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Inside this issue

The *ITTO-BMLEH Teak Newsletter* support and facilitates teak and other tropical species networking and information dissemination in the Asia Pacific and West Africa through ITTO member countries and partners, and support sharing lessons of the project through short news release, occasional papers, project related research and development information. The bi-monthly newsletter is released online through TEAKNET webpage www.teaknet.org and co-hosted by Kasetsart University, Thailand.

For more information,

please contact PK Thulasidas (thulasidas.teak@gmail.com) or Yongyut Trisurat (fforyyt@ku.ac.th)

Policy Brief

Beyond the Moratorium: From Protection to Restoration of *Pterocarpus erinaceus* Poir in Togo

Ayiga E., Segla K.N., Adjonou K., Kokutse A.D., and Kokou K.
University of Lomé, Togo, W. Africa
Email: esseayiga@gmail.com

Abstract

Pterocarpus erinaceus Poir. is a priority species for restoration and sustainable forest management in West Africa but is increasingly threatened by overexploitation and poor natural regeneration. The restoration of degraded natural stands of this species has been a major focus for organizations at the international and governmental levels. This policy brief, based on silvicultural improvement studies conducted by researchers at the Forest Research Laboratory of the University of Lomé, draws the attention of policymakers to the need to move to an active restoration phase as the 10-year moratorium set by the government in June 2016 nears its end. The results obtained in terms of rooting and growth performance in *ex situ* conditions are quite promising, with over 70% rooting *in situ*, 90% survival in *ex situ* conditions, an annual growth rate in diameter of 8.87 ± 1.6 mm year^{-1}, and less than 5% mortality. In contrast, seed-derived seedlings exhibited reduced vigor and high mortality rates. Although cuttings formed callus following water soaking, rooting remained negligible under the tested conditions. These findings confirm that air-layering is an effective propagation technique for *P. erinaceus* and represents a practical alternative for producing vigorous planting material for restoration and reforestation programs.

Keywords: *Pterocarpus erinaceus*; air-layering; vegetative propagation; restoration; silviculture; West Africa; moratorium, Togo

Introduction

Pterocarpus erinaceus is one of the most important economically and ecologically valuable timber yielding tree species in Togo and West Africa, yet its natural populations remain severely threatened by overexploitation and weak natural regeneration. Apart from Teak, other indigenous species like *P. erinaceus* is also being promoted in the ITTO-BMLEH Teak project for production of quality wood in Togo. Research conducted in Togo demonstrates that air-layering is an effective vegetative propagation technique capable of producing vigorous and resilient planting material for restoration programs. Plants produced through air-layering showed high rooting success, rapid post-transplant recovery, vigorous growth, and poor mortality (Photo 1) compared with seed-derived seedlings. Despite the urgency of restoring the species, local producers, nurseries, and communities remain insufficiently trained and equipped in practical propagation techniques for large-scale production. The 10-year moratorium established in Togo in 2016 to regulate logging and

export of the species reaches its term in 2026, creating an urgent need of restoration and propagation actions to avoid further degradation of this strategic species. Immediate investment in restoration capacity, nursery development, and technical training is therefore essential to support sustainable restoration and domestication efforts for *P. erinaceus* in the post-moratorium period.

Photo 1: Strengthening restoration, propagation, and sustainable management of African rosewood in Togo. *A general view of the P. erinaceus experimental plot at the Zogbépimé site, Togo*

Key Messages

⇒ *Pterocarpus erinaceus* is one of the most economically and ecologically valuable tree species in Togo and West Africa, but its natural populations remain severely threatened by overexploitation and weak natural regeneration.

⇒ The 10-year moratorium established in Togo in 2016 to regulate logging and export of the species reaches its term ending in 2026 call for an urgent transition from passive protection towards active restoration strategies.

⇒ Research conducted in Togo demonstrates that air- layering is an effective vegetative propagation technique capable of producing vigorous and resilient planting material for restoration programs.

⇒ Plants produced through air-layering showed high rooting success, rapid post-transplant recovery, vigorous growth, and low mortality rate compared to seed-derived seedlings.

⇒ Despite the urgency of restoring the species, local producers, nurseries, and communities remain insufficiently trained and equipped in practical propagation techniques for large-scale production of planting material.

⇒ Immediate investment in restoration capacity, nursery development, and technical training is essential to avoid further degradation of *P. erinaceus* populations after the expiry of moratorium.

Why the above matters significant?

Pterocarpus erinaceus, commonly known as African rosewood, is a strategic multipurpose species across West Africa (Photos 2). In Togo, it contributes significantly to timber production; craftmanship ; fuelwood and charcoal supply; livestock feeding; traditional medicine; ecosystem restoration; carbon sequestration; mortar and pestle manufacturing ; and support rural livelihood of the local communities. However, decades of intensive exploitation, agricultural expansion, bushfires, and weak regeneration have severely degraded natural populations of the species. In response, the Government of Togo introduced a moratorium in 2016 prohibiting logging, commercialization, and exportation of *P. erinaceus* wood.

Photo 2: The multipurpose species is subjected to (1) Logging, illegal logging; (2) Loading logs; (3) fuelwood and charcoal supply; (4) Planks for making high-quality furniture; (5) Craft production; (6) Livestock feeding and traditional medicine

While this measure slows down pressure on exploitation, conservation efforts remain insufficient without parallel investments in restoration and domestication. As the moratorium is expiring soon by 2026, the country faces a critical transition period. Without large - scale restoration

initiatives and practical propagation systems, remaining populations could rapidly decline further due to overexploitation.

Evidence from Research in Togo

Field and nursery experiments conducted in the Togodo Wildlife Reserve and the Zogbépimé forest station evaluated the performance of vegetative propagation of the species through air layering under contrasting seasonal conditions (Photos 3 (A, B, C). Research into seed germination indicates a good germination rate (70–90%) (Photo 4), but in reality, the germinated seedlings struggle to grow. There is a problem with the early growth stage of the young seedlings.

Main Results

High rooting success through air layering (Table 1) observed.

* Rooting success reached 70% during the rainy season; 57% during dry season (see Table 1).
* Stump-origin shoots performed substantially better than shoots collected from mature seed-origin trees.
* Propagation during rainy-season produced more vigorous shoots and better establishment.

Table 1: Rooting and growth performance of air- layering of *P. erinaceus*

Origin of layering material	Season	Rooted layers (n)	Rooting rate (%)	Layers with callus formation (n)	Dead layers (n)	Mortality rate (%)	Total layers (n)
Stump shoots (ARS)	Dry season	16	57.0	29	34	43.0	79
Stump shoots (ARS)	Rainy season	85	70.0	8	40	30.0	133

Photo 3: Stages of layering *P. erinaceus in situ* at the Togodo Protected Area (A: sapwood exposed; B: sapwood covered with potting soil), followed by C: *ex situ* transplantation to Zogbépimé, at the experimental site of the University of Lomé Forest Research Laboratory

Photo 4: The seedlings of *P. erinaceus*

Strong survival and growth performance (Table 2; Figs 1, 2; Photos 5, 6)

* Transplanted layered plants showed 90% recovery within two weeks of transplantation; only 5% mortality rate after four years of monitoring.

* In contrast, seed-derived seedlings experienced approximately 80% decline during the same period.

* Layered plants demontrates sustained radial growth; vigorous shoot development; and improved resilience to drought stress.

Table 2: Growth parameters of layering shoots

Parameter	Minimum value	Maximum value	Mean ± SD
Basal diameter (mm)	39	92	45.6 ± 9.3
Diameter below first branch (mm)	21.8	77	36.7 ± 10.0
Primary branch diameter (mm)	12	49	23.8 ± 8.1
Total height (m)	1.43	4.15	2.4 ± 0.5
No. of primary branches	2	6	3.7 ± 1.2

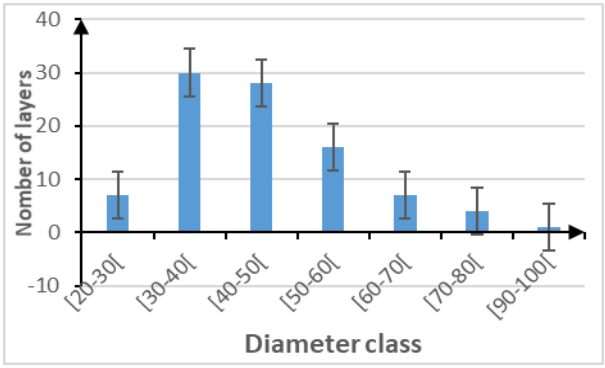

Fig. 1. Diameter classes of air-layered plants

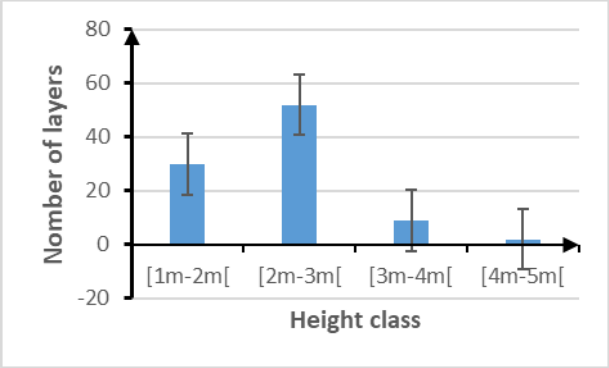

Fig. 2. Height classes of air-layered plants

Photo 5. Field measurement of growth parameters in *P. erinaceus* plants established from air-layered propagules at the Zogbépimé experimental station, Togo.

Photo 6. Vegetative development of shoots produced from air-layered branches of *P. erinaceus* under field conditions

Flexibility of propagation material

- The study found no significant differences in growth performance among apical layers; median layers; proximal layers.
- This provides operational flexibility for nursery production and scaling-up activities.

Limitations of conventional cuttings (Photos 7, 8)

Although cuttings formed callus tissue after soaking treatments, root development remained weak and inconsistent, making this technique less reliable under current conditions.

Photo 7: Scar tissue at the base of *P. erinaceus* cuttings soaked in water

Photo 8: Delayed rooting (9 months) of two types of cuttings (straight and cross-cut) of *P. erinaceus*

Policy Implications

The findings demonstrate that Togo now possesses practical technical knowledge and capability to support large-scale restoration of *P. erinaceus*. However, this scientific progress has not yet sufficiently translated into operational restoration programs or community-based production systems.

The fast approaching end of the moratorium marks a major policy shift and a turning point, highlighting that:

- Protection measures alone will not ensure long-term conservation.
- Restoration and domestication must become national priorities.

Therefore, the country must move swiftly from protection to restoration.

Priority Actions for Decision-Makers

1) *Develop a national restoration strategy for P. erinaceus*

   Integrate the species into:

   National reforestation programs; climate adaptation strategies; AFR100 restoration commitments; and Great Green Wall initiatives.

2) *Scale up vegetative propagation programs*

   Support for:

   Air- layering nurseries; clonal multiplication systems; and community-based plant production.

3) *Train local producers and forestry technicians*

   Establish practical training programs on:

   Air-layering techniques; nursery management; plantation establishment; and post-transplant management.

4) *Promote restoration using stump-origin material*

   Encourage the identification and management of exploited stumps as propagation sources due to their superior rooting performance.

5) *Strengthen research-extension-policy linkages*

   Improve collaboration among:

   Universities; forestry services; local communities; NGOs; and restoration projects.

Strategic opportunity for Togo

The 2016 expiry of moratorium should not mark a returning back to exploitation without preparation. Instead, it offers an opportunity to:

> Rebuild degraded populations; strengthen restoration capacity; create sustainable timber resources; support rural livelihoods; and improve climate resilience.

Scientific evidence now confirms that effective propagation of *P. erinaceus* is feasible. The priority challenge is therefore how rapidly restoration efforts can be scaled up nationally.

Conclusion

The future of *P. erinaceus* in Togo depends on an urgent transition from passive conservation towards active restoration and domestication. Air -layering provides a practical and effective solution for producing resilient planting material capable of supporting large-scale restoration programs.

As the national moratorium approaches ending in 2026, immediate investments in propagation capacity, nursery systems, technical training, and community-based restoration efforts are essential to secure long-term sustainability of this strategic species and the ecosystems and livelihoods that depend on it.

Acknowledgments

The authors sincerely thank the International Tropical Timber Organization (ITTO), Japan for funding this study under Phase 2 of ITTO-BMLEH teak project (PP-A/54-331A) entitled *"Promoting Quality Timber Production in Smallholders and Community-Based Teak and Other Valuable Species Plantations in the Tropics".* The authors are also grateful to the Economic Community of West African States (ECOWAS) for its support through the Support Program for Research and Innovation (PARI). Special thanks are due to the technical partners, local institutions, and all individuals who contributed to the successful implementation of the field activities associated with this study.

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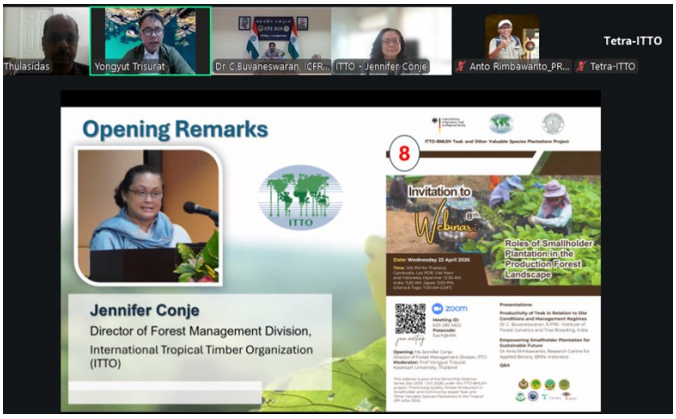
Empowering smallholder teak growers is not only a farm issue, it is central to sustaining jobs, industry, and local economic development.
Photo@Anto Rimbawanto, BRIN

At the 8th Webinar series conducted in last 22nd April on the "Roles of Smallholder Plantation in the Production Forest Landscape", the speakers highlighted that smallholder plantations are playing an increasingly important role in the supply of tropical timber, supporting rural livelihoods and restoring deforested and degraded landscapes. The webinar was organised as part of the ongoing second phase of the ITTO-BMLEH teak project, *"Promoting Quality Timber Production in Smallholders and Community-based Teak and Other Valuable Species Plantations in the Tropics" (PP-A/54-331A).* The webinar was moderated by Prof. Yongyut Trisurat, Faculty of Forestry, Kasetsart University, Bangkok.

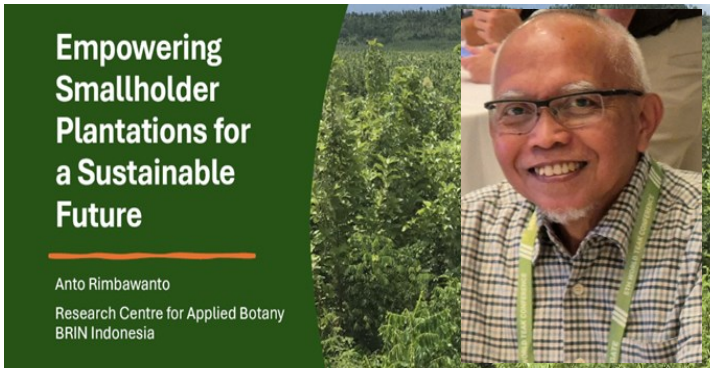


Representing ITTO, Director of Forest Management Division, Ms. Jennifer Conje in her opening remarks underlined the importance of the webinar series as a platform to strengthen local and regional collaboration, knowledge exchange, and policy dialogue.

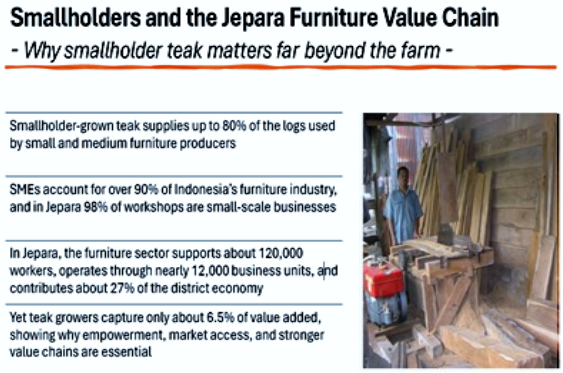
As the 2nd phase of the ITTO-BLMEH teak project is nearing completion by December 2026, its results are already demonstrating how international cooperation can deliver tangible benefits across the six participating countries (Thailand, Viet Nam, Cambodia, India, Indonesia, and Togo). In these nations the project has supported improved timber quality, strengthened smallholder capacity, and contributed to better social and environmental outcomes.

There were two presentations in the webinar. Both the presentations emphasized the contributions of smallholder tree farmers and the practical steps needed to further strengthen their role in sustainable timber value chains.

Empowering smallholder farmers: The first speaker, Dr. Anto Rimbawanto of the Research Centre for Applied Botany (BRIN) Indonesia and Consultant to ITTO - BMLEH Teak project illustrated that smallholders are already supplying timber to the tropical timber producing countries, but their full potential remains untapped without stronger capacity building, proper market access and supportive policy frameworks.



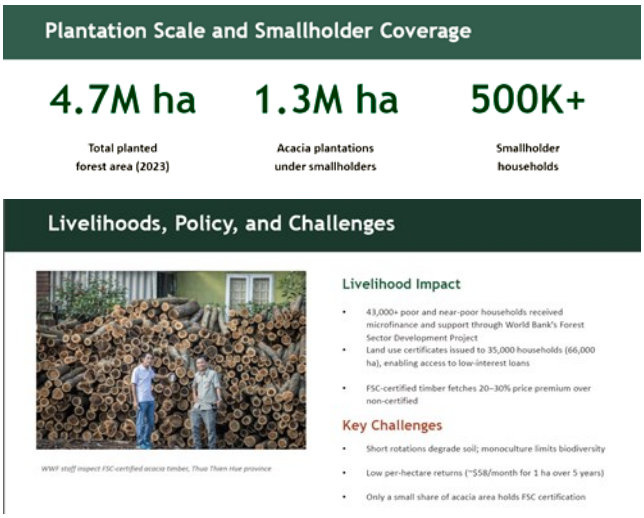
The key question is therefore, how to help smallholders produce good quality, legal and marketable timber products under sustainable management systems as detailed in the below slides.



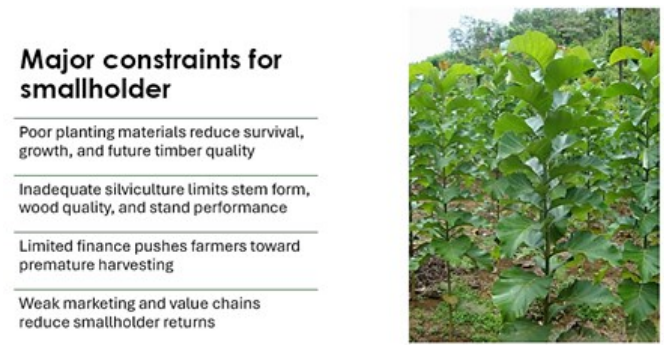
By combining technical assistance, market information, and access to finance, the project supports farmers empowerment to produce higher-quality timber and generate more economic returns. Citing examples of smallholders in the Jepara furniture cluster in Central Java, Dr. Anto elaborate to state that smallholders own roughly one-third of all planted forests worldwide, and supply over 20% of global roundwood. In developing countries, forests contribute 22.2% of rural income, highlighting the central role smallholders play for national and household incomes, local investment, and employment.

The example of Jepara shows that empowering smallholders is not only a farm-level issue, but central to sustaining jobs, industry, and local economic development," said Dr Rimbawanto. The Jepara furniture cluster relies heavily on teak supplied by smallholders, who provide up to 80% of the logs used by an industry supporting around 120,000 workers and contributing 27% of the Regency's total economic output. In Java, 1.5 million smallholders manage 440,000 ha of teak dominated in agroforestry systems.

Dr. Anto Rimbawanto demonstrated the contribution of smallholder forestry in Vietnam with the sustained policy support citing examples of eucalyptus and acacia for the livelihood of rural communities.



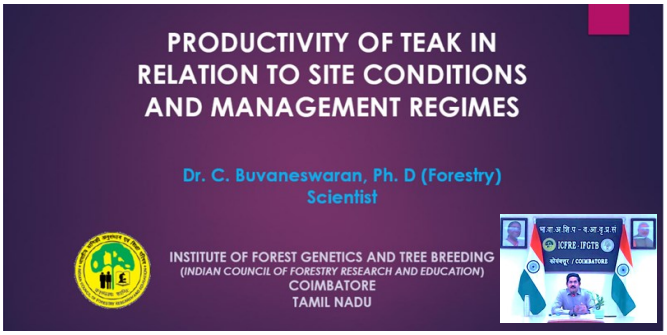
Following land reforms, more than 500,000 smallholder households now manage 50-70% of the country's plantation forests. Access to land-use certificates has enabled many to secure low-interest loans, supporting investment and productivity growth, particularly in export-oriented sectors. These success stories clearly demonstrate that when equipped with right tools, smallholders are capable for the strategic supply of quality timber while contributing to climate and landscape restoration goals, and diversified rural economies, all of which contribute to national development goals.



Quality timber is the result of a series of factors, not a single intervention

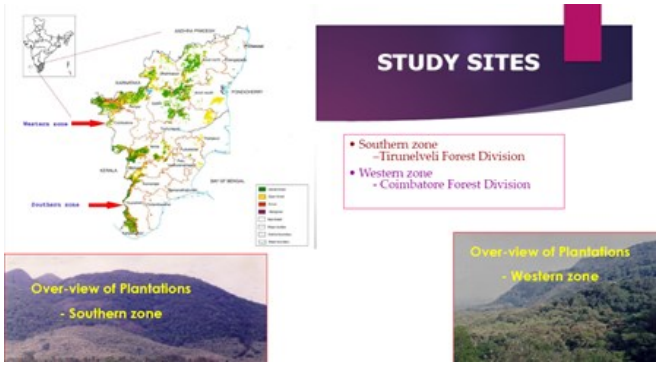
Dr Rimbawanto concluded his talk by stressing that policymakers must focus on enabling conditions, ensuring smallholders can produce high-quality timber, comply with legal standards and regulations, and fully participate in value chains.

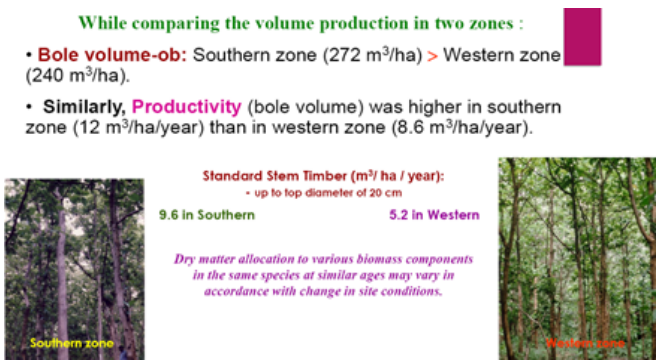
Teak Productivity and site conditions: The next speaker, Dr. C. Buvaneswaran of India's ICFRE- Institute of Forest Genetics and Tree Breeding (IFGTB) presented findings from eight case studies conducted in the Indian state of Tamil Nadu examining factors affecting teak (*Tectona grandis*) productivity and growth.



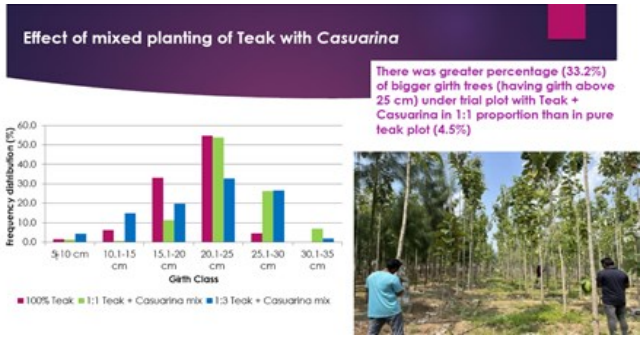
The case study examined two major components in his investigation that pertains to productivity of teak plantations of different ages that were grown in two agro-climatic locations in Tamilnadu and the influence of site factors on the wood properties of teak.

The eight studies revealed that productivity varies significantly depending on site conditions. As shown in the below slide, the overall growth was higher in southern zones of the state, while western zones produced with increased branch wood and reduced stemwood yield, highlighting how environmental factors influence timber quality and output.





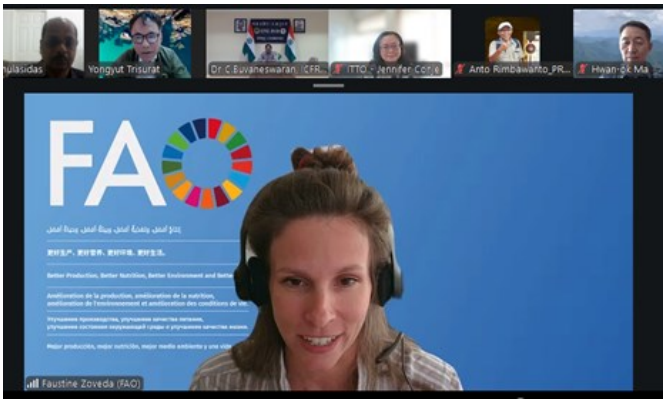
The research also demonstrated the benefits of mixed-species systems. Interplanting teak with fast-growing species such as Casuarina sp. not only improved teak productivity but also provided interim income through pulpwood production, an important consideration for smallholders managing long rotation cycles.



However, wind exposure emerged as a particularly limiting factor, while appropriate thinning practices were shown to significantly improve per-tree productivity.

These findings offered practical insights for improving plantation management and harnessing the potential of nitrogen-fixing tree species like Casuarina integrating in mixed teak plantations to enhance soil fertility and overall productivity of plantations. Refning the breeding and silvicultural strategies with special emphasis on boundary planting systems and the importance of site-specific approaches to maximize productivity, soil fertility, and economic returns may be encouraged.

Smallholder tree-farming systems in the Asia-Pacific Region: In addition to the two webinar talks, a joint report of the FAO of the United Nations in association with Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF), with inputs from ITTO and international partners highlighted the impact of smallholder tree farmers in the Asia- Pacific region which was presented by Ms. Faustine Zoveda, Forestry Officer of FAO-RAP, Bangkok in a special address on the occasion.



The FAO report shows that smallholder systems are already key suppliers of sustainable wood in the region and contributes to resilient agrifood systems. With timber demand projected to increase by approximately 60% over the next 25 years, their role will only become more critical for domestic economies and value chains.

The report identified several priorities for scaling up impact, including clearer land tenure, improved market access, streamlined regulatory frameworks, and stronger technical support. National-level policies, such as India's agroforestry policy, demonstrate how coordinated approaches can boost both timber productivity and smallholder earnings. Ms. Zoveda pointed out, "There is strong interest and momentum for smallholder tree farming across the region," pointing to increased government engagement. The FAO report can be downloaded by scanning the below shown QR code.

Closing remarks: In the closing remarks and after the Q & A session, Ms. Jennifer Conje, on behalf of ITTO Executive Director, Ms. Sheam Satkuru informed the gathering that the experience of the ITTO-BMLEH project clearly shows that with targeted investment and enabling policies, smallholders can play a transformative role in meeting future timber demand while advancing sustainable development and international tropical forestry objectives, and hopeful for continued support of such productive efforts moving forward.

Watch the full webinar video in the project website and download the presentations

Report by

PK Thulasidas, Yongyut Trisurat and Tetra Yanuariadi
ITTO Teak project team

Catalyzing Agroforestry Finance: An insight into NABARD's Initiatives in India

Mohammed Ghouse[1], Rekha Warrier[2] and Yasodha Ramasamy[2]

Abstract

Teak-based agroforestry system offers substantial economic and ecological benefits in India; yet its adoption remains constrained by long gestation periods and limited access to appropriate finances. This article examines the role of the National Bank for Agriculture and Rural Development (NABARD), a Govt. of India enterprise in promoting agroforestry through a combination of institutional analysis and field-level evidence. Drawing on a systematic review of selected policy and program documents, the study identifies key financing mechanisms, regional implementation patterns, and determinants of farmer participation. The findings indicate that while NABARD has established a diversified and regionally adaptive agroforestry financing system, adoption is strongly influenced by financial perception and institutional support. Strengthening long-term credit structures, risk mitigation mechanisms, and market integration will be critical for scaling up agroforestry as a viable investment pathway.

Introduction

Agroforestry has emerged as a strategic approach to integrating agricultural productivity with environmental sustainability and climate resilience. In India, it plays a pivotal role in meeting timber demand through trees grown outside forests ToF) while simultaneously supporting rural livelihoods. Among the various agroforestry systems, teak (*Tectona grandis*) holds particular significance due to its average wood density and high durability, high market value, and long-term economic returns.

Despite these advantages, the expansion of teak-based agroforestry remains limited in the country. The inherent characteristics of tree-based systems–particularly long rotation periods and delayed returns–create a structural mismatch with conventional agricultural credit systems, which are typically designed for short-term cycles. This limits farmers' ability, especially smallholders, to invest in such long-term systems.

Bridging this gap requires financial mechanisms that align with the biological and economic realities of agroforestry. In this context, NABARD plays a pivotal role in developing and promoting agroforestry financing models. This article presents an evidence-based assessment of NABARD's teak investment initiatives, with a focus on their structure, regional implementation, and implications for strengthening agroforestry finance in India.

Agroforestry adoption across regions is shaped by policy support, finance, and market access (Fig. 1). The United States focuses on conservation incentives and strong extension support; Brazil combines subsidized credit schemes with clear regulations and markets, and the European Union promotes agroforestry through structured policies and environmental payments. In Asia, approaches may vary, with China focusing on restoration, Southeast Asia on markets and tenure, and South Asia facing credit and policy constraints. Across all regions, secure land tenure, long-term finance, technical support, and market linkages are key drivers of adoption.

Agroforestry in India

Agroforestry in India helps meet wood demand while supporting farmer income and the environment. The National Agroforestry Policy (NAP 2014) aims to integrate trees into farmer's agriculture and marginal lands promoting it through better coordination, quality planting material, and easier transit rules for timber harvest and sale. It offers benefits like higher income, biodiversity, and climate resilience, with added scope for carbon credits. However, growth is limited by uneven regulations, weak markets, lack of long-term credit, poor insurance, and low-quality planting material. Stronger long-term credit policies, better finance, and improved market linkages are key to scaling up agroforestry in India (Fig. 2). With improved policies, finance, and market systems, agroforestry can significantly enhance farmer's livelihoods while contributing to environmental sustainability and climate goals.

[1] Consultant # 4 - Agroforestry Finance
[2] ICFRE- Institute of Forest Genetics and Tree Breeding, Coimbatore, India
Email: lmdghouse95@gmail.com

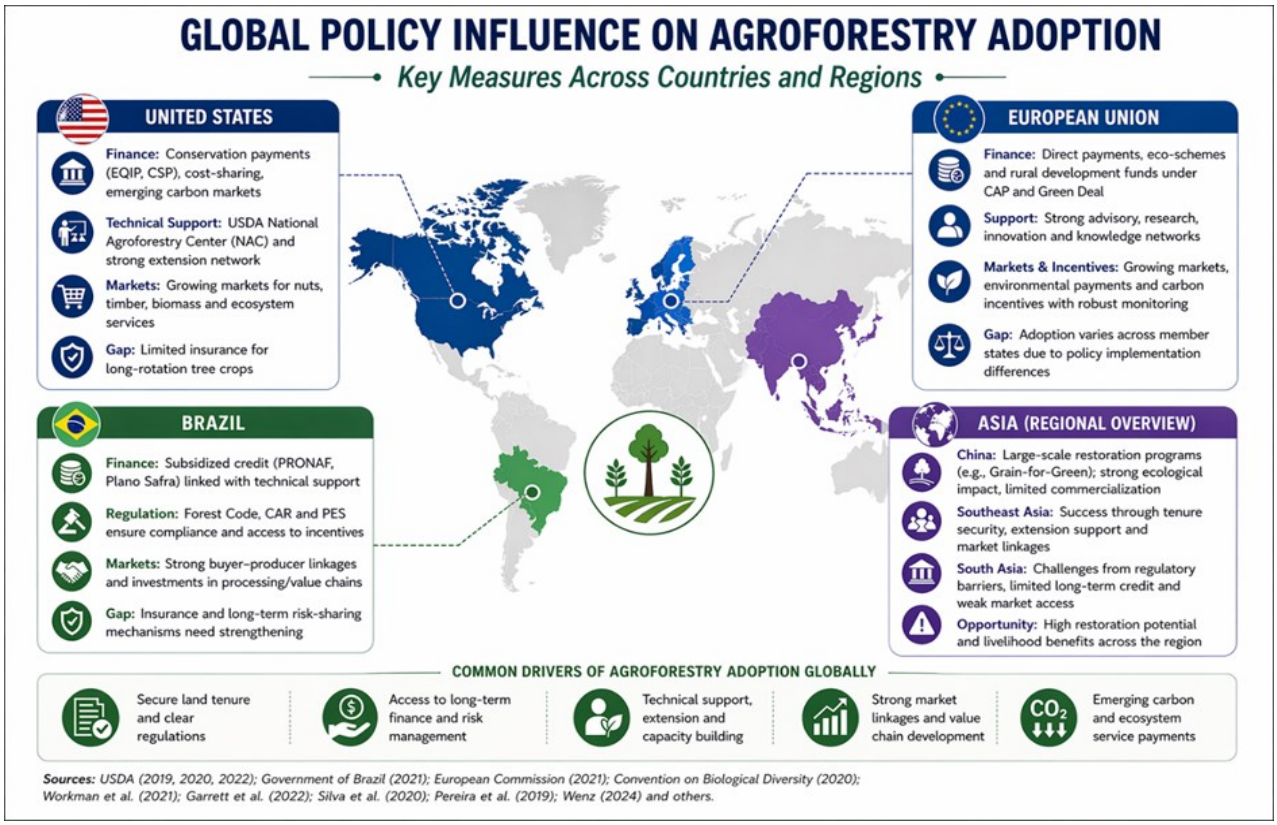


Fig. 1. Global policy influence on agroforestry adoption

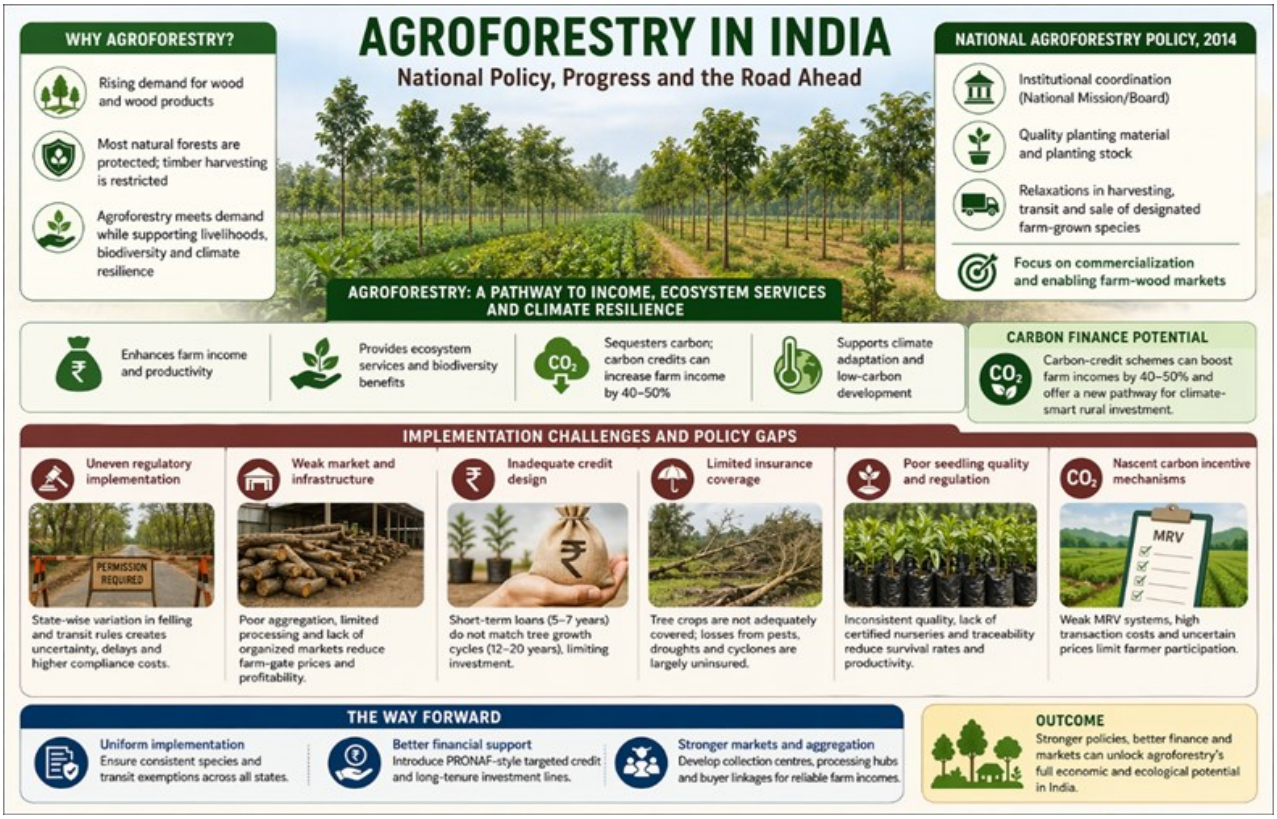


Fig. 2. Agroforestry in India – Overview

Despite these advantages, agroforestry expansion in India is limited by lack of long-term finance, especially for tree crops like teak with delayed return on investments. While NABARD has introduced innovative financing initiatives, their impact and scalability remain underexplored. This study evaluates NABARD's role in promoting teak agroforestry finance, focusing on its investment models, stakeholder support, and key constraints, and identifies pathways for scaling sustainable agroforestry systems in India.

Investment initiatives taken by NABARD for teak plantations NABARD's initiatives have progressively strengthened agroforestry in India by improving access to finance, promoting farmer institutions, and integrating climate-linked approaches. These efforts have enhanced farmer participation, supported timber-based livelihoods, and created a foundation for scaling sustainable agroforestry systems (Fig. 3).

NABARD's agroforestry investments vary across regions based on local needs (Fig. 4). Northern India focuses on watershed and shelterbelt systems, while southern India leads in Wadi programs (integrated tribal development model) and carbon initiatives. Western India emphasizes dryland rehabilitation, and eastern India shows diverse plantation models including bamboo and coastal systems. Central India remains the core teak-growing region with strong program adoption. Overall, these region-specific approaches highlight NABARD's adaptive strategy, combining livelihood support, climate resilience, and large-scale outreach.

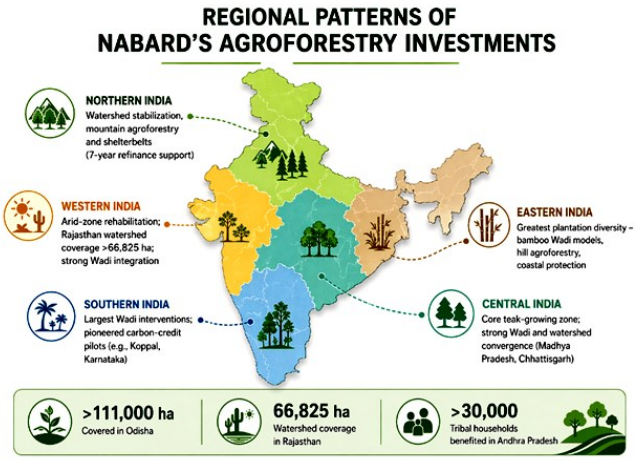


Fig. 4. Regional Patterns – NABARD's Agroforestry Investment models

Consultant #4 (Dr. Mohammed Ghouse) interacts with smallholder teak growers regarding NABARD's Teak Investment Initiatives at Molasur village, Tindivanam

Fig. 3. Investment Initiatives taken by NABARD

Conclusion

NABARD's teak agroforestry initiatives mark a shift towards integrated, climate-responsive development by linking finance with institutional and livelihood support. However, scaling up requires better credit design, risk coverage, market systems, and regulatory clarity. Aligning finance with long-term tree cycles will be key to increasing farmer participation. With strengthened policy, finance, and market support, teak agroforestry can significantly enhance rural livelihoods, restore landscapes, and build climate resilience.

Consultant #4 (Dr. Mohammed Ghouse) interacts with smallholder teak growers at Animur Village, Namakkal in TamilNadu

Editorial Committee

ITTO –BMLEH Teak Newsletter is a bi-monthly electronic newsletter of the Project Team which is intended for circulation among the stakeholders of global teak sector. The views expressed in the newsletter are those of the authors and do not necessarily reflect the views of the organization. The readers are welcome to express their opinions or pass on information concerned with teak. However, we reserves the information on the project and publishing through this newsletter for our esteemed readers.

Address all communications to:
TEAKNET Secretariat
International Teak Information Network
Peechi-680 653, Thrissur, Kerala, India
Tel: +91 487 2690396; Fax: +91 487 2690111
Email: secretariat@teaknet.org