Mapping the Bamboo Construction Value Chain and Assessment of Local Knowledge and Gaps in Fiji

Final Report

11 Nov 2025

Authored by:
Arno Roös – Lead Consultant and Project Manager (Pacific Ark)
Dr. Shipra Shah – Forestry Technical Advisor (Fiji National University)
Gauri Salunkhe – Sustainability Advisor and Research Associate (Pacific Ark)
Sukulu Soko – Community Engagement & Fiji Bamboo Specialist (Sunnyville Bamboo)

This project is a consultancy for the Fiji Bamboo to Adapt and Mitigate Climate Change initiative.

Photo credit: All images in the report have been produced by the authors unless otherwise stated

Mapping the Bamboo Construction Value Chain and Assessment of Local Knowledge and Gaps in Fiji

Final Report

Abstract

This report provides a comprehensive mapping and assessment of Fiji's bamboo construction value chain, integrating field-based evidence, stakeholder consultations, and comparative global insights to identify key knowledge gaps, opportunities, and strategic actions for developing an inclusive, sustainable bamboo sector. Conducted under the *GGGI–Ministry of Forestry Fiji Bamboo to Adapt to and Mitigate Climate Change Project*, the study outlines how bamboo can advance climate-resilient construction, rural livelihoods, low-carbon development, and the enhancement of nature-based solutions (NbS) in Fiji.

Bamboo's potential as a renewable, high-strength, and rapidly regenerating material positions it as a viable alternative to timber and imported construction materials. Yet, the sector remains nascent, constrained by limited treatment infrastructure, fragmented propagation systems, unclear market linkages, and the absence of national standards and certification mechanisms. Through a combination of desk review, field assessments in Savusavu and Navala, and consultations with communities, government agencies, and private sector stakeholders, this report establishes a baseline understanding of Fiji's bamboo value chain—from cultivation and harvesting to processing, construction, and market development.

Case studies from the Philippines, India, Indonesia and Uganda highlight relevant lessons for Fiji, including cyclone-resilient bamboo housing, community-based treatment hubs, and bamboo-related standards and policies. Two key case studies provide further insight:

1. Fiji Pine Limited (FPL) demonstrates how a local forestry enterprise can evolve into a structured, FSC-certified value chain through long-term planning, silviculture, and community inclusion, offering a transferable model for bamboo's sectoral organisation;
2. Kontiki Bamboo Works Ltd (KBWL) in Uganda illustrates how small-scale bamboo enterprises can succeed in socio-economic and land tenure contexts similar to Fiji's, integrating climate adaptation, community participation, and market innovation.

Local analyses reveal that while species such as *Bambusa vulgaris* are widespread, high-performance species (*Bambusa balcooa*, *Dendrocalamus asper*) require targeted propagation and quality management systems. At a local scale, Pacific Ark's practical field trials in Savusavu represent Fiji's only existing evidence base systematically testing all stages of the bamboo value chain — from propagation to construction — generating critical insights on performance, treatment, and community engagement.

A SWOT analysis identifies critical challenges such as inadequate technical training, financing limitations, and policy fragmentation, alongside emerging opportunities for inclusive growth through gender-responsive capacity building, circular production models, and market-driven innovation. The report proposes a strategic roadmap structured around five pillars:

1. Enabling policy and governance frameworks;
2. Infrastructure development;
3. Capacity building;
4. Market activation, and
5. Institutional coordination.

With coordinated national effort, investment in treatment and processing facilities, and strengthened public–private–academic–community partnerships, bamboo can transition from a marginal resource to a cornerstone of Fiji's green economy. This report provides the foundation and strategic direction for scaling bamboo-based construction, enhancing community participation, and positioning Fiji as a regional leader in sustainable bamboo innovation and climate-resilient development.

Acknowledgements

This report was developed under the Global Green Growth Institute (GGGI) engagement with the Ministry of Forestry and the Ministry of Public Works and Housing, Fiji. The work contributes to advancing a sustainable and inclusive bamboo sector that supports Fiji's national goals for climate-resilient housing, reforestation, and green growth.

Sincere appreciation is extended to the Ministry of Forestry for its close collaboration and technical input throughout the project, and to the Ministry of Public Works and Housing for its engagement in exploring bamboo's potential for sustainable construction in Fiji.

The author gratefully acknowledges the GGGI Fiji Country Team, led by Shavneet Mani – Project Officer, for their guidance, coordination, and review support. Special thanks are due to Dr. Shipra Shah (Fiji National University) for her contribution to the environmental, social, and economic sustainability analysis, Gauri Salunkhe for her valuable research assistance, and Sukulo Soko for his practical insights and knowledge sharing from community training and bamboo knowledge.

Acknowledgement is also extended to Pacific Ark, whose on-ground trials, community partnerships, and technical demonstrations across Vanua Levu provided essential field data and practical insights for this report.

Deep gratitude is extended to the village leaders, community members, and landowners across Vanua Levu — including Nakanacagi, Urata, Bagaraki, Naloaloa and Da Roko — whose participation and cooperation made the field research, harvesting, and construction trials possible. Their involvement has been central to grounding this report in lived experience and community priorities.

The author also acknowledges all stakeholders and interview participants from government, academia, private sector, and civil society who shared their time, perspectives, and expertise in shaping the findings of this report.

Vinaka vakalevu to everyone who has contributed — directly or indirectly — to advancing the vision of a sustainable and regenerative bamboo industry for Fiji and the wider Pacific.

Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

CATD – Centre of Appropriate Technology and Development

CIC – Construction Industry Council

EIA – Environmental Impact Assessment

FBA – Fiji Bamboo Association

FPIC – Free, Prior and Informed Consent

FSC – Forest Stewardship Council

FNU – Fiji National University

HCVFs – High Conservation Value Forests

INBAR – International Bamboo and Rattan Organisation

MoF – Ministry of Forestry

NbS – Nature-based Solutions

NAP – National Adaptation Plan

NBSAP – National Biodiversity Strategy and Action Plan

NDCs – Nationally Determined Contributions

NDP – National Development Plan

NTFP – Non-Timber Forest Product

OHS – Occupational Health and Safety

PICs – Pacific Island Countries

RTE – Recalcitrant and Threatened Ecosystem

SOP – Standard Operating Procedure

SPC – The Pacific Community

USP – University of South Pacific

1 Introduction

Bamboo holds significant potential as a fast-growing, renewable resource capable of supporting climate resilience, sustainable construction, and community livelihoods in Fiji. With the country increasingly exposed to the impacts of climate change, including rising sea levels and more frequent cyclones, there is an urgent need to adopt nature-based solutions (NbS) that are ecologically sound and socially inclusive. Bamboo addresses these needs by sequestering carbon, preventing soil erosion, and regenerating degraded landscapes, while also creating livelihood opportunities across its value chain, particularly for women, youth, and Indigenous communities.

Despite this potential, Fiji's bamboo industry remains largely untapped. Knowledge systems are fragmented, policy support is limited, and infrastructure for treatment, processing, and skills development is underdeveloped. Cultivation and harvesting practices are often informal, and there is minimal understanding of how bamboo can be effectively integrated into sustainable construction practices at scale.

This report "Mapping the Bamboo Construction Value Chain and Assessment of Local Knowledge and Skills Gaps in Fiji" was prepared under the Global Green Growth Institute (GGGI) in partnership with the Ministry of Forestry, and the Ministry of Public Works, Meteorological Services and Transport. It provides a comprehensive analysis of Fiji's bamboo construction value chain - from cultivation and harvesting to processing and building - and identifies the critical enablers required to transition from fragmented pilot projects to a coordinated national industry.

The findings draw on literature reviews, field assessments, and stakeholder consultations with government, academia, communities, and private sector partners, including Pacific Ark, whose ongoing fieldwork and pilot projects have contributed valuable practical insights. The report maps the current value chain, highlights key constraints and opportunities, and proposes a strategic roadmap to strengthen bamboo's role in Fiji's green growth. climate resilience and sustainable construction future.

2 Aims and Objectives

The aim of this consultancy is to map the bamboo construction value chain in Fiji and assess local knowledge and skills gaps at each stage of the value chain.

The primary objectives of this consultancy are:

1. Identify and document the key actors and processes within the bamboo construction value chain in Fiji
2. Assess the current level of knowledge and skills among stakeholders (e.g., farmers, landowners, processors, builders, policymakers, and construction professionals)
3. Identify critical gaps in technical knowledge and practical skills related to bamboo cultivation, harvesting, processing, treatment, and construction
4. Analyse barriers to knowledge transfer and skill development across the value chain
5. Provide recommendations for targeted interventions, awareness, training, and capacity-building programs to promote the use of bamboo in construction sector in Fiji

This report consolidates the findings from literature reviews, field assessments, and stakeholder consultations to address these objectives and propose a clear roadmap for advancing a sustainable and inclusive bamboo construction industry in Fiji.

3 Sector Context and Background

Bamboo has emerged globally as one of the most sustainable and versatile non-timber forest products (NTFPs), with applications that support both industrial innovation and rural development. Its rapid growth, renewability, and exceptional mechanical strengths position it as a key material for climate resilient infrastructure and nature-based solutions. Valued at over US $30 billion annually in China alone, bamboo is increasingly applied in bioenergy, textiles, and engineered construction materials and carbon smart composites, alongside its traditional roles in weaving and furniture[1]. Its high strength-to-weight ratio often referred to 'vegetal steel,' makes it a recognised substitute for steel and concrete in structural systems and a proven material for earthquake and cyclone resilient housing[2].

3.1 Bamboo as a Sustainable Climate Resilient Material

Bamboo is increasingly recognised as a renewable and climate resilient material of the twenty-first century, offering a renewable alternative to conventional resources due to its unique biological and ecological characteristics. One of its key advantages is its rapid growth and renewability. Unlike pine, which can take over 25 years to mature, most bamboo species reach maturity within 4-5 years. A well-managed clump can provide a renewable construction resource for generations, with annual harvests that promote continuous regrowth. This makes bamboo a nature-based solution that simultaneously addresses the challenges of resource scarcity, carbon emissions, and livelihood generation in developing island contexts such as Fiji.

In addition to its fast growth, bamboo plays a significant role in carbon sequestration. Its rapid biomass accumulation allows it to capture up to 50 tonnes of CO_2 per hectare per year, up to three times more than timber. When incorporated into construction, bamboo can function as a carbon sink, storing carbon within long-lived structures[3]. By integrating bamboo into the built environment, Fiji can reduce construction sector emissions while enhancing climate resilience in housing and infrastructure.

Bamboo also contributes to land restoration. It is highly resilient and can thrive in depleted soils where other crops struggle. A mature clump can store up to 5,000 litres of water for 6 to 9 months, gradually releasing it to surrounding vegetation. This capacity supports ecosystem recovery, slope stabilisation, and erosion control[4]. These ecological benefits make bamboo an effective landscape restoration tool that supports watershed management and biodiversity conservation. In Fiji, bamboo can play an indispensable role in restoring degraded landscapes including the *talasiga* grasslands (anthropogenic fire-burnt grasslands) where earlier plantation programmes have largely failed.

Another strength of bamboo lies in its versatility as a circular resource. Every part of the plant, the culm, shoots, leaves, sheaths, and rhizomes, can be utilised for a wide range of products, from construction materials and handicrafts to energy and biochar. This "whole plant utilisation" principle forms the foundation of a circular value chain, where waste from one process becomes input for another, such as converting offcuts into biomass energy or producing biochar for soil enrichment. In Fiji, this approach can reduce waste, promote local manufacturing, and stimulate green enterprise development.

[1] INBAR, 2014; UNOSSC & INBAR, 2017
[2] UNOSSC & INBAR, 2017
[3] Yiping et al., 2010
[4] Lobovikov et al., 2007; Kleinhenz & Midmore, 2001

Finally, bamboo cultivation and utilisation provide pathways for community empowerment. The skills required to manage bamboo, from planting to processing, offer sustainable livelihood opportunities for rural communities, including women and youth. When integrated into agroforestry and local construction systems, bamboo not only enhances resilience to climate change but also strengthens inclusive community enterprises and supports the transition towards a circular green economy.

3.2 Bamboo Sector in Fiji: History and Current Status

Fiji's climate and ecological zones provide favourable conditions for cultivating high-value tropical bamboo species such as *Dendrocalamus asper*, *Bambusa balcooa*, and *Dendrocalamus giganteus*. These species are not yet widely cultivated but represent a significant untapped opportunity for the construction sector. At the same time, native (*Schizostachyum glaucifolium*) and naturalised (*Bambusa vulgaris*) species are widely available, although they are mainly used for subsistence and traditional purposes.

While its use in Fiji has so far been limited, bamboo's intrinsic properties, fast generation, high carbon sequestration capacity, and suitability for local construction align closely with Fiji's national priorities on sustainable housing, climate adaptation, and circular economy development[5]. Leveraging on bamboo's ecological and structural attributes within Fiji's local context can create new livelihood opportunities for rural communities, promote regenerative land use, and strengthen the country's bio-based economy.

The Ministry of Forestry (MoF) has identified bamboo as an emerging NTFP with strong potential to contribute to Fiji's reforestation and green growth goals. Fiji's participation in the International Bamboo and Rattan Organisation (INBAR) since 2019 and the re-establishment of the Fiji Bamboo association (FBA) have strengthened institutional collaboration and reconnected national initiatives with International best practices. These efforts complete the MoF's ongoing work under the Low Emissions Development strategy (LEDS) and the national adaptation Plan (NAP), which promote nature-based solutions and sustainable materials for climate resilience.

Harnessing bamboo's sustainability, carbon sequestration, and land restoration properties can directly support Fiji's climate resilience agenda. Moreover, its versatility and circularity create opportunities for generating sustainable livelihoods, including for marginalised groups such as women and youth, through agroforestry, handicrafts, and small-scale value chains. Together, these qualities position bamboo as a strategic resource for inclusive green growth and low-cost, resilient infrastructure in Fiji.

Building on this potential and global insights, this report analyses Fiji's bamboo construction value chain, examining local knowledge and skills, identifying critical gaps, and providing recommendations for targeted interventions, capacity-building, and policy support for bamboo to transition from an underutilised natural resource into a strategic component of Fiji's green growth and sustainable construction agenda.

[5] Liese & Tang, 2015; Yiping et al., 2010

4 Methodology

The research methodology for this consultancy adopted a mixed-methods, participatory, and context-specific approach to ensure a comprehensive mapping of Fiji's bamboo construction value chain and assessment of local knowledge and skills gaps. The study was conducted in three interlinked phases;

1. Desk review and preliminary value chain mapping
2. Field assessment and stakeholder consultation
3. SWOT Analysis and strategic roadmap development

Together, these methods provided a holistic understanding of the ecological, social and economic dimensions of Fiji's bamboo sector with a focus on community engagement and capacity building.

4.1 Desk Review and Preliminary Value Chain Mapping

The desk review analysed academic literature, policy reports, and technical documents on bamboo cultivation, processing, and construction across Fiji and comparable regions. Using insights from the literature, an initial diagram of a potential bamboo construction value chain in Fiji was created to understand the present status of each process and key stakeholders, skills, training and policies involved. Global and regional best practices and success factors in knowledge transfer and skill development in countries like Indonesia, Southeast Asia, India, China, Africa, and Latin America were examined to identify effective models relevant to Fiji.

Furthermore, existing national frameworks, policies, and reports in Fiji were reviewed to understand institutional priorities and how bamboo can be integrated as a nature-based solution within existing programs if any. These included the Forestry Bill (2016), Forest Harvesting Code of Practice (2013), Low Emission Development Strategy (LEDS), and National Adaptation Plan (NDP).

Existing Technical and Vocational Education and Training (TVET) and Higher Education (HE) curricula, NGO and donor-funded programmes, and cooperative training initiatives were assessed to map current training availability and skills gaps. The findings from Fiji were compared with international good practices to identify key knowledge gaps, institutional barriers, and opportunities to strengthen capacity building frameworks for this final report.

4.2 Field Assessment and Stakeholder Consultation

The second phase consists of field assessments and stakeholder engagement to collect data to further understand the current bamboo value chains in Fiji, document real-world processes in detail, and assess stakeholder knowledge and engagement levels. Purposive sampling was used for selecting the participants including bamboo farmers, builders, entrepreneurs, trainers/educators, and policymakers.

Field visits, quantitative and qualitative surveys, interviews, and a participatory community study was conducted with selected participants to examine the actor's role, technical skills, training received, institutional support, and visions for bamboo use in Fiji.

Interviews and surveys were organised with key stakeholders that have been identified to collect data about current practices, cost, labour, and opportunities for bamboo production in Fiji. Key informants include farmers and landowners, artisans, processors, and local builders, TVET and HE institutions, and government agency representatives across Viti Levu and Vanua Levu. The following Table 1lists all the interviews that were conducted and the key objectives and learnings from each interview. Figure 4-1 toFigure 4-6 present photos with some of the interviewees and communities visited as part of the study.

Organisation / Stakeholder name	Individual(s) Interviewed	Meeting day	Objective and Learnings
Centre of Appropriate Technology and Development (CATD)	Opeti Ritova, Training Manager	18 Jun 2025	• Institutional capacity and interest in integrating bamboo into vocational education and training
Fiji Bamboo Association (FBA)	Mark Borg - Trustee	19 Jun 2025	• FBA's structure, challenges, and role in Fiji's bamboo sector
Farmer, bamboo enthusiast, local coordinator (Buiduna Village, Verata Wailevu, Tailevu)	Lala Bukarau - Bamboo Enthusiast	20 June 2025	• Practices around bamboo production by local farmers • Community-level entry points for bamboo propagation and conservation • Need for basic training and accessible treatment techniques • Barriers to engagement for landowners without commercial intent but strong ecological or cultural motivations • Visionary roadmap for how bamboo could support sustainable livelihoods, decentralised processing, and native species preservation
Farmer, bamboo enthusiast, local coordinator (Bach, Western Division)	Wilmo "Bill" Nimbalka Bamboo Enthusiast	Jun 2025	
Construction Industry Council (CIC)	Jon Orton - Chair	30 Jun 2025	• Standards and certification pathways and current regulatory, institutional, and technical environment • Identify the workforce capacity, training needs, and professional acceptance for bamboo.
Ministry of Forestry (MoF)	Alivereti N Naikatini Deputy Conservator Forests-Research & Development & Tevita Kunadei R&D Director	15 Jul 2025	• MoF's role in Fiji's bamboo sector; Past and present bamboo projects by MoF; Existing bamboo standards & codes, skills & capacity, infrastructure & processing • MoF's strategic direction
Fiji Pine Ltd.	Akuila Driso - Plant Manager, Noa Vakacegu - Lands Manager, & Rakuita Vakalalabure - Executive Chair	18 Jul 2025	• Pine industry in Fiji and its alignment with GGGI bamboo research objectives • Value chain & construction relevance; Community Engagement, Inclusion & Livelihoods; Potential Collaboration & Cross-Learning; Treatment & Regulatory Frameworks
Fiji National University (FNU), Department of Forestry	Dr Shipra Shah Associate Professor	01 Aug 2025	• Role of bamboo in Fiji's forestry and construction industry • Gaps in policies and skills & training for use of bamboo as a valuable forestry product

Organisation / Stakeholder name	Individual(s) Interviewed	Meeting day	Objective and Learnings
Pacific Ark	Arno Roos - Director	03 Aug 2025	• Role of private organisation with bamboo expertise in bamboo value chain • Best practices for bamboo production, treatment and processing • Community engagement and bamboo construction projects
Sunnyville Bamboo	Sukulu Soko - Director	05 Aug 2025	• Practices around bamboo production and value chain by local bamboo small-business owner • Collaboration with MoF for community engagement and training programs
Deadline Construction	Joseva Naqota - Director	06 Aug 2025	• Interest of local small construction business in bamboo-based construction and gap in skills & training
University of the Sunshine Coast, Pacific agroforestry and botany (Author of Bamboo Compendium for the South Pacific / Bamboo Species List Fiji (2021))	Dr Lex Thomson Associate Professor	20 Aug 2025	• Discuss opportunities to strengthen Fiji's bamboo industry through improved species knowledge, propagation, agroforestry integration, and policy alignment in support of the GGGI research reports
Kontiki Bamboo, Uganda	Dr Koojo Charles - Director	27 Aug 2025	• Understand journey of Kontiki Bamboo in setting up value chain and capacity building of local communities in Uganda • Learning lessons and recommendations for strategic roadmap for Fiji's value chain and capacity building

Table 1: Interviewees and key learning objectives

Figure 4-1: Wilmo "Bill" Nimbalka

Figure 4-2: Fiji Pine Ltd

Figure 4-3: Lala Bukarau "The Bamboo lady"

Figure 4-4: CATD


Figure 4-5: Navala Village


Figure 4-6: Nakanatagi Village

4.3 Community study: Navala Village

The village of Navala was identified to carry out a community study. Navala was chosen as this village still builds mostly traditional houses (*bures*) in Fiji which incorporate bamboo in some aspects of traditional construction practices. Participatory methods were used to understand the methods of construction of the *bures* in Navala and uses of bamboo for this construction. The community constructs and repairs the *bures* annually. The field researcher spent two days living in the village and participated in this together with the community, learning about construction techniques of their *bures* and uses of bamboo in their construction through observations, hands-on trials and semi-structured interviews and *talanoa*[6] as seen in Figure 4-7 to Figure 4-10.


Figure 4-7: Traditional bures in Navala village


Figure 4-8: Use of bamboo for weaving walls in bure


Figure 4-9: Use of bamboo for roof support trusses and thatching support bracing in bure


Figure 4-10: 15-Year-old Bure – sign of powder post Beatles and fungi

[6] Talanoa is a traditional Fijian way to facilitate dialogue that is inclusive, participatory, and transparent

5 Global Lessons, Context and Comparative Value Chains

With over 1,600 bamboo species, they are native to every continent except Europe and Antarctica; approximately 65% of these species are concentrated in Southeast Asia. Oceania, South America, and Africa also host significant natural populations. While Europe does not have native species, it has developed an emerging bamboo plantation industry, primarily through tissue culture propagation, to meet growing demand[7]. Optimal growth conditions include well-drained soil, high annual rainfall, and full sunlight; conditions that abundant across much of Fiji's tropical and subtropical environment.

Beyond biological suitability, the global bamboo sector offers valuable lessons for FIji on how standards, policy framework and coordinated value chains can accelerate adoption. Standards and codes are vital for building confidence in bamboo as a construction material. Globally, efforts by ISO, INBAR, and national standards bodies have begun to codify bamboo's structural, mechanical, and treatment properties, providing clear guidance for its safe and effective use. For example, ISO 22157 specifies methods for determining the physical and mechanical properties of bamboo, ISO 22156 provides a basis for the structural design of bamboo structures, and INBAR has developed guidelines for using bamboo in construction[8]. Several countries have also introduced national standards, such as India's IS 15912 for Structural design using bamboo and GB/T 15780-1995 for testing physical and mechanical properties of bamboo[9]. These standards are essential for mainstreaming bamboo in construction, as they help ensure consistent quality, safety, and durability, reduce the risk of failure, and increase the material's acceptance among engineers, architects, and policymakers.

5.1 Case Examples and Lessons for Fiji

5.1.1 Philippines: Bamboo in cyclone resilient construction

The Philippines uses ISO 22156 and 22157 for bamboo design and testing and has government-approved treatments and construction protocols. Base Bahay Foundation, a non-profit organisation, developed the Cement Bamboo frame Technology (CBFT) for typhoon prone areas. The system uses ISO tested species treated against rot and pests, concrete footings and tie downs, and carries cyclone and seismic performance certification. Approved under the national housing code, it demonstrates that bamboo can meet building standards for affordable, disaster resilient housing when strong NGO-government - industry partnerships exist

5.1.2 India and Indonesia: Policy and treatment innovation

India' s Bureau of Indian Standards formally recognises bamboo in structural codes and promotes community-based enterprise models through its national bamboo mission. In Indonesia, the Environmental Bamboo Federation has introduced the vertical soak diffusion (VSD) method using Borax - boric acid solution-a low-cost treatment improving bamboo durability against pests and fungi[10]. These examples illustrate how combining national policy support with affordable treatment technologies can rapidly scale bamboo use.

At the global level, the Food and Agriculture Organisation (FAO) provides guidance on sustainable bamboo forest management, including optimal rotation cycles, propagation systems, and selective cutting principles to maintain

[7] van der Lugt & Vogtländer, 2015
[8] ISO, 2019; ISO, 2021; Ibidia, 2015
[9] BIS, 2018; SAC, 1995
[10] EBF, 2020

clump vigour[11]. Such frameworks link cultivation practices with long term ecological health, forming the foundation of sustainable bamboo value chains.

5.1.3 Lessons for Fiji

Currently, Fiji has no national bamboo standards or guidelines for cultivation, harvesting, treatment, processing, and construction. Performance-based approval is possible on a project-by-project basis[12]. Adapting international frameworks to local species and practices will be critical. The most relevant interim references are the ISO 22156/22157 series and the approaches adopted by neighbouring countries such as the Philippines and Indonesia.

In addition to international standards, Fiji's broader forest sector legislation provides several reference points for integrating bamboo into national policy. These existing frameworks focus largely on NTFPs, which offer a useful starting point for bamboo governance and management.

5.2 National Policy context: Non-Timber Forest Products (NTFPs)

The most relevant guidelines and policies for bamboo in Fiji currently would be those related to Non-timber Forest Products (NTFPs). These include the Forest Decree 1992, the Fiji Forest Policy Statement 2007, Fiji Forest Harvesting Code of Practice (FFHCOP) 2013, Forest Bill 2016, the Environment Management Act 2005, and the Endangered and Protected Species Act 2002. Below are details of some of these policies.

1. **Forest Decree 1992:** Fiji's forest decree upholds the customary rights of communities to harvest NTFPs on native land (outside reserves). It permits harvesting of forest resources as per native customs for meeting subsistence needs related to temporary housing, construction that benefits the whole community, fishing stakes, and fuel. The decree also specifies that a licensing officer may issue a license for harvesting of NTFPs from forest reserves, nature reserves, unalienated State land, and unalienated *iTaukei* land.

2. **Fiji Forest Policy statement 2007:** The Fiji Forest Policy Statement 2007 specifies that forest management planning will include NTFPs through inventories, research, and resource evaluations alongside traditional timber assessments. In order to harness the economic potential of NTFPs while ensuring their sustainable utilization, the MoF will implement a strategic development plan for landowners, resource managers, and the private sector. The sustainable production of high-value multipurpose NTFPs will be encouraged through market information, extension services, and technical assistance, in addition to private sector investment. Landowners will be consulted for resource conservation during harvesting operations.

3. **Fiji Forest Harvesting Code of Practice (FFHCOP) 2013**: The FFHCOP stipulates the rigorous use of the diameter limit table (DLT) in harvesting operations. Tree species that are rare, or valued for seeds, fruits and other NTFPs cannot be felled. Landowners should, if feasible, be involved in the tree selection process to assist with tree locations and local uses based on their traditional ecological knowledge. An exception to the strict application of the DLT is when certain tree species with non-timber uses may be chosen for felling in accordance with the DLT, if authorized by the landowners.

4. **Forest Bill 2016**: The Forest bill authorizes the MoF to plan, monitor, and regulate sustainable management of timber and non-timber resources in all forest types. In contrast to the forest decree, Fiji's forest bill

[11] Boissière et. al, 2019

[12] CIC, personal communication, Jun 2025

introduced stricter harvesting regulations, prohibiting the harvesting of NTFPs from forest reserves, nature reserves, unalienated State land, and unalienated iTaukei land unless authorized through a license by the Conservator of Forests. This transition underscores a stronger regulatory approach while harmonising the customary use of NTFPs with national conservation priorities.

While Fiji's existing forest-related laws and policies provide some recognition of NTFPs, they do not explicitly address bamboo, which risks leaving it "lost" within broader NTFP categories. Without specific policies, guidelines, and frameworks tailored to bamboo, its unique ecological, economic, and cultural potential cannot be fully harnessed. Developing dedicated bamboo policies that are aligned with national forestry, climate, and sustainable development priorities will therefore be critical to ensure that bamboo is not overlooked but instead promoted as a strategic resource for sustainable livelihoods, green construction, and climate resilience in Fiji.

Currently the Ministry of Trade is leading an initial review with key stakeholders on how the Bamboo ISO standards can be adopted and incorporated within Fiji's existing building standards and codes, with further review and adaptation processes to follow. This initiative is supported by the Ministry of Forestry, Ministry of Public Works and Ministry of Housing, with technical input form GGGI and other partners through the ongoing bamboo value chain assessment.

Together these and policy instruments demonstrate that Fiji already has a foundation for integrating bamboo within its forest and land use governance systems. Establishing a dedicated bamboo policy framework linked to sustainable housing, climate adaptation and circular economy objectives will be essential to unlock its full ecological and economic potential.

6 Mapping Fiji's Bamboo Value Chain

The following section analysis the structure, performance, and enabling environment of the study, and highlights insights from comparable value chains, standards and codes, skills development opportunities, and the current status of the bamboo construction value chain in Fiji, identifying key opportunities, constraints, and entry points for sector development.

6.1 International and Regional Comparisons

6.1.1 Case Study 1: Fiji Pine Limited (Timber Comparison)

Among Fiji's forest industries, Fiji Pine Limited (FPL) represents a relatively mature and structured value chain that demonstrates how a locally-managed and globally-relevant forestry enterprise can evolve through technical management, long-term planning, and community inclusion. In 2013, the company became the only one in Fiji to receive the Forest Stewardship Council (FSC) certification for forest management. FPL leases more than 85,615 hectares of forest lands, with approximately 31% under pine plantations[13]. The company maintains an annual allowable cut of around 440,000 tonnes, managing plantations on a 20–25-year cycle and processing 65,000–400,000 tonnes of logs annually[14]. Every year, it manages approximately 1,400 hectares of harvests and 3,000 hectares of replanting, maintaining a continuous supply through structured reforestation programs.

[13] Fiji Pine Limited, 2022

[14] Fiji Pine Limited, 2022; FPL, personal communication, Jun 2025

Its production includes saw logs, pulp logs, and posts and poles for construction and export markets which is supported by the entities Tropik Wood Industries Limited and Tropik Wood Product Limited[15]. The wood chips are exported to countries such as Japan and China and also used to fuel the co-generation facility in Drasa. In 2021-2022, over 359,240 Mt of pine chips were exported constituting almost half ($50.1 million) of Fiji's $101.2 million export earnings in the forestry sector. Over 337m^3 of pine timber was also exported contributing to only $0.42 million of the export earnings. FPL's integrated structure, covering nurseries, silviculture, harvesting, processing, export, protection, and environmental monitoring, offers a practical reference for how a forestry value chain can evolve with long-term planning and stable resource management. While pine differs from bamboo in growth rate and material properties, the organisation of operations, replanting schedules, and market systems provides useful insight for building a structured bamboo industry.

Figure 6-1 illustrates the detailed value chain of Fiji Pine Limited based on field assessment data, highlighting main processes and key stakeholders, and provides a reference point for establishing a sustainable bamboo construction industry in Fiji.

Fiji Pine Limited Value Chain

	Input supply	Cultivation & Management	Harvesting	Treatment	Processing	Sales
Sub-processes	- Nurseries - Replanting program of ~3,000 ha/year, ensuring continuity of supply - Environmental Impact Assessments	- Planting and growing - Forest Management - Silviculture - Landowner partnerships - Land management - Restocking strategies	Clearly defined, regulated process involving MoF approvals, ground marking, and felling practices	- CCA treatment with SOPs, lab testing, and compliance with the 1992 Forest Regulation (treated for stability and protection to meet international standards) - Quality Testing and Compliance	- Kiln drying, cutting, stacking, seasoning, and packaging - Quality Testing and Compliance	- Exporting of wood chips to the global market
Key stakeholders	Fiji Pine Limited (parent company)	- Fiji Pine Limited (parent company) - Landowning units - Local labour	- Logging contractors - Landowning units - Local labour - Government (MoF)	- Tropik Wood Industries Limited	- Tropik Wood Industries Limited	- Tropik Wood Products Limited
Other points to note		Joint venture and lease-based land access models	Harvesting cycle is 20–25 years, with continuous replanting		Processes it into a variety of high-quality pine timber products including: Framing timber, Dressed and standard boards, Internal and external lining, Flooring, Decking, Weatherboards	

This integrated value chain allows the Fiji Pine Group to manage the entire process from forest to export, ensuring quality control and sustainable practices. The group also benefits landowners through dividend payments from the profits generated by FPL's operations.

Figure 6-1: Detailed value chain of Fiji Pine Limited

Technical Practices, Compliance & Standards

FPL employs modern machinery for felling, processing, kiln drying, and packaging, supported by Standard Operating Procedures (SOPs), Occupational Health and Safety (OHS) protocols, and compliance with the 1992 Forest Regulations. It coordinates closely with government agencies to ensure that all logging crew meet OHS and Forest Harvesting Code of Practice standards through annual training, accreditation, and regular inspections[16]. Logs undergo copper chrome arsenate (CCA) treatment and are tested by both the company and the Ministry of Forestry, ensuring product quality and durability[17]. FPL is certified under the FSC, meeting

[15] Fiji Pine Limited, 2022

[16] Fiji Pine Limited, 2022

[17] Fiji Pine Limited, 2022; FPL, personal communication, Jun 2025

international standards for environmental and social accountability, enhancing both market access and transparency[18].

A bamboo value chain in Fiji could adopt similar operational standards by introducing small- to medium-scale machinery for harvesting, splitting, and treatment, supported by clear SOPs, OHS guidelines, and alignment with forestry regulations. Currently, bamboo lacks formal harvesting and treatment guidelines in Fiji. Adapting frameworks from the pine industry could help establish national bamboo treatment standards, testing protocols, and certification systems, crucial steps for quality assurance and acceptance in construction markets. Pursuing a similar pathway as FSC or a localised certification scheme would help establish credibility and encourage investment. Coordination with government agencies and vocational training centres could ensure that bamboo harvesters and processors receive appropriate accreditation, regular skills training, and safety inspections.

The existing treatment and processing systems of FPL could potentially be adapted for bamboo, with adjustments to meet bamboo's properties such as different pressure requirements. FPL's research and development team is also exploring bamboo and hybrid material applications, highlighting opportunities for shared learning and innovation between the two sectors on treatment, design, and product diversification[19].

Climate Resilience and Sustainable Management

The pine industry operates under increasing climate pressure such as fires, storms, and rainfall variability that disrupt planting and harvesting cycles. In response, FPL applies low-impact logging techniques and focuses on replanting degraded grasslands to control erosion and restore soil quality as well as ensure resource availability in the long term[20].

Although in the early years of operation, FPL would carry out clear-felling of trees which caused native trees to also be cut down with the pine, they now have more sustainable management strategies. FPL now conducts Environmental Impact Assessments (EIAs), mandated by the Environment Management Act (2005), identifies High Conservation Value Forests (HCVFs), Recalcitrant and Threatened Ecosystems (RTEs), and culturally significant site, and maintains an Environmental Management and Monitoring Plan. Furthermore, no pesticides are used in their forest operations[21].

For bamboo, integrating bamboo species that are cyclone-resistant and good for construction, adopting adaptive harvesting cycles, and promoting agroforestry models could help build resilience while maintaining supply consistency. Bamboo development should begin with baseline environmental assessments and mapping of high conservation and culturally important areas to guide plantation siting and management. Similarly, FPL's focus on land restoration through replanting degraded grasslands demonstrates how bamboo cultivation could be strategically targeted on marginal or degraded lands to enhance soil stability, reduce runoff, and restore ecological function.

Moreover, FPL's fire management and preparedness measures indicate the need for bamboo plantations to incorporate buffer zones, fire breaks, and diversified cropping systems to reduce vulnerability to extreme weather and pest outbreaks. The company's transition from clear-felling to sustainable silviculture also highlights the importance of developing bamboo harvesting guidelines and regeneration protocols that prevent overexploitation and ensure continuous productivity. Establishing community-based monitoring systems and

[18] FPL, personal communication, Jun 2025).
[19] FPL, personal communication, Jun 2025
[20] Fiji Pine Limited, 2022
[21] Fiji Pine Limited, 2022

integrating traditional ecological knowledge could further strengthen resilience, aligning bamboo production with Fiji's broader goals of environmental protection, sustainable land management, and rural livelihood security.

Community Inclusion and Capacity Building

FPL operates on an estate where 94.5% of the land is leased from Indigenous (*iTaukei*) landowners and the remainder is State land[22]. Hence, its operations are deeply connected with Fiji's communal land tenure system (*Mataqali* ownership), requiring ongoing collaboration with landowners and traditional governing systems. FPL's business model integrates community participation at various stages of its value chain through joint ventures, lease rentals ($14 per hectare since 2022), lease bonuses (based on the company's performance), stumpage payments (12% of net revenue (revenue less direct cost of logging, cartage and roading)), and Landowner Community Development Fund (5.5%), which collectively involves traditional landowners in ownership, management, and profit-sharing[23].

These mechanisms are complemented by structured communication channels, including regular meetings with the Fiji Pine Trust (representing landowner shareholders), consultations with Forest Base Companies and contractors, and awareness programs conducted in remote rural areas. Such practices promote transparency, build trust, and strengthen the social license to operate. However, it is to be noted that based on field data from communities, there are still many challenges faced by FPL in including and liaising with communities as it is difficult to build trust and confidence with the communities and have long-term relationships. There are incidents where community members have set fire to plantations, and people have raised concerns that pine plantations are drying up rivers in outer islands.

Employment, training, and certification programs provide further livelihood opportunities within forestry and processing. The company also invests in training, upskilling, and gender-inclusive hiring, building local capacity and reinforcing long-term social resilience[24].

For bamboo, establishing shared-ownership and benefit-sharing models will be essential, particularly given Fiji's land tenure structure where over 80% of land is communally owned[25]. Similarly, FPL's emphasis on communication and awareness programs highlights the importance of continuous dialogue with traditional leaders, women's groups, and youth networks when introducing new livelihood initiatives such as bamboo farming. Ensuring transparency and community participation at all stages, from nursery establishment to harvesting and marketing, will be essential for fostering trust and local ownership.

Bamboo can also build on FPL's approach to capacity development by partnering with institutions like the Fiji Forestry Training Centre and vocational institutes to introduce training in bamboo agroforestry, harvesting, treatment, and product development. This would not only develop a skilled local workforce but also support the creation of certification pathways, similar to those applied in the pine sector. Integrating bamboo into existing forestry education would help standardise practices, improve occupational safety, and align with national forestry and environmental policies.

[22] Fiji Pine Limited, 2022

[23] FPL, personal communication, Jun 2025; Fiji Pine Limited, 2022

[24] FPL, personal communication, Jun 2025; Fiji Pine Limited, 2022

[25] Harrison, 2021

Key Takeaways

Fiji Pine Limited demonstrates how a structured, community-inclusive forestry value chain can operate effectively through coordinated management, technical standards, and long-term planning. Its practices, covering nurseries, processing, replanting, environmental safeguards, and landowner engagement, highlight the importance of sustainable, climate-resilient management alongside transparent benefit-sharing and capacity development. For Fiji's bamboo sector, these lessons suggest establishing clear operational and treatment standards, integrating environmental and social safeguards right from the beginning, and creating inclusive governance and training frameworks. Adopting these approaches can help build a resilient bamboo industry that supports rural livelihoods, strengthens local capacity, and contributes to ecosystem restoration and green economic growth.

6.1.2 Case Study 2: Kontiki Bamboo (Private Sector)

Fiji currently lacks a local bamboo value chain, with no established nurseries, commercial plantations, processing facilities, or market linkages for construction-grade or value-added products. This gap necessitates the adoption of international examples to guide development. Kontiki Bamboo Works Ltd (KBWL) in Uganda was selected as a case study due to its close alignment with Fiji's socio-economic, environmental, and institutional context. Both Uganda and Fiji heavily rely on agriculture, with significant subsistence sectors that sustain the livelihoods of a large part of the population and supply essential raw materials that support a small but expanding industrial sector[26]. Both the countries are highly susceptible to the impacts of climate change, facing more frequent and intense climate change-induced shocks, such as cyclones, rising sea levels, and coastal erosion. Their strong reliance on climate-sensitive sectors like agriculture, fisheries, and tourism further heightens these risks, posing significant challenges to the well-being of local communities[27]. Furthermore, Uganda also has a similar land tenure system as Fiji, with significant communal or customary Indigenous land ownership, making it essential to prioritise inclusion of local and Indigenous communities in developing the bamboo value chain[28].

KBWL provides a compelling model for Fiji, demonstrating how an integrated bamboo value chain can support livelihoods, climate resilience, and green economic growth. Operating in the Albertine Graben region, KBWL integrates the entire bamboo value chain, from nursery establishment and plantation management to processing and product development. The company collaborates with over 230 local farmers and manages more than 200,000 bamboo seedlings, with plans to expand to 1,200 acres by 2025. Their products span biochar, furniture, construction materials, and eco-friendly consumer goods, all produced through circular, low-waste processes[29]. KBWL also runs demonstration plantations, carpentry showrooms, craft centers, and a diploma course in "Bamboo Resource Technology," providing hands-on training and awareness programs to farmers and communities[30].

Farmer Partnerships and Contract Farming Model

A key element of KBWL's success is its farmer partnership and contract farming model, which addresses major barriers to bamboo adoption, such as uncertainty about markets. KBWL established small processing units for toothpicks, boards, and biochar, as well as demonstration carpentry showrooms, to prove that there is a market

[26] Fowler & Rauschendorfer, 2019; Gani & Scrimgeour, 2019
[27] Gatiso & Greenhalgh, 2025; Wichern et al., 2019
[28] Kisekka & Mugasha, 2024; Ben & Gounder, 2019
[29] Kontiki Bamboo Works Ltd., 2025
[30] Koojo, personal communication, Aug 2025

for bamboo products. Farmers are guaranteed that all mature culms will be purchased, providing immediate cash flow and confidence in their investment.

During the first three years, intercropping maize, beans, and legumes between bamboo rows generates additional income for farmers while the bamboo is established. KBWL also uses flexible spacing strategies: 5×4 m spacing for dense, fast-growing poles, and 10–12 m spacing to provide shade for companion crops such as coffee, cocoa, vanilla, ginger, and turmeric. After Year 3, intercropping is no longer necessary (although still possible for certain crops, like dalo, vanilla), and farmers can rely on a one-time annual bamboo harvest as a form of long-term income security[31].

For Fiji, this model can start with naturally occurring *Bambusa vulgaris*, using treated poles for stronger, longer-lasting structures and producing biochar for additional revenue. Demonstrating visible income early on from small-scale interventions can build confidence and encourage gradual scaling to larger plantations and more diverse bamboo products.

Inclusive Approach and Sustainable Practices

KBWL emphasises improving existing local uses of bamboo, such as weaving and housing, by applying treatment methods that extend the lifespan of poles from 3–6 months to 5–10 years. Combined with sustainable harvesting practices such as selectively cutting mature culms, preserving mother culms, and maintaining plantations, this approach ensures high-quality yields over multiple generations. Plantation maintenance, regular clearing, and circular use of by-products improve soil health, reduce pests, and create low-waste production systems. Women, youth, and smallholders are actively involved in cultivation, processing, and training programs, promoting equitable livelihoods and community resilience[32].

Land Acquisition and Community Engagement

In Uganda, KBWL secured land through a combination of private purchases and leases from the National Forest Authority, while fostering trust-based partnerships with over 230 local farmers via "good faith" agreements, demonstration plantations, and guaranteed buy-back schemes. This approach started small with 20–50-acre demonstration plots to build visibility and confidence, which is crucial in contexts where communal or customary land ownership dominates, as in Fiji[33].

In Fiji, agricultural land availability and leasing represent a constant hurdle, often leading to delays in securing long-term access for agricultural or forestry ventures, as highlighted by Fiji Pine Limited and other studies[34]. Hence there is a need for equitable, inclusive processes to balance traditional ownership rights with economic development for long term sustainability. By emphasising informal, handshake-style collaborations rooted in trust and mutual benefits (e.g. intercropping for immediate income and carbon credits for long-term gains), KBWL's framework can be adapted to Fiji's traditional land tenure system. For example, partnering with traditional landowners for joint ventures such as co-managing bamboo cultivation for sustainable harvesting could ensure equitable revenue sharing while preserving bamboo's cultural significance and building climate resilience amongst communities.

[31] Koojo, personal communication, Aug 2025
[32] Koojo, personal communication, Aug 2025
[33] Koojo, personal communication, Aug 2025
[34] FPL, personal communication, Jun 2025; Prasad, 2006

Policy and Institutional Alignment

KBWL operates within Uganda's National Bamboo Strategy (2019–2029) and has gained international recognition, such as being recognised as an African flagship model by the Food and Agriculture Organisation of the United Nations (UN-FAO). They are also developing a blockchain-based carbon-credit system in collaboration with a UK partner[35]. With USD 450,000 invested, KBWL is projected to create over 50,000 jobs in the next five years. Initiatives such as the "Bamboo Per Household" program, targeting 100 million seedlings, illustrate bamboo's potential for community reforestation, livelihood diversification, and climate resilience[36].

Key Takeaways

Overall, KBWL exemplifies how a holistic, circular, and community-driven bamboo value chain, anchored in farmer partnerships, out-grower schemes, sustainable practices, and training programs, can diversify livelihoods, enhance environmental sustainability, and support a green economy. These lessons provide a practical and adaptable blueprint for developing Fiji's bamboo industry while strengthening resilience to climate change.

6.2 Knowledge and Skills Landscape

6.2.1 International best practices

The development of bamboo-related skills and training programs is crucial for fostering sustainable bamboo industries. Several countries with similar ecological and economic contexts to Fiji have implemented targeted bamboo training programs to develop capacities in cultivation, processing, treatment, construction, and product development. These initiatives provide valuable lessons for countries like Fiji as it seeks to build technical capacity and a skilled workforce for the emerging bamboo sector.

Philippines

In the Philippines, the Forest Products Research and Development Institute (FPRDI) has been at the forefront of bamboo training, aiming to build a skilled workforce capable of supporting the growing bamboo industry. The government, through the technical Education and Skills Development Authority (TESDA), has also mainstreamed bamboo skills development by accrediting training for bamboo furniture production, preservation, and engineered bamboo construction.

They offer a range of programs, including:

- ***Bamboo Furniture Construction and Assembly (FPRDI):*** Offers courses on jointing, binding techniques, and use of tools for bamboo and rattan furniture[37].
    1. ***Free Online Webinars*:** Provide training in topics such as NTFP preservation and treatment, basic finishing techniques for wood and bamboo, bamboo handicrafts making, and bamboo waste utilisation, broadening access to technical learning opportunities[38].

[35] Koojo, personal communication, Aug 2025
[36] Kontiki Bamboo Works Ltd., 2025
[37] FPRDI, 2013
[38] The Mindanao Life, 2023

Uganda

Uganda has recognised the potential of bamboo as a sustainable resource and has initiated several programs to develop related skills, empowering local communities and promoting bamboo entrepreneurship:

1. ***Uganda Bamboo Association (UBA)*:** UBA conducts workshops and outreach programs on propagation, planting, and utilisation to enhance community engagement and capacity building. UBA also maintains online materials that promote bamboo species identification and practical applications[39].
2. ***Youth Training in Bamboo Crafts*:** UBA has taught practical skills for creating bamboo products, fostering entrepreneurship among youth[40].

6.2.2 Fijian Context

As mentioned in Section 3.2, Fiji has favourable ecological conditions for cultivating high-value tropical bamboo species (*Dendrocalamus asper*, *Bambusa balcooa*, *Dendrocalamus giganteus*), as well as native and naturalised species (*Schizostachyum glaucifolium* and *Bambusa vulgaris*). However, limited awareness, practical training, and technical expertise across cultivation, treatment, processing, and construction constrains the development of a robust bamboo industry. There is currently no formal, government endorsed curriculum for bamboo related skills, and engineers and builders are not trained in bamboo joinery, construction techniques, loading or performance testing[41]. There is also limited in-house technical capacity within the Ministry of Forestry to support bamboo's Structural application in construction projects[42].

Community level awareness of bamboo production and end use potential is low. There are no established demonstration sites or prototypes structures showcasing modern bamboo-based construction. In Navala village (similar to other villages), traditional knowledge is actively passed down through generations. Elders play a key role in knowledge transmission, with techniques taught orally and through hands-on practice, and young people are still interested in learning how to build using traditional materials, including bamboo and thatch[43]. However, this traditional knowledge is undocumented and underutilised in formal planning and education systems[44].

Small-scale awareness has been carried out by a few actors. For example, W. Nimbalka informally leads a 10-farmer cluster interested in bamboo and hosts regular *talanoa* (Indigenous meeting settings) sessions to discuss propagation, fencing, and product ideas[45]. S. Soko has carried out Sustainable Forest Management workshops in villages such as Qilai village in Namosi province and Nameka village in collaboration with MoF (Figure 6-2 and Figure 6-4). He also carried out a workshop in Nameka village where they constructed a bamboo-reinforced base for the village bamboo tank (Figure 6-5)[46]. These workshops raised awareness about the different species of bamboo, its ecological uses, harvesting, and value adding including making small handicrafts and products, and charcoal from bamboo waste. Some of the handicrafts made by the community in Qilai village were showcased at World Bamboo Day celebrations hosted by GGGI and MoF in 2024 at Colo-i-Suva (Figure 6-3).

[39] UBA, 2025; UBA 2020
[40] UBA, 2018
[41] CIC, personal communication, Jun 2025; CATD, personal communication, Jun 2025
[42] MoF, personal communication, Jul 2025
[43] Roös, 2025
[44] MoF, personal communication, Jul 2025
[45] W. Nimbalka, personal communication, June 2025
[46] S. Soko, personal communication, Aug 2025

Figure 6-2: Sustainable Forest Management workshop in Qilai village

Figure 6-3: Small products and handicrafts made with bamboo by community Qilai village displayed at World Bamboo Day 2024

Figure 6-4: Workshop on making small products and handicrafts with bamboo in Qilai village by S. Soko

Figure 6-5: Workshop in Nameka village to construct a bamboo-reinforced base for the village bamboo tank by S. Soko

There is very limited in-house technical expertise for cultivation, treatment, and engineered bamboo products at the MoF. There is also no formal government-led training curriculum for bamboo carpentry or structural construction in Fiji presently[47]. Any formal training around bamboo has only been a small part of a larger course. For example, S. Soko taught a module on bamboo craft as part of larger courses focused on timber run by the MoF between 2015 and 2020. These modules included understanding of different bamboo species available, ecological uses of bamboo, propagation methods, harvesting, post-harvesting, preservation, and how to make small products with bamboo[48].

[47] MoF, personal communication, Jul 2025

[48] S. Soko, personal communication, Aug 2025

At the Fiji National University (FNU), BSc Forestry students enrolled in the sustainable forest management course engaged in bamboo harvesting, processing, and value-adding facilitated by S. Soko and S. Shah. As part of their coursework, students used bamboo to create handicrafts and fencing models which were assessed based on factors such as creativity, innovation, and craftsmanship (Figure 6-6). The products were displayed in 2025 at the World Bamboo Day celebrations hosted by GGGI and MoF in FNU Koronivia Campus (Figure 6-7) and at the Open Day in FNU Nasinu Campus. These hands-on activities served as a means of transformative learning allowing students to apply theoretical knowledge to real-world contexts while developing skills in sustainable resource utilisation and bamboo-based product development. In the future, FNU plans to develop formal bamboo-focused short courses which can be rolled out to local communities[49].

Figure 6-6: Students from Vanuatu engaged in building fencing models

Figure 6-7: Bamboo products on display at the World Bamboo Day celebrations

Alongside these institutional and community initiatives, Pacific Ark has been implementing on the ground bamboo trials and workshops that span the full value chain from cultivation to planting, harvesting and treatment to processing and construction (Figure 6-8 to Figure 6-13). These demonstrations have provided practical training for local individuals and generated firsthand data on bamboo durability, joinery, and market readiness. Detailed results from these trials are presented in Section 6.4.

[49] S. Shah, personal communication, Aug 2025

Figure 6-8: Community engagement in Naloaloa Village on bamboo harvesting, clump management, and awareness of bamboo's ecological and cultural significance by Pacific Ark (Oct 2023)

Figure 6-9: Species gene pool investigation with the Ministry of Forestry, including collection of cuttings for propagation trials by Pacific Ark (August 2025)

Figure 6-10: Construction of the bamboo market stall at Da Roko Settlement with community participation and hands-on guidance throughout the build by Pacific Ark (Sept 2024)

Figure 6-11: Collection cuttings from five bamboo species at Cola-i-Suva with the Ministry of Forestry (July 2025)

Figure 6-12: Presentation of the Bamboo Playground model to teachers, parents, and students at Urata Kindergarten during a talanoa session on the project concept and design by Pacific Ark (February 2025)

Figure 6-13: Curved prefabricated bamboo beams prepared for the Urata Playground structure by Pacific Ark (July 2025)

6.3 Current Value Chain in Fiji

The following Figure 6-14 outlines the processes in the value chain that would be required for using bamboo in construction in Fiji. This section outlines the present status of each process and key stakeholders, skills, training and policies involved.

Figure 6-14: Processes in the value chain that would be required for using bamboo in construction in Fiji

6.3.1 Input supply

Several species of bamboo are presently found in Fiji, including native and naturalised species. These bamboo species, especially the native species, *Schizostachyum glaucifolium* (locally known as *bitu dina/bitu Kau*), and naturalised species, *Bambusa vulgaris* (locally known as *bitu vavalagi*), are found most abundantly in the wetter zones of Viti Levu and Vanua Levu, particularly in river valleys, highlands, and coastal plains where water is readily available. On drier islands, bamboo is found in scattered pockets. Hence, there is abundant local bamboo resources, especially the native and naturalised species, for local community use. However, there is a lack of bamboo resources that have high value for construction such as *Dendrocalamus asper*, *Bambusa balcooa*, and *Dendocalamus giganteus*. There is also no formal national bamboo species registry and even though the knowledge of local and introduced species exists, it is scattered across projects and private initiatives[50]. Pacific Ark has collected and propagated multiple bamboo species, contributing to the early development of Fiji's bamboo planting materials base and informal species registry[51].

6.3.2 Cultivation and management

Although bamboo occurs naturally, there are only a few people and organisations that are growing bamboo as a resource based on field assessments and interviews. These include local bamboo champions such as L. Bukarau, W. Nimbalka, and S. Soko, and A. Roös that are growing different species of bamboo at a small scale[52].

Based on the study, no village community has been identified that grows bamboo in their plantations. If bamboo is used by any community for traditional uses, it is usually obtained from bamboo that grows in the wild[53]. The main species used is the native *Schizostachyum glaucifolium* or locally known as *bitu dina/bitu kau*[54]. Furthermore, community members might consider bamboo as a "nuisance" plant, removing it from areas around their farms or riverbanks[55]. An academic interviewed during the study also mentioned that during a field visit, she observed youth burning bamboo along the river despite the community facing recurrent floods. This shows that there was poor awareness on the role of bamboo in controlling erosion and mitigating floods along riparian zones[56]. This shows the lack of knowledge and understanding of bamboo and its advantages and uses.

[50] MoF, personal communication, Jul 2025
[51] A. Roös, personal communication, Aug 2025
[52] W. Nimbalka, personal communication, June 2025; A. Roös, personal communication, Aug 2025; S. Soko, personal communication, Aug 2025; L. Bukarau, personal communication, Jun 2025
[53] Roös, 2025; S. Soko, personal communication, Aug 2025
[54] Roös, 2025
[55] S. Soko, personal communication, Aug 2025
[56] S. Shah, personal communication, Aug 2025

Pacific Ark maintains small experimental plots and agroforestry plantings that tests different management techniques, climate and ecological conditions, and intercropping systems, providing the only continuous cultivation data for Fiji's emerging bamboo sector[57].

6.3.3 Harvesting

At present, there are no guidelines or standards for sustainable bamboo sourcing or harvesting in Fiji[58]. Selection of bamboo to harvest in villages is based on maturity, determined by color and traditional knowledge passed down through generations[59]. Through the field assessments, one traditional method that was followed for harvesting was based on the lunar observations - bamboo is harvested on new moon, not at full moon, to ensure the lowest starch content in the bamboo, making it less attractive to pests and fungus, lighter to transport, and faster to dry[60].

The small-scale cultivators of bamboo mentioned in section 6.3.2 are self-taught through personal observations and experimentation, resources available through the Ministry of Forestry, online resources, offline resources, and independent courses[61]. At a government level, the MoF is involved in policy oversight and resource governance but does not operate any direct bamboo cultivation or processing operations[62].

Pacific Ark has documented harvesting trials using both traditional and modified cutting cycles, introducing modern moisture testing and post-harvest handling practices to improve pole quality and reduce pest attack. These practical observations have provided the first baseline of data on local harvesting efficiency, pole yield, and handling conditions, helping identify the critical steps that influence durability and material performance.

6.3.4 Treatment and preservation

Currently, there are no government-standardised protocols for post-harvest handling and preservation, and no treatment guidelines and facilities for bamboo in Fiji[63]. In traditional uses of bamboo in construction, bamboo is harvested fresh and stored under trees, not in the sun or shelter. After construction, the entire *bure* gets smoked from a duration of one week to even 1-2 months with a small, controlled fire in the *bure*[64].

Several individuals and small enterprises have begun experimenting with natural treatment methods in Fiji:

- S. Soko has been treating bamboo by either immersing it in water for one month or curing it with fire. He usually uses the latter as a treatment method, where he places the bamboo on corrugated iron over a flame, and covers it with banana leaves[65].
- W. Nimbalka has recently adopted the method of soaking bamboo poles in water for three days and curing them with fire. However, he would like to learn more treatment methods[66]

[57] A. Roös, personal communication, Aug 2025
[58] M. Borg, personal communication, Jun 2025
[59] Roös, 2025
[60] Roös, 2025; S. Soko, personal communication, Aug 2025
[61] W. Nimbalka, personal communication, June 2025; A. Roös, personal communication, Aug 2025; S. Soko, personal communication, Aug 2025; L. Bukarau, personal communication, Jun 2025
[62] MoF, personal communication, Jul 2025
[63] MoF, personal communication, Jul 2025; M. Borg, personal communication, Jun 2025
[64] Roös, 2025; Elkharboutly & Wilkinson, 2022
[65] S. Soko, personal communication, Aug 2025
[66] W. Nimbalka, personal communication, June 2025

- A. Roös and A. Duckworth applies boron-based solution (boric acid and Borax) using small scale diffusion setups to improve protection against the powder post beetle, termites and fungi[67]

The field trials that Pacific Ark has conducted has expanded on these traditional and individual methods, testing both boron diffusion and vertical soak diffusion (VSD) systems using locally sourced materials. These experiments produced invaluable data, for further planned expansion activity for small scale bamboo factory setups.

6.3.5 Processing and shaping

In traditional bamboo construction practices, the main processing step involves splitting and weaving bamboo strips for walls and fences, and as temporary sheds or shelters[68]. However, modern bamboo processing in Fiji remains extremely limited and primarily experimental.

Pacific Ark leads small scale processing and shaping experiments, testing lamination, joinery systems, and removal of the outer silica layer to improve adhesion for gluing and finishing. These trials also involve cutting and planing culms for laminated panels, preparing dowel and rope connections, and testing drilling and pegging; methods suitable for Fiji's available tools and workforce[69]. A. Duckworth's work includes small-scale applications of using bamboo as structural components joint with fiberglass and epoxy resin in a small demonstration build[70].

At present, there are no mechanised processing facilities or standardised workshops in Fiji dedicated to bamboo production. Most processing is conducted with manual hand tools and adapted timber equipment, limiting production capacity and precision. Pacific Ark's field experiments provide early data on production efficiency, waste rations and tooling needs, creating the foundation for a scalable bamboo processing framework suited to Fiji's small enterprise context, as seen in Section 6.4. Introducing semi-mechanised processing units, such as splitters, planers, and sanders, would significantly increase quality control and reduce labour costs.

6.3.6 Construction use

Bamboo is used to a limited but culturally significant extent in Fiji. Following colonisation, traditional bamboo and timber houses (*bures)* were largely replaced by modern materials, reducing their share to only 1.9% of total housing in 2016[71]. Traditionally, *bures* located in areas with high cyclone risk have incorporated more flexible materials, such as wood and bamboo, to withstand stress without breaking[72].

Bamboo is primarily utilised in woven wall panels, roof thatching support bracing and lightweight trusses[73]. Prior studies have established the cyclone resistance of *bures* owing to strong foundations that prevent the houses from being washed away with runoff, hipped roofs that can withstand strong winds, and structural connections which divert pressure from the roofs to the foundations[74].

[67] A. Roös, personal communication, Aug 2025; A. Duckworth, personal communication, Jun 2025
[68] Roös, 2025
[69] A. Roös, personal communication, Aug 2025
[70] A. Duckworth, personal communication, Jun 2025
[71] Government of Fiji, 2016
[72] Ali et al., 2025
[73] Roös, 2025
[74] Miyaji et al., 2017; Elkharboutly & Wilkinson, 2022

Communities such as Navala continue to demonstrate the resilience of bamboo in vernacular architecture. According to local accounts, more than half of the bamboo-based *bures* in Navala survived Cyclone Winston in 2016, a Category 5 cyclone, while many tinned houses were destroyed. Community members attributed this resilience to bamboo's inherent flexibility and the use of traditional joinery methods[75].

Beyond vernacular uses, small-scale innovation is emerging through applied projects. Pacific Ark has constructed Fiji's first bamboo market store in Da Roko Settlement, a bamboo-based playground at Urata Primary School, and several eco-tourism prototypes in Savusavu (Section 6.4). These projects have demonstrated bamboo's potential to bridge traditional knowledge with modern, sustainable construction practices, while also revealing the technical constraints faced by builders, such as limited treated-pole supply, lack of standardised design templates, and absence of formal training.

According to the Ministry of Forestry (MoF), there are no large-scale documented trials in Fiji for bamboo's structural performance, although anecdotal evidence from villages about its strong structural performance exists[76]. However, small-scale local builders and construction workers that usually carry out house construction projects in villages do not have technical knowledge about how to construct with bamboo[77].

Together, these findings indicate that while bamboo has proven structural potential, its wider adoption in Fiji's construction sector will depend on formal training, local testing, and the establishment of design and engineering standards under the Ministry of Trade's ISO adaptation process.

6.3.7 Marketing and end use

The marketing and end-use of bamboo in Fiji are currently at an early stage of development, with limited domestic production and minimal consumer awareness. Most products available in Fiji are imported rather than locally manufactured. In 2017, imports accounted for over 99% of the total bamboo and rattan trade in Fiji, valued at approximately US$ 397,925[78].

Field observations and stakeholder consultations confirm that there is still no established market for construction grade bamboo, largely due to low awareness among potential end users, including homeowners, builders, architects, and developers, about bamboo's structural capacity and long-term performance. This lack of demand is compounded by limited technical skills in bamboo cultivation, treatment, processing, design and construction, meaning that even if raw materials were available, few stakeholders would be able or willing to use them.

Pacific Ark's demonstration projects have begun bridging this awareness gap by showcasing practical examples of bamboo construction, including the Da Roko bamboo market store, the Urata playground, and eco-tourism prototypes in Savusavu. These projects have generated early interest among local councils, schools, and resort operators, signalling the beginning of a niche market for climate-resilient, locally sourced building materials.

At present, no structured marketing or certification mechanisms exist to promote bamboo products in Fiji, and local producers have limited incentives to enter the market or scale up production. Traditionally, bamboo has been used in subsistence and cultural applications, such as building small huts, walls, fences, floor coverings, and weaving household items and crafts[79].

[75] Roös, 2025
[76] MoF, personal communication, Jul 2025
[77] J. Naqota, personal communication, Aug 2025
[78] INBAR, 2025
[79] INBAR, 2025; Roös, 2025

Despite this growing national and regional interest in sustainable, circular, and nature-based materials provides a timely opportunity to position bamboo as both an environmental and economic solution. Establishing targeted awareness campaigns, public sector demonstration projects, and formal training programs will be essential to build consumer confidence, stimulate private sector participation, and create a functional market ecosystem that supports production along the bamboo value chain.

6.4 Case Study: Pacific Ark's Fiji based Field Insights

Pacific Ark has undertaken end-to-end practical trials demonstrating the full bamboo construction value chain in Fiji from propagation and harvesting to treatment, processing, and construction. The organisation's fieldwork, led by A. Roös, has been carried out across the Savusavu region, testing locally available species such as *Bambusa vulgaris*, *Bambusa balcooa* and Schizostachyum *glaucifolium* through every production stage under real conditions as seen in Figure 6-15.

Figure 6-15: Pacific Ark trials from Bamboo Harvesting > Treatment > Prepping > Curing & storing

6.4.1 Harvesting and Resource Access

Most bamboo utilised by Pacific Ark originates from unmanaged wild clumps rather than structured plantations. Harvesting therefore presents both logistical and technical challenges including dense growth, steep terrain, and limited access to mature culms, increased labour time and handling difficulty. Since bamboo is widely perceived as a low value or nuisance plant, communities have generally welcomed Pacific Ark's initiatives and readily granted permission to harvest, once informed of the purpose and sustainable methods being applied. In several cases, small financial exchanges or community contributions were offered as appreciation for access, establishing fair and transparent engagement with landowners, often providing goodwill payments of FJD$2 per pole (9m) or in-kind contributions. These experiences highlight that sustainable harvesting is socially feasible in Fiji but will require structured management, training, and compensation systems as the industry scales.

The work confirmed that community access and social licensing for bamboo harvesting are feasible in Fiji, provided there are clear agreements on benefit-sharing and sustainable cutting practices. Labour teams of two

to three workers can harvest roughly 20 poles (3.5 m each) within six hours, averaging $45 per day per worker. Transport of a full truckload costs approximately FJD $100, depending on terrain and access conditions.

6.4.2 Agroforestry and Cultivation Systems

Pacific Ark's bamboo agroforestry and plantation initiative forms the foundation of its long-term sustainable supply model (Figure 6-16). Established across pilot sites in Savusavu and Valelawa, the program integrates bamboo within mixed cropping systems to restore degraded lands, stabilise slopes, and enhance farm resilience.

The initiative combines bamboo with crops such as dalo, eggplant, mahogany, banana, small fruit trees, and cocoa, creating multi-layered, productive landscapes that improve soil structure and biodiversity while generating both short- and long-term income streams for landowners. Bamboo's extensive root system enhances water retention and erosion control, while its rapid regrowth provides a renewable source of biomass for construction and community energy use.

Pacific Ark's field trials focus on *Bambusa balcooa* propagation and early growth performance under varying soil, shading, and irrigation regimes. Each planting is managed through selective harvesting to ensure long-term productivity without soil depletion. Data are being collected on shoot regeneration, culm density, and intercropping performance, establishing Fiji's first local baseline for bamboo agroforestry and plantation site performance using a single high value construction species. These trials are providing critical insights into growth rates, yield potential, and management requirements under Fijian conditions, forming the scientific foundation for future large scale bamboo plantations and regenerative land use planning.

The program also functions as a live demonstration for community training, where farmers and youth groups participate in planting, maintenance, and early harvesting activities. This model has proven effective in increasing rural engagement by linking livelihood opportunities directly to climate adaptation and land restoration.

In the long term, Pacific Ark's agroforestry initiative aims to supply a consistent flow of mature bamboo poles to feed treatment and construction operations while regenerating degraded landscapes across Vanua Levu and the wider Pacific.

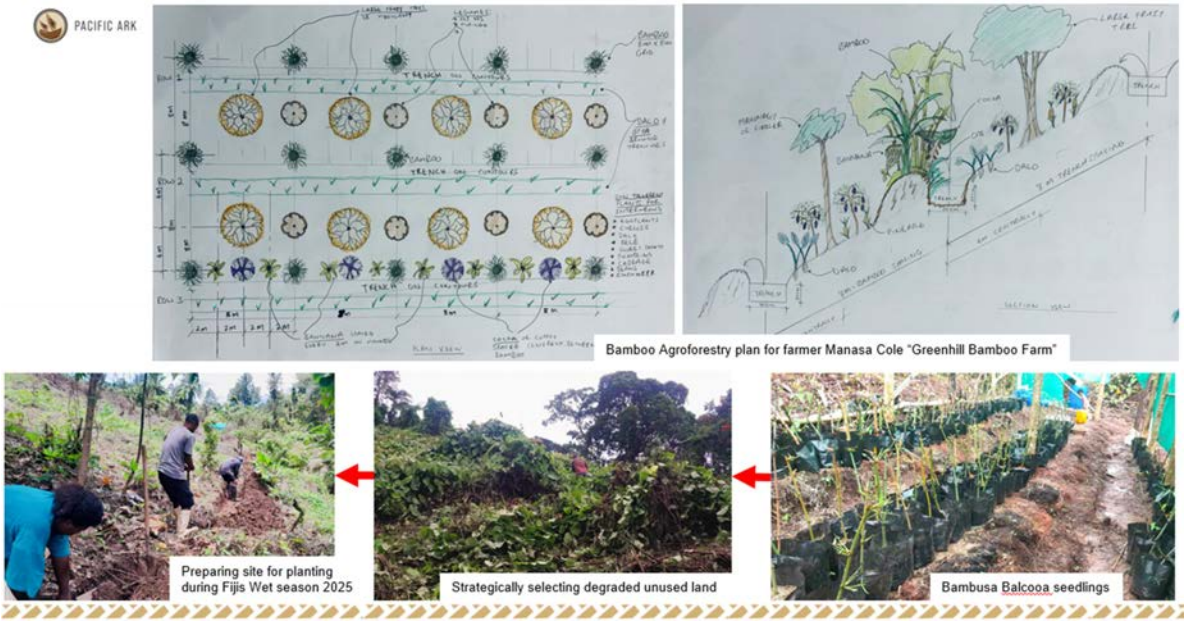

Figure 6-16: 10 Acre Green Hill Bamboo Farm agroforestry initiative, demonstrating integrated bamboo cultivation and mixed-crop systems under Pacific Ark's registered sites

6.4.3 Treatment and Processing

Pacific Ark has trialled both boron diffusion (Hot & Cold) and vertical-soak diffusion (VSD) treatment systems using locally sourced materials to determine optimal solution concentrations, soaking durations, and retention levels suited to Fiji's humid climate (Figure 6-17 to Figure 6-19). Experimental smoke curing and solar-drying methods were also tested to compare durability, colour, and workability.

Figure 6-17: Vertical Soak Diffusion (VSD) setup for trials by Pacific Ark in Savusavu, Vanua Levu

Figure 6-18: Dissolving boron mixture in hot immersion, prior to lacing bamboo into mixture (Pacific Ark)

Figure 6-19: Placing bamboo into hot immersion tanks keeping it submerged at all times (Pacific Ark)

6.4.4 Construction and Joinery

Pacific Ark has constructed Fiji's first bamboo market store at Da Roko Settlement (Figure 6-20), a bamboo-based playground at Urata Primary School (Figure 6-21), shade shelters, and eco-tourism prototypes in Savusavu, using locally processed poles and hand-crafted joinery. These builds have proven bamboo's load-bearing strength, versatility, and aesthetic potential when combined with modern connection systems, reinforced footings, and appropriate design detailing. They also revealed practical constraints such as irregular supply of mature poles, limited availability of treatment facilities, and the absence of engineer approved structural templates for any type of certification.

Figure 6-20: Da Roko Settlement Market Stall: Step-by-step construction of demonstration bamboo build, from framing to finished structure

Figure 6-21: Urata Kindergarten bamboo playground: Step-by-step construction of demonstration bamboo build, from testing the bamboo's bending limits, framing to finished structures

6.4.5 Training and Community Engagement

Pacific Ark's team has delivered hands-on training and awareness programs in collaboration with the Ministry of Forestry, reaching over forty participants across multiple villages, for example Naloaloa Village. These sessions covered bamboo propagation, selective harvesting, treatment methods, and basic construction joinery. The participatory approach, learning by doing, proved the most effective model for community skill transfer and long-term adoption.

6.4.6 Field Research and Data

Pacific Ark has documented every stage of the process, collecting empirical data on treatment retention, processing waste ratios, curing times, and construction performance. This evidence base provides the first locally verified technical inputs for bamboo's performance under Fijian conditions. The findings directly support the development of national treatment guidelines, processing standards, and training modules under the Ministry of Trade's ISO adoption framework.

Key Insights and Lessons Learned

- **Supply:** Need for structured species propagation, clump management, and sustainable harvesting cycles
- **Treatment:** Standardised boron diffusion and VSD methods can deliver long term durability with local materials
- **Processing:** Absence of mechanised facilities limits scaling; semi-mechanised tools are essential for consistency
- **Construction:** Bamboo performs well structurally but requires engineered designs and certification pathways
- **Market:** Early demand is emerging from schools, resorts, and rural community projects for low-cost, climate-resilient infrastructure

Together, these demonstrations position Pacific Ark as Fiji's leading field laboratory for bamboo construction, translating research into built evidence and validating bamboo's potential in real-world conditions, and informing both national policy and community practice (Figure 6-22).

Figure 6-22: Completed bamboo works, from artifact and construction in Indonesia to prototypes in Fiji, demonstrating cross regional knowledge transfer and craftmanship by Pacific Ark

7 SWOT Analysis

A SWOT analysis was conducted to summarise Fiji's current position for establishing sustainable and inclusive production and use of bamboo as a resilient, sustainable and cost-effective construction material to increase supply of affordable, resilient and accessible buildings. It identifies internal strengths and weaknesses, as well as external opportunities and threats shaping sector development. The findings presented in Table 2 and Table 3 draw from stakeholder consultations, literature review, and field data collected between May and October 2025.

Internal Factors	
Strengths	**Weaknesses**
Existing grassroots leadership and networks such as W. Nimbalka and S. Soko who are already leading bamboo-related initiatives in their regions	**Low awareness of bamboo's economic and environmental value and negative perception** of bamboo among locals, often dismissed as "wild grass" or a "poor man's timber" 3. Farmers and builders are reluctant to grow bamboo and build with it 4. Low priority in policies as it is perceived as a low-status material
Private-sector leadership and Fiji's only evidence-base by Pacific Ark in strong collaboration with communities, government and researchers as demonstration and knowledge sources, providing verified technical data and real demonstrations for bamboo construction	**Infrastructure gap** as there are no national treatment or processing facilities and testing lab. 5. Causes misconceptions about bamboo's short lifespan to persist with lack of access to modern treatment methods
Institutional foundation through the Fiji Bamboo Association (FBA) to support national coordination with strong interest in revitalising its role through collaborations and for training and research	**Fragmented data base** as there is no central data, trials, or testing facilities about bamboo species and its structural performance, reducing quality control and scalability as bamboo propagation and construction remains informal, relying on mixed, unidentified species and lacking structured nurseries or genetic repositories
Indigenous knowledge base on bamboo harvesting, treatment, and processing, especially for constructing *bure* (traditional houses), providing a traditionally rooted base for reviving bamboo as a modern construction material	**Very limited cultivation and management** of bamboo currently; locals harvest it from the wild when needed
Policy alignment and enabling environment for bamboo as a nature-based solution with Fiji's national agendas, such as the Nationally Determined Contributions (NDCs), already prioritising climate adaptation, biodiversity conservation, and sustainable livelihoods	**Institutional and operational gaps within Fiji Bamboo Association (FBA)** as it currently lacks an active committee, operational body, funding, capacity, communication channels, and technical expertise to execute its strategy to drive propagation, awareness, and policy efforts

Internal Factors	
Strengths	**Weaknesses**
Emerging collaboration momentum among government, private sector, and academia (e.g. GGGI, MoF, Trade, CIC, CATD, FNU, Pacific Ark) can be built upon to develop bamboo value chain	**Limited technical capacity** as there no formal training programs covering the full bamboo value chain, from cultivation to construction, and only a few farmers and builders possess the knowledge
	Lack of national guidelines and standards for sustainable bamboo sourcing, harvesting, treatment and construction that are aligned to local conditions

Table 2: Internal strengths and weaknesses

External Factors	
Opportunities	**Threats**
Guidelines for bamboo established internationally or in other countries which could be used as guidance to form Fiji's national guidelines for bamboo that are aligned to local conditions	**Lack of formal standards and certification pathways** for performance testing and building code approvals, hence insurers and lenders are unlikely to accept bamboo structures and there are liability issues for engineers 6. Engineers' and builders' limited training in bamboo design and joinery further inhibits certification and market confidence
Land restoration is required in many degraded lands of Fiji due to deforestation, unsustainable farming practices, etc., and bamboo can regenerate land, reduce erosion, and reduce reliance on native timber	**Limited market and demand for bamboo** as Fiji currently imports nearly all its bamboo and rattan products, reflecting weak domestic demand (99% imports of bamboo and rattan products to Fiji in 2017 (MoF, 2022)
Growing demand for sustainable, resilient, and affordable housing with increasing cyclones and flooding in Fiji due to climate change could be met with bamboo-based construction	**Lack of bamboo resources with high value for construction** in Fiji
Abundant native and naturalised species of bamboo in Fiji already exist	**Land tenure complexity** as Fiji's communal land ownership (*Mataqali* system) can complicate leasing and long-term investments for bamboo plantations, which require sustained management over decades
Nature-based solutions such as bamboo are being called for internationally for climate adaptation, biodiversity conservation, land restoration, and sustainable livelihoods	**Risk of bamboo not being established without irrigation in drought-prone regions** like the Western Division and Vanua Levu as it requires consistent moisture in the first year

External Factors	
Opportunities	**Threats**
Alternative livelihood sources are needed by communities severely impacted by climate change and biodiversity loss, such as bamboo agroforestry that produces other crops with bamboo for food and income	**Erosion of indigenous knowledge around bamboo** without documentation and revival efforts, leading to loss of cultural and practical wisdom vital for sustainable use
Bamboo can align with Fiji's existing national policies for climate mitigation and adaptation and biodiversity conservation to leverage them for funding and implementation; including the Low Emission Development Strategy (LEDS), National Adaptation Plan (NAP), National Biodiversity Strategy and Action Plan (NBSAP), Climate Change Act, and the Build Back Better framework	**Quality control and safety risks** as the absence of training and oversight in bamboo construction can lead to poor workmanship, reducing structural safety and damaging bamboo's reputation as a credible building material
Bamboo could be integrated current goals of training institutes such as CATD's "Greening" approach to Technical and Vocational Education and Training (Greening TVET) to align with sustainable development goals and FNU's interest in including bamboo in the curriculum	**Climate change** induced increased frequency of cyclones and droughts that could affect plantation stability and harvest cycles
Private-sector investment could be leveraged as there is early interest from tourism, resorts, and green-building sectors	
Lessons from other sectors in Fiji such as the pine industry provides models for developing SOPs, OHS compliance, and training systems that could be adapted for bamboo	
Fiji is already a part of international networks such as INBAR for access to training, research, and standards development support	
Partnerships could be rebuilt with countries like Indonesia and the Philippines, which have similar climates and successful bamboo construction programs to learn from and collaborate with them (e.g. Philippines' *Base Bahay's certification and hybrid systems* could guide Fiji's pathway toward recognition in housing and infrastructure)	
Emerging field data and demonstration projects, can serve as proof of concepts for scaling bamboo construction	

Table 3: External opportunities and threats

Fiji possesses a strong foundation for developing a sustainable and inclusive bamboo sector through existing grassroots leadership, traditional knowledge, and institutional interest. However, significant structural gaps, particularly the lack of standards, limited technical expertise, and low public awareness, must be addressed to unlock bamboo's potential as a climate-resilient construction material.

By learning from established sectors like pine and international bamboo leaders (e.g., Base Bahay, INBAR), Fiji can develop context-specific guidelines, training systems, and demonstration projects to mainstream bamboo into the construction and agroforestry sectors. Building on these foundations, revitalising the Fiji Bamboo Association and integrating bamboo into national education, forestry, and climate programs would ensure that its benefits — affordable housing, livelihood diversification, and ecosystem restoration — reach women, youth, and marginalised communities, contributing to a resilient and inclusive green economy.

7.1 Barriers to Developing Bamboo Value Chain for Construction in Fiji and Potential Responses

An analysis of various barriers to developing bamboo value chain for construction in Fiji was conducted, identifying each of their causes and impacts. The following Table 4 summarises the analysis and presents potential responses.

Barrier	Cause	Impact	Potential response
Low awareness and negative perception of bamboo	Low exposure to modern bamboo treatment and understanding of its ecosystem benefits	Farmers and builders are reluctant to grow bamboo and build with it Low priority in policies as it is perceived as a low-status material	Nationwide awareness campaigns, demonstration builds, and training for policymakers, communities, and builders to showcase structural, social, and environmental value.
Infrastructure gap	No national treatment or processing facilities and testing lab	Misconceptions about bamboo's short lifespan persist with lack of access to modern treatment methods	Establish national or regional treatment, processing, and testing facilities, create mobile treatment units for rural areas.
Fragmented knowledge and data	No central data, trials, or testing facilities about bamboo species and its structural performance	Reduces quality control and scalability as bamboo propagation and construction remains informal, relying on mixed, unidentified species and lacking structured nurseries or genetic repositories. Misconceptions about bamboo's short lifespan persist	Develop a national bamboo knowledge platform, research partnerships with universities, and establish genetic repositories and nurseries.

Barrier	Cause	Impact	Potential response
Limited cultivation and management	Locals harvest it from the wild when needed as bamboo is not widely used and not seen as a valuable crop to grow	Unreliable raw material supply for construction, unmanaged clumps cause poor quality culms	Train communities on bamboo agroforestry and clump management, integrate bamboo into reforestation and sustainable farming programs.
Institutional and operational gaps within Fiji Bamboo Association (FBA)	Currently lacks an active committee, operational body, funding, capacity, communication channels, and technical expertise	Unable to execute its strategy to drive propagation, awareness, and policy efforts	Support FBA restructuring, provide core funding, technical training, and digital communication tools for coordination.
Limited technical capacity	No formal training programs covering the full bamboo value chain, from cultivation to construction, and only a few farmers and builders possess the knowledge	People are unable to sustainably grow and use bamboo for construction even if there was an interest to do so	Develop a national bamboo training framework across cultivation, treatment, and construction; train the trainers at CATD/FNU. Awareness programs to promote understanding about the benefits and potential of bamboo among communities Training amongst local communities on cultivation and management of bamboo through methods like agroforestry, and treatment and construction methods National training programmes covering the full bamboo value chain, aligned with bamboo-related standard, guidelines, and certifications, to build technical capacity
Lack of national guidelines and standards for sustainable bamboo sourcing, harvesting, treatment and construction that	Bamboo has not been integrated in construction codes or forestry regulations Bamboo has not been a priority in policy-making and national plans	Reducing quality control and scalability. Misconceptions about bamboo's short lifespan persist. Insurers and lenders reject bamboo structures; engineers	Adopt ISO 22156/22157 as interim reference; develop localised guidelines through CIC, MoF, MoPW, and Engineers Fiji. Create national guidelines and standards for sustainable bamboo sourcing, harvesting,

Barrier	Cause	Impact	Potential response
are aligned to local conditions. Lack of certification pathways for performance testing and building code approvals	Engineers' and builders' limited training in bamboo design and joinery	reluctant to certify designs	treatment and construction that are aligned to local conditions, and certifications for performance testing and building code approvals, learning from international standards and standards from other countries (e.g. Philippines and INBAR)
Limited availability of high-value construction species	Naturalised species, *Bambusa vulgaris*, is the most widespread species in Fiji, but it is not a highly valued species for construction	Difficult to find species for construction in Fiji	Develop nurseries and mother clumps for *Bambusa balcooa*, *Dendrocalamus asper*, and *Gigantus*; introduce certification of planting material. Establish gene banks and nurseries to propagate bamboo species with high construction value, sourcing seeds from other countries such as China
Weak Market demand	Fiji currently imports nearly all its bamboo and rattan products, reflecting weak domestic demand (99% imports of bamboo and rattan products to Fiji in 2017 (MoF, 2022)	There would be no market for selling the bamboo even if farmers start cultivating it, hence bamboo would not be considered a valuable crop to grow	Engage private sector to create a market for bamboo Promote bamboo through pilot builds in public housing, resorts, and schools; integrate bamboo procurement into green-building policies. Training in bamboo treatment, processing and construction, to create a market
Land tenure complexity	Fiji's communal land ownership (*Mataqali* system)	Can complicate leasing and long-term investments for bamboo plantations, which require sustained management over decades	Strong community engagement and partnerships with landowners Develop community-based lease and buy-back models; promote cooperative bamboo farming contracts. Community awareness about the value of bamboo

Barrier	Cause	Impact	Potential response
Climate and water constraints	Bamboo requires consistent moisture in the first year	Inability to cultivate bamboo in drought-prone regions	Irrigation systems may be required in these regions. Smart irrigation systems could ensure that water is not over-consumed.
Loss of traditional knowledge and quality risks	Lack of documentation and revival efforts	Loss of cultural and practical wisdom vital for sustainable use	Strong engagement of Indigenous communities and documentation and integration of traditional knowledge around bamboo species, cultivation, harvesting, treatment, construction, etc. through participatory methods
Quality control and safety risks	Absence of training and oversight in bamboo construction	Poor workmanship, reducing structural safety and damaging bamboo's reputation as a credible building material	Create national guidelines, standards, and certifications for sustainable bamboo sourcing, harvesting, treatment and construction that are aligned to local conditions, learning from international standards and standards from other countries. National training programmes to ensure that curriculum is structured and aligned with bamboo-related standard, guidelines, and certifications

Table 4: Analysis of barriers to developing bamboo value chain for construction in Fiji and potential responses

8 Recommendations and Strategic Roadmap for Sustainable Bamboo Sector in Fiji

8.1 Inclusive and sustainable bamboo for construction

The sustainable use of bamboo for construction in Fiji offers an opportunity to address climate adaptation and mitigation, enhance biodiversity, and promote sustainable livelihoods, particularly for women and other marginalised groups. As such, it represents a Nature-based Solution (NbS), defined by the International Union for Conservation of Nature (IUCN) as "actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"[80].

When designing and implementing NbS such as bamboo-based construction, it is vital to ensure that interventions are not only ecologically effective but also socially just and inclusive, guided by principles that embed equity, transparency, and accountability throughout planning and implementation[81]. While NbS are generally conceived as "inherently good" approaches to addressing climate and disaster risks, even well-intentioned projects can produce unequal outcomes and unintended trade-offs if they overlook power relations and socio-political dynamics[82].

For Fiji, positioning bamboo construction as a NbS highlights its dual potential, to strengthen ecosystem resilience and to create fair, community led livelihood opportunities. This approach connects directly to Fiji's national priorities under the Climate Change Act, Low Emissions Development Strategy (LEDS), and National Adaptation Plan (NAP), which promotes nature based and inclusive climate actions.

Nesshöver et al. (2017) highlight five interrelated elements that underpin sustainable and equitable NbS[83]. Table 5 below outlines these elements and illustrates how they can be applied to the design, governance, and implementation of bamboo-based NbS for resilient and inclusive construction in Fiji.

Element	Key Idea	Relevance to Bamboo-based NbS in Fiji
1. Dealing with uncertainty and complexity through adaptive management	NbS operate within complex socio-ecological systems that require flexible, learning-oriented approaches to manage uncertainty and change. Adaptive management involves iterative planning, monitoring, and adjusting actions over time.	Apply adaptive management to pilot and scale bamboo initiatives. Start with demonstration sites to test species, treatment methods, and social models. Use structured monitoring to track ecological performance, durability, and socio-economic benefits, allowing refinement of practices and policies over time.

[80] IUCN, 2016
[81] Boyland et al., 2022
[82] Pelling et al., 2015
[83] Nesshöver et al., 2017

Element	Key Idea	Relevance to Bamboo-based NbS in Fiji
2. Ensuring the involvement of multiple stakeholders	Inclusive participation of all actors affected by or contributing to NbS (i.e. communities, government, private sector, academia) enhances legitimacy, ownership, and effectiveness.	Engage grassroot leaders, local landowners, women's groups, and youth cooperatives in bamboo value chains who bring different perspectives through co-design processes. Build partnerships between the Ministry of Forestry, PacificArk, the Fiji Bamboo Association (FBA), and education institutions (e.g. CATD, USP) to strengthen governance, training, and implementation.
3. Ensuring the sound use of multi- and transdisciplinary knowledge	Successful NbS integrate ecological, technical, social, and Indigenous knowledge to ensure both environmental soundness and social acceptability.	Combine traditional Fijian knowledge of bamboo harvesting and use (e.g. bure construction) with modern treatment, testing, and design standards. Foster collaboration between engineers, foresters, social scientists, and local communities to co-produce contextually relevant bamboo solutions.
4. Developing a common understanding of multifunctional solutions, trade-offs, and natural adaptation	NbS serve multiple goals (e.g. ecological restoration, climate adaptation, livelihoods). Trade-offs between social, economic, and ecological objectives must be identified and negotiated transparently.	Recognise and plan for multifunctional benefits of bamboo systems—erosion control, habitat restoration, carbon sequestration, and affordable housing. Develop policies that enable balanced outcomes between ecosystem conservation and community economic empowerment.
5. Evaluating and monitoring for mutual learning	Continuous evaluation of NbS against ecological, social, and economic indicators enables learning, accountability, and long-term improvement.	Establish participatory monitoring frameworks involving local communities and technical experts. Track outcomes such as biodiversity recovery, income generation, women's participation, and housing resilience. Use findings to refine national bamboo strategies and inform future policies.

Table 5: Framework of elements for successful NbS (adapted from Nesshöver et al., 2017) and their application to bamboo-based NbS for construction in Fiji

These five operational elements should be guided by the justice-oriented principles proposed by Boyland et al. (2022), which call for inclusivity, transparency, and accountability in NbS governance:

1. Ensure inclusivity and transparency in the design, governance, and implementation of NbS initiatives.
2. Address root causes of marginalisation, inequality, and injustice at every stage of the process.
3. Minimise economic and non-economic losses, and prevent the unjust redistribution of risks and costs among communities.
4. Prioritise actions in the most vulnerable and at-risk areas and communities.
5. Develop and apply valuation and measurement tools that capture not only ecological outcomes but also social and political change.

For bamboo-based NbS in Fiji, this means ensuring that local voices and traditional decision-making structures, (e.g., village councils and mataqali leaders), that benefits are equitably shared, and that risks such as land tenure insecurity or gender exclusion are proactively addressed. By doing so, the bamboo sector can contribute not only to environmental sustainability but also to transformative, inclusive development that harmonises relationships between people and nature.

8.1.1 Integrating Pacific-Centric GEDSI Principles in NbS Design

Recent regional insights from the report "*Integrating Gender Equity, Disability and Social Inclusion (GEDSI) in Nature-based Solutions for Climate Adaptation: Principles, Case Studies and Lessons Learned*" highlight the importance of grounding NbS in Pacific values, social systems, and lived realities[84]. For example, many Pacific societies value communal decision-making, kinship, and collective stewardship. Harnessing these cultural strengths can enhance women's leadership and inclusive governance in bamboo projects.

Drawing from nine Pacific case studies, the report emphasises that integrating GEDSI principles from the outset is critical for ensuring that NbS are inclusive, culturally grounded, and sustainable. Embedding these principles throughout all stages of project design and implementation not only strengthens the effectiveness and longevity of outcomes but also fosters trust, social justice, and equal participation, ensuring that all individuals can contribute to and benefit from the project's success. These Pacific-based guiding principles provide a contextual lens for operationalising the justice-oriented and adaptive principles discussed above. The seven guiding principles include:

1. Obtaining Free, Prior and Informed Consent (FPIC):

FPIC ensures that Indigenous and local communities have the right to freely give or withhold consent to projects affecting their lands and livelihoods. Applying FPIC through a GEDSI lens means engaging women, youth, and other marginalised groups in consent processes and maintaining ongoing dialogue and accountability. In Fiji's bamboo sector, FPIC upholds customary land rights and empowers communities to co-determine how bamboo cultivation and construction initiatives align with their aspirations.

2. Intentional Inclusion of Marginalised and Underrepresented Groups

Equitable NbS must actively remove barriers to participation and ensure representation of women, youth, and persons with disabilities in all decision-making spaces. Inclusion enhances project innovation and ownership. Within the bamboo value chain, inclusive participation can be fostered through training programs, equitable employment in processing facilities, and leadership opportunities in cooperatives and associations.

3. GEDSI Analysis to Inform Project Design and Implementation

Conducting a GEDSI analysis enables practitioners to identify inequalities, power imbalances, and differentiated roles within communities. This data-driven approach ensures that interventions address specific needs and capabilities. For bamboo-based NbS, GEDSI analysis can guide the equitable distribution of benefits, such as access to bamboo resources, training, and income generation, across gender, age, and ability groups.

[84] SPREP, 2025

4. **Investing in Women's Economic Empowerment**

Supporting women's access to finance, skills, and leadership opportunities fosters economic independence and enhances NbS outcomes. In the bamboo sector, women's economic empowerment can be achieved through entrepreneurship support, value-added product development, and recognition of women's roles in resource management and innovation.

5. **Developing a GEDSI Strategy for Projects**

A formal GEDSI strategy provides a clear framework for inclusion throughout project design, implementation, and monitoring. It ensures accountability and transparency. For bamboo-based NbS, such a strategy could be embedded in national bamboo policies and action plans, mandating inclusivity across training, production, and marketing initiatives.

6. **Building a Community of Practice for GEDSI**

Establishing a regional or national GEDSI community of practice enables continuous learning, collaboration, and innovation among practitioners. For Fiji's bamboo initiatives, this could involve regular exchanges between local women's groups, disability networks, and technical agencies to share lessons and strengthen collective capacity. Establishing a bamboo NbS learning network across various institutions can foster peer learning and innovation.

7. **Engaging Experts to Improve Disability Inclusion**

Partnering with disability inclusion experts ensures that NbS are accessible and responsive to the needs of persons with disabilities. For example, bamboo training and employment programs can adopt inclusive facilities, adaptive tools, and communication materials to ensure full participation and equitable benefits.

Applying GEDSI across the bamboo value chain

Operationalising GEDSI principles throughout the bamboo value chain can ensure that inclusion and equity are embedded from production to market.

1. In the **cultivation** stage, land access, tenure rights, and participation of women and marginalised groups in nursery management and planting decisions should be prioritised.
2. During **processing**, equitable access to training, equipment, and financing can help diversify employment and leadership opportunities, particularly for youth and women's cooperatives.
3. In the **construction** phase, integrating gender-responsive design and labour practices can promote safer, more inclusive work environments.
4. In **marketing and enterprise development**, supporting women- and community-led businesses through fair pricing, branding, and partnerships can strengthen local economies while promoting social justice and environmental stewardship.

By embedding GEDSI across each stage, bamboo-based NbS in Fiji can generate not only ecological and climate benefits, but also transformative socio-economic outcomes rooted in Pacific values of collective wellbeing and respect.

8.2 Enabling Environment & Policy Actions

Creating a strong enabling environment for the sustainable and inclusive development of bamboo as a construction material in Fiji requires coordinated policy frameworks, participatory governance, and institutional support. Bamboo's potential to contribute to affordable housing, climate resilience, and economic empowerment, particularly for women and other marginalised groups, can only be realised if policies are holistic, community-centred, and informed by evidence.

8.2.1 Policy Integration and Institutional Coordination

To ensure coherence and scalability, bamboo development should be integrated across multiple policy domains, including housing, forestry, agriculture, environment, disaster risk reduction, and tourism. Bamboo should be formally recognised as both an economic resource and a climate resilience material positioned as a key component of Fiji's climate resilience and sustainable development agenda. Integrating bamboo within national frameworks, such as the National Development Plan (NDP), Build Back Better Programme, Climate Change Act (2021), National Adaptation Plan (NAP), and National Biodiversity Strategy and Action Plan (NBSAP), can ensure coherence between forestry, housing, and disaster risk reduction efforts and institutional ownership. Bamboo should be incorporated as a strategic species in Fiji's upcoming Planted Forest Policy, which emphasises the role of nature-based solutions (NbS) for the restoration of degraded landscapes. Any future agroforestry policy[85] should also recognise the potential of bamboo-based production systems as pathways to support rural livelihood development, strengthening community resilience, and diversifying income streams.

A key step is to position bamboo as a **Non-Timber Forest Product (NTFP)**, recognising its subsistence, cultural, and ecological value beyond commercial forestry. This classification will ensure that bamboo production remains within community-based management systems rather than being absorbed into industrial forestry, maintaining local ownership, preserving cultural uses, and ensuring equitable benefit-sharing. Specific harvesting and treatment guidelines should accompany this designation to guarantee sustainability, quality, and safety in construction use. Accompanying this should be clear harvesting, treatment and processing guidelines that uphold sustainability, quality, and safety in bamboo construction.

To avoid fragmentation, **research, policy and practice must be better aligned**. Academic findings, technical trials, and community-based innovations should directly inform national and local policy formulation. Ministries and agencies must not operate in silos; instead, coordinated planning and shared data platforms can promote cross-sector learning and efficiency.

A **National Bamboo Strategy** could serve as an umbrella framework, aligning the mandates of the Ministry of Forestry, Ministry of Public Works, Meteorological Services, and Transport, Ministry of Environment and Climate Change, Construction Industry Council (CIC), Engineers Fiji, and other stakeholders. This strategy should apply a "whole of system" approach, acknowledging the interlinkages between ecological, social, and economic dimensions of bamboo policy — from species selection and sustainable cultivation to post-harvest handling, treatment, construction, and marketing.

Establishing a **National Bamboo Taskforce**, led by MoF and comprising various stakeholders such as the CIC, Engineers Fiji, Ministry of Environment and Climate Change, Ministry of Public Works, Fiji National University (FNU), and civil society partners, would strengthen coordination, streamline decision-making, and ensure transparency across agencies.

[85] Shah, 2023

Effective policy implementation depends on strong intersectoral collaboration between government ministries, civil society organizations, academia, and the private sector. The National bamboo taskforce should serve as a collaborative platform for policy dialogue, data sharing, and innovation, helping ministries move beyond siloed operations.

This collaboration can ensure locally relevant and evidence-based policies, aligned with international commitments such as the SDGs and the Global Biodiversity Framework, while maintaining focus on Fiji's unique social and ecological context.

8.2.2 Participatory and Inclusive Governance for Sustainable Resource Management

To prevent bamboo from becoming an exclusive commodity once it gains traction in tourism and export markets, policies must embed **social equity and community participation** at every stage of the value chain. This means embedding participatory methods in policy design, not as token consultations, but as co-creation processes that give local landowners, women, and youth real decision-making power.

A community-led bamboo management framework should formalise **Free, Prior and Informed Consent (FPIC),** integrate traditional and local knowledge, local governance structures, capacity building, and enable community representation in all policy forums and technical taskforces. Policies should promote regulated harvesting, sustainable propagation, and post-harvest management, recognising bamboo's subsistence and cultural value alongside its economic potential. Standards and guidelines should consider local contexts, accessibility to resources, and purposes. For example, treatment guidelines could be differentiated based on community-based treatment methods and large-scale treatment methods.

Given that 80% of land in Fiji is traditionally owned, bamboo policy must uphold FPIC principles and encourage production by smallholder farmers, cooperatives, and women's groups. To support long-term investment and equitable benefit-sharing, policy reforms clarify and formalise **transparent land tenure** arrangements for bamboo cultivation. Strengthening local governance through cooperatives or Forest-Based Community models can enhance accountability, adaptive management, and inclusive decision-making.

Agroforestry contracts can provide price incentives and risk-sharing mechanisms, enabling more sustainable land uses supporting poverty reduction in developing economies like Fiji. Research on communities' willingness to accept (WTA) agroforestry contracts on abandoned sugarcane leases in Fiji found a strong preference for denser, long-duration production systems with higher carbon sequestration potential, as these configurations offer more secure revenue streams compared to less dense and shorter duration contracts[86].

Introducing "Community Contractor" or "Farming Contractor" models, such as those piloted by Pacific Ark in Vanua Levu, can offer a practical pathway, allowing communities to supply bamboo poles under guaranteed buy-back schemes with private investors or government programs while retaining ownership of the resource base. This approach creates employment, builds trust, and aligns directly with Fiji's inclusive green growth principles. By empowering landowners to act as contractors rather than as passive leaseholders, this model promotes employment creation, trust-building, and equitable benefit-sharing, while supporting Fiji's inclusive green growth principles.

[86] Santos et al., 2025

8.2.3 Standards, Guidelines, and Certification

Public confidence and investor trust in bamboo construction depends on the establishment and enforcement of national bamboo standards and guidelines that ensure safety, durability, and quality compliance. Quality control standards enable insurance coverage, financing eligibility, and engineering sign-offs. Fiji should develop locally relevant codes informed by international references such as ISO 22156 and ISO 22156 and cyclone performance models from ICC/US/Philippines. Such standards must be adapted to Fiji's geography, culture, and climate, not merely adapted from external contexts (e.g. ANZ codes), to ensure relevance to Fiji's environmental conditions and social realities. Current material approval processes are also fragmented and bureaucratic. Hence, the development of a formalised approval pathway is essential.

Collaborating with Engineers Fiji, CIC, Ministry of Public Works, FNU, and CSIRO or equivalent testing institutions would enable the creation, implementation and enforcement of:

- National sourcing and propagation protocols, Harvesting and post-harvest handling and treatment guidelines to maintain structural integrity and prevent overharvesting and maintain biodiversity.
- National Bamboo Construction Standards and Quality Control Protocols
- A Materials Approval Guideline, supported by a multi-agency taskforce to streamline bureaucratic approval processes and reduce fragmentation across agencies.
- Cyclone and durability testing guidelines

The codes should include monitoring mechanisms to systematically track requirements. Communities should be trained to submit annual reports outlining harvest volumes, stand conditions, and regeneration success. Compliance should be ensured through periodic field inspections and cross-checking the reports with actual on-ground field conditions. In order to enhance adherence to the code, a certification mechanism similar to Fiji Pine's FSC certification should be developed. Compliant harvesters could be rewarded with access to niche markets, while non-compliance could trigger corrective actions or suspension of certification.

8.2.4 Monitoring, Evaluation, and Adaptive Policy Learning

A national Bamboo Monitoring and Evaluation Framework should track outcomes across ecological, economic, and social indicators. This includes biodiversity restoration, employment creation, gender participation, and housing resilience. Centralised data and regular reporting will create accountability, guide investment, and foster adaptive learning. Transparent feedback loops will help refine regulations, inform investment decisions, and strengthen adaptive management.

8.3 Infrastructure for a Sustainable Bamboo Industry in Fiji

Developing a resilient and inclusive bamboo-based construction sector in Fiji requires targeted investment in infrastructure that supports the entire value chain, from cultivation to processing, treatment, and end-use. Infrastructure development must be aligned with national priorities for sustainable housing, climate adaptation, circular economy, and economic diversification, while ensuring equitable access for communities, smallholders, and women-led enterprises.

8.3.1 Propagation and Cultivation Infrastructure

A reliable and diverse supply of quality planting material forms the foundation of a sustainable bamboo industry. Establishing regional **nurseries** under the Ministry of Forestry would help preserve and propagate priority bamboo species for construction (e.g. *Dendrocalamus asper*, *Dendrocalamus gigantus*, *Bambusa Balcooa*) and ensure a continuous supply of resilient planting stock suitable for Fiji's diverse climates and soil conditions. These centres can be **co-managed** by local cooperatives and women's groups to promote equitable benefit-sharing and provide training on nursery management, soil care, and integrated pest management. In the long term, a coordinated nursery **network** would facilitate the establishment of community-based plantations, agroforestry systems, and restoration projects on degraded and marginal lands.

Gene banks would be a strategic intervention to conserve the country's bamboo genetic resources and support long-term sectoral development. Currently, the diversity, distribution, and genetic characteristics of Fiji's bamboo resources are poorly documented. This poses a risk of genetic erosion, limiting the country's capacity to identify species suitable for different ecological zones. Establishing a national bamboo gene bank coordinated by the MoF in collaboration with research organizations like FNU and SPC would enable the systematic documentation, collection, and preservation of native and introduced bamboo germplasm.

A **national propagation protocol** and seed bank (with seeds sourced from other countries like China) should complement these facilities to ensure biodiversity conservation and resilience against climatic shocks. In addition, integrating **soil health practices**, such as using bamboo leaf litter as compost and converting offcuts into biochar, would enhance soil fertility while sequestering carbon. The Fiji Bamboo Association (FBA) encourages trialling low-impact harvesting, zero-waste processing, and locally led supply chains to strengthen sustainability and community ownership.

8.3.2 Processing and Treatment Infrastructure

The absence of dedicated treatment and processing facilities remains a major barrier to scaling bamboo construction in Fiji. Effective preservation extends bamboo's lifespan from a few months to over a decade, making it suitable for structural and semi-structural applications.

In the short term, collaboration with the pine industry offers a practical opportunity to leverage existing infrastructure and expertise. Fiji Pine Limited has expressed openness to collaborate on alternative materials like bamboo and share its kilns, drying facilities, and processing spaces. Such partnerships could also include technical exchange, R&D collaboration, and training programs to strengthen early-stage capacity in the bamboo sector.

Over time, these shared facilities can evolve into **dedicated bamboo treatment and processing centers** in different regions, equipped with environmentally friendly treatment systems and modern machinery such as splitting knives, drilling machines, preservation troughs, pressing machines, and moulding tools. These centers could be established in proximity to major bamboo-growing areas and could also serve as **innovation and training hubs,** fostering skills development in bamboo preservation, product design, and structural applications for local entrepreneurs and artisans. **Mobile treatment units** could serve remote communities, reduce transportation costs and ensure equitable access to quality treatment services.

8.3.3 Circular and Low-Carbon Infrastructure

Integrating circular economy principles into bamboo infrastructure development is critical to achieving long-term sustainability. **Biochar production** from bamboo waste provides a valuable opportunity to capture carbon, improve soil health, and generate heat that can be reused in treatment facilities, creating a closed-loop, energy-efficient system.

Bamboo residues can also be transformed into **secondary products** such as pellets, compost, or fertilizer, contributing to **circular value chain development** and additional income for local communities. Using renewable energy sources like solar power and systems like rainwater harvesting in treatment and drying facilities would further reduce emissions and align with Fiji's low-emission development targets.

8.3.4 Testing, Certification, and Demonstration Facilities

Infrastructure for **testing, design, and structural verification** is essential to ensure that bamboo construction meets local and international safety standards, and to build public confidence in bamboo as a structural material. A **Bamboo Testing and Innovation Centre**, jointly led by stakeholders such as MoF, Engineers Fiji, the CIC, and FNU, could develop locally relevant testing standards for cyclone resilience, load-bearing capacity, and treatment durability. Prototype construction projects such as community halls, model homes, or schools, would serve as **demonstration sites** showcasing best practices, testing modular and cyclone-resilient bamboo designs, and informing regulatory standards.

8.3.5 Infrastructure for Training and Capacity Building

Human capital investment is central to scaling the bamboo sector. Establishing **well-equipped training centres** with appropriate tools, such as carpentry sets, preservation troughs, and small-scale treatment systems, can provide hands-on training for local carpenters, youth, and women. These centres should focus on both technical and entrepreneurial skills, combining traditional craftsmanship with modern engineering approaches.

Training should combine traditional craftsmanship with modern construction methods, emphasising safety, durability, and design innovation. Partnerships with CATD, FNU, and Pacific Ark can ensure consistent curriculum delivery, aligned with emerging bamboo standards and certification pathways.

8.3.6 Transport, Logistics, and Market Access

For bamboo to become a viable construction material, the infrastructure that supports its movement from cultivation sites to processing facilities and markets must be strengthened. Upgrading rural **access roads** and **transport cooperatives** for bamboo supply chains can reduce post-harvest losses and create local employment. **Storage and drying facilities** are needed in each production region to maintain quality standards and reduce degradation during transport.

Market hubs and digital trading platforms can connect bamboo producers, builders, and buyers—ensuring transparent pricing, reliable delivery, and traceability. These hubs can also facilitate export readiness and private-sector engagement, strengthening Fiji's position as a regional supplier of sustainable bamboo products.

8.4 Capacity building for a Sustainable Bamboo Sector in Fiji

Developing a resilient, inclusive, and culturally grounded bamboo-based construction industry in Fiji requires a comprehensive approach to capacity building. Physical infrastructure, such as nurseries, genebanks, and processing facilities, must be complemented by knowledge and training infrastructure to enable communities, practitioners, and institutions to propagate, harvest, process, and utilise bamboo in ways that are ecologically sustainable, socially equitable, and economically viable.

Awareness and training initiatives must also challenge outdated perceptions of bamboo as a “poor man's timber” and reposition it as a modern, climate smart material.

8.4.1 Training Centers, Innovation Labs, and Grassroots Training

Establish a national network of bamboo training and demonstration centres in partnership with community-based organisations, vocational institutes, private sector, and NGOs, focusing on both technical and entrepreneurial skills. These centres would provide hands-on technical and entrepreneurial training on sustainable harvesting, low-cost treatment techniques, processing, and climate-resilient design, combining traditional Fijian methods such as bure construction and farming methods with modern structural and treatment approaches. Practical training should be complemented with demonstration projects, showcasing successful applications in community buildings or low-cost housing.

Training infrastructure should be gender-responsive and inclusive, ensuring women, youth, and persons with disabilities have equitable access to tools, training, and entrepreneurship opportunities. Establishing community-based innovation labs would provide spaces where traditional craftsmanship merges with modern sustainable design, fostering creativity, experimentation, and locally led problem-solving.

Training programs should be linked to certification schemes, enterprise development, and employment pathways, creating a bridge between knowledge, practice, and livelihood opportunities. Capacity building must extend to smallholder farmers, community leaders, and local innovators, focusing on practical skills, including cultivation, harvesting, low-cost treatment, and product development (e.g. construction, pot plants, weaving). Integrating local and Indigenous knowledge alongside modern practices strengthens cultural heritage while enhancing bamboo’s structural and economic potential.

Visual and written guides should be created as training material, accessible in multiple languages and illustrated with diagrams, photos, and step-by-step instructions. This should include a documented archive of traditional techniques, ensuring that Indigenous knowledge is formally recognised and integrated into modern training approaches.

Community leaders and early adopters can catalyse adoption by sharing knowledge and demonstrating the benefits of bamboo integration at the local level. Programs should engage women’s groups, youth groups, religious organisations, and elders as trainers or mentors to ensure strong buy-in and sustainable participation. This participatory approach also fosters self-reliance, reducing dependency on external project contracts and enabling communities to manage bamboo initiatives autonomously.

8.4.2 Awareness, Outreach, and Demonstration

Awareness and outreach initiatives are critical for building **public and stakeholder perception** of bamboo's economic, environmental, and social value, that will drive demand. Campaigns (e.g. Community workshops, school programs, and media campaigns) should target policymakers to elevate bamboo as a national priority, while community-level campaigns can showcase the practical benefits of cultivation, treatment, and use for livelihoods. Visible **demonstration builds** that are visible and low-cost structures built with treated bamboo can illustrate bamboo's structural potential and social benefits.

Outreach must emphasise bamboo's **subsistence, cultural, and ecological significance**, alongside its market and economic value. This approach ensures traditional uses such as cooking, weaving, and home construction are preserved while creating opportunities for tourism, cultural products, and new income streams. **Grassroots-level engagement** ensures training is adaptable to local context, considering factors like seasonal rainfall, soil conditions, and specific community preferences for agroforestry integration or product development.

8.4.3 National Frameworks and Institutional Integration

A **national training and upskilling framework** is essential to coordinate capacity-building initiatives across communities, vocational institutes, and universities. Institutions like FNU, CATD, USP, and NGOs, can integrate bamboo-focused modules into existing curricula, from carpentry and agriculture to construction technology and home economics. Programs should move from theoretical instruction to **practical, business-focused training**, linking research, community knowledge, and enterprise development.

Capacity-building efforts must also include **technical exchange, participatory research and development, and "train-the-trainer" programs** to ensure sustainability. Public-private partnerships can provide resources, infrastructure, and expertise while strengthening community-based innovation and entrepreneurship. Training should also cover occupational health and safety, environmentally responsible production, and quality standards to ensure that bamboo interventions meet emerging regulatory and certification requirements

8.4.4 Research, Monitoring, and Evaluation

Capacity building should extend to **research, monitoring, and evaluation skills**, enabling communities and institutions to track ecological, economic, and social outcomes. Training in data collection, participatory monitoring, and analysis supports adaptive management, informs evidence-based policy, and ensures continuous improvement in bamboo interventions. For example, communities should be trained to submit annual reports in line with harvesting codes, outlining harvest volumes, stand conditions, and regeneration success. Encouraging applied research that links local practices, sustainability goals, and policy priorities strengthens the sector's evidence base and supports the development of standards, certifications, and locally relevant guidelines.

8.4.5 Entrepreneurial and Value Chain Development

Capacity building should support the development of **local entrepreneurship and value chains**, ensuring that bamboo remains an accessible and community-driven resource. Training in business management, marketing, and product diversification can help smallholder farmers and cooperatives participate in formal markets while retaining cultural and subsistence values. Skills in biochar production, circular economy approaches, and low-impact harvesting reinforce sustainable practices and generate additional revenue streams.

8.5 Market Activation & Financing Mechanisms

Developing a sustainable bamboo sector in Fiji requires a robust market ecosystem and accessible, diversified financing mechanisms. Market activation and finance are critical to ensure bamboo remains community-driven, inclusive, and economically viable, while supporting sustainable production, value-added products, and ecosystem benefits.

8.5.1 Market Development & Demand Creation

Stimulating demand for bamboo is essential to drive adoption and scale up production. Demonstration projects and pilot builds, including low-cost community structures and visible applications, can showcase the structural, cultural, and economic potential of treated bamboo. Public procurement pilots in government and institutional projects provide early market signals that support scale-up and build confidence among builders and communities. Market development also requires establishing value-added product lines, from construction materials to handicrafts, furniture, and agroforestry products. Pilot pricing strategies and market research can support price discovery, helping communities understand bamboo's economic potential and enhancing their ability to participate in emerging markets. Investment in dedicated processing and treatment facilities ensures quality, efficiency, and consistency, enabling smallholder producers to meet market requirements and expanding opportunities for local entrepreneurship.

Collaboration with the private sector, including tourism operators and construction companies, can facilitate large-scale adoption, treatment, and marketing of bamboo products. Grassroots-level engagement ensures training and awareness are contextually relevant, considering local climate, soil, and community preferences for agroforestry integration or product development.

8.5.2 Financing Mechanisms & MSME Support

A diversified and sustainable financing framework is key to long-term sector resilience. Microcredit and revolving funds can support Micro, Small & Medium Enterprises (MSMEs), cooperatives, and individual farmers to invest in seedlings, cultivation, processing, and local value addition. Institutions such as the Fiji Development Bank (FDB) could provide loans, buy-back schemes, or concessional financing to incentivise grassroots adoption. Public-private partnerships (PPPs) can provide both funding and technical expertise for treatment hubs, processing facilities, and shared infrastructure, while also facilitating mentoring and market linkages.

Strategic partnerships with international donors, private investors, and corporate social responsibility initiatives can provide consistent funding streams, ensuring that benefits flow directly to local cooperatives, women's groups, and smallholder farmers. Government incentives such as tax rebates, concessional loans, grants, and green building preferences can further encourage bamboo-based production and sustainable construction. Positioning bamboo as an official cash crop within national policies strengthens institutional legitimacy, supports certification schemes (e.g. FSC-aligned or localised standards), and enhances market access. Fiji could establish community-centered funding mechanisms and green investment facilities to support bamboo cultivation, processing, and enterprise development.

Developing a bamboo blockchain carbon credit system in Fiji could be an inclusive and transparent approach to monetise bamboo's high carbon sequestration potential while empowering landowners. By combining blockchain technology with bamboo-based agroforestry systems, each stand could be digitally registered, monitored, and verified for carbon capture, allowing the issuance of traceable digital carbon tokens on a secure ledger. Smart contracts would automate benefit-sharing among landowners, investors, and developers, ensuring fair and

transparent revenue distribution while preventing double-counting[87]. This approach aligns with Fiji's communal land ownership structure, National Carbon Market Strategy, and inclusive green growth principles.

Fiji can learn from both local and international initiatives. Drawa's Rainforest REDD+ project provides an exemplary example, where eight *Mataqalis* have committed their lands to forest conservation and ensuing REDD+ carbon payments for over 18,000 carbon credits annually. The Drawa Block Forest Community Cooperative administers member dividends, promotes income-generating opportunities, and enhances village infrastructure as part of its community development initiatives[88]. This model can be adapted for bamboo-based production systems. In the Philippines, InfraBlocks Technologies, in partnership with the Asian Development Bank (ADB) and Rhizome, recently launched a digital platform for bamboo carbon credits for engineered bamboo plantations based on satellite imagery, blockchain, and MRV systems. In Uganda, Timeless Bamboo is collaborating on a bamboo-based carbon pilot project with Fedrok AG, a Swiss blockchain company. The initiative combines a transparency-focused digital infrastructure layer with a community-led rehabilitation effort. While Fedrok's system will document discussions, surveys, and planting programs on a secure digital ledger, women's and youth groups will spearhead mobilisation and planting operations. By leveraging these examples, Fiji could establish blockchain bamboo carbon projects that ensure digital verification through smart contracts, enhancing transparency and efficiency in emissions trading.

8.5.3 Linking Market Activation to Policy and Standards

Market and finance initiatives are most effective when supported by clear policy frameworks and locally relevant standards. National strategies should position bamboo as a non-timber forest product (NTFP), prioritising community access, sustainable management, and long-term viability. Standards and guidelines for harvesting, treatment, processing, and construction are necessary to ensure safe, high-quality products and to enable certification, insurance, and financing. Policy incentives, such as public procurement preferences, tax rebates, or support for localised certification schemes, can scale bamboo adoption while ensuring inclusivity. Integration across ministries and agencies avoids siloed implementation, strengthens coordination between research, policy, and market development, and provides a supportive enabling environment for a resilient bamboo sector.

[87] Merlo et al., 2025

[88] Shah and Race, 2024

8.6 Institutional Coordination & Roles

The successful development of Fiji's bamboo sector hinges on a well-coordinated institutional framework that connects government agencies, private sector actors, research institutions, and communities. Historically, bamboo initiatives in Fiji have been fragmented—often led by individual champions or external projects without sustained policy integration. Moving forward, a multi-stakeholder coordination mechanism is needed to align bamboo initiatives with national goals in forestry, climate resilience, biodiversity, and green building.

The Ministry of Forestry (MoF) should lead national coordination, supported by line ministries such as Trade, Environment, Public Works, and Housing. This inter-ministerial collaboration must break down existing silos and ensure that bamboo is mainstreamed into key policy areas including climate adaptation, biodiversity, sustainable livelihoods, and disaster-resilient housing.

8.6.1 Public–Private–Academic–Community Partnerships

Collaboration between government, academia, private sector, and communities is vital for bridging research, innovation, and application. Partnerships between the Fiji Bamboo Association (FBA), Pacific Ark, and technical institutions such as FNU, CATD, and USP can promote innovation in bamboo treatment technologies, species trials, and community-based restoration. Joint initiatives with Engineers Fiji and the Construction Industry Council (CIC) should support localised adaptation of international bamboo building standards (e.g., ISO 22156) and the creation of Fiji-specific cyclone-resilient design codes.

The private sector, particularly SMEs and social enterprises, plays a critical role in driving market activation, establishing nurseries, treatment facilities, and processing units. Support from the government through targeted subsidies, technical training, and access to finance will be essential to build public confidence in bamboo as a construction material and to encourage entrepreneurship in rural communities.

Meanwhile, research institutions should focus on applied R&D and performance evidence for local bamboo species, closing the gap between academic studies and community-level implementation. This shift from theoretical to practice-oriented work will ensure that scientific research translates into tangible outcomes for the industry.

Local communities, landowners, and grassroots leaders are central to the bamboo value chain, from cultivation and nursery management to monitoring and innovation in traditional building techniques. Governments and NGOs should establish inclusive mechanisms to support citizen science, participatory monitoring, and co-management of bamboo landscapes. Empowering communities through training, seedling access, and smallholder buy-back schemes can strengthen stewardship and create sustainable livelihood opportunities.

Fiji's bamboo sector would benefit from stronger partnerships with international and regional actors such as INBAR, Base Bahay Foundation, and member countries with advanced bamboo sectors. Technical exchanges on treatment, design, and performance modelling can accelerate the development of Fiji's own National Bamboo Centre—a proposed hub combining nursery operations, training facilities, and demonstration structures.

8.6.2 Stakeholder Capacity and Coordination Matrix

To build institutional momentum, the sector requires clear roles, capacity development plans, and accountability pathways across all major actors. The following Stakeholder Capacity and Coordination Matrix (Table 6) outlines the roles, capacity needs, and immediate next steps of key actors to develop Fiji's bamboo sector. This serves as a practical roadmap for implementation, aligning institutional strengths with opportunities for capacity building, policy development, and enterprise growth.

Stakeholder	Primary Function	Role	Capacity Gap	Next Steps
Ministry of Forestry (MoF)	National policy leadership, coordination, standards development	Lead	Lacks a comprehensive national bamboo strategy and standards and guidelines	Develop a national bamboo strategy; Identify suitable growing zones with communities and research bodies; Oversee bamboo governance, value chain development, national initiatives
Ministry of Public Works & Housing (MPWH)	Regulates construction standards and green building codes	Support	Limited bamboo integration in housing policies	Collaborate with Engineers Fiji and CIC to localise bamboo construction codes and green building standards; Promote bamboo in public housing and green infrastructure.
Ministry of Trade, Co-operatives and Small and Medium Enterprises and Communications (MTCSME)	Promotes industrial growth, MSME development, market access, and export development	Support	Limited engagement with bamboo MSMEs	Include bamboo as a national cash crop and explore certification schemes; Support local entrepreneurs, cooperatives, and SMEs
Ministry of Environment and Climate Change	Implements climate adaptation, NDCs, and biodiversity programs	Support	Fragmented coordination with forestry programs	Align bamboo with climate adaptation, biodiversity, and sustainable livelihoods policies (e.g. NDCs, NAP, NBSAP, BIOFIN, green financing mechanism)

Stakeholder	Primary Function	Role	Capacity Gap	Next Steps
Fiji Bamboo Association (FBA)	Coordinates national propagation, awareness, and enterprise development for bamboo	Lead	Limited technical expertise for certification and testing	Partner with Engineers Fiji, CIC, PacificArk, and FNU to pilot treatment and training programs; Central coordination, awareness, training, and national propagation
Fiji National University (FNU) / University of South Pacific (USP)	Conducts R&D and academic programs. Lead social and environmental monitoring for community inclusion and policy feedback	Lead Research / Support Policy	Need for applied research and updated curricula around bamboo	Conduct applied R&D on bamboo species, treatment, and construction performance; Develop applied training programs and localised standards; Establish a long-term research and monitoring framework with MoF and FBA to assess ecological, social, and economic impacts of bamboo initiatives, ensuring results inform national policy and local practice.
Centre for Appropriate Technology and Development (CATD)	Provides vocational and technical training	Support / Implementer	Requires modern equipment and trained instructors for bamboo	Vocational upskilling, community training, demonstration projects Establish "train-the-trainer" modules and certification courses
Construction Industry Council (CIC)	Coordinates construction industry standards	Lead (Admin / Policy)	Limited awareness of bamboo standards.	Collaborate with Engineers Fiji to develop localised bamboo construction codes referencing ISO 22156 and 22157-1 and other internationally-used standards; Policy guidance, advocacy, and pilot facilitation.

Stakeholder	Primary Function	Role	Capacity Gap	Next Steps
Engineers Fiji	Technical body for building standards and testing	Support / Technical Lead	No dedicated testing for bamboo performance	Initiate testing & performance evaluation and certification pathways for bamboo structures to inform future building codes
Communities & Grassroots Leaders	Custodians of land and local knowledge; Key actors in cultivation and monitoring	Lead (Local Implementation)	Limited access to seedlings, finance, and training	Support early adopters and grassroots leaders in cultivation and treatment; Identify early adopters and establish demonstration sites with training support; Local stewardship, traditional knowledge integration, monitoring.
Private Sector (Pacific Ark, SMEs, Builders)	Develop agroforestry, processing, construction; Invest in infrastructure, and product development.	Lead (Private)	Limited financing and infrastructure	Pilot buy-back schemes, shared treatment hubs, and green procurement, and integrate bamboo into construction supply chains
Industry Actors (e.g. Fiji Pine Ltd.)	Operate large-scale processing facilities and provide technical expertise	Support / Knowledge Partner	No dedicated bamboo line	Facilitate knowledge exchange and shared infrastructure for early-stage bamboo processing; Short-term infrastructure sharing, technical R&D collaboration
NGOs / Civil Society	Support gender inclusion, livelihoods, and environmental awareness	Support	Limited bamboo-specific programming	Partner on awareness, gender inclusion, community mobilisation, and capacity-building initiatives

Table 6: Stakeholder Capacity and Coordination Matrix outlining the roles, capacity needs, and next steps of key actors to develop Fiji's bamboo sector

A strong and coordinated stakeholder network is essential to bridge policy, research, enterprise, and community stewardship for a bamboo sector in Fiji that is sustainable and inclusive in the long term.

9 Implementation Pathway

This section presents a possible 10-year implementation roadmap for developing a sustainable and inclusive bamboo construction sector in Fiji, beginning in 2026. The roadmap follows a "Holistic" approach, acknowledging the interlinkages between the ecological, social, and economic dimensions of bamboo policy and practice across the entire value chain. Implementation will be phased, with lead coordination by the Ministry of Forestry (MoF) in partnership with key ministries, research institutions, civil society, and private-sector actors.

The implementation pathway is structured around three key phases designed to progressively build policy, capacity, and market systems for a nationally recognised bamboo industry.

Phase 1 (2026–2027): Foundation and Policy Framework

The initial phase focuses on building the enabling environment and institutional mechanisms required to support the bamboo sector's development. The Ministry of Forestry will lead the formulation of a National Bamboo Strategy, ensuring alignment with Fiji's climate, forestry, and housing agendas. A National Bamboo Taskforce will be established to facilitate awareness campaigns, and to coordinate implementation between agencies such as the Construction Industry Council (CIC), Engineers Fiji, Fiji National University (FNU), Centre for Appropriate Technology and Development (CATD), civil-society organisations, and private-sector partners.

A community-led bamboo management framework will be introduced to formalise Free, Prior and Informed Consent (FPIC), integrate traditional governance systems, and ensure equitable benefit-sharing with landowning groups. Regional nurseries and genebanks will be established to propagate priority species such as *Bambusa balcooa* and *Dendrocalamus asper*. Early demonstration builds will test harvesting, treatment, and construction systems under Fijian conditions, while training-of-trainers programs will strengthen technical capacity. Research findings will inform the drafting of national harvesting, treatment, and certification guidelines, supported by awareness programs targeting policymakers, engineers, and communities.

To ensure equitable access and long-term sustainability, bamboo will be formally recognised as a Non-Timber Forest Product (NTFP) under forestry legislation. This will safeguard community ownership, maintain cultural uses, and prevent monopolisation by industrial forestry operations.

Phase 2 (2028–2030): Expansion and Capacity Building

The second phase focuses on expanding operational capacity, infrastructure, and training systems to consolidate Fiji's bamboo value chain. Regional treatment and processing hubs, along with mobile treatment units, will be established to service remote areas and reduce transportation barriers. The creation of a Bamboo Testing and Innovation Centre will enable the development of local cyclone-resilience testing, load-bearing certification, and quality standards for bamboo construction.

Education and vocational training institutes such as CATD and FNU will integrate bamboo-focused curricula and hands-on training programs, supported by illustrated bilingual learning guides and demonstration projects that bridge traditional craftsmanship with modern design. Public procurement pilots in community housing and public infrastructure will create early demand and showcase bamboo's performance in real-world applications.

Transparent land-tenure agreements will be formalised to facilitate bamboo agroforestry and plantation initiatives, ensuring fair partnerships with *Mataqali* (Indigenous clans) landowners. Wider capacity-building programs will train farmers, builders, and artisans, with deliberate inclusion of women and youth to promote

equitable participation. This phase will also deepen collaboration across ministries, academia, and the private sector to reinforce bamboo's role in Fiji's low-carbon and circular-economy objectives.

Phase 3 (2031–2035): Certification, Market Integration, and Export Development

The third phase aims to establish bamboo as a certified, insurable, and economically viable material for domestic and regional markets. The focus will shift toward integrating bamboo into national certification, insurance, and financial systems, enabling access to construction credit and engineering approvals. Domestic markets for bamboo construction materials, furniture, and crafts will expand, while export-ready product lines will be developed through small and medium-scale enterprises and design partnerships.

Circular-economy practices will be implemented by converting bamboo waste into biochar, compost, and pellets, strengthening carbon sequestration and soil health while creating new income streams. A national Bamboo Monitoring and Evaluation (M&E) Framework will be introduced to track ecological, economic, and social outcomes such as employment creation, biodiversity restoration, and women's participation. Data collected through this framework will inform adaptive policy learning and continuous improvement of standards and training.

By 2035, Fiji will be positioned as a regional leader in bamboo innovation, training, and sustainable product exports, contributing to both national development goals and regional climate resilience.

Cross-cutting Actions and Governance

Throughout all three phases, strong coordination between government ministries, academic institutions, NGOs, and the private sector will ensure policy coherence and efficient delivery. Continuous feedback between research, demonstration projects, and policy formulation will drive evidence-based decision-making. Inclusive governance will guarantee women and youth leadership within community enterprises and training programs.

Visibility through national media, exhibitions, and demonstration builds will sustain momentum, attract investment, and build public confidence in bamboo as a climate-resilient, sustainable material. Monitoring and evaluation indicators will cover governance effectiveness, infrastructure development, skills training, market activation, and social outcomes, ensuring accountability and adaptive learning throughout implementation.

Visual Summary of the Implementation Pathway

The following visuals present a concise overview of Fiji's ten-year bamboo sector roadmap (Figure 9-1Figure 9-2; Table 7). Each summarises one key component of the implementation framework.

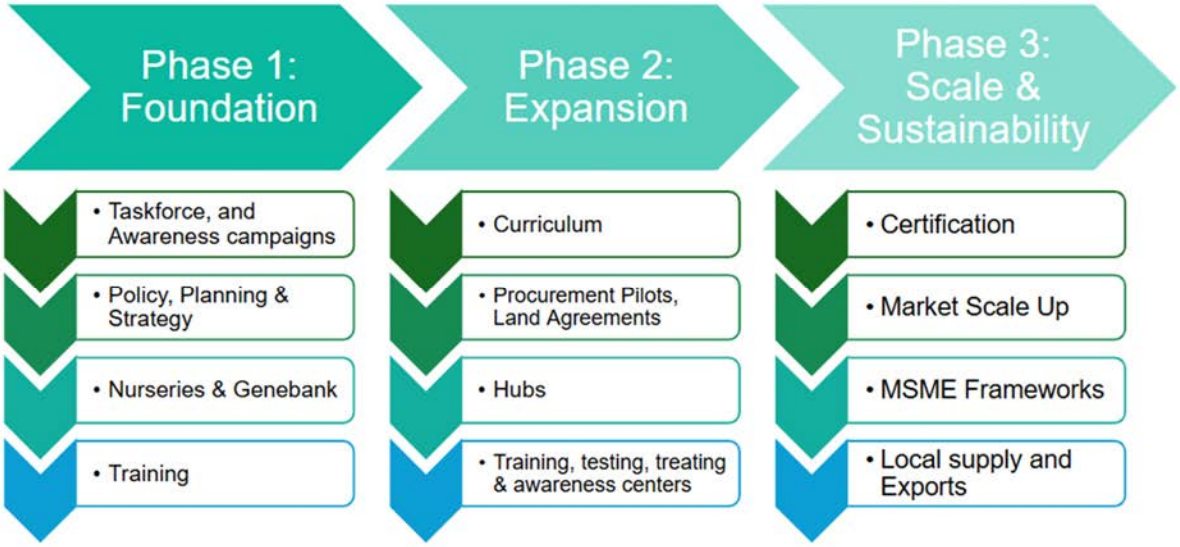

Figure 9-1: Phased roadmap outlining Fiji's 10-year bamboo sector development—from policy and nursery establishment to certification, markets, and exports

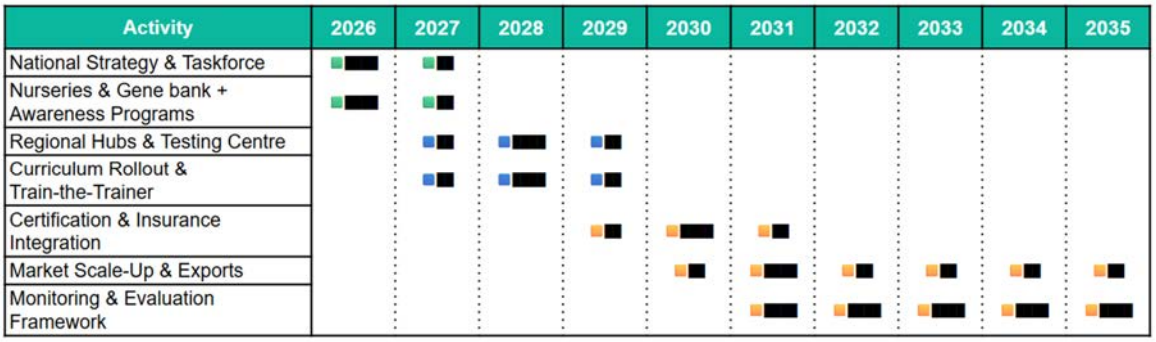

Figure 9-2: Ten-year Gantt-style implementation timeline showing progressive milestones, lead agencies, and expected outcomes across the bamboo value chain

Outcome Area	Target by 2035	Lead Agencies
Policy & Governance	• National Bamboo Strategy institutionalised • Taskforce operational • Bamboo recognised as NTFP	MoF, GGGI, Trade
Infrastructure & Innovation	• 15 regional nurseries • 1 gene bank • 2 regional treatment hubs • 1 Testing & Innovation Centre • Mobile treatment units operational	MoF, CIC, FNU
Skills & Training	• 1000 trained practitioners • Bamboo curricula mainstreamed in CATD & FNU programs	CATD, FNU, MoE
Market & Finance	• 25 certified bamboo builds • 10 export-ready products • Green finance facility launched for bamboo	FDB, Trade, Pacific Ark
Social & Environmental Impact	• 1000+ community livelihoods improved • 10,000 ha restored under bamboo-agroforestry	FBA, MoF, NGOs

Table 7: Summary of targets across governance, infrastructure, training, market activation, and social impact, aligned with Fiji's national development goals

10 Conclusion and Way Forward

Globally, bamboo has been successfully integrated into housing and infrastructure through clear standards, targeted skills training, and market development. However, in Fiji, bamboo remains underutilised, with little awareness, fragmented efforts, limited technical capacity, absence of bamboo-specific policy, and no established demand in construction. Currently, bamboo sits ambiguously within broader non-timber forest product (NTFP) classifications, leaving its potential contribution to sustainable livelihoods, resilient housing, and low-carbon development largely untapped.

Current efforts to develop the bamboo sector in Fiji are dispersed across ministries, private organisations, and community initiatives. However, there is strong momentum and willingness to collaborate, supported by growing policy interest, pilot projects, and emerging community and private-sector champions. Pilot projects by Pacific Ark across Savusavu and Vanua Levu demonstrates the full bamboo construction value chain, from propagation and harvesting to treatment and structural application, on a small scale. Development of integrated bamboo agroforestry systems combining bamboo with crops such as cocoa, mahogany, small fruit trees, and bananas, and the construction of Fiji's first bamboo market store at Da Roko Settlement and a bamboo playground at Urata Primary School, demonstrate feasibility with Fiji's first locally verified performance data and practical cost benchmarks for bamboo as a construction material.

The transition from isolated initiatives to a nationally coordinated bamboo economy depends on three key enablers:

1. Establishment and enforcement of standards, guidelines, and approval systems to ensure quality, safety, and public confidence;
2. Development of training centres, nurseries, and treatment hubs, together with inclusive capacity building and awareness programs to enhance technical skills and awareness;
3. Market activation and financing mechanisms, including demonstration builds, certification pathways, and diversified financing

Together, these elements will enable bamboo to move from informal, small-scale use to a formalised and trusted component of Fiji's sustainable construction and rural development strategy. Fiji's bamboo sector should be guided by a holistic, inclusive, and evidence-informed policy vision that recognises bamboo not merely as an economic commodity, but as a social-ecological asset that strengthens community resilience, restores ecosystems, and supports climate adaptation and mitigation. A coordinated, multi-stakeholder approach involving the Ministry of Forestry, other relevant ministries, Fiji Bamboo Association, Pacific Ark, FNU, CATD, Engineers Fiji, CIC, and community partners is essential to operationalise this vision.

A well-designed enabling environment should promote smallholder participation, uphold traditional land rights, and ensure that bamboo remains accessible to communities even as demand from tourism and construction industries grows. Long-term monitoring and feedback processes involving diverse stakeholders are essential to continuously improve policies, guidelines, and training programs to ensure that the sector remains adaptive and inclusive. Future research should prioritise inclusivity by engaging women, youth, and Indigenous knowledge holders across the value chain, ensuring that bamboo sector development translates into local empowerment and equitable benefits.

Beyond construction, bamboo offers diverse opportunities for Fiji's sustainable future: restoring degraded lands, advancing carbon credit innovation (e.g. through blockchain-enabled monitoring), and expanding community-based enterprises producing furniture, crafts, and eco-tourism goods. By substituting imported bamboo-based products such as toothpicks, utensils, and decorative items with "Made in Fiji" alternatives, bamboo can strengthen domestic value chains and showcase Fijian craftsmanship. Community initiatives, especially those led

by women's groups and artisans, can tap into tourism and public procurement markets by supplying locally made, low-carbon products to schools, clinics, and government offices. In doing so, bamboo becomes more than a construction material; it becomes a symbol of regeneration, linking traditional knowledge, modern innovation, and economic opportunity in support of Fiji's climate-resilient development pathway.

References

Adier, M.F.V., Sevilla, M.E.P., Valerio, D.N.R. and Ongpeng, J.M.C. (2023) 'Bamboo as sustainable building materials: A systematic review of properties, treatment methods, and standards', *Buildings*, 13(10), p.2449. Available at: https://doi.org/10.3390/buildings13102449

Ali, I., Tikoitoga, M., Kocovanua, T.F. and Qi, J. (2025) *Traditional ecological knowledge for climate change adaptation and disaster risk reduction in Fiji*. International Institute for Sustainable Development (IISD), Wildlife Conservation Society (WCS) and World Wildlife Fund (WWF).

Ashukem, J.-C.N. (2020) 'Land grabbing and customary land rights in Uganda: A critical reflection of the constitutional and legislative right to land', *International Journal on Minority and Group Rights*, 27(1), pp.121–147.

Ben, C. and Gounder, N. (2019) 'Property rights: Principles of customary land and urban development in Fiji', *Land Use Policy*, 87, 104089. https://doi.org/10.1016/j.landusepol.2019.104089

Boissière, M., Beyessa, M. and Atmadja, S. (2019) *Guiding principles for sustainable bamboo forest management planning: Benishangul-Gumuz Regional State (BGRS)*. Rome: FAO.

Boyland, M., Tuhkanen, H., Green, J. and Barquet, K. (2022) *Principles for just and equitable nature-based solutions*. SEI Discussion Brief, May 2022. Stockholm: Stockholm Environment Institute. Available at: https://www.sei.org/publications/principles-for-just-and-equitable-nature-based-solutions

Bureau of Indian Standards (2018) *IS 15912:2018 Structural design using bamboo — Code of practice (First revision)*. New Delhi: Bureau of Indian Standards.

Cousins, J.J. (2021) 'Justice in nature-based solutions: Research and pathways', *Ecological Economics*, 180, 106874. https://doi.org/10.1016/j.ecolecon.2020.106874

Department of Trade and Industry (DTI) (2018) *Philippine Bamboo Industry Development Roadmap 2018–2022*. Manila: Department of Trade and Industry.

Dolom, P.C., Palacpac, A.B., Capinpin, H.L.L., Tolentino, N.L., Villanueva, M.M.B., Camacho, S.C., Daracan, V.C., Codilan, A.L., Devera, E.E., Alborida, L.M. and Razal, R.A. (2019) 'An enabling policy for a more vibrant Philippine bamboo industry', *Ecosystems and Development Journal*, 9(1–2), pp.37–44.

Environmental Bamboo Foundation (EBF) (2021) *Vertical Soak Diffusion Manual*. Bali: Environmental Bamboo Foundation.

Fiji Pine Limited (2022) *Forest Management Public Summary*. Certification Code: SCS-FM/COC-004378. Available at: https://content.app-sources.com/s/83735126163585746/uploads/Files/Forest_Management_Public_Summary_2024_August_2-7329193.pdf (Accessed: 3 August 2025).

Forest Products Research and Development Institute (FPRDI) (2013) *Trainings*. Available at: https://fprdi.dost.gov.ph/index.php/18-trainings (Accessed: 3 August 2025).

Fowler, M. and Rauschendorfer, J. (2019) *Agroindustrialisation in Uganda: Current status, future prospects and possible solutions to pressing challenges*. Working Paper No. F-IH-UGA-006-2. London: International Growth Centre.

Gani, A. and Scrimgeour, F. (2019) 'Trade, agriculture and inter-industry spillover effects in Fiji', *The Journal of Developing Areas*, 53(4), pp.193–206. Available at: https://www.jstor.org/stable/26598336

Gatiso, T.T. and Greenhalgh, S. (2025) 'Socioeconomic resilience of local communities in the face of climate change-induced hazards: The role of social capital', *Climate Resilience and Sustainability*, 4(1).

Harrison, D. (2021) *Tourism, tradition and culture: A reflection on their role in development*. Wallingford: CABI.

Ibidia, J.M. (2015) *Construction manual for bamboo: Technology transfer models*. Beijing: International Network for Bamboo and Rattan (INBAR).

International Bamboo and Rattan Organisation (INBAR) (2014) *Bamboo and rattan: A trade overview 2014*. Beijing: INBAR.

International Bamboo and Rattan Organisation (INBAR) (2025) *Bamboo in Fiji: Country overview*. Beijing: INBAR. Available at: https://www.inbar.int/country/fiji/ (Accessed: 2 August 2025).

ISO (2019) *ISO 22157: Bamboo — Determination of physical and mechanical properties of bamboo culms*. Geneva: International Organization for Standardization.

ISO (2021) *ISO 22156:2021 Bamboo structures — Bamboo culms — Structural design*. 2nd edn. Geneva: International Organization for Standardization.

IUCN (2016) *World Conservation Congress Resolution 6 069: Defining nature-based solutions*. Gland: International Union for Conservation of Nature.

Jayaraman, D. and Long, T.T. (2020) *Manual for sustainable management of clumping bamboo forest*. Beijing: International Network for Bamboo and Rattan (INBAR).

Kontiki Bamboo Works Ltd. (2025) *About us*. Available at: https://kontikibambooh.com/about/ (Accessed: 28 August 2025).

Merlo, A.L.C. et al. (2025) 'Blockchain for the carbon market: A literature review', *Discover Environment*, 3, 68. https://doi.org/10.1007/s44274-025-00260-4

Ministry of Forestry, Fiji (2022) *Celebrating World Bamboo Day 2022*. Available at: https://www.forestry.gov.fj/pressdetail.php?id=137 (Accessed: 17 September 2022).

Nesshöver, C., Assmuth, T., Irvine, K.N., Rusch, G.M., Waylen, K.A., Delbaere, B., Haase, D., Jones-Walters, L., Keune, H., Kovacs, E., Krauze, K., Külvik, M., Rey, F., van Dijk, J., Vistad, O.I., Wilkinson, M.E. and Wittmer, H. (2017) 'The science, policy and practice of nature-based solutions: An interdisciplinary perspective', *Science of the Total Environment*, 579, pp.1215–1227. https://doi.org/10.1016/j.scitotenv.2016.11.106

Pelling, M., O'Brien, K. and Matyas, D. (2015) 'Adaptation and transformation', *Climatic Change*, 133(1), pp.113–127. https://doi.org/10.1007/s10584-014-1303-0

Prasad, B.C. (2006) 'Resolving the agricultural land lease impasse in Fiji', *Pacific Economic Bulletin*, 21(2). Canberra: Asia Pacific Press.

Roös, A. (2025) *Field assessment of traditional building practices in Navala Village, Ba Province, Qaliyalatini District, Fiji*. July 2025.

Santos, P., Chipperfield, B. and Shah, S. (2025) *Understanding the potential adoption of agroforestry in Fiji using procurement auctions*. Monash Economics Working Papers 2025-07. Melbourne: Monash University.

Shah, S. and Race, D. (2024) 'Greening the Blue Pacific: Lessons on reducing emissions from deforestation and forest degradation (REDD+)', *Forest Policy and Economics*, 166, 103263. https://doi.org/10.1016/j.forpol.2024.103263

SPREP (2025) *Integrating gender equity, disability and social inclusion in nature-based solutions for climate adaptation: Principles, case studies and lessons learned*. Mangubhai, S. and Chung, M. (authors), Kraft, M. (ed.). Apia, Samoa: Secretariat of the Pacific Regional Environment Programme.

Standardization Administration of the People's Republic of China (SAC) (1995) *GB/T 15780-1995 Testing methods for physical and mechanical properties of bamboos*. Beijing: Standardization Administration of the People's Republic of China.

The Mindanao Life (2023) 'FPRDI urges public to learn wood, bamboo skills via free webinars', *The Mindanao Life*, 15 March. Available at: https://themindanaolife.com/fprdi-urges-public-to-learn-wood-bamboo-skills-via-free-webinars/ (Accessed: 3 August 2025).

Uganda Bamboo Association (UBA) (2018) 'Youth trained in making bamboo crafts', *Uganda Bamboo Association*, 14 January. Available at: https://ugandabambooassociation.com/news/Youth-trained-in-making-bamboo-crafts (Accessed: 12 August 2025).

Uganda Bamboo Association (UBA) (2020) *Introduction to bamboo*. Available at: https://www.ugandabambooassociation.com/bamboo (Accessed: 12 August 2025).

Uganda Bamboo Association (UBA) (2025) *Programs*. Available at: https://ugandabambooassociation.com/programs (Accessed: 12 August 2025).

UN Office for South–South Cooperation (UNOSSC) and International Bamboo and Rattan Organisation (INBAR) (2017) *Inspiring sustainable development with bamboo*. Available at: https://southsouth-galaxy.org/wp-content/uploads/2019/03/Inspiring-Sustainable-Development-with-Bamboo-INBAR-2017.pdf

ABOUT THE GLOBAL GREEN GROWTH INSTITUTE

The Global Green Growth Institute was founded to support and promote a model of economic growth known as “green growth”, which targets key aspects of economic performance such as poverty reduction, job creation, social inclusion, and environmental sustainability.

GGGI

The Global Green Growth Institute

19F Jeongdong Building, 21-15, Jeongdong-gil,
Jung-gu, Seoul, Korea 04518

Follow our activities on Facebook, X, LinkedIn and YouTube.

www.GGGI.org