

Concept Note: Proposed Bamboo Development Project

Background & Context

The Maharashtra Cabinet Decision on 17th November 2023 mandated MITRA (Maharashtra Institution for Transformation) to detail the implementation framework for the recommendations outlined by the Economic Advisory Council (EAC). The EAC has set an ambitious goal of achieving a \$1 trillion economy for Maharashtra by 2028, necessitating an annual growth rate of 13% in the Agriculture & Allied Sector. This target requires significant improvements in agricultural infrastructure, agroforestry, and agricultural value chains.

Bamboo is a strategic agroforestry resource with a high growth rate, strong carbon sequestration potential, versatile industrial applications, making it both a key climate solution and a sustainable income source for farmers. A strategic intervention through a policy on bamboo-based ecosystems can position Maharashtra as a key player in India's bamboo value chain.

Introduction

Maharashtra, under the Green Maharashtra Programme, seeks to simultaneously advance poverty eradication, food security, climate resilience, and biodiversity conservation. Bamboo, due to its rapid growth, carbon sequestration ability, and versatility, is at the center of this transformation. The global bamboo market, projected to reach US\$88.42 billion by 2030, presents an immense opportunity for the state. Maharashtra aims to transition into a bamboo-based green economy by leveraging its natural resources, industry needs, and multilateral support.

Bamboo stands out as a key species due to its exceptional growth rate, versatility, and potential to address multiple policy objectives, including climate change mitigation, rural development, and industrial sustainability. Bamboo, often termed "green gold," is a renewable resource with applications across industries such as energy, furniture, biofuels, construction, and textiles.

The 2017 reclassification of bamboo as a "grass" unlocked cultivation on private lands, aligning with the Maharashtra Agroforestry Policy 2023 and National Bamboo Mission. This initiative prioritizes private lands owned by farmers and Farmer Producer Organizations (FPOs), integrating global best practices. Collaboration with Community Forest Rights (CFR) frameworks ensures inclusive growth, ecological resilience, and reduced carbon emissions.

Maharashtra aims to increase green cover by 20% under the Green Maharashtra Program (GMP), aligned with India's National Bamboo Mission and the Paris Climate Agreement commitments. Bamboo's rapid growth, high carbon-sequestration potential, and diverse industrial uses make it an ideal crop to advance SDG 13 (Climate Action), SDG 15 (Life on Land) and rural livelihoods. Although India accounts for 45% of global bamboo production, it holds only 4.5% of market share; Maharashtra's 20.5 M ha farmland offers scope to add 1.1 Million Ha under bamboo, closing supply-demand gaps

Goal & Objectives

Goal: To significantly enhance the green cover across Maharashtra while simultaneously establishing a robust, sustainable economy centered around bamboo cultivation and its diverse applications.

Objectives:

1. **Support for Farmer Producer Organisations (FPOs):** To provide support to farmers engaged in bamboo cultivation through Farmer Producer Organisations (FPOs). This includes supplying them with high-quality planting materials for healthy crop yields, extending Production Linked Incentive (PLI) subsidies to FPOs for encouraging and sustaining their agricultural practices, and offering specialized training programs designed to improve cultivation techniques, resource management, and overall productivity.
2. **Development of Market Ecosystems:** To create and nurture dynamic market ecosystems that facilitate the growth of the bamboo industry. This involves establishing strong industrial linkages that connect bamboo producers with manufacturers and distributors, thereby promoting the development and commercialization of a wide range of bamboo-based products. Introduction of the PLI scheme to the bamboo-based industries will bring investments to set up industries in the state. This will also address and reduce the significant supply gap within the national bamboo demand-supply chain. Detailed market analysis will be undertaken to meet the demands of the bamboo end product market.
3. **Integration of Bamboo Biomass in Energy Production:** To actively integrate bamboo biomass into the energy sector, particularly through its inclusion in thermal power generation. This will involve implementing a mandate by the Ministry of Power, Government of India that requires thermal power plants to co-fire with at least 5% bamboo biomass, contributing to cleaner energy production and the reduction of carbon emissions, for which a pellet plants need to be set up for meeting the demands of thermal power plants.
4. **Innovation and Research:** A Technical Assistance (TA) support will be leveraged from the multilateral banks to bring about innovation and establish tissue culture labs in the state. The TA will be used to bring about innovation in the bamboo sector by carrying out research aiming to reduce dependency of bamboo imports in Maharashtra. The TA will be utilised for resource mapping, baseline assessment, upstream studies, demand mapping, etc. using technologies such as blockchain, GIS, remote sensing, drone surveys, etc. to strengthen the bamboo value chain.
5. **Regeneration of Forest:** The land in Forest will be supported to plant bamboo and regenerate the forest land. This will increase the green cover of the state and thereby help in the increase in the production of bamboo. The silviculture technique will be adopted

for sustainable bamboo management in these lands. Apart from forest land, the barren land shall be utilised for bamboo plantation with the help of MGNREGA schemes.

6. **Community Engagement:** The project will aim at upliftment of the local farming community and tribal population by providing green jobs in bamboo production and processing sectors. This will also focus on gender inclusion and women empowerment through self-help groups, FPOs, etc.

Key Activities

Activity	Details
Resource mapping & MIS	Optimization of bamboo resource inventory using GIS and other advanced technologies, including centralized dashboard for plantation monitoring.
Plantation clusters	Establishment of 1.1 M ha across Solapur, Latur, Dharashiv, Nandurbar, Thane, Palghar, Chandrapur, Gadchiroli and other potential parts of Maharashtra.
Industrial cluster and PLI scheme	Establishment of Bamboo parks in Maharashtra for furniture, construction, pulp/paper, and handicrafts. Offering PLI to industries in the bamboo sector.
Energy Integration	Setting up of pellet and torrefaction plants for thermal power plant needs and for bio-ethanol production.
Research & Innovation	Establishment of regional research centers and fund academia-industry collaborations with matching grants. Incubation program for startups, material testing laboratory, and innovation challenge fund.
Regeneration of Forest	Restoration of degraded forest land and creation of employment opportunities.
Quality planting material	Strengthening of tissue-culture labs, empanelment of Department of Biotechnology-certified nurseries, and distribution of tissue-cultured bamboo at subsidised rates.
Infrastructure & processing	Setting up of decentralized processing units, common facility centres (CFCs), industrial parks, export hubs via Public-Private Partnership (PPP).

Market development	Buyer-seller interfaces, branding, logistics improvements, integrate waste-to-pellet facilities.
Capacity building (including certifications and best practices)	Training for farmers, artisans, FPOs in scientific cultivation, grading, value-addition; engage Technical Support Agency for Management, Monitoring, Media, and Evaluation & Research (MMER); hand out certificates and promote best practices in cultivation and end production.
Policy and Institutional Framework	Alignment of the project with Bamboo-specific industrial policy and explore R&D and innovation in the policy.

Expected Outputs

- **Development of GIS-Mapped Bamboo Distribution and Functional Management Information System (MIS):** A comprehensive Geographic Information System (GIS) will be created to accurately map the distribution of bamboo across various regions. This will be integrated with a robust Management Information System (MIS) to facilitate efficient data management, tracking, and decision-making processes, enhancing resource allocation and monitoring.
- **Establishment of Extensive Bamboo Plantations:** Over the next 5-7 years, a targeted area of 1.1 million hectares will be cultivated with bamboo plantations. This large-scale afforestation initiative aims to boost bamboo availability, support environmental sustainability, and provide raw materials for various industries.
- **Operationalization of Processing Units and Supporting Infrastructure:** A network of state-of-the-art bamboo processing units will be established, complemented by storage facilities, pellet-making units, and industrial parks. Additionally, dedicated export hubs will be set up to streamline the supply chain and enhance international trade capabilities for bamboo-derived products.
- **Significant Increase in Bamboo Yield:** Efforts will be directed towards improving bamboo cultivation techniques to achieve an impressive yield of at least 40 tons per hectare. This marks a substantial increase from the current average yields of 20-25 tons per hectare, reflecting enhanced productivity and agricultural efficiency.
- **Economic inclusion:** A greater economic inclusion will be promoted through leveraging existing government schemes as well as support in the form of farming infrastructure and silviculture management techniques as part of the project.
- **Introduction to PLI scheme:** A structured Production-Linked Incentive (PLI) scheme and targeted subsidy programs will be implemented to support units engaged in bamboo-based industries. This incentive will be sector agnostic and will promote any

industries like furniture, paper/pulp, textile, bioenergy, charcoal, etc. to set up in the bamboo ecosystem.

- **Integration of Renewable Energy:** Bamboo will be integrated as an alternative to biomass with a 5% co-firing mandate in Maharashtra's thermal power plants, thus reducing dependency on biomass for green energy.

Outcomes

- **Economic Outcomes:** The initiative is expected to significantly boost the incomes of farmers and tribal / rural communities by creating new revenue streams and promoting sustainable agricultural practices. This will be complemented by the generation of green jobs, which will bolster local economies and foster environmentally friendly employment opportunities. Additionally, the development of a circular bamboo economy will contribute to sustainable resource management, ensuring long-term economic resilience and growth.
- **Environmental Outcomes:** The project aims to achieve substantial benefits, including enhanced carbon sequestration, which will play a critical role in mitigating climate change and greenhouse gas reduction. There will also be a notable improvement in soil organic carbon levels, leading to healthier, more fertile soils. Bamboo-derived biochar will further improve soil health through an increase in soil organic carbon levels from 0.3% to 1% within a span of three years. Furthermore, the project will support biodiversity conservation, preserving the variety of plant and animal life, which is vital for maintaining ecological balance.
- **Social Outcomes:** The project emphasizes the empowerment of rural communities by providing them with greater economic opportunities and decision-making power. The project will benefit the tribal population by generating green jobs in the producing and processing of bamboo and allied value chain. It seeks to enhance gender inclusion through the establishment of women-led Farmer Producer Companies (FPCs) and Self-Help Groups (SHGs). This focus on female leadership will promote equality, encourage active participation of women in the agricultural sector, and drive inclusive community development.

Implementation & Institutional Arrangements

- Implementing Agencies (IAs):
 - Dept. of Industries, Energy, Labour & Mining, GoM (Lead Agency)
 - Forest Department
 - MGNREGA Scheme, Planning Department
- Project Management Unit (PMU): Industries Dept., with a coordination unit at MITRA.
- Duration: Jan 1, 2026 – Dec 31, 2032 (7 years).

- Phased Roll-out:
 - Phase 1: Pilot in Southern region (Solapur, Latur, Dharashiv)
 - Phase 2: Northern & Eastern expansion
 - Phase 3: Statewide scale-up

Budget Summary

Component	INR (in Cr)*	USD (in Million)
Total external assistance	2,990.05	350
State Govt. contribution	1,281.45	150
Total Project Cost	4,271.50	500

According to the exchange rate, one US Dollar equivalent to 84.53 Indian rupees

Innovative Features

- **Decentralized Processing by promoting cluster-based industries:** By establishing processing units closer to production sites, this approach significantly reduces the need for long-distance transportation, effectively cutting down on transport-related emissions. This not only promotes eco-friendliness but also leads to cost savings for farmers/FPOs and supply chains.
- **Monitoring of bamboo value chain using advanced technologies:** Utilizing advanced technologies such as drone surveys, IoT, blockchain and integrating with Management Information Systems (MIS) and Geographic Information Systems (GIS) for improvement of crop health and integration of traceability in the bamboo value chain.
- **Application of Bamboo Biochar to Enhance Soil Organic Carbon:** The use of bamboo-derived biochar is a sustainable practice aimed at improving soil health. This method targets an increase in soil organic carbon levels from 0.3% to 1% within a span of three years. By enriching the soil, it fosters better crop yields, improves water retention, and contributes to carbon sequestration, positively impacting both agriculture and the environment.
- **Risk Mitigation and Sustainability:**
 - Actively engage Farmer Producer Organizations (FPOs) and the private sector to strengthen and secure robust market linkages. This strategic collaboration ensures consistent demand and growth opportunities.
 - Encourage and promote adherence to international and national quality standards, such as ISO 19624:2018 and the IS 15912 bamboo structural code. This commitment to quality fosters credibility and enhances market acceptance.
 - Optimize resources and impact by leveraging and integrating existing governmental schemes, including the National Bamboo Mission and the Atal

Bamboo Yojana. This convergence facilitates comprehensive development and sustainability.

Gender and Community Engagement

- Foster active participation of women in bamboo production and end production of value-added products. This inclusivity strengthens community cohesion and economic empowerment.
- Enhance community involvement through consistent monitoring and feedback mechanisms, such as the Bamboo Bulletin and the establishment of local committees. These tools promote transparency, accountability, and grassroots engagement.

Conclusion

This project offers a transformational pathway to enhance Maharashtra's green cover, rural livelihoods, and low-carbon industrial growth through a well-structured bamboo ecosystem - linking cultivation, processing, and markets under robust institutional and financial arrangements.

Exit Plan

The project will transition to self-sustaining models managed by Farmer Producer Organisations (FPOs), Self-Help Groups (SHGs), Gram Panchayat (GP), Forest Management Committees, ensuring long-term community ownership. These groups will take over responsibilities for bamboo cultivation, harvesting, and value-chain management, supported by capacity-building initiatives conducted during the project.

- Regular training, and market linkages to self-sustained industries will empower local stakeholders to maintain profitability.
- Policy convergence with initiatives like the MGNREGA, National Bamboo Mission and the Atal Bamboo Samruddhi Yojana will provide ongoing financial and technical support.
- Setting up decentralized processing units can be a game-changer for local communities. Instead of relying on distant facilities, these units allow people to process raw materials right where they're produced. This creates jobs, keeps money circulating locally, and helps small producers—like farmers save time and costs.