

Bamboo: The Wonder Tree

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Bamboo, well known as the poor man's timber or green gold, is one of the world's highest-yielding renewable natural resources. It belongs to the family Poaceae, a subfamily of Bambusoideae, and has 75–107 genera with over 1642 known species of bamboo worldwide (Vorontsova *et al.*, 2016).

Bamboo is a widely distributed grass in the tropical, sub-tropical belts and mildly temperate regions between latitudes around 46° north and 47° south covering Asia, Africa, north, central and south

America. The total estimated bamboo resource in the world is 35.0 million ha, of which 24.9 million ha (71% of the total bamboo area) is in Asia. Most of the Asian forests have bamboo, with its significant presence in Northeast (NE) India through Burma to southern China, and through Sumatra to Borneo. The total area under bamboo in the world increased by around 50% between 1990 and 2020, mostly because of the increases in China and India. India is a major bamboo-

producing country covering 15 million ha (FSI, 2021) followed by China which covers 6.01 million ha. In terms of bamboo diversity, China is among the richest countries in the world and alone has about 861 species belonging to 43 genera. India has reported around 148 species of bamboo belonging to 33 genera and 6

different varieties. Around 70% of the overall bamboo forest area in China is dominated by moso bamboo (*Phyllostachys pubescens*), whereas in India the widely distributed bamboo genera



are *Bambusa* and *Dendrocalamus*. Due to their biological attributes and rapid growth, bamboo forests are ecologically important for their role in carbon sequestration, soil erosion control, water conservation, and land rehabilitation. Bamboo acts as a potential carbon sink and can improve land and water quality, thus improving the microclimate. It also has enormous potential for the eco-restoration of degraded lands. In addition to the diverse ecosystem services provided by

bamboo grown in villages, total biomass and carbon storage in bamboo-based family forests can provide an opportunity for carbon farming. Bamboos can provide local coping strategies that increase the resilience of ecosystems. The cultivation of bamboo is likely to help the rural and urban populations to develop resilience toward the impacts of climate change. Bamboo, as a strategic resource, can alleviate poverty, develop economies, address climate change through sustainable management and utilization, and hence, can contribute significantly to the accomplishment of the UN 2030 Agenda for Sustainable Development Goals (SDGs), UN Strategic Plan for Forests 2017–2030, the Paris Agreement adopted under the United Nations Framework Convention on Climate Change (UNFCCC), green growth of Organisation for Economic Co-operation and Development (OECD), and Reducing Emissions from Deforestation and forest Degradation (REDD ?) targets of UNFCCC. The International Network of Bamboo and Rattan (INBAR) under its 2015–2030 strategy set priorities to promote environmentally sustainable development and green economy action plans by using bamboo and aims to fully permit stakeholders to utilize bamboo's potential in climate change mitigation and adaptation.

Medicinal Importance of Bamboo

Bamboo shoots have been regarded as a traditional Chinese medicinal material for more than 2000 years. In the traditional system of Indian medicine, the silicious concretions found in the shoots are called 'banslochan' and in the Indo Persian and Tibetan system of medicine, it is called 'tabashir' or 'tawashir' and commonly called as 'bamboo manna' in English

(Nirmala *et al.*, 2001). Modern research has revealed that bamboo shoots have a number of health benefits, from cancer prevention and weight loss to lowering cholesterol level, improving appetite and digestion etc.

Sustainable Utilization of Bamboo In Land Restoration

The bamboo plantation is crucial in the process of land restoration, and it holds a key role in the economic development of the country. It also provides important additional benefits as a commodity (Abebe *et al.*, 2021). Many plants and grass-like bamboos will be able to manage the degraded lands and stop runoff due to their intensive root systems. Bamboo has exceptional environmental and biophysical properties that make it potential and economical approach to addressing some of the complex challenges of land degradation, which we are currently facing, particularly in areas of severe degradation. Bamboo has properties that make it perfect for recovering degraded lands. It can grow in poor soils and on steep slopes where several other plant species cannot survive. Its large fibrous roots allow it to stabilize in loose soils and prevent soil erosion. Multiple studies have revealed that bamboo's subterranean rhizomes and fibrous roots may cover up to 100 km per hectare of the bamboo stand, develop to a depth of 60 cm, and survive for 100 years. Bamboo can survive even after destroying above-ground biomass due to its good regeneration capacity of rhizomes. Bamboo is one of the fastest growing woody trees, capable of growing up to one metre in a single day, owing to its enormous root system. Therefore, it may re-vegetate and restore productivity to barren land in a short duration. As a

result, a growing number of governments have started to recognize as well as expressly list bamboo as a high priority plant for restoration of the landscape. Ethiopia, Ghana, China, Kenya, India, Cameroon, Madagascar, Vietnam, and Philippines are just a few of the nations that have made bamboo a priority in their plans to achieve Sustainable Land Management.

Bamboo Plantation In Phytoremediation

In phytoremediation, plants are used to shift, stabilize, extract, and/or get rid of pollutants in the groundwater and soil. A low-cost method of cleaning up contaminated areas is phytoremediation, which uses plants with exceptional metal-accumulation capabilities. The strategy is more palatable to the local population and less detrimental to the environment. Certain bamboo species have the ability to absorb heavy metals and adapt to metallic environments. Heavy metals, which are mostly deposited in the cell wall, vacuole, and cytoplasm, may accumulate in considerable amounts in the tissues of its rhizome and culm. It has been demonstrated that certain bamboo species, including *Phyllostachys edulis* and *P. praecox*, can absorb and retain heavy metals in contaminated soils.

Structure

The structure of bamboo, which determines its ultimate mechanical qualities, is described in the anatomy of bamboo. The above-ground stem, which may be straight or bent. The stem base, which is the lower portion of the stem that reaches the ground. The stem petiole, which is composed of several short sections and is the lowest part of the stem. The culm, which is the main stem of a plant, is made up of two key parts:

internodes and nodes (also called diaphragms). Nodes are areas where cells are oriented either across or parallel to the stem, while internodes are made up of cells that run along the length of the stem. Most culms are hollow, like tubes, and the thickness of the stem's wall defines the space between the inner and outer surfaces. However, some plant species may have solid stems instead of hollow ones. Because of its high content of potassium, bamboo helps to maintain normal blood pressure and is labeled as a heart-protective vegetable. Its relatively high content of up to 4% cellulose increases the peristaltic movement of the intestines and helps digestion. It also prevents constipation and decreases body fat. Due to high content of dietary fibres and presence of phytosterols, bamboo shoots are known to lower cholesterol level. Shoots of *B. arundinacea* / *B. bamboos* contain choline, betain, nuclease, urease, cyanogens, glucosides and are used in the treatment of diarrhoea, thread worm and cough.

Conclusion

For a long time, bamboo has been “poor man’s timber”, so it became the choice of material for most low-cost or cost-effective housing. Bamboo grows quickly and is in high demand, but its sustainability is under threat. We need to closely evaluate how renewable it is to meet both traditional and modern needs. Bamboo can thrive in almost any climate and can be harvested in 3 to 5 years, making it more versatile than many other woody plants. Despite being used for thousands of years, bamboo has not been depleted. However, we must explore advanced

methods to use bamboo more effectively to ensure its long-term sustainability.

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