  
▪ Khadigram Udyog Outlets  
▪ IRCTC, PSU’s and other institutes |

Keeping in view the increasing popularity of Business to Consumer (B2C) solutions, online web portals can be an effective tool in linking up the consumers to the manufacturers. However, such measures should be initiated with the following adequate support in systems:

▪ Logistic  
▪ Distribution System  
▪ Inventory management system  
▪ Customer care service  
▪ Consignment tracking  
▪ Payment solutions  
▪ Marketing team support

II. Consumer Behaviour Analysis

Consumer Behavior Analysis constituted an important aspect of the study which focused on having a better understanding of the consumers’ perception towards various bamboo product categories. This analysis would assist in designing an effective strategy for capturing the target consumers.

1. Consumer Buying Behavior

Consumer behavior is the total of consumers’ decisions with respect to the acquisition, consumption, and disposition of goods, services, time, and ideas by (human) decision-making units. In other words, consumer behavior involves the thoughts and feeling people experience and their actions. Moreover, it includes all the things in the environment that influence thoughts, feeling, and actions. The key components of consumer buying behaviour analyzed in the study are discussed below:
a. **Nature of buying decision**
The key observations made under this heading are as follows:

i. The bargaining power of the customer is high
ii. The demand for most of the bamboo products is cyclical and seasonal. The demand for the bamboo based product (especially the handicraft category) depends upon the different fairs and exhibitions that are arranged during the winter and post monsoon season
iii. Increasing consumer awareness and demand for the natural product has gathered momentum and is increasingly affecting buying decision especially among the upper middle class consumers
iv. Consumers now increasingly prefer handmade and ethnic products. The trend seen in the revival of khadi products into a fashionable novelty product can also be clearly seen among bamboo product especially in the handicraft and utility segment
v. Rising purchasing power of people with higher propensity to consume with preference for unique products is providing constant impetus to growth

b. **Consumer perception analysis**
The key observations made under this heading are:

i. Price: The consumers were found to be highly price sensitive in buying the bamboo products. The utility and furniture segment was perceived to be particularly high priced in comparison to the other available substitutes. In contrast the handicraft and utility products category were perceived as being priced in the reasonable and lower price category respectively. However, under the existing marketing situation more than 75 per cent of the consumers are not willing to pay a premium for the bamboo based products and hence the need for a different branding and marketing strategy.

ii. Availability: The availability of bamboo products was found to be highly limited by the consumers. Most of the consumers can access bamboo products only in the seasonal fairs/exhibitions and haats due to negligible penetration of other channels like organised retail outlets. In fact, 74 per cent of the respondents become aware of various bamboo product categories only through the fairs/haats/exhibitions. For certain high value products like home furniture the consumers preferred to buy from organised outlets but due to non-availability of such outlets or due to lack of wide range of choice they easily switch to other competing products.

iii. Expected features: The perceived notion about the low durability of bamboo products was the main concern voiced by the consumers. Even non-users of bamboo products perceived bamboo as non-durable and only fit for petty handicrafts items and not fit for utility items or furniture meant for rigorous use. This perception was also seen among some of the channel members, particularly the out of state wholesalers/retailers with smaller contribution of bamboo products to total sales. The three most preferred attributes of consumers regarding bamboo products are design and uniqueness, low maintenance and cost effectiveness. On an average more than 90 per cent of surveyed consumers preferred bamboo products due to their design and uniqueness as compared to other competing products. The key expected features of the consumers for buying the bamboo products are superior finishing, low maintenance and warranty services for the high value products. The consumers were also of the opinion that greater availability and wide range of choice will also facilitate usage to a large extent.
c. Average purchase time and distance traveled
The key observations made under this heading are:

i. On an average 49 per cent of the respondents used less than 30 minutes to make a purchase decision
ii. Impulse buying is observed in case of handicrafts, decorative items and other lower and mid range products
iii. In case of high value products like furniture a prolonged pre-purchase evaluation is observed along with on store decision making period of about 1 to 2 hours
iv. Most of the consumers traveled a distance of 2-5 km for assessing bamboo products

To gauge the need gap between consumer awareness, preferences & usage/availability of bamboo products a study was undertaken and the summary of the same is enumerated below:

2. Consumer Awareness Study
This section of the study captured the awareness of consumer for various products and media used for product promotion. The key observations made during the study are enumerated below:

i. In Mumbai/Pune, Delhi/Chandigarh and Kolkata the products having maximum awareness among consumers are table mats, baskets for various purposes, construction material, flower sticks, trays, wall hangings, toys, decorative items, handicraft items, window blinds, furniture, utility products and flower packing
ii. In addition the Delhi/Chandigarh region has a large demand for window blinds
iii. Awareness about bamboo products through promotional campaigns or mass media was lacking in all the survey locations unlike other natural products like coir, coconut, etc. Hence, the consumers become aware of various bamboo products only through word of mouth, self use, fairs/exhibitions/haats, traditional retail shops or through mass media to a limited extent
iv. In Mumbai/Pune 92 per cent and 88 per cent of the surveyed consumers became aware of the various bamboo products through self-use and word of mouth respectively
v. In Delhi/Chandigarh 74 per cent of the consumers become aware of the various bamboo products through the fairs/exhibitions and haats which are frequent in the region
vi. In Kolkata the usage of bamboo products was found to be higher in comparison to the other surveyed locations and 97 per cent, 91 per cent and 82 per cent of the consumers become aware of various bamboo products through self use, word of mouth and traditional retail shops respectively
vii. The heightened consumer environmental awareness has given a boost to the sales of bamboo product

3. Consumer Preference Study
This section identified and analyzed the taste and preferences of the consumers for different products and channel.
a. Overall product preference
The key observations made under this heading are:

i. In Mumbai/Pune the highest preferred products are baskets and wall hangings with 67 per cent and 63 per cent respectively. Other products preferred by the consumers are table mats, flower sticks and handicraft products in order of preference

ii. In Delhi/Chandigarh the highest preferred products are decorative items, handicraft products and flower sticks with the consumer preference of 82 per cent, 80 per cent and 76 per cent respectively. Of the other products that are preferred by the consumers are wall hangings, window blinds and toys

iii. In Kolkata furniture and handicraft products are highly preferred. Of the other products that are preferred are baskets, lamp shades and gift items

iv. In all the survey locations a latent demand for bamboo furniture was observed. Both the traditional and modern designs are being preferred by the consumers to provide a unique appearance to home decoration. A growth of the bamboo furniture sector towards mass market segment (in contrast to the present build to order status, low and erratic availability) in laminated, moulded and detachable segment will greatly increase its market penetration. The growth can be similar to the success of bamboo flooring sector through adoption of innovative and modern designs

b. Product preference based on usage
The key observations made under this heading are:

i. In Mumbai/Pune the preference in terms of usage are place mats, baskets and flower sticks

ii. In Delhi the preference in terms of usage are flower stick, window blinds, wall hangings and handicraft products

iii. In Kolkata the preference in terms of usage are baskets, decorative items, utility products and handicraft products

c. Channel preference
The key observations made under this heading are:

i. Of the surveyed consumers 92 per cent gave the preference to purchase products from a traditional shop. The main reason behind this can be attributed to the comfort of consumers in buying products from an identified supplier in absence of any formal warranty even in high value products

ii. Haats, fairs and exhibitions come as the next preferred channel for the consumers with 72 per cent of the respondents giving the choice for the same. This observation can also be attributed due to the relative lack of other channels in contrast to other competing and substitute products

Even though organised retail outlets for bamboo products are fairly low in penetration, 47 per cent of the consumers preferred the organized channel. Given a better value proposition the consumers of traditional shops and fairs/haats and exhibitions can easily migrate to the organized channel

Based on the survey of the traders, retailers and consumers a product matrix of the most potential products based on cross-matching of channel and consumer dynamics was prepared (Figure 1). These products can be taken up
on a priority basis for undertaking research and development and appropriate marketing activities. Later on other products can be brought into the product mix based on market response.

Apart from handicrafts, window blinds and table mats the other potential segments observed with latent demand are furniture and toys.

Road Ahead

The future of the North East Bamboo Industry hinges upon strengthening of the supply chain through establishment of active linkages of manufactures with the end consumers. Also, there is a requirement of developing robust business model to consolidate the manufacturers and develop interface with consumers through coordinated effort among various market functionaries.

Introduction of such measures will be a dynamic market driven process and will require a separate organization or a Nodal Agency with adequate funding, systems and support structure in place. The Nodal Agency will be based in North East India and will act as a service provider to facilitate direct trade between manufacturers of bamboo products and traders and retailers. The Nodal Agency will operate on a B2C (Business to Consumer) model through a dedicated web portal. The same shall be supported by business development units which will have dedicated marketing staff in the major consumption markets. The nodal agency in effect will act as a bridge between the buyers and sellers of bamboo products thereby eliminating tiers of intermediaries. Further,
the nodal agency will work on a service based revenue model. Based on the supply chain requirements the following services are identified:

- Free online registration for buyers and sellers
- Providing samples for order booking
- Physical order booking from buyers
- Booking orders on behalf of traders who pays in cash
- Online Product Catalogue and Price List
- Online payment gateways
- Online Trading
- Home deliveries for retail buyers
- Stock verification upon delivery of consignment
- Toll free customer care
- New Product Information
- Information about bamboo events such as fairs/exhibition
- Tracking of consignment
- Online product rating survey
- Warehousing

There has to be an active role of the government to establish the nodal agency in its initial phase. The support can come in the form of grant to enable the nodal agency to deploy the necessary system and infrastructure in place. Further, soft support in form of providing manpower or existing infrastructure such as office space/godown space at various locations can greatly reduce the overall implementation cost.

Clearly the role of the nodal agency will be to aid in eliminating the extra tiers of intermediaries present in the existing trade channel. At the back end it will help in consolidating the unorganized artisans and small traders. Considering the existing situation, the organized suppliers have low importance in the buyers supply chain. The suppliers have low to negligible bargaining power. On the other hand the artisans, despite of contributing to maximum value addition in the bamboo products are not having the terms of trade I their favor. The figure below depicts the current situation of the artisans and organized suppliers in the Buyer-Supplier Matrix (Figure 2).
The current position of suppliers and artisans in the buyer supplier matrix is likely to change through interventions brought by introduction of Nodal Agency. The efforts to bridge the gap between suppliers and the consumers through interventions such as geographical indication, branding etc. is going to increase the supply strength of the organized suppliers. Further, organizing the artisans through medium of Nodal Agency is going to boost the negotiating power of the artisans in the buyers supply chain.

It is estimated that the cost benefit of the operations of the nodal agency will increase the price realized by the suppliers and will also be able to post a competitive pricing in the market. The real time information flow of demand, customer preferences and changing market dynamics will help narrow down the information gap between the manufacturers and the market. Further introduction of value added services such as product branding, product warranty and Geographical Indicator at a later stage is going to boost the perception of bamboo products among consumers.

**Conclusion**

The Indian Bamboo Industry is rapidly orienting itself towards the tastes and preferences of the consumers. The bamboo industry of the North East India needs to develop a strong market driven approach to remain abreast with the ever changing market situation. Establishing market linkages to bridge the gap between manufacturers and consumers will play an important role in the revamping the image of North East Bamboo Industry on a pan India basis. Further, adequate support from relevant government agencies and a dedicated nodal agency on a structural level will be required to ensure sustained and inclusive growth of the North East Bamboo Industry.
Income from Bamboo and Cane Handicrafts, cases from Bjoka, Silambi, Gongdue and Kangpara in Bhutan

Dorji Wangdi and Marianne Meijboom

Abstract

Handicrafts made of a climbing bamboo locally called Yula (*Neomicrocalamus andropogonifolius*) and cane (*Calamus spp.*.) form the major source of cash income in selected pockets in the country of Bhutan. The bamboo and cane resources are derived from the wild. This paper shares the experiences from the management, production and commercialization of handicrafts in the remote areas of Bjoka, Silambi, Gongdue and Kangpara in Bhutan. The paper stresses the importance of working along the entire value chain including sustainable management of the resources through community based management, product development and establishing proper marketing linkages.

Introduction

Bhutan lies in the Eastern Himalayas in between China and India. The total land area is about 38,394 km$^2$ of which 72.5 % is classified as Forest land. Bhutan has a population of 635,000 people of which 69% live in rural areas (National Statistics Bureau, 2005). According to the poverty analysis carried out in 2007, about 32% of the population live under the national poverty line (Nu 740.36 which is equivalent to about 15 USD) per month per capita. There is a higher incidence of poverty in the rural areas (National Statistics Bureau, 2007).

Rural areas in Bhutan are often located far from market centres or even road heads. People living in these areas depend on forest resources to a large extent for their livelihood as agriculture production is low due to crop raiding by wild animals. This paper addresses the experiences from Bjoka (Zhemgang district), Silambi (Mongar district) and Kangpara (Trashigang district). See the map in figure1. In these geogs people intensively use bamboo (*Neomicrocalamus andropogonifolius*) and cane (*Calamus spp.*) for handicraft production. Bamboo and cane handicraft production is one of the 13 traditional crafts in Bhutan and is known as Tshazo (cane & bamboo work).

*Neomicrocalamus andropogonifolius*, locally known as Yula and Ringshoo (respectively in Kengka and Sharchopa language$^4$) is one of the about 30 species of bamboos found in Bhutan (Stapleton, 1994). This

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$^3$ The road head refers to the nearest road accessible by car

$^4$ The official language in Bhutan is Dzongkha while Sharchopa is spoken in large parts of Eastern Bhutan and Khengka in the Keng areas in Zhemgang and Mongar districts.
climbing bamboo species has very smooth and flexible culms of less than two cm in diameter with long shiny internodes. The culms can reach a length of up to twelve meters long (see figure 2). Yula is found in warm broadleaf forests at an altitude range of 300 to 1800 meters above sea level and needs tree branches or bushes for support and shade (Stapleton, 1994; Noltie, 2000; Department of Forests, 2008). In Bhutan it is mainly found in the wetter sub-tropical forests in the East in Zhemgang, Mongar, Samdrup Jongkhar and Sarpang Districts. Farmers prefer the use of elastic, one or two year-old shoots of Yula, which are easy to use for weaving. Older culms loose their elasticity.

Figure1: Location of Bjoka, Silambi, Gongdue and Kangpara
Bamboo management under Community Forestry

According to the Forest and Nature Conservation Rules, 2006 a management plan should be in place prior to the extraction of natural resources on Government Land for commercial purposes. For the management of the bamboo and cane resources management plans have been developed according to the rules for Community Forestry. A Community Forestry Management Plan consists of two parts: the first part describes the resource management, which includes the socio-economic background of the village, traditional management systems, the planning process, product prioritization and demand/need assessment, goals and objectives, location and boundaries including resource maps, resource inventory including data on methodology used, analysis of data, information on annual harvesting limits, sustainable management and harvesting prescriptions - annual plan of operation and a chapter on monitoring and evaluation. The second part includes the by-laws. By-laws refer to good governance of the group and stipulate the institutional arrangements for the group including: the membership arrangements (including fee), the roles and responsibilities of the management committee (e.g. chairperson, vice-chair, secretary and treasurer), roles and responsibilities of group members, benefit sharing procedures (including provisions for the poorest group members), fees, offences & penalties, community fund mobilization, record keeping, conflict resolution, provisions for amendment and support required from service providers. The management plan needs to be approved by the Department of Forest (DoF). After approval the area is officially handed over to the community for management, providing the community legal access to the resources. The management plan is valid for a time span of 10 years.

DoF furthermore published guidelines for resource assessment and management of Yula (2008). In these guidelines rules for harvesting are described to ensure the sustainable management of the species (see box 1). These guidelines are based on local knowledge and combined with the more technical knowledge of the foresters.
Box 1: Harvesting guidelines to sustain the Yula resource base

- Harvesting should be limited to one, two year-old or older culms (when culms produce second shoot (branch) at the top);
- Harvest culms only from clumps that have more than five culms;
- Two to three young (one to two-year old) culms should be maintained in each clump to favour more shoot regeneration in the following season;
- Culms should be harvested between November and May (the growth of Yula shoots is hampered if younger culms are damaged. Therefore, the Yula area should not be visited during the rest of the year).
- Livestock should be kept out of the growing areas of Yula especially during the period from May to November; presence of cattle will stunt the growth of young shoots.

(DoF, 2008)

Product development

The production process starts with the collection of Yula and cane from the natural forests. The cane and bamboo is cut into bundles to ease transportation to the village. In the village the cane and bamboo is further peeled and cut into strips usually of about 40 cm long and a few mm wide. These strips are dried in the sun for up to three hours and afterwards dyed. The coloured strips are then used to make the different products. For the processing no sandpaper, glue or varnish is used. According to the traders and buyers, customers in Bhutan prefer the natural rustic look.

The main handicap products made out of bamboo and cane are the traditional baskets “Bangchungs” of various sizes and other baskets (see Figure 3). The handicraft skills and patterns are handed over from one generation to the next. Bangchungs are used as plates, lunch boxes or bowls to keep certain food products in the local villages while in urban areas they are mostly used for decoration. The Bangchungs are made in several pockets of the country, of which the most famous for commercial purposes are Kangpara and Bjoka. The materials needed for making Bangchungs are Yula, cane (Calamus spp.) and chemical dyes. Natural dyes were used in the past (about 50 years ago) but not at present anymore because chemical dyes are more easy to use and stick better to the bamboo strips. Chemical dyes are used to get the four basic colours of blue, red, green and yellow. The difficulty in the weaving designs depends on the number of colours used. The most difficult patterns include 4 colours while the easiest designs are plain of one colour (Yangzom, 2002). The price for Bangchungs is about Nu 100-450 (USD 2-9) per set depending on its size and place of selling.
The Rural Enterprise Development Programme (REDP) provided support in product development, marketing and business planning. Trainings were provided for villagers mainly from the target area of Bjoka in 2005 on new product design, and technologies for processing and seasoning by the Cane and Bamboo Technology Centre (CBTC) in Guwahati, Assam, India. The trainees were provided a new toolkit with 21 different tools developed by the Indian Institute in Mumbai. In total 225 toolkits were distributed in 2005 and 2006 (REDP, 2009). In order to replicate the successes from Bjoka to other areas in the country, including Silambi, Gongdue and Kangpara, UNDP further supported the “Skills Development Project” which is focused on product diversification, processing, quality control, and product costing. As part of this project another 178 artisans were trained in January and February 2009.

On 27 and 28th of June, 2009, a two days handicraft exhibition was held in Thimphu to test and market the new handicraft products developed by the communities of Bjoka, Silambi, Gongdue and Kangpara. The exhibition was attended by three Ministers, including the Minister of Economic Affairs as the Chief Guest, the Minister of Agriculture and the Minister of Labour and Employment as the event was considered very auspicious for promotion of rural handicrafts aimed at addressing the rural poverty in remote areas in Eastern Bhutan.

Seven participants represented the three communities and brought 40 different kinds of products for sale during the exhibition. The exhibition attracted many people on both days which indicated a strong interest in the new products. People showed great interest in about 30 out of the 40 products, especially in those new products that have traditional elements (see figure 4). Some of the products were developed in joint collaboration with

5 The RED programme (2002-2007) was implemented by the Ministry of Economic Affairs (MoEA) with financial support from UNDP and technical assistance from the Netherlands Development Organisation (SNV)
Tarayana Foundation with communities providing bamboo mats with traditional designs and Tarayana Foundation doing the stitching. A number of hoteliers and international tourists, handicraft shops placed orders as the exhibition had only limited number of products and some direct market linkages were established between interested buyers and the communities. During the two days exhibition, the three communities sold their entire stock worth Nu.200,000 (about 2100 $). For the exhibition some leaflets were developed showing different designs and describing the origin of the products.

The exhibition was considered very successful as it gave insights in product demands, and helped to establish direct marketing linkages. Representatives of the involved communities expressed their appreciation and gratitude to the government - MoEA, UNDP and SNV for organizing the exhibition and made requests for similar arrangements in the future.

The exhibition included new product designs shown in Figure 4 and aimed to help establish direct market linkages for the communities involved.

**Figure 4: New product designs**

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**Handicraft production in Bjoka**

Bjoka lies about 3 days walk from the road head and two days drive from the capital Thimphu. Handicraft production has been a traditional activity of the local villagers for over a number of generations. Nowadays almost all 150 households of the geog are involved in this craft and make all sorts of colourful baskets in Bhutan known as “bangchungs, baykor and lakchungs”. A study in 2004 revealed (Moktan et al, 2004) that 66% of the monetary income is derived from bamboo and cane handicraft production.

Bjoka was one of the pilot sites of the second phase of the Community-based Natural Resource Management (CBNRM) Project6 (2005-2008), and received support in the establishment of a Community Forestry

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6 The CBNRM project was executed by the Council for Renewable Resources Research of Bhutan (CoRRB) with financial support from the International Development Research Centre (IDRC) and technical assistance from SNV
management plan in order to ensure the sustainable supply of the resources as resources were getting depleted in the vicinity of the villages. This management plan has been approved by the Department of Forests (DoF) and ensures the legal access to the resources for a period of 10 years (2007-2017). Almost all villagers are part of the Community Forestry Management Group. The by-laws of the management plan of Bjoka include the set up of a Community Development fund (raised through sale profits, membership fee, and fines) which will be used for the operation of the community forestry group, community works such as the repairs of Lhakangs, drinking water supply and construction of an office, provision of loans to its members and for sending orphans to school.

The CBNRM project has supported the villagers with the establishment of weaving centres, where farmers can jointly gather and craft their products, learn from each other and monitor each other’s techniques and products. The weaving centres are equipped with solar panels so that farmers can work on handicraft production in the evenings and complete their farm work during the day.

As part of the RED programme, villagers in Bjoka were trained in product diversification and as a result villagers make currently 12 different main products, including the Bangchungs of different sizes. However, according to the business plan, the Bangchungs form still the major products and provide the major income to the villagers.

In late 2008, a handicraft sales centre was established in Zhemgang town with the objective of becoming a major outlet for the handicrafts, and a business plan has been developed in order to optimize marketing. At present the group sells about 60% of the products to local middlemen, 30% at exhibition, fairs and middlemen in Thimphu and 10% at the road head.

Because of the group formation, product diversification, and quality control, the direct income for the farmers in Bjoka is about Nu. 347,500 per year. On average this means Nu 2,635 per household which is about twice as much what they were earning before the group formation (Meijboom et al, 2008).

**Handicraft production in Silambi and Gongdue**

Silambi lies about 2 days walk from the road head and two day drive from Thimphu. It is one day walk from Silambi to the neighboring village called Dali in Bjoka Geog. With support of DoF and technical assistance of SNV, Community Forest management plans (describing the management of the bamboo and cane resources as well the by-laws) have been developed for Nagor (129 households) and Gyelgong (20 households) located in Silambi geog. Both groups have created a Community Development fund raised from membership fees, fines, sale profits, and donations. In Nagor, the group intends to use this fund for the provision of loans, as a commission to the committee members, maintenance of the community Lhakhangs and water supply schemes, and the maintenance of the community weaving shed. The Community Forest Management Group of Gyelgong plans to use the raised funds for the construction of community weaving shed, to purchase facilities for the shed such as solar lights and buying of improved varieties of agricultural seeds.

Tarayana Foundation supports the villagers in this area and has established a weaving centre in Nagor village in Silambi Geog. They carry out quality control and buy Bangchungs which meet the quality standards from the villagers for a set price and sell the products mainly in Thimphu.
Villagers in Silambi and Gongdue only produce the traditional “Bangchungs” in various sizes. Recently under the Skills Development Project training on product development was organized by the Skills Development Project and during the training four potential products for commercial purposes were identified apart from the bangchungs as the traditional products have a limited market demand. The products have been labelled and tested during an exhibition in Thimphu held in June 2009. (See the chapter on product development above).

Handicraft production in Kangpara

Kangpara has a total of 388 households spread over 13 villages and lies in Eastern Bhutan (with the centre half a day walk from the road head) and about 3 days drive from Thimphu. In this Geog, two villages Passaphu and Maduwa are well-known for their fine handicraft production skills especially of the traditional baskets. It is said that the best handicrafts of Bhutan come from this area.

Villagers have been able to keep up the tradition and passed the crafting skills over from one to the next generation, despite the fact that resources have been completely degraded for decades due to increasing demands, unsustainable harvesting techniques, forest fire and deforestation. Now, farmers travel to Serchem and Martang in Samdrup Jongkhar to get the raw materials. A round trip from Kangpara to Samdrup-Jongkhar and collect the bamboo takes 7 to 8 days. Because of the long travel distances, artisans make only one to two trips per year and can only take two backloads per trip which severely reduces the quantity of handicrafts from this area. Also the bamboo resources in Sechem and Martang dwindle rapidly because of the unsustainable techniques (collection of all young culms which severely hampers the shooting of new culms). The guidelines from DoF are not implemented nor enforced. Although a Ringshoo management group was formed in 2005, there is no management plan in place to ensure the sustainable management of the resources in Kangpara, Serchem and Martang. Plans are that next year a Community Forests will be formed for managing the resources in Kangpara (Trinh et al, 2009).

Because of the depletion of the resources, the villagers have set up a nursery and a plantation of 30 acres with wildlings from Samdrup Jongkhar in 2005. However the plantation was not very successful and many plants did not survive because of poor site selection, poor plantation techniques, poor quality of wildlings (too old) and lack of maintenance (Trinh et al, 2009). As requested by the community and recommended by the Dungkhag (local administration), UNDP provided funds for another 30 acres of plantation and fencing during 2009 while RSPN provided technical training in proper nursery and plantation set up.

Kangpara is also one of the selected sites for the “Skills Development Project” and 70 artisans from Passaphu and Maduwa took part in a training carried out with resource persons from the Cane and Bamboo Technology Centre. Apart from the bangchungs and other traditional products, six other designs were selected for product diversification as traditional products have limited market demand. Like Bjoka and Silambi, the selected products have traditional aspects (see chapter above on product development).

As of now, artisans sell their products to middlemen who are living in the same village. The middlemen take the products to major towns such as Thimphu, Trashigang, and Mongar.
Community and economic development

The three communities depend for a large extent on bamboo handicraft production for their livelihood. At present the traditional bangchungs form the major part of the business as these baskets are used in almost every household in Bhutan. As the tourism market is increasing, other designs are introduced by projects in order to diversify for attracting new market outlets, including tourists, hotels, handicraft shops, etc. Designs that are most successful include traditional Bhutanese elements.

Apart from the direct monetary income derived from the handicrafts production, the communities also profit through the Community Development Fund as established in Bjoka, Nagor and Gyelgong which is used for the economic development of the entire community.

Challenges

The areas of Bjoka, Silambi & Gongdue and Kangpara face similar problems in marketing their products. As the areas are very isolated, transport costs are very high which result in relative expensive products. Furthermore, because of the isolated location and the dispersed location of the households in the mountainous terrain, it takes time to communicate the requests of the buyers and traders to the producers. Therefore at present villagers just produce and try to sell their products instead of producing the handicrafts based on market demands.

The isolated location furthermore makes it difficult for villagers to have access to new information, techniques and materials. For example chemicals for processing the raw bamboo and sandpaper, wood glue, varnish and chemical dyes are only available in India. Also villagers are less aware of the new market developments related to colours, patterns and product designs. This does not constitute a major problem as long as there is a large market demand for the traditional baskets in its current form. However, it will become a problem if the market shifts and demands more sophisticated products.

There is a risk that alternatives such as plastic baskets will dominate the market and replace the traditional bamboo baskets. Plastic products are weather resistant and therefore more durable and also very cheap. People might prefer these and the demands for the traditional bamboo baskets might drastically decline as a result. However the Government of Bhutan discourages the use of plastics.

Yula can be cultivated but needs moist conditions and grows best under a forest canopy cover. This makes that almost all Yula is derived from the wild. In Bjoka and Silambi, villagers carried out some successful enrichment planting in designated areas in the forest in a small scale. In Kangpara a plantation has been established successfully established. Because of the high demand for the resources there is a potential risk that the resources are over-exploited and entirely get depleted or become locally extinct as in the case in Kangpara. If resources get depleted, it will take more time to collect the raw materials for producing the crafts which will lead to higher prices of the products and/or less income for the villagers.

Yula grows only in some selected pockets of the country in warm broad leaf forest. Because of this, there is limited scope for up-scaling handicraft production from this species and as a consequence production quantities will remain relatively low, while prices are relatively high.
Because of the above reasons, the possibilities for villagers living in these areas are limited to produce handicrafts in sufficient quantities of international standards which can compete on international markets. Therefore the Bhutanese handicrafts target the national market rather than the export market at present.

**Lessons learnt**

It is essential to have a management plan in place in order to ensure the sustainable supply of the raw materials. The depletion of the resources is one of the major constraints in all production areas. This management plan should be developed in a participatory manner and clearly describe the boundaries of the area, management prescriptions, harvesting rules, zoning, etc. It is important to carry out inventory exercises with local people as they will have then a better understanding and respect for the outcomes. Also the management prescriptions are best defined by combining traditional knowledge of farmers with technical and scientific knowledge of foresters. The community’s interest to adhere to the management plan depends on a feeling of ownership of the plan and the resources to be managed. Apart from the description on natural resource management in the management plan, the by-laws are at least as important. Good leadership from the committee is crucial for the functioning of the group. Also Community Forest Management Groups that are homogenous and of a controllable size and have a strong cohesion are more likely to be successful in achieving their objectives.

Apart from the formation of a management group ensuring the sustainable supply of the resources, it is essential to have a marketing group. This group could be the same as the management committee or could be different based on the interest of the villagers. The objective of the marketing group is simply put to minimize the marketing costs and increase the benefits for the farmers. Even villages in one geog are often located a days walking distance from the collection centre. Therefore, the task of the marketing group is to coordinate the marketing activities, including communicating quantity and quality requirements from buyers to the villagers, minimizing transportation costs, agreeing upon place and time for selling the products, setting and monitoring quality requirements & standards and determining standard prices for the different products. These tasks should be formally agreed upon by all villagers and written down as a specific Terms of Reference for the marketing group. As these activities are time consuming, the people assigned to the marketing group should get a commission / percentage of the total value sold as agreed upon by the villagers. A commission will help to stimulate the marketing group to carry out their tasks properly and also stimulate them to look for wider markets. Of course it is essential that the marketing group keeps detailed records of the sold products, prices, outlets where the products were sold, etc. Clear terms of reference, the provision of a financial incentive and records will help the villagers in keeping the marketing group accountable. In Bjoka, a separate marketing group has been formed, whereas in Silambi the tasks of the marketing group are mainly carried out by the Tarayana Foundation.

Although training has been provided in a number of designs, the most popular products are the traditional bangchungs in various sizes and products with traditional elements. Some designs turned out to be too complicated, not suitable for the Bhutanese market or too bulky, such as chairs, lampshades and tables, in order to make a profit.
The construction of weaving centres equipped with solar panels, are not only instrumental to increase productivity (because farmers can work on handicraft production in the evening), but are also instrumental as meeting places to share ideas and experiences.

Conclusions

Bamboo & cane handicrafts play a crucial role in the livelihoods of poor communities in Bjoka, Silambi, Gongdue and Kangpara as their cash income is mostly derived from these products. In order to increase the economic benefits for the local villagers, it is important to work along the entire value chain including resource management, product development and marketing. Related to resource management it is important to formally form a Community Forest management group in order to have legal access to the resources and to ensure the sustainable supply of the raw materials. Related to product development, products should be within the skills of the artisans, have a market demand and be suitable to the local circumstances e.g. products should not be bulky if there is no road access. Furthermore labelling helps to show the origin and distinctiveness of the product while the marketing of the products should be well coordinated in order to increase the bargaining power of the villagers as well as to minimize the transportation costs which always form a substantial part of the production costs in the mountainous terrain of Bhutan.
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