

Bamboo - Carbon Sequestration Associated Livelihood Opportunities and Sustainable Development

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Introduction

Time is running out and fast rising carbon dioxide levels and higher temperatures will soon set in motion potentially catastrophic changes that will take hundred or even thousand of years to reverse. During last 30 years, the world has experienced significant temperature increase, particularly in northern hilly altitudes. The climatic scenario considered by the Third Assessment Report of the IPCC projects, the increase in global annual average surface temperatures by year 2100 to be 1.4-5.8^{°C} Celsius higher than the mean over the period 1990-2001. In some regions this projected warming will generate a climate not experienced in recent evolutionary history.

Forests, natural resources and people's livelihood are all being adversely affected by global climate change. In addition, to gradual change in precipitation and temperature patterns, the amplitude and frequency of weather related such as hurricanes, droughts and accompanying fires and pests and diseases are likely to increase. Weak industrial, political and economic conditions limited to adaptive capacity of developing countries making their populations vulnerable to climate change, which threatens to undermine many of their livelihoods.



Land-use change including tropical deforestation is a significant source of carbon emissions and an active contributor to global warming. Deforestation is estimated to have contributed on average 1.6 gigatonnes of carbon per year. This represents about 1/5th of current global carbon emissions, which is more than what comes from the fossil fuel-intensive global transport sector. Emissions from deforestation in Brazil and Indonesia alone are equivalent to the entire emissions reduction target of the industrial countries through the first commitment year of 2008-2012.

Approximately 400 million people live in or adjacent to tropical forests regions, of whom many are poor and depend on forests for income. Forest-based activities in developing countries provide about 30 million jobs in the informal sector as well as 13-35% of all rural non-farm employment. Developing countries provide \$ 30-40 billion worth of timber and processed wood products each year, although only a small portion of this currently benefits poor households.

Forests also offer important subsistence contribution to the well-being of the poor. The World Bank estimates that 90% of the 1.2 billion people living in extreme poverty depend on forest resources for some part of their livelihood. Approximately 2 billion people depend primarily on fuelwood, charcoal and other biomass fuels for their energy. The World Health Organization (WHO) estimates that two billion people rely on traditional medicines for their health, most of which come from forest.

As the poor ultimately bear the brunt of all adversities, scientific management and augmentation of forest has to be given highest priority in development. This suggests *inter-alia* a policy to actively encourage and support plantations of those species which contribute most to overcome these constraints. In this scenario, bamboo stands as an ideal species capable of achieving conservation of soil and moisture, repair of degraded land, ecological food and nutritional, livelihood and economic security because of its manifold uses and industrial application rendered possible by advances in technology.

Bamboo grows abundantly all over India except Kashmir valley and tolerates adverse soil and rainfall conditions from organically poor to mineral rich, moisture levels between 10-20 mm rainfall to over 6350 mm and drought to submergence.

Forest and woodlands play a significant role in the global carbon cycle and consequently in accelerating or decelerating global climate change. Forest contains about 50% of the world's terrestrial organic carbon stock and forest biomass constitutes about 80% of the industrial biomass. Forest contributes over 2/3rd of the global terrestrial net primary production. Growing bamboo forests restoring forest cover in deforested areas could thus help mitigate the climate change.

There exist a number of climate change mitigation options based on bamboo. Climate change mitigation opportunities from bamboo sector can be categorized into i) bamboo plantation; ii) bamboo as a energy source; and iii) bamboo products.



MAIN USES OF BAMBOO

It has more than 1500 documented applications. Bamboo is useful for different things at different stages:-

- Food items mainly edible shoots;
- Building and construction material, e.g. Scaffolding, housing, bamboo grids in road construction;
- Tiny and cottage industries e.g. agarbatti, ice-cream, cracker, fishing rods and sticks;
- Handicrafts;
- New generation products as wood substitutes, industrial products like activated carbon, truck bodies, railway carriage, Bamboo Boards, furniture;
- Medicinal products;
- Large bamboo based industries like paper.

Bamboo has been used for the construction of houses throughout tropical and sub-tropical regions for centuries. It is estimated that more than one billion people live in bamboo houses in Bangladesh alone more than 70% of the houses are made of bamboo. In some countries in Latin America, there is a rich and longstanding bamboo building culture, using Guadua bamboo for the construction of Bahareque and Quincha houses. Bamboo has strength, flexibility and versatility and when treated properly it is a suitable material for almost every component of the house.

Population growth, rapid rural-urban migration, inadequate housing for the poor and an unsustainable use of forest resources are compelling us to find alternative, affordable and environmentally friendly housing solutions. Due to its versatile nature, bamboo provides the perfect solution to these problems because of

following characteristics:-

- is readily available in many regions;
- requires minimal technology to process;
- is easy to use and build-simple prefabricated houses can be assembled in 4-5 hours;
- is inexpensive;
- is earthquake resistant; and
- is environmentally-friendly and sustainable.

BAMBOO FOREST FOR LIVELIHOODS

Tropical forests represent about 51% of the world's forest and are the important biodiversity rich suite (due to bamboo species) of terrestrial ecosystem on earth. Over 400 million people live in or at the



edge of these tropical forests including the world's 60 million native are indigenous people who rely entirely on the forest for their way of life. Any thing happening to the forest will affect these people as they largely depend for their livelihood on bamboo products.

For sustainable development of bamboo forest, following recommendations may be followed:-

- Bamboo development in India has come a long way since the launch of Bamboo Missions by the Government on 5th June, 1999.
- The country is at a crossroads and should take this moment to make a journey on the road to bamboo development - an inclusive development judiciously using a resource that is a versatile vehicle for both grass roots and industrial development - as it happened in China. The key to this would be development from grassroots upwards so that such prosperity is more rooted and sustainable.
- There is an urgent need for a coherent strategy for bamboo involving all stakeholders - enthusiasts, manufacturers, investors, bankers, and the government in order for India to achieve the target and the objectives as set forth by the government under NMBA and NBM.
- Bamboo is still a peripheral sector in India and the existing agencies implement routine schemes that are not bringing in dividends appropriate to the resource.
- There is a need for an agency to fully own bamboo and to develop it in an integrated fashion to its fullest potential for ecological and economic benefits. Forward and backward linkages must be developed and to do this, both policy support and an institutional mechanism are necessary.
- By the year 2020, the world will have seen tremendous changes. The population will most likely exceed 8 billion people, with more than 90% growth taking place in developing countries such as India and China Continued population growth, combined with an increasing economic status in these countries, will require a global effort to feed, house, cloth and provide the energy to sustain global economic growth.
- Because of its versatile applications bamboo is called **green gold** and has the potential to provide economic security to the rural population.

SUSTAINABLE FOREST MANAGEMENT

In spite of the efforts of the global community in its collective search for solutions to address the suboptimal use of forest lands and resources and to promote sustainable forest management (SFM), tropical forests are undergoing unprecedented pressure as population and demand for new agricultural land, forest products and ecosystem services increase. These efforts have nevertheless resulted in an increase of natural forests set aside for timber production under more ecologically sensitive management. The number of tropical forests in which “sustainability” is a priority consideration, although low, is nevertheless expected to increase in the near future



The management of Bamboo as a resource has been neglected and underutilized as it is considered a secondary species compared to timber in forests and in non-forest area a wild growth. Lack of scientific management, technology and industry based demand growth have contributed to its under-developed state. There is, however, a huge yield gap between the present and potential yield. For example, while the highest yield in Assam from *Melocanna baccifira* is 5 MT dry/ha., it is reported that with intensive cultural operation and fertilization *Dendrocalamus giganteus* gave an annual yield of 20-30 MT/ha. in Taiwan. Appropriate selection of site, choice of species, protection and silviculture tending can raise productivity substantially. This is all the more important as due to flowering nature of bamboo, no genetic improvement strategies are currently available and therefore Bamboo production technology has to be necessarily seed based, i.e. through seeds, offsets and clumcutting, which necessitates a system for seed production, multiplication and storage centres. Indeed the *in vitro* methods offer an attractive alternative to conventional methods for the mass propagation of bamboos.

Ambiguity in policies, ineffective or inconsistent law enforcement, corruption and overall weakness in the rule of law are still preventing many developing countries from realizing the full socio-economic, developmental and environmental benefits from the use of their production forests. Without major reforms in policies and practices for a more transparent forest productive sector, efforts to have better managed forests and involve local communities in their management are likely to have limited effectiveness. As a result of civil society demands, new governance regimes are emerging for tropical forests (public-private partnerships, logging companies - NGO partnerships, non-state governance market systems like certification processes) that have potential to facilitate change.

To manage forest ecosystems in a sustainable way implies knowledge of their main functions, and the effects of human practices. In recent years, scientific literature has shown an increasing attempt to understand integrated and long-term effects of current practices of forest management on sustainable development. But often, environmental or socio-economic effects are considered in isolation, or there is no sufficient understanding of the potential long-term impacts of current practices on sustainable development. Payment for Environmental Services (PES) schemes for forest services (recognizing carbon value) may be foreseen as part of forest management implementation, providing new incentives to change to more sustainable decision patterns. Experience, however, is still fairly limited and is concentrated in a few countries, notably in Latin America, and has had mixed results to date.

CONCLUSION

Forestry mitigation projections are expected to be regionally unique, while still linked across time and space by changes in global physical and economic forces. In the tropical regions, the human induced land-use changes are expected to continue to drive and dynamics for decades. In the meantime, the enhanced growth of large areas of primary forests, secondary, re-growth and increasing plantation areas will also increase the sink. Beyond 2040, depending on the extent and effectiveness of forest mitigation activities within tropical areas and very particularly on the effectiveness of policies aimed at reducing forest degradation and deforestation, tropical forest may become net sinks.



In the long-term, carbon will only be one of the goals that drive land-use decisions. Within each region, local solutions have to be found that optimize all goals and aim at integrated and sustainable land use. Developing the optimum regional strategies for climate change mitigation involving forests will require complex analyses of the trade-offs in land-use between forestry and other land uses, the trade-offs between forest conservation for carbon storage and other environmental services such as biodiversity and watershed conservation and sustainable forest harvesting to provide society with carbon-containing fibre, timber and bio-energy resources, and the trade-offs among utilization strategies of harvested wood products aimed at maximizing storage in long-lived products, recycling and use for bio-energy.

It is high time that we make serious efforts to harness the full potential of Bamboo. India is rich in bamboo resources, being the second largest bamboo growing country in the world. We must improve our practices for bamboo cultivation and its conversion into industrial products so that better quality raw materials as well as superior value-added products are generated for optimal growth of bamboo sector to serve as an eco-friendly source of goods, services and livelihoods to our millions of rural people living below poverty line.

The ability of bamboo to stitch and repair the degraded soil, conserving soil and moisture is well recognized. It converts pollutants into plant nutrients. Sequestration of Carbon makes it a natural environment cleansing system, which more than matches its value as an economic resource. Transformation of this fast-regenerating and plentiful natural resource from 'green grass' to 'green gold' through proper management and systematic value-addition, is crucial not only for employment generation and poverty alleviation but also for maintenance of ecology, environment and mitigation of climate change.



References:

1. Chomitz K. et al. 2006. *At Loggerheads? Agricultural Expansion and Poverty Reduction in Tropical Forests*. World Bank Policy Research Report <http://go.worldbank.org/TKGHE4IA30>.
2. IPCC, 2007. *Climate Change 2007 Synthesis Report*.
3. IPCC, 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry et al. (eds.), Cambridge University Press, Cambridge, UK.
4. Nasi, R., J.-C. Nguingiri, D.Ezzine de Blas (Eds.) 2006. *Exploitation et gestion durable des forêts d'Afrique Centrale: la quête de la durabilité*. ITTO, CIFOR, CIRAD, L'Harmattan, Paris, 429p.
5. Nasi, R. (Guest Editor) 2006. *Do we need new management paradigms to ensure sustainability in tropical forests? Ecology and Society* <http://www.ecologyandsociety.org/viewissue.php?sf=27>
6. Tewari D.N., 2003. *National Mission on Bamboo Technology and Trade Development*, Planning Commission, GOI.
7. World Bank 2003. *World development report 2003* Washington, D.C.: The World Bank.

