BAMBOO FOR ECONOMIC PROSPERITY AND ECOLOGICAL SECURITY
WITH SPECIAL REFERENCE TO NORTH-EAST INDIA

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"……..The programme envisages the cultivation of bamboo over two million hectares and promotion of technology and networking for enhancing trade. Economic and social benefits from these activities will lead to creation of 8.6 million jobs and market opportunities worth over Rs. 6500 Crore with investment of Rs. 2,600 Crore. This will be useful for additional development of the North Eastern Region……"

- Excerpt from the speech of Dr. A.P.J. Abdul Kalam, former President of India, on the eve of country's 56th Republic Day addressed to the nation highlighting the importance given by him to National Bamboo Mission.

The "Green Gold" of the 21st Century and commonly known as "Poor man's timber", bamboo played a significant role in human society since time immemorial and today it contributes to the subsistence needs of over a billion people worldwide. It has been traditionally used as fuel, food, rural housing and shelter, fencing, tools and various other purposes. In modern days, it is being used as industrial raw materials for pulp and paper, construction and engineering materials, panel products etc. Bamboo, which can be grown easily, much faster in growth than any known tree, eco-friendly and adaptable to various locality factors, is now becoming the most promising wood substitute. It has more than 1500 documents applications, ranging from medicine to nutrition and from toys to aircraft.

The north eastern region, a landmass of eight states, spread over an area of 262179 Km^2 representing around 8% of the total geographical area of the country with a population of about 39.04 million is a region which is abundant in bamboo resources. The region houses about two-thirds of the bamboo resources of the country spreading over an area of about 3.10 million hectares where 89 species of bamboos are available. This invaluable gift of nature to the region is integral to life and culture of all the ethnic groups of North Eastern India. Its multipurpose uses have made it an indispensable resource for the rural people. Being interwoven with daily life of ethnic groups, it has been incorporated in their cultural and social occasions also. Efforts backed by a surge in people oriented policies by the State Governments of the Region have begun to bear fruits. Bamboo being principal natural resources, the people of the region in particular will be better served by this God given bounty, if we all get down to the task of economic taming of this resource. A look at the facts reveal that sustainable and economic utilization of bamboo will throw open a plethora of opportunities, especially for the rural poor. Continued technological advancement and research have put bamboo into more and more uses and as raw materials of several industries. A priority requirement for harnessing its economic potential would be to draw up a well coordinated multilateral approach. The raw stock of bamboo in the region is conservatively valued at Rs. 5,000 crores. Even with a modest target of two-fold value addition to the stock through suitable methodologies, an annual turnover of approximately Rs. 10,000 Crore can easily be generated in the Region.

The first bamboo based panel was developed in China in the 1940s. Since then, over 30 panel products have been developed. For instance in China, over 10,00,000 cubic meters of panels of various types are produced annually in some 200 Mills, whereas in India, industrial scale production of panels is confined to bamboo mat board with about 2000 cubic metres board produced by just seven mills. There are also enormous environmental and socio-economic implications and benefits. For example in India, it is estimated that if Bamboo mat boards replace $1/4^{th}$ of plywood, it can save 4,00,000 cubic metres of round wood, thereby preventing the disturbance to 30,000 hectares of forests per year. Further more, it will generate 16.7 million workdays of employment per year.

A large section of the society depends on bamboo for livelihood. Although the people of rural area cultivate a few species of bamboos in homestead land to cater to their domestic needs, most of the tribal people depend on the wild bamboos occurring in forests. Large resource of bamboo in the Region is mainly utilized for domestic, handicrafts and in paper industries. Many of the species which are available in the region have great farming potential. Apart from wastelands and degraded lands, bamboo can be grown in marginal farm and underutilized lands. There is also great scope of increasing the yield and productivity of the bamboo bearing forest areas through scientific management and by introducing quality planting stock of selected commercially important species. Farming is obviously related to utility, gap between demand and supply of raw materials, economic returns etc. Therefore, setting up of industries for high value bamboo products, which require bamboo of uniform age, dimensions, quality and colour will enable the utilization of the resources in bulk and in turn generate further opportunity for farming.

The details of forest cover of the tribal district of N.E. Region and that of all India in the year 2003 are as under:

Name of the State	Total Geographical Area in Sq. Km	No. of Tribal district	Geographical area of tribal /Hill district (Sq.Km)	Area of Forest cover (Sq. Km)	Percentage of Forest cover
Arunachal Pradesh	83743	13	8374	68019	81.22
Assam (1) Assam (2)*	78438	16 3	50137 19153	12052 13158	24.04 68.70
Manipur	22327	9	22327	17219	77.12
Meghalaya	22429	7	22429	16839	75.08
Mizoram	21081	8	21081	18430	87.42
Nagaland	16579	8	16579	13609	82.09
Sikkim	7096	4	7096	3262	45.97
Tripura	10486	3	10486	8093	77.18
NER Total:	262179	71	253031	170681	67.45
All India	3287263	187	1103463	407298	36.91

*Data on 3 hill districts of Assam namely Karbi Anglong, North Cachar Hills and Nagaon covering an area of 19153 Sq.Km.

Mass plantation of bamboos in forest areas and private land will go a long way in mitigating the situation of the depleting forest cover of the country in general and for the North Eastern Region in particular. Bamboo can conserve soil and water in catchments areas, minimize soil erosion and control flash floods in the valleys and plains. It is most effective in

controlling landslides and can protect road sides, riverbanks, canal banks and dam sites. In recent time, bamboo is seen as the '*Wonder Plant'* of 21st Century and as substitute of wood, it can mitigate the pressure on natural forests and contribute to conservation of biodiversity. Bamboo is the best plant for carbon sequestration to retard pace of climate change.

The Government of India has launched the "*National Bamboo Mission*", a 100% centrally sponsored scheme through the Department of Agriculture and Co-operation under the Ministry of Agriculture, to promote holistic growth of the bamboo sector through area based regionally differentiated strategies. Similarly, the North Eastern Regional Bamboo Mission (NERBaM) under North Eastern Council, has also taken up implementation of a comprehensive Short Term, Medium Term and Long Term Plan for development of Bamboo for poverty alleviation and saving forests, specially for North Eastern Region.

Interest in bamboo increasing the world over

Many nutritious and active minerals such as vitamins, amino acids, flavine, phenolic acid, polysaccharide, trace elements and steroid can be extracted from bamboo culm, shoot and leaf. And all these have anti-oxidation, anti-aging, anti-bacterial and anti-viral functions. These are valuable in health care, and can be processed into beverage, medicines, pesticides, or other household items like toothpaste, soaps etc. At present, quite a few products have found their way into markets:

- Bamboo leaf contains 2% to 5% flavine and phenolic compound that have the power to remove active oxy-free-radicals, stopping sub-nitrification and abating blood fat. Flavine beverage and beer have been widely accepted particularly in east Asian countries like China, Korea and Japan mainly because of their value in health care.
- Some materials extracted from bamboo can be used in fresh flavour preservation or food storage application.
- Some additives obtained from bamboo are used in food such as bamboo juice, beverage, bamboo flavoured rice etc.
- Bamboo shoot is one kind of ideal vegetables being free in pollution, low in fat, high in edible fiber and rich in mineral. It is cold in properties, functions well in removing sputum, enhance digestion, relieve toxicity, improves diuresis and often used for healing swollen state of tissues or edema and abdominal disease in which watery fluid collects in cavities or body tissues called ascites. Shoot also contains saccharine which can resist against little white mouse tumour and tumour – 180 and also has anti aging elements.

For all these chemical properties of bamboo and its capacity to set right various global problems such as the pollution of air and water resources, the aging of population and increasing prevalence of old age diseases have aroused unprecedented interest in bamboo the world over. Of late, research have shown that *bamboo charcoal* is one of the base material for human health right from water treatment to its uses as shield from electro magnetic radiation. With the increasing demand for returning to the nature, there is an increasing preference for products processed or extracted from plants. With its high growth rate, wide range of applications and high renew ability, the bamboo resources have taken significant position in the 21st century.

Market size of Bamboo

Product/ Application	Current Market (Rs.)	Expected Market (Rs.)
Bamboo shoot	4.8 crore (2001)	300 crore (growing at 25%)
Bamboo as wood substitute	10,000 crore (import value)	30,000 crore (in next 20 years)
Bamboo Ply board	200 crore	500 crore
Bamboo Ply board for use in trucks and railways	1000 crore	3408 crore (in 2015)
Bamboo flooring	100 crore(Domestic) 100 crore(Export)	1950 crore (2015)
Bamboo pulp	100 crore	2088 crore (2015)
Bamboo furniture	380 crore	3265 crore (2015)
Building and construction Material		
Scaffolding	-	861 crore (2015)
Housing	-	1163 crore (2015)
Roads	-	274 crore
Bamboo grids	-	1000 crore (2015)
Tiny and cottage industry		
Agarbatti, Miscellaneous Industry.(ice cream sticks, fire cracker, lathis, ladders, etc.), Pencil /match Industry	394 crore	600 crore

Bamboo and the socio-economic life of the region

The vast areas of the land in the NE region is predominantly owned or occupied by the tribal community which has their own peculiar system of land administration. The concept of ownership of land among tribals is different. They believe that the people who work on the land have a right to the produce and as such the system of community ownership of land leading to an individual with no stake in the property and there is no impetus to grow and expand. Property rights in the context of NE Region have two aspects:

- Restrictions on grant of property rights to non-natives (includes people from other states of the NER.

- Investors have not been able to set up industry & business which has been creating ingenuous ways of circumventing the restriction and transacting business and exposing exploitative situations.

The Silent Feature of bamboo economics in the NE region:

1. Except in Tripura & Sikkim the forest cover in the region is in decreasing trend which is reduced from 160242 Sq.Km. in 1997 to 159108 Sq.Km. in 2001. In case of Tripura & Sikkim, the forest cover has been increased from 5535 Sq.Km. to 7065

Sq.Km. and 3041 Sq. Km. to 3193 Km. respectively. However, in over all, the region showed an increase in forest cover which increased from 168818 Sq.Km. in1997 to 169366 Sq.Km. being 64.60% of the geographical area.

2. Tribal communities of the region heavily rely on forest resources for their subsistence and 90% of the population use biomass as an important source of energy.

3. In most of the N.E. States bamboo forms an important non-timber forest produce with immense potential.

4. The NER has a rich heritage of traditional skills in weaving, cane & bamboo crafts, carpentry, wood curving to meet domestic requirement.

5. About 89 species of 12 genera out of 136 species under 22 genera covering an area of 8.96 millions hectares in India of which around two-thirds of the total bamboo resources exist in the region.

6. The major clump forming bamboo species constituting the growing stock are Dendocalamus strictus (45%), Bambusa bamboos (Kotaba in Brahmaputra valley and Baroowa in Barak valley) 13%, D. Hamiltonii (phulrua in Mizo and Kakopesha in Garo) – 7%, B. Tulda (Jati in Assam, Mirtinga in Tripura) 5%, and B. Pallida known as Makla in Assam, Markel in Tripura, Naohei- Wa in Manipur accounts for 4% of the stock. Melocanna Baceifera a non-clump forming bamboo popularly known as Muli in Tripura and Mautak in Mizo accounts for almost 20% of the growing stock and is found all over the north eastern region.

7. The ten major species used for commercial purposes are *Bamboosa bambos, B. balcooa, B. nutans, B. tulda, B. pallida*, *Dendrocalamus strictus, D. hamiltoni*, *Malocanna bacifera, Schizostachyam polymorphum (locally known as Bajal or Nal* in Assam and Wa chall in Garo or Paphals by Lepcha).

8. The major user of bamboo in the north east is the paper industry, which consumes about 68% of the total annual production from the government forests. In addition bamboo supports a number of traditional cottage industries including production of handicrafts, incense sticks, and related articles.

9. A steady and reliable source of quality raw material supplies is fundamental need to the success of any planned economic activity.

    - In bamboo sector, despite the region and the country having one of the largest resource bases in the world, there are tremendous supply/demand problems that need to be overcome for successful development of the sector.

The constraints

There were several constraints that were identified in the course of the roundtables and field visits as well as from secondary sources. These can be listed as follows:

- The regulatory constraint on transit of bamboo as well as on harvesting from private plantations,
- The irregular supply of bamboo to industries,
- Poor market linkage of the products,
- Technology application for new product design along with testing, certifying of products,
- Lack of an institute on bamboo application and technology,
- Lack of application of known scientific methods in plantation, poor post-harvest treatment, and up-gradation of skill formation,
- Waste utilisation, and
- Competition from Chinese products.

The regulatory restrictions on transit and harvest of bamboo are the biggest impediment to the growth of bamboo based industries and applications. This happens because bamboo is defined to be a tree, when it is a grass and therefore it is treated at par with timber and other forest produces.
The transit pass requirement adds to delay and increases the cost due to red tapism. For example, the cost of one pole of *Dendrocalamus Strictus* is rupees ten but by the time the pole is available for further processing in Hyderabad city, the price increases to rupees forty per pole. This arises from the severe restrictions on movement of bamboo. Failure to get movement licenses forces people to move to other plantation trees like eucalyptus.

Another drawback on the path of realizing the potential of bamboo is the poor market linkage and technology application. New technology and product options need to be developed. Only when this happens will it encourage manufacturing units to be established. A public interest awareness campaign was felt to be essential for promoting the sector by most of the industry representatives throughout the country. The sector cannot thrive by making handicraft items like baskets anymore. There has to be a movement towards lifestyle products and utility products. Further therefore, there is the need for market establishment of these products, with product testing for quality being a necessity which will ultimately lead to market acceptability. Bamboo technology is not taught in India per se. So it was felt that there is a need for a bamboo technology institute, which can also impart the desired training. It needs to be located where the bamboo industry shows potential. The institute can also provide immediate solutions to local problems and help disseminate the information after research is carried out for further development. There was the need for a credible certifying organisation that would be accountable on quality issues. This can help the grower grows appropriate varieties that have industrial applications and the institute can spread awareness among states that will promote the use of bamboo. Presently, CBTC is designated by the ministry of Labour, Govt. of India as a certifying agency for cane and bamboo artisans.

Several other constraints also stand in the way of development of this sector in India, like lack of application of known scientific methods in plantation, poor post-harvest treatment, product development and up-gradation of skill formation. Low yield per hectare reveals poor

management of extant bamboo forests. Inadequate trained manpower and inadequate infrastructure for large scale harvesting in the event of gregarious flowering was also identified as a potential constraint. The bamboo cutters are usually exploited in the present system, especially by the Paper Mills, with no welfare schemes to benefit them and they work at abysmally low daily wage rates. As a result, many migrate in search of jobs. Bamboo Plantation activities over the next 5 years could generate about 50.4 million man days of work according to the Planning Commission. In the nursery sector, total estimated employment to be generated every year is to be around 9.7 lakh man days. Besides this, there will be employment generation in both skilled and unskilled segments in the handicraft sector.

The most important bottleneck was identified as the regulatory bottleneck, and as long as this was not meaningfully addressed, the sector cannot grow beyond a certain threshold level. In general, there seemed to be a strong promotional role of a governmental organisation, which would help generate awareness on bamboo products, run a nationalized campaign and help develop product-market linkages, apart from handholding the sector in the initial stages. The government initiatives and agencies created for the development of the sector was described and although there seems to be overlapping of jurisdictions, the sector is presently at such a nascent stage of development that there cannot be shortages of initiatives. What perhaps is lacking is a more concerted effort and better planning, and to overcome this drawback, there should be a permanent 'Board' for the development of the Bamboo sector in India, in lines of the 'Coffee Board' or the 'Tea Board'. In early 2005, the **North Eastern Council** launched the **North East Regional Bamboo Mission (NERBaM).** Under the provisions of the North East Bamboo Mission, the **Cane and Bamboo Technology Centre** was identified as a **Special Purpose Vehicle** to implement the North East Bamboo Mission and an Action Plan was also drawn up, in which key areas requiring intervention were identified. Thereafter, since October 2004, the Cane and Bamboo Technology Centre has been carrying out the mandate of the North East Bamboo Mission.

Similarly the Department of Science and Technology having launch National Mission on Bamboo Application (NMBA) especially for technology application in bamboo sector, National Bamboo Mission by the Ministry of Agriculture and Co op has been launched for holistic development of the sector with initial focuses on bamboo cultivation in both forest and non-forest/private plantations and it is hoped for that in future bamboo will be treated at par with other plantation crops once the viability of private plantations is demonstrated in different parts of the country.

Need for institutional reforms

While there are local practices with respect to production and processing, there is a need for developing appropriate management techniques in the production-to consumption system. Moreover, there seems to be perpetual tussle between the forest official and the grower/extractor with respect to its control. Most of the bamboo found in India is forest bamboo. Hence the tussle has also been between the forest department and the artisans etc. The dialogue has been on de-reservation of forests for bamboos as indicated earlier, reclassification of bamboo as an agricultural crop rather than a tree, etc. In the NE, while most of the land and forests are owned by the community, there exists a *mahaldari* contract system for the sourcing of raw bamboo from the extraction centers. This system leaves a lot of scope for corruption and leakages including trading of the contracts.

The large inflow of funds into the NER from the central government has resulted in a passive work culture and created government monopoly in employment. Funds earmarked for development of the region have been channellized elsewhere. This has resulted in a marked disparity of income between the grower households and the trader and government class leading to community disharmony. Grower households can increase their income levels by participating in the bamboo-based industry.

Sustainable development through community forestry/farming has successfully enabled a number of developing economies to elevate living standards and reduce the divide between the business class and the local communities and thereby set up organised industry based on forest or agricultural-produce. The NER with its substantial bamboo resources and historical strength in the wood industry is highly compatible with the requirements of the sustainable development model. The only weak links in the chain are related with policies and regulations and market development. Changes in these can be brought about through proper presentation of facts to stakeholders in a phased manner.

Now is the time for action. The problems that exist in the NER to date – lack of land tenure records, the practice of jhum cultivation and the almost feudal hold of the district councils – can all be put to positive utilisation, starting with the humble and endearing bamboo with which the locals are as familiar as with themselves.

CBTC's Intervention

The Cane and Bamboo Technological Up gradation and Networking Project was launched in the North Eastern Region of India taking into account the vast resources and potential of cane and bamboo in the region. Prior to the launching of this Project, the two important plants i.e. cane and bamboo was simply taken for granted as these are common in most areas. These plants were basically used for four main purposes only i.e. for construction of houses/barns and small bridges, as food, in the Paper Industry and in the handicrafts sector. There was no awareness that when we may end up bereft of these natural resources. A similar event has already taken place in respect of timber. Taking a serious view of the wanton destruction of forest resources, the Hon'ble Supreme Court of India had banned the felling of trees in forest lands. This had an immediate impact as a large number of industries, which were dependent upon timber had to close down. Taking a cue from this, the day is not far when a similar ban might need to be imposed on the felling of immature bamboo to maintain the growth and vigour of the stand.

The Cane and Bamboo Technology Centre (CBTC) came into being in December, 2000 as an offshoot of the UNDP/UNIDO project. After the 1st phase of the UNIDO project period was over in 2004, CBTC has been registered under the Society Registration Act and since then it has been functioning as an autonomous body under the NEC. It has retained some of the committed employees while taking in many more staff with different specialization. During the few years of existence, the society has established itself as a most remarkable institution for competence and information especially for cane and bamboo. It has been catering to technical and technological equipment needs of the people in the region in collaboration several renowned institutions and manufacturers within and outside India.

Thus CBTC has been playing the diverse role of facilitating the promotion and propagation of knowledge as well as machineries and infrastructures to the beneficiaries/entrepreneurs on bamboo and cane. This has greatly improved the optimum utilization of these resources. In other word, the gap between the manufacturers of the machineries and the end user and for that matter, the gap between the industrial unit and the poor villagers have been narrowed down to a great extend through the effort of CBTC

Over the years, the CBTC has developed several core competencies:

- A hub for information, technologies and networking on Bamboo sector
- A vehicle for multi- disciplinary approach to varied application of Cane and Bamboo
- Manpower development and training of craft persons, entrepreneurs and trainers
- Coordinator for technical, legal and economic policies on cane and bamboo
- Consultation to small and medium scale entrepreneurs in the cane and bamboo Industry

The main collaborating partners of CBTC include:

- Development Commissioner (Handicrafts)
- Building Materials and Promotion Council (BMTPC)
- Indian Plywood Industry Research & Training Institute (IPIRTI)
- German Technical Cooperation (GTZ)
- National Institute of Design (NID)
- Forest Research Institues

At present, CBTC is one of the Bamboo Technical Support Group [BTSG] for the National Bamboo Mission(NBM) covering the eight NE states and the states of West Bengal, Jharkhand, Bihar and Orissa under the National Bamboo Mission, implemented by the Ministry of Agriculture, Govt. of India.

The IInd Phase of the UNIDO–CBTC project **"Sustainable Development of Bamboo Industries for Livelihood Creation in North Eastern India" which aims at creating Cane and Bamboo clusters** is due for implementation in the near future and it is fervently hope that this initiatives of the UNIDO for the region will take us steps ahead in the sector for which the involvement of the states and the people is very crucial for its successful outcome which aims at making this so Called ***"Poor man's Timber into the Timer of 21st Century"..***

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