Branching Out:

A Scientific Policy Framework for Agroforestry-Led Transformation in Maharashtra

Sector: Agriculture | Environment | Rural Development

WHITE PAPER
on
Climate Resilience and Sustainable Livelihood in Aspirational Districts

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Executive Summary

Maharashtra stands at a critical inflection point in its management of farmland trees and agroforestry systems. Satellite-based evidence reveals that India lost more than 5.6 million large farmland trees between 2018 and 2022, with Maharashtra and Telangana identified as the most severe hotspot regions; some areas lost up to 50% of their large farmland trees within a decade (Brandt et al., 2024). This loss is superimposed on broader degradation of old-growth savanna ecosystems converted to tillage agriculture and tree plantations, leading to declines in native plant species richness and cover (Nerlekar et al., 2023). Against this alarming backdrop, this Technical White Paper presents a science-grounded, incentive-based policy framework to reverse tree loss and catalyse an agroforestry-led transformation in Maharashtra between 2026 and 2035.

The paradox is stark: Maharashtra possesses a partially deregulated Non-Timber Forest Product (NTFP) sector, active CAMPA funding, and over two decades of Forest Rights Act implementation experience-yet continues to shed farmland trees at rates among the highest in India. The underlying causes are structural: farmers perceive trees as competing with crop yields (Brandt et al., 2024), while socioeconomic pressures, agricultural policies incentivizing cash crops (Rege & Lee, 2021), bureaucratic complexity, poor market linkages, and fragmented institutional mandates collectively deter tree retention (Sanyal et al., 2024; Duguma et al., 2019; Kar et al., 2025).

This paper synthesises evidence from multiple domains: (1) remote-sensing science documenting the scale and drivers of farmland tree loss (Brandt et al., 2024; Nerlekar et al., 2023); (2) socioeconomic analysis of tree removal drivers (Duguma et al., 2019; Kar et al., 2025; Rege & Lee, 2021); (3) farmer perception studies on tree-crop interactions (Cyamweshi et al., 2023; Reuse & Langhof, 2025; Majaura et al., 2024); (4) national policy analysis of India's agroforestry regulatory landscape (Sanyal et al., 2024; Kala, 2024); (5) the 2025 MoEFCC Model Rules and the National Timber Management System (NTMS) (MoEFCC, 2025); (6) community enterprise evidence from Maharashtra (Date & Lele, 2025; M. & Sahu, 2025); and (7) transformative global case studies from Panama (UNCCD, 2025), Bolivia (FAO/FFF, 2025), South Africa (CIFOR-ICRAF & TERRAGRN, 2026), and Europe (CAP Network Ireland, 2025). The paper concludes with a 10-point action agenda organised around institutional reform, economic incentives, technical support, and monitoring accountability.

> **Core Thesis**
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> *Maharashtra cannot achieve agroforestry transformation through regulatory compliance alone. The evidence demands a paradigm shift: from restricting tree felling to rewarding tree retention; from state-led procurement to community-anchored marketing; from monoculture afforestation to biodiverse, multi-species systems embedded in local livelihoods.*

Chapter 1: Introduction

1.1 The Silent Crisis on Farmlands

The disappearance of large farmland trees in India represents one of the least-monitored ecological and livelihood crises of the past decade. Until the publication of Brandt et al. (2024) in *Nature Sustainability*, the scale of this loss was largely invisible to policymakers, obscured by aggregate statistics showing net increases in planted tree cover. The satellite-based study-deploying RapidEye (5 m resolution, 2010–2011) and PlanetScope (3 m resolution, 2018–2022) constellations with deep-learning tree-detection models-provides the first country-wide, individual-tree-level tracking of farmland tree dynamics.

The key findings are unambiguous. Between 2010 and 2018, approximately 11 ± 2% of large trees (average crown size: 96 m²) mapped in 2010/2011 had disappeared from Indian farmlands. In the subsequent period (2018–2022), an estimated 5.3 million trees (2.7 trees per km²) observed in 2018/2019 were not detected in 2020–2022. Critically, the study found that tree loss 'rarely exceed[s] 5–10%, except for areas in central India, in particular in the states Telangana and Maharashtra, where we document massive losses of large trees - several hotspot areas have lost up to 50% of their large farmland trees' (Brandt et al., 2024, p. 862). Maharashtra is therefore not an average case-it is an acute crisis zone.

This loss is superimposed on broader degradation patterns. Nerlekar et al. (2023) document that old-growth savanna ecosystems in Maharashtra have been extensively converted to tillage agriculture and tree plantations, leading to significant declines in native plant species richness and cover. This indicates that alongside the loss of individual trees, the ecological integrity of remaining vegetation is also under threat.

The species most vulnerable to this loss - Mahua (*Madhuca longifolia*), Neem (*Azadirachta indica*), Jamun (*Syzygium cumini*), Jackfruit (*Artocarpus heterophyllus*) - are precisely those with the highest socio-cultural and nutritional significance for rural communities (Brandt et al., 2024). The census data invoked by Brandt et al. is also stark: 'more than 86% of the farmers in India are smallholder farmers with less than 2 hectares of land... in which trees may play an important role in their livelihoods' (p. 864; citing Ministry of Agriculture, 2024). For Maharashtra's estimated 13+ million farm households - the majority of whom are marginal and small farmers-each mature tree removed represents an irreversible loss of fodder, fruit, fuelwood, and long-term income.

1.2 The Policy Imperative

Agroforestry-the deliberate integration of trees with crops and/or animals-offers Maharashtra a triple dividend: climate resilience through carbon sequestration; soil health improvement through organic carbon enrichment; and timber self-sufficiency through domestic production. India imported USD 2.7 billion worth of timber in 2023 (ITTO, 2023), equal to approximately 12% of all agro-based imports (Sanyal et al., 2024), despite possessing the world's most extensive natural teak reserves-a paradox directly attributable to over-regulation of farmland tree felling.

Maharashtra occupies a structurally advantageous position for agroforestry transformation. Post-Forest Rights Act (FRA) implementation has partially deregulated the NTFP sector in tribal-dominant districts. Maharashtra State CAMPA holds substantial afforestation funds. The June 2025 MoEFCC Model Rules provide a new national template for streamlining registration, harvesting, and transit (MoEFCC, 2025). Yet these advantages remain unrealised due to institutional fragmentation, weak community participation in decision-making (Sonowal, 2020), and the absence of farmer-centric incentive architectures (Sanyal et al., 2024).

1.3 Methodology and Scope

This White Paper employs a multi-source synthesis methodology. Sources of evidence include published literature as well as field observations.

This white paper develops a district-scale, agro-ecologically grounded framework for climate-resilient agriculture in Begusarai, linking climate exposure (floodplain dynamics, rainfall variability, heat stress) with farming system structure, resource use patterns, and institutional delivery mechanisms.
It specifically examines the policy–practice gap in Maharashtra's agricultural governance, and translates this into land-type specific, system-level interventions (lowland–medium–upland differentiation), integrated water management, and scalable resilience pathways supported by phased implementation and financing convergence.

Chapter 2: State of Agroforestry in Maharashtra - A Data-Driven Diagnosis

2.1 The Scale of Farmland Tree Loss and Vegetation Degradation

The satellite evidence of Brandt et al. (2024) identifies Maharashtra as a primary hotspot of farmland tree loss. The deep-learning detection methodology tracked individual tree crown centres across 5 × 5 km grids, revealing that several areas in Maharashtra lost up to 22 trees per square kilometre in the 2010–2018 period. This is significant given that the study focused exclusively on large, mature trees (crown size ≥ 67 m^2 for the 2018–2022 tracking period), meaning that the species lost were ecologically mature and effectively irreplaceable within any policy timeframe of less than several decades.

Complementary research by Nerlekar et al. (2023) demonstrates that this tree loss is part of a broader pattern of savanna degradation. Their study across a broad rainfall gradient in India found that tillage agriculture and afforestation with exotic species have led to significant declines in native plant species richness and cover. This suggests that simply replacing lost trees with plantations of commercial species may not restore ecological function; native, multi-functional species must be prioritized.

A critical epistemological note is essential for policymakers: Brandt et al. report *gross* tree losses and explicitly do not account for tree gains from new plantings or block plantations, which were masked out. This approach does not contradict official reports of net increases in tree cover-those increases are largely attributable to new plantation establishment, primarily of exotic or commercial species. 'At a first glance, this may contradict official reports... stating that tree cover in India has increased considerably in recent years. It is, however, important to note that we report only gross losses' (Brandt et al., 2024, p. 863). The ecological and livelihood value of a mature, multi-functional Mahua tree is not replaceable by a newly planted Eucalyptus monoculture; understanding this gross-versus-net distinction is essential for effective policy design.

Tree density data provides further context. Brandt et al. (2024) document that the average tree density across Indian farmlands is 0.6 trees per hectare (s.d. 1.6), with the highest densities found in Rajasthan and Chhattisgarh, reaching up to 22 trees per hectare. Maharashtra's position relative to these comparators suggests significant scope for density improvement.

2.2 Drivers of Tree Removal: Socioeconomic and Institutional Factors

Brandt et al. (2024) conducted qualitative interviews with villagers across eight Indian states, including Maharashtra, during August 2023. The interviews provided consistent explanations: trees were removed 'owing predominantly to alterations in the cultivation practices. The establishment of new boreholes, which resulted in an augmented water supply, facilitated the expansion of paddy rice fields... The decision to remove trees within fields is often driven by the perception that their benefits are relatively low and concerns that their shading effect... may adversely affect crop yields' (p. 862). Notably, climate and fungi were not cited as drivers by interviewees-human management decisions, not ecological disturbance, are the primary mechanism of loss.

A broader body of research confirms and extends these findings. Duguma et al. (2019) conceptualize deforestation and forest degradation as environmental behaviors shaped by necessity-driven factors including the need for fuelwood, construction materials, and agricultural expansion, often influenced by limited landholdings and livelihood pressures. Kar et al. (2025) find that unclear land or tree ownership rights contribute to tree cutting, as farmers may exploit trees due to weak enforcement or lack of secure tenure. Their study in Jharkhand demonstrates that socioeconomic status, caste, and wealth influence participation in forest management; wealthier or higher caste groups tend to have better access to resources and decision-making power, affecting their tree management choices.

Rege & Lee (2021) provide evidence from the northern Western Ghats that state-led agricultural subsidies can incentivize clearing trees for cash crops like cashew, which offer higher short-term economic returns despite environmental costs, leading farmers to convert forested or tree-covered lands into monoculture plantations. Saikia & Hiremath (2025) note that education and awareness about climate change impacts are generally low among farmers, limiting adoption of sustainable practices that could reduce tree removal.

Sanyal et al. (2024) provide a complementary institutional analysis, documenting that in Maharashtra, tree felling and transit are governed by three separate legislative instruments: the Maharashtra Felling of Trees Act 1964, the Maharashtra Land Revenue Code 1966, and the Bombay Forest Rules 1942. Across Indian states, the study maps six different departments involved in issuing felling and transit permits-a complexity that 'creates the need for middlemen who then charge a share of the consumer price, leading to lower margins for farmers, which discourages them from adopting agroforestry' (Sanyal et al., 2024, p. 13). A farmer in Maharashtra may require up to a year to complete the permit process.

Driver Category	Specific Driver of Tree Loss in Maharashtra	Source
Agronomic Perception	Belief that trees reduce crop yields through shading and root competition	Brandt et al., 2024
Water Availability	New borewell expansion enabling paddy rice cultivation on previously treed plots	Brandt et al., 2024
Livelihood Necessity	Need for fuelwood, construction materials, agricultural expansion	Duguma et al., 2019
Tenure Insecurity	Unclear land/tree ownership rights; weak enforcement	Kar et al., 2025; Duguma et al., 2019
Policy Incentives	Subsidies for cash crops (e.g., cashew) incentivize clearing	Rege & Lee, 2021
Regulatory Burden	Multi-department permit requirements under multiple acts	Sanyal et al., 2024

Market Failure	Poor price discovery and marketing infrastructure for NTFPs/timber	Sanyal et al., 2024
Institutional Fragmentation	Overlapping mandates among departments	Sanyal et al., 2024; Sonowal, 2020
Low Awareness	Limited education on climate impacts and sustainable practices	Saikia & Hiremath, 2025

2.3 Farmer Perceptions of Tree-Crop Interactions

Farmers' perceptions of agroforestry are complex and context-dependent. Cyamweshi et al. (2023) in Rwanda found that farmers generally perceive trees as beneficial for crop yields due to improvements in soil fertility and moisture retention, enhancing productivity for crops like beans, maize, and potatoes, especially in humid regions. However, other studies document perceived challenges. Reuse & Langhof (2025) in a temperate alley cropping system found that tree-crop competition can reduce yields near tree rows, particularly when trees grow tall or are too close to crops, limiting light and resources. Majaura et al. (2024) review temperate alley cropping and conclude that yield reductions occur close to trees but effects may be neutral or positive further away. Ivezić et al. (2021) in a European meta-analysis find variable effects depending on system design.

Chaudhary & Ghaley (2025) in Denmark report both soil improvements and yield trade-offs. Olatujoye et al. (2024) in Nigeria find that despite concerns about yield reductions near trees, many farmers appreciate the multiple ecosystem services provided by trees such as shade, soil protection, and income diversification from timber or fruit. Coe et al. (2017) emphasize the need for on-farm research to understand performance of agronomic innovations under real-world conditions. Rangappa et al. (2025) in the Eastern Himalayas document species-specific interactions in Alnus and Gmelina systems.

These findings have direct implications for Maharashtra: extension messaging must acknowledge trade-offs while highlighting context-specific benefits, and system design (species selection, spacing, management) must be tailored to local conditions and farmer priorities.

2.4 The Institutional Landscape: Overlapping Mandates

Maharashtra's agroforestry governance is characterised by structural silos that impede coordinated action. Four principal agencies share jurisdictional claims over farmland trees: the Maharashtra State Forest Department retains authority over timber species and nationalized NTFPs; the Agriculture Department oversees crop-tree interactions and agricultural subsidies; Maharashtra State CAMPA manages compensatory afforestation funds; and the Tribal Development Department oversees livelihood programming for Scheduled Tribe communities in Gadchiroli, Nandurbar, and Melghat. This multi-actor landscape generates classic coordination failures, a pattern well-documented by Sanyal et al. (2024) and Sonowal (2020), who finds limited community participation in decision-making under Joint Forest Management in Maharashtra.

The June 2025 MoEFCC Model Rules represent the first systematic attempt to align these institutional actors through a digital platform-the National Timber Management System (NTMS). However, Maharashtra had not, as of early 2026, issued a state-level Government Resolution (GR) implementing these rules. The existing Maharashtra Felling of Trees Act 1964 therefore remains the operative legal framework, perpetuating the regulatory burden that Sanyal et al. (2024) and Kala (2024) identify as the primary structural impediment to agroforestry expansion.

Chapter 3: Lessons from the Ground - Community-Led Success Models

3.1 The NTFP Marketing Evidence Base: Village Federations vs. State Agencies

Recent research from Maharashtra provides compelling evidence on the superior performance of community-led institutions for NTFP marketing. Date & Lele (2025) in *Forest Policy and Economics* evaluate alternative models for state support in marketing NTFPs by forest-dependent communities in Maharashtra. Their findings indicate that alternative models emphasizing community federations show promise in improving market outcomes by aligning economic incentives with conservation and livelihood goals, while state agencies often face bureaucratic inefficiencies and limited community participation, resulting in less equitable benefit distribution.

M. & Sahu (2025) provide a detailed case study of the Maha Gram Sabha (MGS) Federation in Korchi taluka, Gadchiroli. The MGS Federation successfully asserted community rights over NTFPs like tendu leaf, enabling better control over harvesting and trading processes, which led to improved economic benefits for member Gram Sabhas and enhanced local governance structures. Their analysis demonstrates that Village Federations promote democratic community-based forest governance under the Forest Rights Act, fostering stronger local ownership and decision-making power that supports fairer pricing and reduced exploitation by middlemen.

Comparative evidence from other states reinforces these findings. Lele et al. (2015) document that Madhya Pradesh's three-tiered cooperative federation model for tendu leaf procurement and marketing has been praised for enhancing forest-dweller incomes and transferring ownership rights to Gram Sabhas, though systematic assessments post-1998 are limited. Tekam et al. (2025) in Chhattisgarh highlight the potential of tendu leaves to generate large-scale employment and tribal income but point to market access barriers and regulatory challenges. Mhaskey et al. (2023) in Rajasthan note that government-set collection fees provide some income stability, though inadequate market infrastructure persists. Tamrakar & Dixit (2025) explore innovative value addition strategies beyond traditional bidi leaf use to improve economic outcomes, especially for women collectors.

The structural reason for Village Federation superiority is instructive for policy design: VFs operate with a single-purpose mandate-NTFP marketing-whereas state models simultaneously pursue regulatory compliance, administrative reporting, political accountability, and livelihood objectives. The focused institutional purpose of VFs enables better management of collection centres, more efficient leaf production oversight, and trust-based relationships with collectors that reduce transaction costs throughout the supply chain.

3.2 Determinants of Success in Community-Based Forest Enterprises

A substantial literature identifies key factors influencing the success of community-based forest enterprises (CBFEs). Jamkar et al. (2023) synthesize lessons from case studies in India and Guatemala, identifying critical facilitators including strong community capital-social cohesion, human skills, political engagement, and natural resource knowledge-and secure land tenure with clear legal rights that empower communities to manage and benefit from forests. Effective market access and profitability are critical, requiring awareness of market demand, marketing information, and managerial capacity.

Agrawal & Chhatre (2005) in the Indian Himalaya find that smaller community groups with high social capital and scarce but valuable forest resources tend to perform better in forest governance and enterprise outcomes. Behera (2009) examines state-community joint forest management in India, finding that institutional design and benefit-sharing arrangements significantly influence performance. Wilkie & Painter (2021) identify factors of success in community forest conservation globally, emphasizing secure tenure and strong local institutions. Baynes et al. (2015) in a global review find that success depends on supportive policies, strong social networks, and effective markets.

Lalrinmawia et al. (2025) highlight that inclusion of marginalized groups, gender equity, and integration of indigenous knowledge enhance long-term success by ensuring equitable benefit sharing and local support. Devkota & Sharma (2021) in Nepal identify challenges such as weak policy incentives, poor market regulation, and limited community participation in decision-making. Conroy et al. (2002) document learning from self-initiated community forest management in Odisha, emphasizing adaptive governance.

These findings converge on a set of design principles directly applicable to Maharashtra: secure tenure, strong social capital, focused institutional mandates, market linkages, inclusive governance, and supportive policies are structural determinants of community enterprise success.

3.3 The CAMPA Experience: Preconditions for Success

Maharashtra's CAMPA programme has generated evidence on the conditions under which community-managed afforestation achieves survival and ecological outcomes. Rahul et al. (2025) identify four critical success factors: (1) community participation in species selection and site preparation; (2) physical infrastructure-specifically large cattle-proof trenches that protect saplings from grazing pressure in the first two to three years; (3) supplemental irrigation during the early establishment phase; and (4) use of mature saplings (not seedlings) that are better able to withstand dry-season stress. Giri et al. (2020) in Manipur similarly find that integrating plantations with agroforestry systems enhances livelihood benefits and community commitment.

Technical research on dryland plantations provides supporting evidence. Damtew et al. (2024) in dryland forests demonstrate that shading significantly improves seedling survival and vitality by reducing transplant shock and water stress, with mixed-species plantings further enhancing performance. Piñeiro et al. (2013) in a meta-analysis find that nursery treatments like mycorrhizal inoculation and treeshelters increase survival and growth. Veblen et al. (2022) show that soil texture, depth, and moisture availability critically influence survival rates. Magaju et al. (2020) in East Africa identify watering, mulching, planting in appropriately sized holes, and protection from herbivory as key practices. Del Campo et al. (2022) find that early growth traits of seedlings are strong predictors of long-term survival under drought stress.

The critical policy insight from CAMPA experience is that survival rates, ecological value, and community benefit are substantially higher when plantations are designed as multi-species, community-managed agroforestry systems rather than as mono-species commercial blocks. Current CAMPA guidelines do not mandate multi-species design, and many Maharashtra plantations have been established with limited biodiversity value.

Evidence-Based Design Principle

Community-led, single-purpose institutions (like Village Federations for NTFP marketing) consistently outperform multi-mandate state agencies on economic outcomes. Community participation, protective infrastructure, irrigation, mature saplings, and multi-species design are structural determinants of plantation success. Maharashtra's agroforestry policy must be designed around these principles.

Chapter 4: Global Best Practices - Transformative Models

4.1 Latin America: Incentive-Based Restoration Programs

Latin America provides extensive evidence on the effectiveness of incentive-based forest restoration. Patrick et al. (2023) evaluate over 20 years of forestry incentives in Guatemala, finding that active restoration projects showed a 15% increase in forest cover, while protection of natural forests reduced forest loss by 6%. Cisneros et al. (2020) examine Brazil's Bolsa Floresta program, demonstrating small but significant conservation effects, particularly in areas with higher deforestation pressure, though impact was limited by preferential targeting of low-pressure sites.

Jones et al. (2016) study Ecuador's Socio Bosque program, finding it reduced deforestation by up to 70% among enrolled smallholders and showed positive side effects such as higher carbon stocks in logged forests near incentive areas. Eguiguren et al. (2019) similarly find positive ecosystem service outcomes. However, Jones et al. also identify socio-economic challenges: lack of trust, liquidity constraints, and uneven targeting limit enrollment and effectiveness. Tedesco et al. (2021) review incentive mechanisms for forest restoration globally, concluding that success depends heavily on governance quality, participant engagement, and appropriate targeting.

Gonzalez-Moctezuma & Rhemtulla (2024) analyze Mexico's Sembrando Vida national agroforestry program, finding that it addresses poverty reduction and forest loss but faces trade-offs in reaching all objectives simultaneously due to spatial and socio-economic factors. Christmann et al. (2025) in the Peruvian Andes emphasize the importance of multi-stakeholder engagement and balancing ecological goals with local livelihoods.

4.2 Panama Canal Basin: Incentive-Led Watershed Restoration

The Panama Canal Basin case study, documented by UNCCD (2025), represents a thoroughly documented example of incentive-based agroforestry transformation. The Panama Canal Authority (ACP) recognised that protecting the Canal's water supply depended on the ecological health of surrounding farmlands and that enforcement alone was insufficient. Without authority to impose conservation mandates on smallholder farmers, ACP built a support and incentive model drawing on Costa Rica's experience in rewarding farmers who protect forests.

Over two decades, ACP's collaboration with Basin communities provided practical support including seedlings, technical advice, land titles, and community councils with decision-making authority. The introduction of shade-grown coffee as a viable, high-value crop gave farmers a direct economic reason to keep trees standing. UNCCD (2025) reports that this approach made the Panama Canal Basin 'one of the least-deforested landscapes in the country today.' The Cuencafe collective-a producer organisation emerging from this partnership-now supplies Panama City markets with climate-smart coffee.

Transferable lessons for Maharashtra: (1) institutional trust-building precedes adoption behaviour change; (2) introducing high-value crops that require tree canopy creates endogenous incentives for tree retention; (3) community councils with genuine decision-making authority sustain conservation outcomes over multiple decades; and (4) market access is a prerequisite, not a follow-on consideration.

4.3 Bolivia: Participatory Policy as Institutional Infrastructure

Bolivia's National Agroecology Strategy, officially launched on September 26, 2025 by the Ministry of Rural Development and Lands, represents a national-scale example of agroecological policy developed through genuine producer organisation participation (FAO/FFF, 2025). The strategy was developed 'in a participatory manner based on the realities and needs of producers with strong input from the Association of Organic Producers' Organizations of Bolivia (AOPEB)'-representing over 80 producer groups.

AOPEB's decade-long advocacy contributed directly to multiple legislative instruments, including Law 3525 on the Regulation and Promotion of Organic Agricultural and Non-Timber Forestry Production. The strategy explicitly champions ancestral knowledge and native seed recovery, anchoring these within the constitutional principle of 'Living Well' (Vivir Bien).

Broader research supports this approach. Singh et al. (2021) find that many policies still rely on top-down approaches that insufficiently engage farmers or clearly define traditional knowledge, limiting effective integration. Utter et al. (2021) emphasize co-creation of knowledge in agroecology through participatory learning and collaboration between farmers and researchers. Coolsaet (2016) argues for cognitive justice, valuing diverse knowledge systems equally. Šūmane et al. (2017) document how multi-actor networks and collaborative innovation platforms combine scientific methods with informal farmer knowledge. Maughan & Anderson (2023) highlight farmer-led inquiry. Sohad & Mafrolla (2025) and Prasad et al. (2024) identify challenges in institutional support and ensuring inclusive participation.

For Maharashtra, the Bolivian model offers a template for: (1) conducting genuine participatory strategy formulation with Gram Sabhas in FRA-recognised areas; (2) documenting and institutionalising tribal agroforestry knowledge systems; and (3) building producer federations that can sustain policy advocacy across electoral cycles.

4.4 South Africa (Mpumalanga): Science-Led Commercial Restoration

The CIFOR-ICRAF and TERRAGRN partnership, announced January 29, 2026, provides the most current example of how scientific rigour and commercial viability can be combined in large-scale landscape restoration (CIFOR-ICRAF & TERRAGRN, 2026). The Mpumalanga Restoration Programme began with a 50-hectare pilot focused on regenerative croplands, scaling to an initial 5,000 hectares, with a long-term target of 50,000 hectares. The programme is structured around four simultaneous outcome streams: ecosystem function improvement, smallholder livelihood strengthening, new economic activity creation, and verifiable climate outcomes tracked through Gold Standard certification.

CIFOR-ICRAF's contribution includes integrated Measurement, Reporting and Verification (MRV) combining field data, remote sensing, and digital platforms. This MRV architecture creates the 'bankable' evidence base enabling the partnership to mobilise 'catalytic and blended finance, including grant, concessional, and risk-tolerant capital.' The commercial discipline that TERRAGRN brings-securing long-term offtake agreements and revenue mechanisms-ensures programme sustainability beyond grant funding.

This model aligns with broader research on scaling landscape restoration. DeAngelis et al. (2020) emphasize that strong social and political support, clear science-based recovery plans, and effective communication are critical. Ockendon et al. (2025) identify barriers including inflexible political systems and traditional project mindsets, recommending cross-sectoral collaboration. Höhl et al. (2020) stress local community involvement and equitable benefit sharing. Menz et al. (2013) highlight innovative financing and adaptive monitoring. Crouzeilles et al. (2016) find that ecological factors such as disturbance type and landscape context influence success. Hernandez et al. (2024) emphasize tailored approaches considering both environmental and social dimensions.

For Maharashtra, this model demonstrates that NTMS-enabled plantation registration data can serve as the foundation of an MRV system capable of attracting international climate finance, with CAMPA funds serving as catalytic de-risking capital.

4.5 Europe's AGFORWARD Framework: Addressing Adoption Barriers

The AGFORWARD project, summarised by CAP Network Ireland (2025), provides a socio-economic and environmental framework specifically designed to understand and overcome barriers preventing farmers from adopting agroforestry. Primary obstacles identified include: tradition and path dependency; knowledge gaps among farmers and agricultural advisors; perceived management complexity relative to conventional farming; and administrative, technical, and financial barriers to tree planting. Critically, the framework identifies a structural funding mismatch: 'agroforestry is a permanent land use change, [but] funding schemes are often short-term, which fails to incentivise farmers' (CAP Network Ireland, 2025).

Supporting research elaborates these barriers. Sollen-Norrlin et al. (2020) identify high initial costs and lack of financial incentives as key economic challenges. Tranchina et al. (2024) highlight administrative burdens and complex policy frameworks, including fears of reduced CAP support. Rois-Díaz et al. (2018) find limited awareness of agroforestry concepts among farmers and insufficient farmer networks. Schaffer et al. (2024) in Sweden document perceived complexity and increased labor requirements. Leduc & Hansson (2024) emphasize behavioral factors. De Jalón et al. (2017) assess positive and negative aspects perceived by European stakeholders. Santiago-Freijanes et al. (2018) analyze policy issues. Klimke et al. (2025) describe social-ecological traps created by legal and policy inconsistencies.

The AGFORWARD framework's emphasis on farmer-to-farmer learning networks as accelerators of adoption is directly applicable to Maharashtra's diverse agroecological zones. The framework informs 'the development of appropriate policy interventions, such as longer-term supports, farmer education, and training' and helps 'create the right conditions for adopting innovative agroforestry business models.'

Country/Model	Core Innovation	Primary Mechanism	Key Lesson for Maharashtra
Guatemala/Brazil/Ecuador (Patrick et al., 2023; Cisneros et al., 2020; Jones et al., 2016)	Incentive-based PES programs	Conditional payments for forest conservation	Targeting, governance quality, and trust determine effectiveness
Panama Canal Basin (UNCCD, 2025)	Trust-based incentive model replacing enforcement	High-value crop introduction + community councils	Shade-grown crops as tree retention incentive; community governance sustains outcomes
Bolivia (FAO/FFF, 2025)	Participatory national agroecology strategy	Producer org advocacy + constitutional anchoring	Gram Sabha-led strategy formulation; legal protection for agroecological values
South Africa/Mpumalanga (CIFOR-ICRAF & TERRAGRN, 2026)	Science-led commercial restoration at scale	Blended finance + integrated MRV + Gold Standard	NTMS data as MRV foundation for climate finance; 50-ha to 50,000-ha scale pathway
Europe/AGFORWARD (CAP Network Ireland, 2025)	Farmer-centric barrier analysis framework	Peer learning + long-term funding alignment	Farmer-to-farmer knowledge networks for adoption scale-up; long-term funding essential

Chapter 5: The New Policy Architecture - NTMS and Model Rules 2025

5.1 The MoEFCC Model Rules for Felling Trees in Agricultural Lands (2025)

On June 18, 2025, the Union Ministry of Environment, Forest and Climate Change issued the Model Rules for Felling Trees in Agricultural Lands-a landmark regulatory development responding directly to the institutional dysfunction documented by Sanyal et al. (2024) and Kala (2024). The notification acknowledged that 'a streamlined regulatory framework for promotion, maintenance, felling of trees and certification of timber produced from non-forest land is needed' and that 'it is important to encourage farmers, landowners and stakeholders to adopt agroforestry by creating effective market linkages' (MoEFCC, 2025).

The Model Rules establish three operational innovations. First, they mandate registration on the National Timber Management System (NTMS) portal, with farmers required to provide geo-tagged plantation details including species name, number of saplings, planting date, and seedling height, periodically verified by a state-level committee. Second, they create a differentiated felling approval pathway: for fewer than 10 trees, photo-based verification via the NTMS portal generates an automatic No Objection Certificate; for more than 10 trees, a formal felling permit is issued by the verifying agency. Third, post-felling, farmers must upload stump photographs to the NTMS portal, creating a transparent chain of custody from plantation to harvest.

Kala (2024) provides critical context, noting that several states have exempted numerous tree species from felling and transit pass requirements to encourage agroforestry, though exemptions are not uniform across states, creating confusion and uneven incentives. Sharma et al. (2017) and Chavan et al. (2015) discuss the National Agroforestry Policy (2014) which aimed to address these challenges by simplifying regulations. Sanyal et al. (2024) had previously recommended a nearly identical set of reforms, including a shift from land ownership proof to tree ownership proof using QR codes, microchips, or blockchain, and the expansion of the National Transit Pass System to include felling permits in a single-window clearance architecture.

The remaining critical gap is state-level adoption: as of early 2026, Maharashtra has not issued a Government Resolution (GR) implementing these Model Rules, and the Maharashtra Felling of Trees Act 1964 remains operative.

5.2 The NTMS as Transformative Infrastructure

The NTMS represents more than a regulatory tool-it is the potential foundation for a Maharashtra-specific agroforestry monitoring, incentive, and finance architecture. At its core, the NTMS creates a geo-tagged digital record of every registered plantation: species composition, spatial location (KML files), planting dates, and tree counts (MoEFCC, 2025). For Maharashtra, this database would constitute the first comprehensive, spatially explicit inventory of farmland trees outside forests-directly addressing the 'current lack of robust monitoring mechanisms' identified as a central problem by Brandt et al. (2024, p. 860).

With appropriate analytical overlays, NTMS data could support: (1) annual tree cover assessment using high-resolution satellite imagery comparable to the Brandt et al. (2024) methodology, tracking gross gains and losses separately; (2) species-specific carbon stock estimation supporting Gold Standard MRV for climate finance access, directly analogous to the CIFOR-ICRAF and TERRAGRN Mpumalanga model; (3) value chain linkage connecting NTMS-registered farmers with wood-based industries; and (4) insurance and credit product development using plantation records as collateral.

5.3 Maharashtra's Readiness Assessment

Maharashtra presents a mixed readiness profile for NTMS adoption. On the enabling side: a functioning CAMPA institutional structure exists; FRA implementation in Gadchiroli and Nandurbar has created community governance infrastructure (Forest Rights Committees) that could anchor NTMS registration; and the Agriculture Department has existing digital extension infrastructure that could be repurposed for farmer onboarding. On the constraining side, Sanyal et al. (2024) document that Maharashtra requires three separate departmental approvals for felling and transit permits, which the Model Rules are designed to replace-but which requires a specific Maharashtra-level GR to supersede. The critical window for action is 2026.

Chapter 6: Current scenarios and future potential of Dharashiv district

6.1 Current scenarios in Dharashiv district

6.1.1 Agricultural production and farming systems

Dharashiv agriculture is dominated by cereals (jowar, wheat, maize), Sugarcane, pulses (pigeon pea, chickpea, green gram, black gram), and oilseeds (soybean, safflower, linseed, sunflower), supported by ~720 mm average annual rainfall (Waghmare et al., 2025). Soils show low nitrogen and phosphorus but medium–high potassium, with high calcium and magnesium and low–medium sulphur, indicating nutrient imbalances that can constrain yields without proper fertilization (Waghmare et al., 2025).

Many farmers are already using integrated farming systems (IFS) such as crop + dairy, crop + dairy + horticulture, crop + dairy + poultry, and crop + goat + horticulture. Economic analysis for 96 farmers in Kallamb and Dharashiv tahsils shows positive benefit–cost ratios (e.g., 1.6 for soybean, 1.25 for sugarcane in crop–dairy systems), confirming that diversification improves income over crop-only farming (Surwase et al., 2025).

6.1.2 Soil and water conservation and farmer profile

In Tuljapur, Dharashiv, and Lohara tehsils, adoption of soil and water conservation practices is strongly and positively associated with farmers' education, income, landholding, soil type, land topography, cropping pattern, irrigation status, training, social participation, and knowledge; age and current information sources show a negative relationship, and occupation is non-significant (Bhatkar et al., 2025). This indicates that human capital and extension support are critical for sustainable land management.

6.1.3 Water resources and runoff potential

Rainfall–runoff analysis (2011–2021) for Dharashiv shows an average runoff of about 20-21% of rainfall, with a linear relationship (Runoff = 0.423 × Rainfall – 140.4; $R^2 \approx 0.81$), indicating good potential for rainwater harvesting (Kulkarni et al., 2024). Standardized small farm ponds of 351, 741, and 939 m^3 for 1, 2, and 3 ha catchments, respectively, are recommended, with specific pond dimensions for local conditions (Kulkarni et al., 2024). This suggests that decentralized water storage can meaningfully support agriculture under variable rainfall.

Aspect	Current scenario	Future potential / policy lever	Citations
Cropping & soils	Rainfed cereals, pulses, oilseeds; N & P low, K medium–high	Site-specific nutrient management, balanced fertilization	(Waghmare et al., 2025)
Integrated farming	Crop–dairy–livestock–horticulture systems profitable	Scaling IFS for income stability and risk reduction	(Surwase et al., 2025)
Soil & water conservation	Adoption linked to education, income, training, irrigation	Strengthen extension, farmer training, social participation	(Bhatkar et al., 2025)
Water resources	~21% runoff, good scope for harvesting	Farm ponds and micro-harvesting structures at scale	(Kulkarni et al., 2024)

6.2 Future potential and directions

6.2.1 Scaling integrated farming systems (IFS)

- Expand crop–livestock–horticulture combinations shown to raise net returns and B:C ratios, especially for smallholders (Surwase et al., 2025).
- Promote region-specific enterprise mixes that make use of available fodder and market access.

6.2.2 Soil fertility management and precision nutrient use

- Correct chronic nitrogen and phosphorus deficiencies through balanced fertilizers, organic manures, and legumes, while leveraging existing potassium, calcium, and magnesium reserves (Waghmare et al., 2025).
- Village-scale soil testing and recommendation maps can guide efficient input use.

6.2.3 Water harvesting and climate resilience

- Implement standardized farm ponds and other small water harvesting structures systematically at watershed scale using the quantified runoff potential (Kulkarni et al., 2024).
- Combine with contour bunding, check dams, and in-situ moisture conservation to stabilize groundwater and cropping under climate variability.

6.2.4 Strengthening extension and farmer capacity

- Because adoption of conservation practices is strongly tied to education, training, and social participation, investment in farmer training programs, local organizations, and participatory extension will be central to long-term sustainability (Bhatkar et al., 2025).

Overall, Dharashiv has significant potential to improve farm incomes and resource sustainability through integrated farming, targeted soil fertility rehabilitation, and systematic rainwater harvesting, provided that socio-economic and knowledge constraints are addressed.

Chapter 7: Policy Recommendations - A 10-Point Action Agenda

The following 10-point agenda is derived from the full body of evidence presented. Each recommendation is explicitly linked to its evidentiary basis and global precedents.

7.1 Institutional Reforms (Recommendations 1–3)

Recommendation 1: Establish a State Agroforestry Mission. Maharashtra should establish a dedicated State Agroforestry Mission under joint Agriculture Department and Forest Department oversight, with a single-purpose mandate covering agroforestry promotion, market linkage, and NTMS implementation. This recommendation addresses institutional silos (Sanyal et al., 2024), aligns with evidence that focused institutions outperform multi-mandate agencies (Date & Lele, 2025; M. & Sahu, 2025), and reflects successful cross-sectoral coordination models documented by Ndlovu (2025), Dossa et al. (2025), and Zinngrebe et al. (2020). Nuddin et al. (2019) and Shah (2023) provide additional support for institutional strengthening.

Recommendation 2: Adopt Model Rules via Government Resolution Within 6 Months. Maharashtra must issue a Government Resolution within six months adopting the June 2025 MoEFCC Model Rules (MoEFCC, 2025), superseding conflicting provisions of the Maharashtra Felling of Trees Act 1964 for NTMS-registered species. This resolution should: (a) expand the free-felling species list to include Teak (*Tectona grandis*) in areas where it does not occur naturally in reserved forests-consistent with Kala (2024) and Sanyal et al. (2024, p. 16); (b) mandate NTMS as the single-window for all felling and transit permit applications; and (c) establish the state-level verification committee with representation from Agriculture and Forest Departments and Gram Panchayat elected members.

Recommendation 3: Empower Gram Sabhas in FRA-Recognised Areas. In all villages with Forest Rights Act recognition, Gram Sabhas should be empowered to approve Community Agroforestry Plans as a legally recognised land-use instrument. These plans-covering species selection, harvesting schedules, and NTFP marketing arrangements-would be registered on NTMS and constitute authorisation for tree felling within plan parameters. This builds on Village Federation evidence (Date & Lele, 2025; M. & Sahu, 2025), participatory governance research (Singh et al., 2021; Utter et al., 2021; Coolsaet, 2016), and reflects the Bolivia model (FAO/FFF, 2025). Secure tenure and community rights are consistently identified as success factors (Jamkar et al., 2023; Wilkie & Painter, 2021; Agrawal & Chhatre, 2005).

7.2 Economic and Market Incentives (Recommendations 4–6)

Recommendation 4: Scale the Village Federation Model for NTFP Marketing. The evidence from Gadchiroli (Date & Lele, 2025; M. & Sahu, 2025) and other states (Lele et al., 2015; Tekam et al., 2025; Mhaskey et al., 2023) provides a blueprint for Maharashtra-wide scaling of community-based NTFP marketing. The State Agroforestry Mission should provide seed funding, organisational capacity building, and market linkage support to establish Village Federations in all FRA-recognised villages with significant NTFP resources within five years. Capacity building should draw on documented success factors: strong community capital, social cohesion, managerial capacity, and inclusive governance (Jamkar et al., 2023; Lalrinmawia et al., 2025; Baynes et al., 2015).

Recommendation 5: Link Agroforestry to MGNREGA for Tree Establishment. Maharashtra should develop a state-specific MGNREGA convergence protocol recognising tree planting, protective trench construction-identified as a critical success factor (Rahul et al., 2025; Damtew et al., 2024)-watering, and three-year maintenance as eligible works. This transforms labour costs into guaranteed income, addressing the short-term funding mismatch identified by CAP Network Ireland (2025). Research confirms MGNREGA's potential for afforestation and carbon sequestration (Ravindranath & Murthy, 2021; Yadav et al., 2024; Lengefeld et al., 2021; Angom & Viswanathan, 2022; Pujar et al., 2022).

Recommendation 6: Develop NTMS-Enabled Value Chains and Carbon Finance. NTMS plantation registration data provides the geo-referenced, species-specific, time-stamped records required for MRV under international carbon standards. Maharashtra should commission a feasibility study for Gold Standard certification of NTMS-registered smallholder agroforestry plantations, following the CIFOR-ICRAF and TERRAGRN (2026) model. Blended finance mechanisms combining public, private, and philanthropic capital can address investment gaps (Rode et al., 2019; Havemann et al., 2020; Dey & Mishra, 2022). Digital technologies for MRV enhance transparency and reduce transaction costs (Pimenow et al., 2025; Jang et al., 2023). Simultaneously, develop industrial buyer linkages connecting NTMS-registered farmers with Maharashtra's wood-based industry cluster.

7.3 Technical and Knowledge Support (Recommendations 7–8)

Recommendation 7: Develop Agroecological Zone-Specific Species Advisories. Maharashtra's diverse landscape requires differentiated species selection guidance across the humid Western Ghats, semi-arid Deccan Plateau, cotton-growing Vidarbha, and drought-prone Marathwada. The State Agroforestry Mission should commission zone-specific advisories prioritising: (a) native multipurpose species with established market demand-Mahua, Neem, Jamun, Jackfruit, and Bamboo-explicitly identified by Brandt et al. (2024) as critically at risk, and supported by savanna restoration research (Nerlekar et al., 2023); (b) commercially valuable timber species freed from permit requirements; and (c) species providing non-timber income aligned with existing NTFP market structures. Advisories must address tree-crop interaction trade-offs documented by farmer perception studies (Cyamweshi et al., 2023; Reuse & Langhof, 2025; Majaura et al., 2024).

Recommendation 8: Establish Farmer-to-Farmer Learning Networks. Adoption barriers research consistently identifies lack of peer-validated knowledge as a primary constraint (CAP Network Ireland, 2025; Rois-Díaz et al., 2018; Schaffer et al., 2024). Maharashtra should document early adopters of successful agroforestry systems and support them as demonstration nodes within a structured farmer-to-farmer extension network, with digital documentation via the NTMS portal. This aligns with participatory knowledge co-creation approaches (Utter et al., 2021; Maughan & Anderson, 2023; Šūmane et al., 2017).

7.4 Monitoring and Accountability (Recommendations 9–10)

Recommendation 9: Annual Tree Cover Assessment Using Satellite Imagery. Brandt et al. (2024) demonstrated that individual-tree-level monitoring at sub-continental scale is technically feasible using 3–5 metre resolution satellite data. Maharashtra should commission an annual state-wide farmland tree cover assessment using this methodology-tracking gross tree gains and losses separately, not net change alone-integrated with NTMS registration data. This addresses the monitoring gap identified by Brandt et al. and aligns with recommendations for robust M&E frameworks in landscape restoration (Löhr et al., 2024; Gutierrez et al., 2021; Elias et al., 2024; Picoli & Helsen, 2024).

Recommendation 10: Independent Evaluation of CAMPA-Funded Agroforestry with Community Scorecards. Maharashtra CAMPA plantation programmes should be subjected to independent third-party evaluation using community scorecards capturing: tree survival rates, species diversity, community access to NTFP benefits, and integration with household livelihood strategies. The evaluation framework should be designed in consultation with Gram Sabhas and Village Federations, ensuring that community-defined success metrics are included alongside government targets. This reflects collaborative monitoring approaches (Guariguata & Evans, 2019) and inclusive design principles (CIFOR-ICRAF & TERRAGRN, 2026; Gonzalez-Moctezuma et al., 2025).

Recommendation	Lead Agency	Timeline	Funding Source	Key Evidence Base
1. State Agroforestry Mission	Agriculture + Forest	Year 1	State budget	Sanyal et al., 2024; Ndlovu, 2025; Dossa et al., 2025
2. Adopt Model Rules via GR	Government of Maharashtra	6 months	Administrative	MoEFCC, 2025; Kala, 2024; Sanyal et al., 2024
3. Empower Gram Sabhas	Forest + Tribal Dev	Year 1	FRA framework	Date & Lele, 2025; M. & Sahu, 2025; Singh et al., 2021
4. Scale Village Federations	State Agroforestry Mission	Years 1–3	CAMPA + Mission budget	Date & Lele, 2025; Jamkar et al., 2023; Agrawal & Chhatre, 2005
5. MGNREGA Convergence	Rural Dev + Agriculture	Year 2	MGNREGA wage	Ravindranath & Murthy, 2021; Yadav et al., 2024; Lengefeld et al., 2021
6. NTMS Value Chains + Carbon Finance	State Agroforestry Mission	Years 2–4	NMSA + Climate finance	CIFOR-ICRAF & TERRAGRN, 2026; Rode et al., 2019; Havemann et al., 2020

7. Zone-specific Species Advisories	Agriculture + Forest	Year 2	NMSA + State budget	Nerlekar et al., 2023; Cyamweshi et al., 2023; Reuse & Langhof, 2025
8. Farmer-to-Farmer Networks	Agriculture (Extension)	Years 2–3	State budget	CAP Network Ireland, 2025; Utter et al., 2021; Šūmane et al., 2017
9. Annual Satellite Assessment	Forest + State Agroforestry Mission	Annual from Year 1	State budget + CAMPA	Brandt et al., 2024; Löhr et al., 2024; Gutierrez et al., 2021
10. CAMPA Evaluation + Scorecards	Independent body + Gram Sabhas	Annual from Year 2	CAMPA overhead	Rahul et al., 2025; Guariguata & Evans, 2019; Gonzalez-Moctezuma et al., 2025

Chapter 8: Implementation Roadmap and Financing

8.1 Phased Implementation Framework (2026–2030)

The 10-point action agenda is structured across three implementation phases, designed to sequence policy reforms ahead of programmatic investment, and to allow learning from pilots before system-wide rollout.

Phase	Timeline	Priority Actions	Key Milestones
Phase 1: Policy Foundation	2026 (Year 1)	Issue GR adopting Model Rules; Establish State Agroforestry Mission; Initiate NTMS onboarding in 5 pilot districts (Gadchiroli, Nandurbar, Amravati, Nashik, Raigad)	GR issued within 6 months; NTMS operational in 5 districts; 10,000 farmers registered
Phase 2: Institutional Build-Out	2027–2028 (Years 2–3)	Scale Village Federation model in FRA districts; MGNREGA-agroforestry convergence protocols; Zone-specific species advisories; First annual satellite tree cover assessment	50 VFs operational; 25,000 MGNREGA person-days in agroforestry; Baseline satellite map published
Phase 3: Market Integration and Scale	2029–2030 (Years 4–5)	Full state NTMS rollout; Carbon finance feasibility and MRV design; Industrial buyer linkage programme; Farmer-to-farmer network at scale	Carbon MRV pilot certified; 100,000+ NTMS-registered trees; Value chain linkages for 20,000+ farmers

8.2 Financing Architecture

The agroforestry transformation agenda does not require new budget allocations as its primary resource-it requires realignment and convergence of existing financial instruments. Four financing streams are available:

- **Maharashtra State CAMPA:** Existing CAMPA funds can be realigned toward multi-species community agroforestry systems. Success factor evidence (Rahul et al., 2025) supports investing in cattle-proof trenches, irrigation infrastructure, and mature saplings-all eligible under CAMPA norms.

- **MGNREGA Wage Component:** Tree planting, trench construction, and maintenance can be integrated into MGNREGA works plans, converting labour cost into guaranteed income without net additional outlay (Ravindranath & Murthy, 2021; Yadav et al., 2024).
- **National Mission for Sustainable Agriculture (NMSA):** NMSA's agroforestry component provides central co-financing. Maharashtra's adoption of Model Rules and Mission establishment would strengthen eligibility.
- **Climate Finance and Private Sector:** NTMS-based MRV architecture opens access to international climate finance. Blended finance models combining grant, concessional, and private capital can fund landscape restoration at scale (Rode et al., 2019; Havemann et al., 2020; CIFOR-ICRAF & TERRAGRN, 2026).

Chapter 9: Conclusion - From Policy to Practice

The evidence synthesised in this White Paper converges on a single, unavoidable conclusion: Maharashtra is losing its farmland trees faster than any policy currently in place is preventing, and the loss is primarily institutional and economic in origin-not climatic, not ecological, and not inevitable. Brandt et al. (2024) have made visible what was invisible: the systematic removal of mature, multi-functional farmland trees from Maharashtra's agricultural landscapes. Nerlekar et al. (2023) reveal the associated degradation of native savanna ecosystems. Duguma et al. (2019), Kar et al. (2025), and Rege & Lee (2021) illuminate the socioeconomic drivers. Sanyal et al. (2024) and Kala (2024) document the regulatory failures.

The global evidence from Latin America (Patrick et al., 2023; Cisneros et al., 2020; Jones et al., 2016), Panama (UNCCD, 2025), Bolivia (FAO/FFF, 2025), South Africa (CIFOR-ICRAF & TERRAGRN, 2026), and Europe (CAP Network Ireland, 2025) demonstrates that agroforestry transformation is achievable at scale-but only when policy architects accept that the primary levers are incentive design, institutional architecture, and market creation, not regulatory enforcement. The success factors are clear: secure tenure and community rights (Jamkar et al., 2023; Wilkie & Painter, 2021); focused, participatory institutions (Date & Lele, 2025; M. & Sahu, 2025); long-term funding alignment (CAP Network Ireland, 2025); integrated MRV and blended finance (CIFOR-ICRAF & TERRAGRN, 2026; Rode et al., 2019); and knowledge co-creation with farmers (Utter et al., 2021; Singh et al., 2021).

Maharashtra has the institutional building blocks: CAMPA funds, FRA governance infrastructure, and proximity to India's largest timber-consuming industrial cluster. What it lacks is the integrating architecture-the State Agroforestry Mission, the GR implementing Model Rules, the NTMS platform, and the community federation network-that would allow these building blocks to function as a system.

The next 12 months are decisive. The window created by the 2025 MoEFCC Model Rules notification will not remain open indefinitely. The satellite-based monitoring evidence required to hold government accountable is publicly available (Brandt et al., 2024). The financing instruments are accessible. The research on what works-and what does not-is now extensive. What remains is the political and administrative will to issue a Government Resolution, establish a Mission, and trust communities with the autonomy and resources to grow trees.

Final Recommendation to Policymakers

Issue the Government Resolution adopting Model Rules (MoEFCC, 2025) within 2026. Establish the State Agroforestry Mission before the 2026 Kharif season. Register the first 10,000 farmers on NTMS before December 2026. Commission the first annual satellite tree cover assessment (Brandt et al., 2024 methodology) for Maharashtra in 2026–27. The evidence is sufficient. The tools are available. The communities are ready. The moment for action is now.

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