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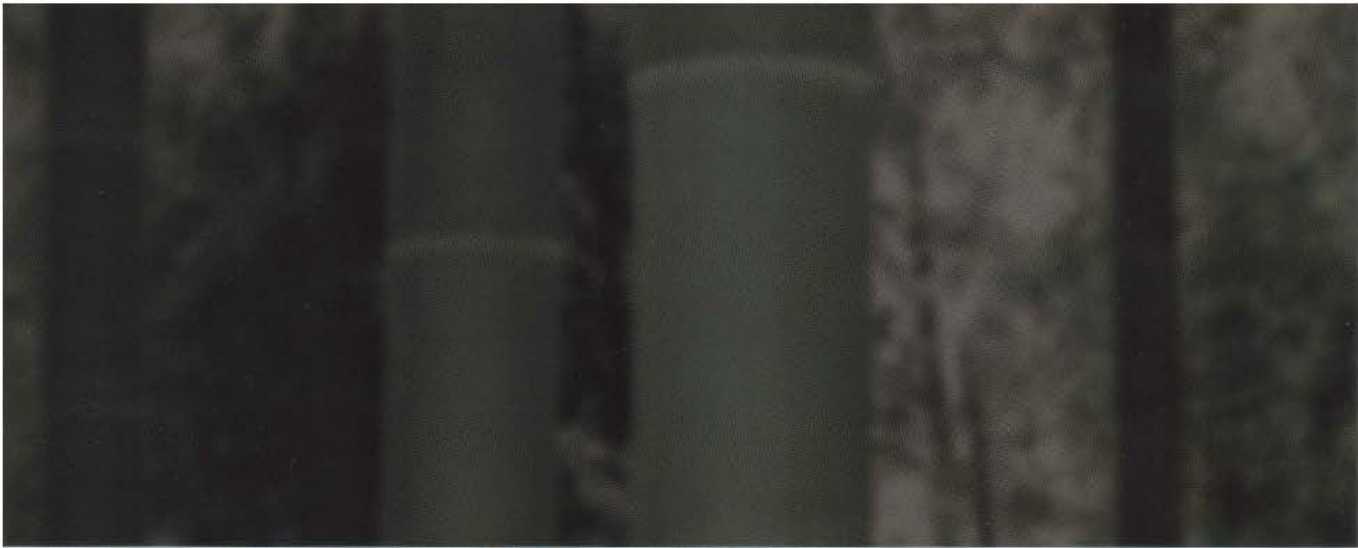


Perennial benefits

Developing a bamboo supply chain
and industrial base in Sri Lanka



INCLUSIVE AND SUSTAINABLE INDUSTRIAL DEVELOPMENT



Industrial development and climate change mitigation: the dual potential of bamboo grasses

Bamboo is a highly renewable and versatile natural resource used by people since time immemorial to craft numberless products. More recently, what used to be known as “poor man’s timber” has come of age as an industrial crop, a valuable commodity processed into such products as pulp and paper, veneer sheets, laminated panels, flooring, and furniture.

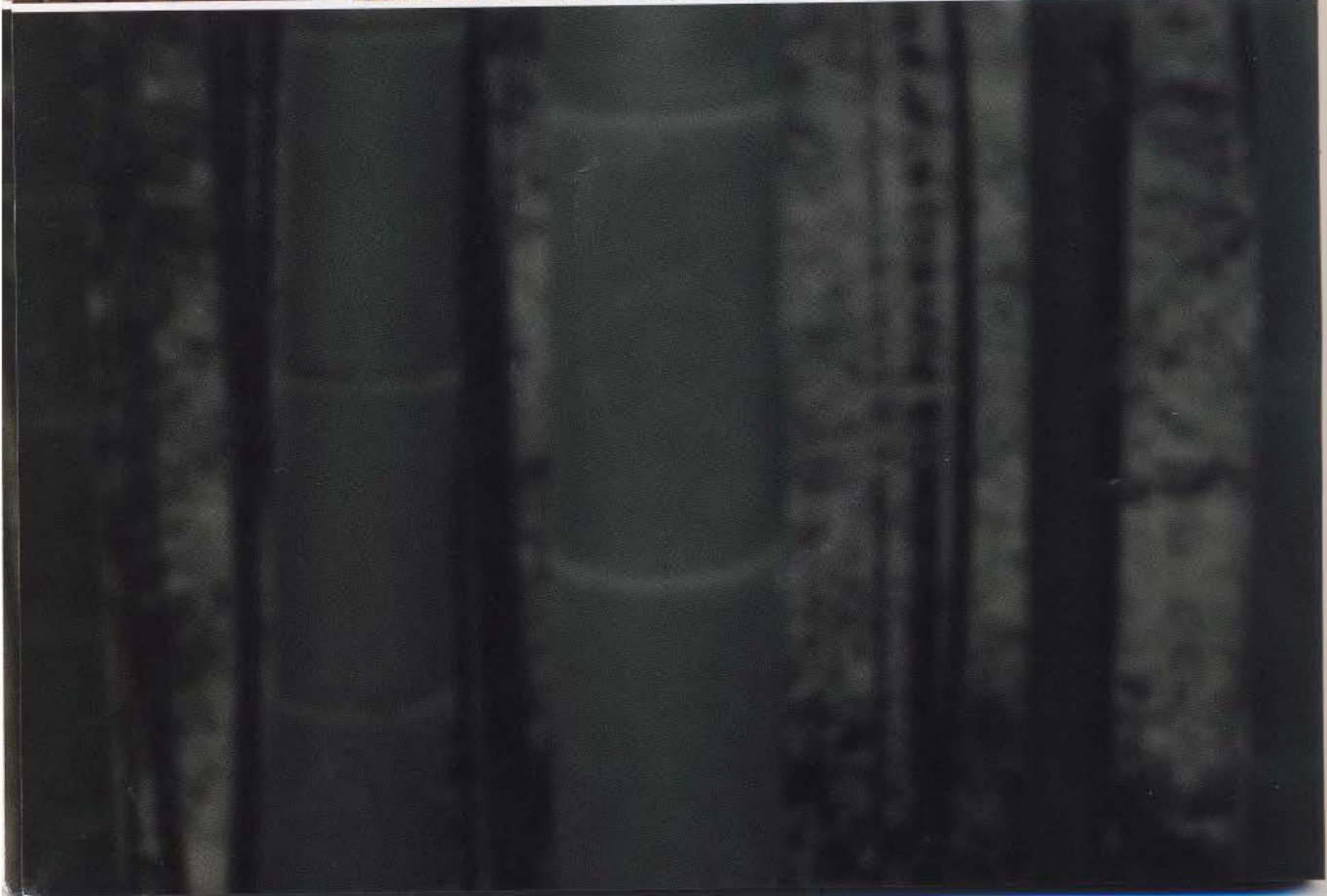
Bamboo grasses are exuberant perennial plants featuring fast growth and strong fertility. Bamboo plantations capture and sequester more atmospheric carbon than fast-growing trees, and their minimal mechanization, irrigation and fertilization requirements as well as the use of crop residues in place of fossil fuels allow the avoidance of significant emissions of greenhouse gases (GHG). All these factors account for the low carbon footprint of bamboo grasses and make them a standout plant family in the campaign to mitigate climate change.

There is a growing awareness in the developing world that a sustainable bamboo industry can be an important source of employment, export revenues, energy, and environmental benefits. Over the last two decades, the United Nations Industrial Development Organization (UNIDO) has assisted several Asian and African countries in developing viable bamboo-based industrial capabilities.

An ISID project for Sri Lanka

Supported by the Global Environment Facility (GEF), a seven-year project designed by UNIDO for Sri Lanka aims to capitalize on the dual potential of this perennial resource by developing a bamboo supply chain and industrial base with the additional benefit of contributing to the efforts to reduce the global environmental impact of greenhouse gases. “Bamboo Processing for Sri Lanka” reflects the principles of Inclusive and Sustainable Industrial Development (ISID), which is the core of the new UNIDO mandate pronounced in the 2013 Lima Declaration. With its potential to upgrade the traditional bamboo cottage sector and to launch industrial processing thereby developing a sustainable source of employment and supplementary income in mostly rural areas, the Sri Lanka project will contribute significantly to the pursuit of the overarching goal of poverty eradication. At two ISID Global Forum events hosted by UNIDO in 2014, the Organization reaffirmed its commitment to this foremost goal of the post-2015 UN development agenda, and stressed the need to support the growth of small-scale agro-industrial enterprises, which are generally flexible and innovative and have a high job-creation potential.

The UNIDO-GEF project seeks to develop plantations on up to 10,000 hectares of degraded land to serve as the resource base for an emerging bamboo industry focused on engineered materials for structural applications, biomass pellets, and food products. In close cooperation with the Government of Sri Lanka, the project is currently developing a policy framework to meet requirements related to plantation establishment and management, technology transfer, and capacity building. Another key stakeholder is the recently established National Bamboo Association of Sri Lanka, which is expected to ensure the involvement of the private sector.



Technology transfer: tools and skills for harvesting sustainable economic benefits

The transfer of bamboo technology will help build up the feedstock supply (plantations) and will play a catalytic role at the later value-addition stages of the project. Appropriate technologies will be transferred from India, where UNIDO was successfully involved in the planning and development of the bamboo sector, primarily through the Cane and Bamboo Technology Centre in Guwahati, established in 2001. Another potential technology provider is China, the undisputed regional leader in bamboo R&D and processing machinery, and a valued UNIDO partner in similar technical assistance interventions in the past.

Unlike other countries in the Asia-Pacific region, Sri Lanka does not have bamboo resources that can support large-scale industrial operations. Consequently, the establishment of an adequate feedstock supply constitutes the foremost initial task. The UNIDO project will upgrade the tissue culture laboratory established under the on-going Riverine Bamboo Project managed by the Mahaweli Authority of Sri Lanka and designed to control soil erosion along river banks and subsequently promote bamboo processing. The focus of UNIDO's intervention will be on mass propagation of drought-resistant species to be cultivated in the dry eastern areas of the island. Two native bamboo species (*Bambusa bambos* and *Dendrocalamus cinctus*) and one introduced species (*Dendrocalamus strictus*) are the main candidates, and the introduction of two more species (*Oxytenanthera abyssinica* and *Bambusa blumeana*) is also being considered.

It is envisaged that the bamboo biomass will be used as a sustainable energy source. Bamboo has a wide range of energy applications such as fuel for power generation, heating, cooking and industrial furnaces. Bamboo feedstock such as briquettes, charcoal and pellets can be produced from harvested bamboo as well as from bamboo industry waste. Transferring bamboo processing technology for energy feedstock production will provide an alternative solution for biomass energy in the country. Moreover, the introduced technology can be kick-started with biomass feedstock from the existing wood industries and at a later stage can use other energy crops.

One promising area is the processing of bamboo shoots into food products that enjoy a growing demand particularly in Asian countries. Processing, canning and vacuum packing equipment will be introduced by the project, and UNIDO experts will conduct skill development in machinery operation and maintenance. Feasibility studies carried out by UNIDO have identified several present species of bamboo which, although not cultivated widely until now, are highly suitable sources of edible shoots, especially *Thyrsostachys siamensis* and *Dendrocalamus asper*.

The most ambitious objective for the later stages of the project is to lay the foundations for the manufacture of engineered bamboo products, primarily flooring. Such products are the cutting edge of the emerging global bamboo industry with new technologies being tested, most notably in China and Europe. The Sri Lanka project will focus on engineered flooring, consisting of a thin layer of bamboo veneer over a composite board, but other high-value products such as laminated panels and whole-culm and panel furniture may also be included.



The ultimate processing challenge: bamboo as a wood substitute for industrial applications

As with most UNIDO endeavours, the Sri Lanka project seeks to contribute to poverty reduction by developing a sustainable source of employment and supplementary income. The immediate potential to meet this objective is greatest where the need for livelihood support is most urgent. In Sri Lanka, as in most other countries of the Asia-Pacific region, bamboo growing and processing is largely a subsistence-oriented cottage industry. The availability of traditional low-cost technologies, low overhead costs, and substantial markets for numerous handicraft products suggest that large numbers of poor people, most of them living in rural areas which offer very limited income generation opportunities at best, could gain access to the cash economy. Moreover, handicraft work can be a source of additional income for the underemployed and is ideally suited to fill the spare time of women with domestic duties.

Consequently, the short-term objectives of the UNIDO project include upgrading the handicraft sector with new designs, tools, and market access opportunities as well as establishing production clusters in areas where *Ochlandra stridula* (the main source of raw material for handicrafts in Sri Lanka) is abundant. A first pilot initiative in this respect was a workshop held in the village of Padukka in the southwest of the island; several applications introduced by the workshop are already evident in the products of local artisans, and the no less evident benefits to the local community prompted the project management to speed up planning for the replication of this initiative elsewhere in the country.

With an adequate feedstock supply in place, the ultimate challenge will be to develop pilot manufacturing capabilities which can add significant value to bamboo in intermediate and finished products. In flooring and furniture, bamboo can replace wood successfully in both practical and aesthetic terms with the additional appeal of a substitution that benefits the environment. Bamboo flooring has physical similarities to hardwoods, such as strength, durability, and resistance to moisture, and the fast growing demand it enjoys in Europe and elsewhere holds the promise of attractive export opportunities for Sri Lankan manufacturers.

The two-track development strategy designed by UNIDO for Sri Lanka – upgrading the output and operation of the informal bamboo sector, and laying the groundwork for the manufacture of high-value industrial products – is a model that renders itself to replication particularly in island states with bamboo handicraft traditions and an existing but unsustainable wood industry. Two small island states, Fiji and Vanuatu, have already expressed their interest in hosting similar projects.



A UNIDO-GEF project with a rich environmental agenda

The potential of bamboo to provide global environmental services was an important consideration in the design of the Sri Lanka project, which foresees reductions of GHG emissions that are fully in conformity with the goals of the Climate Change Focal Area of the GEF. At the same time, in line with the new GEF-6 approach, the project addresses several key drivers of environmental degradation. It covers all three climate-related services bamboo can render: on-farm carbon sequestration, prolonged carbon storage in durable products such as flooring, panelling and furniture, and GHG emission avoidance by the use of bamboo as a bio-energy resource replacing fossil fuels. Moreover, in addition to significant on-farm carbon sequestration, bamboo cultivation will have an even greater carbon impact by reducing pressure on Sri Lanka's wild forests. Since it provides fuel and reduces or eliminates the need for shifting cultivation, it is estimated that every hectare of bamboo plantation can prevent the destruction of up to 10 hectares of forest cover.

Assessments of the project's expected outcomes show that the benefits of the use of bamboo as a bio-energy resource are significant. It is envisaged that 25% of the biomass produced by the project will replace existing unsustainable fuel sources for power generation to the tune of 113,800 MWh per year. An additional 25% of bamboo biomass is to be used as a source of energy for cooking thereby replacing unsustainable forest biomass. The combined climate mitigation effect of these two bio-energy applications will be an annual emission avoidance of 156,850 tonnes CO₂eq.

The prolonged storage of carbon in such durable products as flooring will contribute further emission avoidance estimated at 87,520 tonnes CO₂eq, thus raising the total climate mitigation impact of the project to 244,370 tonnes CO₂eq per year.

Another important environmental objective of the project is addressing the challenge of land degradation. Most available degraded land, including abandoned tea plantations, is in the dry eastern areas of the island, which also have strong industrial development potential.

Excessive extraction of native bamboo growing in natural forests has led to genetic pool erosion, which makes preserving biodiversity in and within bamboo species an urgent necessity. The need to protect bamboo resources in order to safeguard the only source of income for many communities has been a major issue for decades in Sri Lanka. One native species in particular (*Ochlandra stridula*) accounts for four-fifths of the country's total bamboo resources, and the livelihoods of large numbers of rural gatherers, traders and artisans depend on this small bamboo with thin culms occurring in the humid lowlands and hills in the south and southwest of the island. Moreover, the survival of bamboo in its old-growth forest habitats augurs well for a wide range of flora and fauna, including some endangered plant, animal and bird species whose subsistence is dependent to various degrees on bamboo ecosystems.



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