



Sustainability of Natural Raw Material Harvesting for Production in Nagaon Paper Mill

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Abstract

The study has been undertaken to investigate the sustainability of natural raw material harvesting for production of paper. Industries use natural resources as raw materials. This paper seeks to examine the possible effects of the exploitation of the raw material in an industry. It deals with the natural resource sustainability that is the sustainability of bamboo which is used by the Nagaon Paper mill as the main raw material. Environmental resources are scarce and using these resources in one way has an opportunity cost. By opportunity cost we mean the net benefits forgone from the next best use. The resources may be of two types (i) renewable resources and (ii) non renewable resources.

Renewable resources are those resources that are replenished naturally, including plant resources such as forests and stock of animal species like fish. Natural production means that the stock of these resources can increase overtime. On the other hand non renewable resources are those resources that exist in given stocks in the environment and can not be replenished within the time span relevant to human planning. Non renewable resources are also called exhaustible resources.

Bamboo being a multipurpose, eco friendly natural resource, needs to be managed and exploited in a sustainable manner.

Introduction

Industries use natural resources as raw materials. The Nagaon Paper Mill uses bamboo as the main raw material. This paper seeks to examine the possible effects of the exploitation of the raw material in an industry. It deals with the natural resource sustainability that is the sustainability of bamboo which is used by the Nagaon Paper mill as the main raw material. Environmental resources are scarce and using these resources in one way has an opportunity cost. By opportunity cost we mean the net benefits forgone from the next best use. The resources may be of two types (i) renewable resources and (ii) non renewable resources.

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Bamboo is a renewable natural resource. It is the main raw material of the Nagaon paper mill. The mill collects around 3.525 to 4.5 lakh tones of bamboo per annum not only from different parts of Assam but also from other north eastern states particularly from the state of Meghalaya. This huge amount of bamboo procured by the mill may adversely effect the environment and may cause deforestation.

Objectives:

To examine whether the raw material resource base of Nagaon paper mill that is bamboo vegetation is being exploited in a sustainable manner.

Methodology:

The study is carried out by collecting both primary and secondary data. The secondary data is collected from various government and non government publications. Primary data are collected from three villages of Kamrup and Karbi Anglong district of Assam. Some basic statistical tools are used to analyse the data.

Bamboo as the Raw Material

Several bamboo producing countries, such as China and India use bamboo in paper and pulp. Bamboo paper has practically the same quality as paper made from wood. Its brightness and optical properties remain stable, while those of paper made from wood may deteriorate overtime. The morphological characteristics of bamboo fibers yield paper with a high tear index, similar to that of hardwood paper. The quality of paper may be improved by refining the pulp. (Hazra A, 2003)

Bamboo is a fast growing versatile woody grass. It is an economic resource having potential for improving the quality of life of people particularly the rural people of the country. Bamboo provides raw material not only to paper industry but also to cottage and handicraft industries. The world market for bamboo is valued at US \$ 10 billion out of which the China's share is around 50%. The market for bamboo is expected to reach about US \$ 20 billion by 2015. The size of the bamboo industry in India is estimated to be about Rs 6505.00 crores which may grow to Rs 26000.00 crores by 2015. (National Bamboo Mission Report, 2005)

Role of Bamboo in the Social Life

Bamboo plays an important role in the life of not only the people of Assam but also in the life of the people of other north eastern states. Total bamboo area in Assam is about 2.23 million hectares as against India's 11 million hectares under bamboo. Out of the 130 bamboo species available in the country 34 species are found in the state. The National Mission of Bamboo Application (NMBA) states that bamboo has been an integral part of the cultural, social, and economic traditions of Assam and it is an important component of the wealth of Assam.

From centuries traditional communities in the state has been using bamboo as a basic resource material for basketry, home building and for agricultural support. Bamboo is utilized in many ways like for housing,

fencing, functional articles, agricultural implements, basketry, and even fuel and food. People of this region possess traditional skills of working with the material and knowledge of the cultivation and management of bamboo. It has also become source of livelihood for many artisans and craftspeople that produce various decorative products from bamboo.

Sarma B K (2009), states that bamboos are indispensable for the rural people of Asia for their variety of uses in day to day life- for shelter, food, furniture, handicrafts, house building material and various ethno-religious purposes. Bamboo is also called the poor man's timber. It is one of the most important renewable natural resources having wide distribution throughout the country. This resource has major contribution to the rural economy of India.

A report of the Bamboo and Rattan Policy of Assam, 2003 states that bamboo has over 1500 documented uses. In India it is primarily used for making paper which is around 35% of the total use of bamboo in the country. The percentage of other uses are like housing 20%, non residential uses 5%, rural uses 20%, fuel 8.5%, packing including basket 5%, transport 1.5%, furniture 1% and other wood industries 1% and other 3%. The following table shows this percentage distribution.

Table 1: Consumption Pattern of Bamboo in India

Types of Uses	Percentage of Consumption
Pulp	35
Housing	20
Non residential	5
Rural uses	20
Fuel (non industrial)	8.5
Packing, including basket	5
Wood based industries & transport	2.5
Furniture	1
Others including ladders, mats etc,	3
Total	100

Source: Tewari, D N (1992)

It is obvious from the above table that the highest percentage of total bamboo of the country is used for paper production. The second highest use is for housing and other uses by the people of rural areas.

Bamboo has been an integral part of the cultural, social and economic traditions of Assam. Many people in the state still depend on it for their livelihood and for household and functional uses.

Bamboo also helps to preserve the environment in many ways. It is an important element in the balance of oxygen and carbon dioxide in the atmosphere. The unique root structure and rhizome act as binders and control the erosion of soil. That means the extensive rhizome system of bamboos lies primarily

in the top layers of soil, so bamboos often plays a major role in stabilizing soils on slopes and river banks preventing erosion and land slips.

Uses of Bamboo

Bamboos are multipurpose crops, with over 1500 documented uses. Their most important traditional uses include housing, food and material for handicrafts. Worldwide over 2.5 billion people trade in or use bamboo. Globally, domestic trade and subsistence use of bamboo are estimated to be worth US \$ 4.5 billion per year and export of bamboo generates another US \$ 2.7 billion. (The International Network for Bamboo and Rattan, 1999)

The literatures regarding the basic characteristics of bamboo highlights some of the important advantages of bamboo.

- (i) The biological characteristics of bamboo help to reduce carbon dioxide level in the atmosphere. Bamboo also generates more oxygen as compared to other similar type of trees.
- (ii) Bamboo not only grows faster but also needs relatively less water. The maturity time of Bamboo is four to five years.
- (iii) Bamboo helps to protect soil erosion and landslides.
- (iv) Traditionally bamboo is also uses as medicine by different communities.
- (v) Bamboo is also used as food. The bamboo shoots are most popular in different pars of the world. Hazra A, (2003), states that Taiwan alone consumes 80,000 tons of bamboo shoots annually constituting a \$ 50 million industry.

A bamboo is used for different purposes at different stages of its growth. The uses vary from food to construction work. The use of a bamboo at different stages of its growth is shown in the following table.

Table: 2: The Use of a Bamboo at Different Stages of its Growth

Up to one month	Bamboo shoots are used as food
Between 6 to 9 months	for basketry
Between 2 to 3 years	for laminates and boards
Between 3 to 6 years	for construction
Bamboo gradually loses strength after the sixth year.	

Source :(Hazra A, 2003)

Bamboo is considered to be the most suitable species for agro-forestry models on degraded lands in Indian context. Ecological benefits of bamboo are numerous. Researches have shown that bamboo has the fastest growing canopy for the greening of degraded areas. It generates plenty of oxygen, lowers light intensity and protects against ultraviolet rays and is an atmospheric and soil purifier. Furthermore, it conserves water and greatly reduces soil erosion. (Anneth, 1996)

State of Bamboo in India

Bamboo is mostly found in forests in India. According to the Forest Survey of India (1999), 9.6 million hectares forest area of the country contains bamboo amounting to 12.8% of the forest cover. India's bamboo rich areas are confined to the north eastern states. The other bamboo growing places are Siwalik hills of Uttar Pradesh, Bastar, region of Madhya Pradesh, Western Ghats in South India and the Andaman islands.

The major states/regions by area under bamboo are shown in the following table.

Table 3: The Percentage of Area under Bamboo in Major states/regions in India.

State/Region	Percentage of area	Percentage of growing stock
North-Eastern states	28%	66%
Mizoram	8.45%	13.18%
Assam	7.54%	16.23%
Arunachal Pradesh	4.21%	11.91%
Manipur	3.39%	13.88%
Meghalaya	2.89%	5.34%
Tripura	.86%	1.04%
Nagaland	.70%	4.43%
Madhya Pradesh	20.3%	12%
Maharastra	9.9%	5%
Orissa	8.7%	7%
Andhra Pradesh	7.4%	2%
Karnataka	5.5%	3%
Others	20.2%	5%

Source: Madhab Jayanta (National Horticultural Mission, Government of India, 2003)

From the above table it is obvious that among the north eastern states Mizoram has the highest percentage of area under bamboo cover.

Bamboo in Assam

About 34 percent of Assam's total forest area is under bamboo – from massive *Bhaluka* or *Bambusa balcona* to the slender *Saru Bijuli* or *Bambusa assamica*. (National Bamboo Mission, 2008)

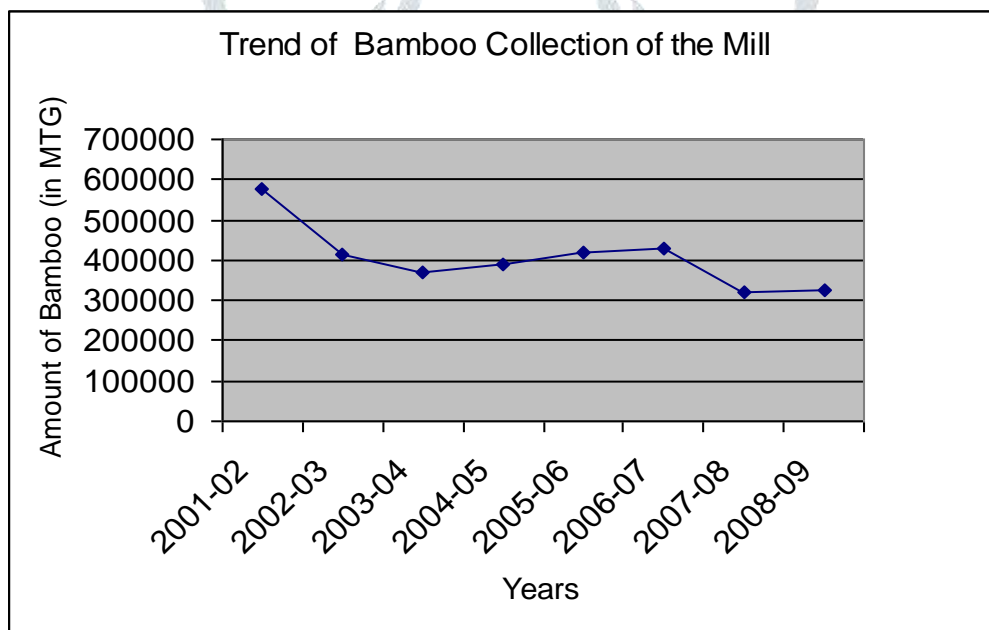
Hazra A (2003) also states that in Assam, the overwhelming industrial use for bamboo is still for pulp and paper. The paper mills in the state have a capacity of 800000 tones per annum, met largely from Assam, but to a lesser extent from the neighbouring states. Most of the bamboos utilized in these spheres come from the forests through a system of contracts, leases and departmental operations.

Trend and Composition of Bamboo Supply from Different Sources to Nagaon Paper Mill

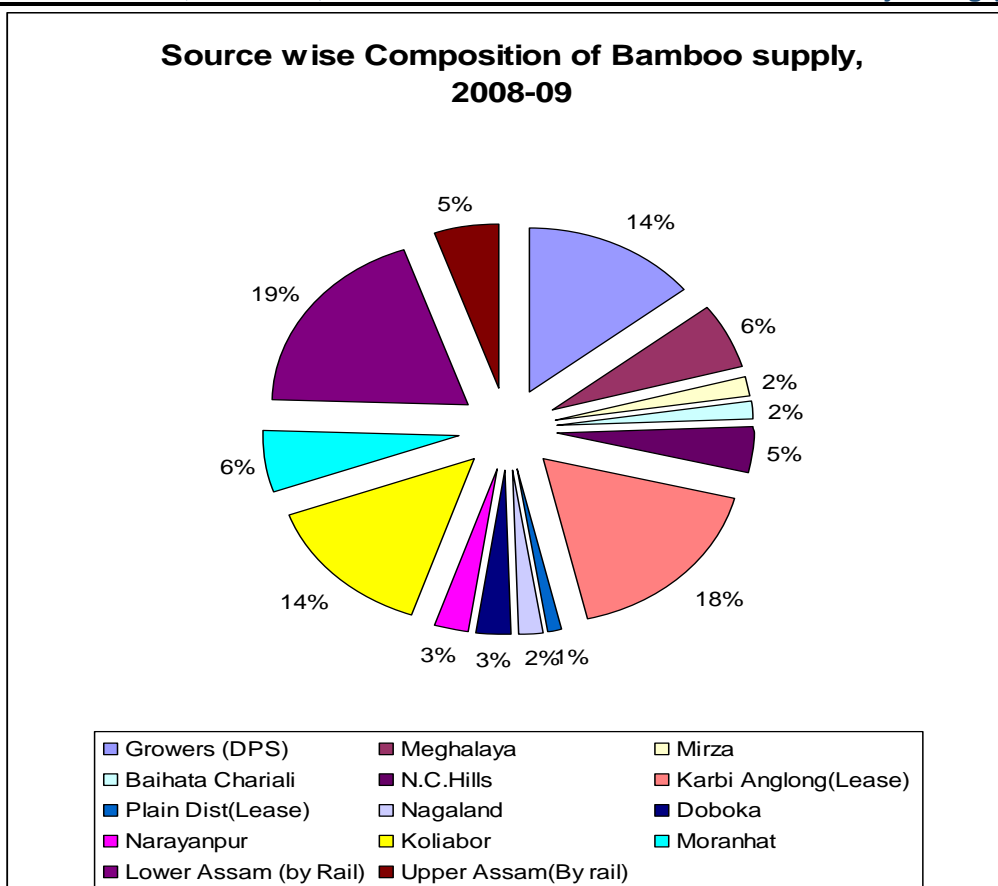
The Nagaon paper mill collects bamboo not only from the state of Assam but also from the other North-eastern states and West Bengal. The total requirement of bamboo and pulp wood is 4 to 4.5 lakh metric ton per annum. The mill produces two varieties of papers depending on the nature of raw material-

- (a) Wood free paper which is produced by using 100% bamboo and
- (b) Wood mix paper which is produced by using 90% bamboo and 10% pulp wood.

The bamboo collection work is done under the supervision of the Forest Department of the mill. The sources or the bamboo collecting points are defined in a certain way. As for example the source Numaligarh means the bamboo supply from and beyond Numaligarh to the next source. Accordingly the collecting price varies depending upon certain factors. These factors includes the distance of the source from the mill, plain or hill district and the state that means the bamboo coming from the state of Assam or other state. The means of transportation by road or rail also one of the determining factors of the bamboo procure price. The mill authority can change the source or collecting points according to their feasibility. The bamboo collecting sources are classified into different categories like plain area, lease area, forest area, direct purchase scheme etc.



Source: Nagaon Paper Mill(2009), (MTG- Metric tonn in Green)



Bahjani (Boko)

Location:

The village Bahjani is located near Boko in the south bank of the Brahmaputra river in the western part of kamrup district of Assam.

Bamboo Supply from the Bahjani Village:

The bamboo supplier of this village supplies bamboo not only from the Boko source but also from other sources like Mirza and the west Khasi hills of Meghalaya. The bamboo for the Mirza source comes mainly from Rani and Patharkhama. The bamboos supplying from the west Khasi hills come from the areas like Malang, Nakhel, Bogaikhas etc. These Meghalaya bamboos are from the forest areas of the state which are given in lease for a certain period of time by district councils of Meghalaya. During this time period the supplier can collect any amount of bamboo from the specified area. While cutting these bamboos no definite method is used, that means they can cut the bamboos at a stretch without keeping any branch intact. This process of cutting can affect adversely in the natural growth process of the bamboos. In these hilly areas lots of bamboos are also destroyed due to jhum cultivation. The jhum cultivation which is also known as the shifting cultivation is a system of cultivation practiced in the hill areas. This system of shifting cultivation involves a number of operations. In the first stage, forest bushes are cut up to the stump level in the month of December- January and small trees and bamboos are felled. The short tree stumps and large tree boles are left intact. The underground organs of different species are not disturbed. Next, the stumps are allowed to

dry after which they are set on fire. After the burning is completed the land is cleared and digging sticks and seeds of different crops as required are scattered in to the holes before the onset of the rains. The cultivation is confined to the area closed to the village. After every crop season or two, the area is left for 10 to 20 years and the cultivator moves to another area to slash and burn and cultivate (Lekhi & Choudhury, 1994). Thus in the hill areas of Assam and Meghalaya, bamboos are cut mainly for two reasons- one is for the paper mill and the other is for jhum cultivation. Though lots of bamboos are cut in the west khasi hill areas of Meghalaya for these reasons, there is no bamboo plantation in the forest areas. This may be the problem of property rights that prevails in the state of Meghalaya. There is no individual ownership of land and it is owned by the community as a whole. The property rights are the set of valid claims to a good or resource that permits the use of that good or resource and transfer of its ownership through sale. These rights are generally limited by law and social custom. Thus the ownership rights set out different types of rules to manage the resources. Some of the major rules are user rights, rights to prevent or admit others to use the resource, right to sell or not to sell and customary laws. The pattern of ownership and rights are commonly known as property rights. Property right is an institutional system in which the ownership and management of resources are well specified and well prescribed. Resources classified accordingly are private goods, public goods, state owned goods, common property resources and open access resources (Kadekodi Gopal K, 2004). Since the bamboo vegetation becomes common property for the community as a whole, in Meghalaya it is very difficult to

For the bamboo supplying source Boko (Agsia) household bamboos are collected from different villages of the nearby areas. Around 15 to 20 trucks of household bamboos are supplied per month from different villages of Agsia. One of these villages is the Bahjani village. This is a large and bamboo abundant village. The village has nearly 400 households. More than 50 percent population of the village engaged in bamboo related works. Bamboos are supplied not only to the Nagaon paper mill but also to Guwahati, Dhubri and Goalpara. Bamboos supplied to the Guwahati city is basically used for construction purposes. On the other hand bamboo supplied to Goalpara and Dhubri are used to make bamboo broom, match box and incense sticks.

The total supply of bamboo from Bahjani village to the paper mill in the last four years is presented in table 5.4.2. The number of bamboo trucks supplied to the mill was 13 in 2005 which come down to 8 trucks in 2008. This shows that the supply of bamboo is decreasing from the Bahjani village.

Table 4: Total Supply of Bamboo from Bahjani Village in Four Years

Year	No of bamboo trucks
2005	13
2006	11
2007	10
2008	8

Source: Field survey (2010)

This decrease of bamboo supply to the paper mill may be for two reasons. The supply of bamboo to Guwahati and other places is increasing. Secondly no bamboo plantation is made in the village.

Conclusion

Beneficial Effects: The people in the bamboo supplying areas are engaged in different activities related to the bamboo supply to the paper mill. These activities are basically the cutting and carrying bamboos. In the field study it was found that about 10 to 25 persons are engaged under each bamboo supplier. In the peak season the figure increases up to 50. Therefore income of the rural poor has increased to some extent by these activities. In some villages like Bahjani almost all the household of the village are engaged in bamboo related activities. This village supply bamboo not only to the Nagaon paper mill but also to Guwahati and Dhubri. The bamboo supplied to the Guwahati city is basically used for construction purposes, while the bamboo supplied to Dhubri and other parts of lower Assam are used to make incense stick and broom.

Adverse Effect: In one of the three sights adverse effect on bamboo supply is noticed which is not within the state of Assam but in Meghalaya.

The forest bamboos of the west Khasi hill district are cut as much as they can during the lease period which may affect the natural growth process of the bamboos. On the other hand there is no plantation of bamboo in these areas.

But this problem may be overcome by institutional reforms. Therefore in a broader sense there is not only sustainable exploitation of bamboo but also it leads to income generation.

Bamboo being a multipurpose, eco friendly natural resource, needs to be managed and exploited in a sustainable manner.

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