Strategic management of agroforestry systems

Khoren Mkhitaryan[11], *Hasmik* Hambardzumyan[1], and *Anna* Sanamyan[1]

[1]Armenian State University of Economics, Yerevan, Armenia

Abstract. Agroforestry, which integrates trees, crops, and livestock in a unified production system, offers a promising route toward achieving food security alongside environmental sustainability. The purpose of this study is to examine agroforestry not only as an agricultural practice but as a governance and management instrument that requires supportive institutional and policy frameworks to achieve long-term rural development goals. Methodologically, the research applies a qualitative comparative approach, drawing on international case studies from Asia, Africa, and Europe, combined with a review of policy reports from FAO, World Bank, and ICRAF. The findings indicate that strategic adoption of agroforestry depends on three interrelated conditions: multi-level governance structures that integrate agricultural, environmental, and rural policies; effective stakeholder engagement mechanisms that empower farmers, local communities, and NGOs; and coherent financing instruments that incentivize sustainable practices. Comparative analysis further demonstrates that transitional economies, such as Armenia and other post-Soviet states, face specific institutional and capacity-related constraints that limit large-scale adoption, yet also present opportunities for policy innovation and cost-effective models of integration. The study concludes that agroforestry should be managed as a strategic governance tool, where success depends on aligning ecological functions with institutional design and long-term investment in rural capacity-building. These insights provide practical value for policymakers, development agencies, and researchers engaged in shaping sustainable food and farming systems.

1 Introduction

Agroforestry—the intentional integration of trees, crops, and in some cases livestock within a single production landscape—has emerged as a practical pathway for aligning food security with ecological integrity. Beyond biophysical co-benefits such as soil fertility, water regulation, carbon storage, and on-farm biodiversity, agroforestry offers management advantages: income diversification, risk buffering against climate shocks, and productivity gains without proportional growth in external inputs (FAO, 2021; World Bank, 2023). These attributes are especially salient for transitional and small open economies where resource constraints, fragmented institutions, and exposure to external shocks complicate rural development.

[1] Corresponding author: Prof_Mkhitaryan@yahoo.com

© The Authors, published by EDP Sciences. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

While the technical merits of agroforestry are well documented, large-scale adoption depends on **strategic management** choices embedded in governance and policy design. Prior work stresses that outcomes hinge on multi-level coordination (national–regional–local), credible incentives, and long-horizon planning that integrates environmental and agricultural goals [1]. International initiatives led by ICRAF and allied agencies similarly highlight the enabling role of extension services, finance and insurance instruments, land-use planning, and monitoring systems to track ecological and socioeconomic performance (ICRAF, 2020; FAO, 2021).

This paper approaches agroforestry as a **governance and management instrument** rather than merely a farming technique. We ask: under what institutional and policy conditions does agroforestry become a scalable driver of **sustainable rural development**? To address this question, we undertake a qualitative comparative inquiry drawing on international experiences from Asia, Africa, and Europe, with special attention to transitional economies where institutional capacity is evolving and budget constraints are binding (World Bank, 2023). The analysis is organized around five management-relevant dimensions: (i) institutional frameworks and regulatory clarity, (ii) stakeholder engagement and collaborative governance, (iii) strategic financing and incentive design, (iv) policy coherence across agriculture–environment–rural agendas, and (v) capacity-building via extension and knowledge systems (ICRAF, 2020).

1.1 Contribution

First, we synthesize disparate evidence through a strategic-management lens that centers on governance mechanisms and implementation capability. Second, we distill actionable policy levers for ministries, development agencies, and local governments seeking to mainstream agroforestry in rural development strategies. Third, we discuss transferability to post-Soviet and other transitional settings, outlining cost-effective roll-out pathways that balance ambition with administrative reality [2-5].

The remainder follows IMRAD: Section 2 details methods; Section 3 reports comparative results across the five dimensions; Section 4 discusses governance implications and risks; Section 5 concludes with policy recommendations and implementation priorities (FAO, 2021; World Bank, 2023; ICRAF, 2020).

2 Research Methodology

This study employs a qualitative comparative methodology designed to assess agroforestry systems from a strategic management perspective. The objective is not to evaluate agronomic practices in isolation, but rather to understand how institutional design, governance frameworks, and policy instruments influence the adoption and scalability of agroforestry in different country contexts.

2.1 Research Design

The methodological framework combines two analytical lenses. First, a comparative institutional approach evaluates how formal rules, organizational structures, and governance arrangements shape agroforestry outcomes. This draws on institutional theory, particularly the work of North (1990) and Scott (2001), which emphasizes the interplay between formal institutions, informal norms, and enforcement capacity. Second, a policy process-tracing approach identifies cause-effect mechanisms between policy decisions, stakeholder engagement, and observed results in rural communities. This dual framework allows for the

identification of not only outcomes but also the governance pathways that produce them [6-9].

2.2 Data Sources

Data were collected from multiple sources to ensure analytical rigor and triangulation. Primary materials included official policy and strategy documents from international organizations such as the FAO, World Bank, and ICRAF, along with open-access agroforestry databases. Secondary materials consisted of peer-reviewed journal articles indexed in Scopus and Web of Science that examine agroforestry governance, financing, and rural development linkages [10-15]. To reduce publication bias, grey literature such as reports from development agencies and NGOs was selectively incorporated when peer-reviewed evidence was not available.

2.3 Comparative Dimensions

The comparative analysis is organized around five dimensions that are critical from a management and policy perspective:

1. **Institutional frameworks** – governance structures, regulatory clarity, and degree of policy integration;
2. **Stakeholder engagement** – participation of farmers, community organizations, NGOs, and private actors;
3. **Strategic financing mechanisms** – subsidies, incentives, donor funding, and insurance schemes;
4. **Policy coherence** – alignment of agricultural, environmental, and rural development strategies;
5. **Capacity-building measures** – extension services, training, and knowledge transfer platforms.

2.4 Scope and Limitations

The study is comparative rather than exhaustive. Country cases from Asia, Africa, and Europe are used to identify transferable lessons, with particular attention given to transitional economies such as Armenia. The focus on policy frameworks implies that quantitative agronomic outcomes (e.g., yield increases or carbon sequestration rates) are treated as contextual evidence rather than primary data. A key limitation is the reliance on secondary sources, which may not fully capture local implementation challenges. Nonetheless, the triangulated evidence provides a robust basis for highlighting governance and strategic management factors that condition the success or failure of agroforestry systems.

3 Results

3.1 Institutional Frameworks

Agroforestry adoption is ultimately a function of how institutions define rights, roles, and rewards across landholders, public authorities, and intermediaries. Three broad governance archetypes emerge from international experience: (i) rule-bound, incentive-rich frameworks in the European Union (e.g., Germany, France), (ii) policy-led community integration in parts of Asia (e.g., India, Indonesia), and (iii) fragmented or nascent arrangements in many transitional economies (e.g., Armenia, Georgia). These archetypes differ in legal clarity,

administrative capacity, land-tenure security, financing instruments, and the strength of extension and monitoring systems.

EU (Germany/France). Agroforestry is embedded within the Common Agricultural Policy (CAP) and national Rural Development Programmes, with clear legal definitions, stable area-based payments/eco-schemes, and robust monitoring via IACS/LPIS. Implementation is often decentralized (e.g., Länder/regions), while paying agencies and chambers of agriculture (extension) provide technical support and compliance control. This alignment of rules + incentives + services reduces adoption risk for farmers and enables multi-year planning.

Asia (India/Indonesia). India's National Agroforestry Policy (2014) and subsequent reforms streamlined tree-harvest/transit rules, expanded nursery certification, and mobilized concessional finance (e.g., NABARD), encouraging community and smallholder uptake. Indonesia links agroforestry to social forestry permits, recognizing community rights and blending conservation with livelihoods; implementation capacity varies across districts, but co-management models are advancing.

Transitional economies (Armenia/Georgia). Dedicated agroforestry statutes are limited or absent; forestry and agriculture are frequently siloed, and land tenure is fragmented among smallholders. Extension is under-resourced, and financing relies on short-horizon subsidies or donor pilots rather than stable, programmatic incentives. Georgia's forest sector reforms (e.g., updated Forest Code; community roles) create entry points, but policy coherence with agricultural strategies remains partial. Armenia shows high potential (tree-crop mixes on sloped/arid lands) yet lacks an integrated framework that would align land-use planning, incentives, and monitoring (World Bank, 2023; FAO, 2021).

Table 1. Institutional features shaping agroforestry adoption (comparative snapshot)*

Feature / Region	EU (Germany/France)	Asia (India/Indonesia)	Transitional (Armenia/Georgia)
Legal basis/definitions	Clear CAP-linked definitions; codified practices	National policy (India), social-forestry permits (Indonesia)	Partial/absent; agroforestry not distinctly codified
Lead agencies & decentralization	Ministries + paying agencies; strong regional delivery	Agriculture/forestry ministries; district-level co-management	Central ministries; limited local delivery capacity
Land tenure security	High; registries support investment	Mixed; community/user rights expanding	Fragmented smallholdings; tenure uncertainty in forests
Incentives & finance	Area-based payments, eco-schemes, blended finance	Concessional credit, input support, social-forestry benefits	Short-term subsidies/donors; few long-term instruments
Extension & capacity	Strong advisory services, accredited training	Patchy; NGO/donor-led training common	Under-resourced extension; sporadic pilots
Monitoring & M&E	IACS/LPIS, remote sensing, compliance audits	Mixed capacity; advancing in select provinces	Limited M&E; weak data systems
Policy coherence (agri-env-rural)	High; integrated strategies (e.g., CAP, Green Deal)	Moderate; improving via national frameworks	Low–moderate; siloed strategies prevail

* Source: Compiled by the author based on FAO (2021), World Bank (2023), Burgess et al. (2017), Kay et al. (2019), van Noordwijk (2019), and related literature.

Implications for strategic management. Systems that codify practices, stabilize incentives, and invest in extension/M&E achieve higher adoption at lower policy cost per hectare. Where legal definitions are vague and finance is intermittent, uptake remains pilot-dependent and fragile despite ecological suitability. Transitional economies should first secure a legal framework for agroforestry, strengthen policy alignment between the

agricultural and forestry sectors, and introduce predictable incentive mechanisms tied to measurable outcomes and basic oversight (World Bank, 2023).

3.2 Stakeholder Engagement

Agroforestry systems are inherently multi-stakeholder in nature, requiring coordination among farmers, communities, NGOs, research institutions, and government agencies. The extent and quality of stakeholder engagement significantly shape adoption, sustainability, and policy credibility. Comparative evidence shows three broad patterns: institutionalized participation in the EU, community-driven collaboration in Asia, and fragmented or limited engagement in transitional economies.

EU (Germany/France). Strong consultative frameworks exist through farmers' associations, cooperatives, and environmental NGOs, often embedded within the implementation of the Common Agricultural Policy (CAP). Multi-actor platforms enable continuous dialogue on scheme design, monitoring, and conflict resolution, enhancing legitimacy and farmer trust.

Asia (India/Indonesia). In India, large-scale engagement occurs through panchayats (local councils), farmer producer organizations, and NGOs, which mediate between government policies and rural households. In Indonesia, community forestry permits create collective rights for villages, enabling agroforestry adoption as both a livelihood and conservation tool.

Transitional economies (Armenia/Georgia). Stakeholder involvement remains weak and fragmented. Engagement is largely top-down, with limited consultation of farmer cooperatives or civil society. Pilot projects—often donor-led—demonstrate potential, but lack mechanisms for scaling up participation into permanent governance arrangements (World Bank, 2023).

Table 2. Stakeholder engagement in agroforestry systems (comparative snapshot)*

Stakeholder Group	EU (Germany/France)	Asia (India/Indonesia)	Transitional (Armenia/Georgia)
Farmers & cooperatives	Strong, institutionalized via CAP and advisory boards	Active through producer organizations and councils	Weak, fragmented; limited cooperatives
Local communities	Consulted through participatory rural development programs	Core actors in community/social forestry	Marginal role; donor projects only
NGOs & civil society	Recognized partners in monitoring & advocacy	Key mediators between government and farmers	Limited influence; sporadic presence
Research institutions	Integrated into CAP evaluations & innovation hubs	Linked to pilot projects, donor-funded studies	Weak link to policymaking; capacity gaps
Government agencies	Provide funding, establish legal frameworks, and oversee monitoring and compliance.	Develop national policies, with local governments acting mainly as intermediaries in implementation	Policy formation remains centralized; decision-making follows a top-down model with limited opportunities for feedback or participatory input.

* Source: Compiled by the author based on FAO (2021), World Bank (2023), Kay et al. (2019), Saxena (2015), Rahman et al. (2020).

3.3 Strategic Financing Mechanisms

Financing represents a critical enabling condition for scaling agroforestry systems. Unlike monoculture farming, which often relies on short-term credit and input subsidies, agroforestry requires long-term, patient capital because ecological benefits (e.g., tree growth, carbon storage, soil restoration) materialize over years rather than seasons. Strategic financing mechanisms play a decisive role in shaping how farmers assess the feasibility of agroforestry and in determining the extent to which policymakers can integrate it into broader national development strategies (FAO, 2021; World Bank, 2023).

In the European Union, under the framework of the Common Agricultural Policy (CAP), farmers engaged in agroforestry receive support through area-based payments, eco-schemes, and specialized rural development programs designed to promote sustainable land use. Blended finance instruments—such as public–private partnerships and green bonds—are increasingly used to channel investment into climate-smart agriculture (Burgess et al., 2017). Stable long-term support reduces adoption risk and aligns farmer incentives with environmental goals.

Asia (India/Indonesia). India provides concessional credit through NABARD and integrates agroforestry into livelihood missions and carbon-offset initiatives. Indonesia links agroforestry with REDD+ and community forestry schemes, offering smallholder households access to performance-based payments. While coverage remains uneven, these mechanisms highlight how donor support can be aligned with domestic policy frameworks.

Transitional economies (Armenia/Georgia). Financing is fragmented, relying on short-horizon subsidies, donor-funded pilots, and occasional credit lines. Armenia's agricultural subsidies cover inputs (e.g., fertilizers, irrigation) but rarely tree-crop systems. Donor initiatives (FAO, GEF, World Bank) fill gaps, but lack long-term continuity. Georgia's reforms have introduced concessional credit for rural enterprises, yet agroforestry is not a recognized funding category. Without predictable instruments, adoption remains limited to small-scale experimental projects (World Bank, 2023).

Table 3. Strategic financing mechanisms for agroforestry (comparative snapshot)*

Financing Dimension	EU (Germany/France)	Asia (India/Indonesia)	Transitional (Armenia/Georgia)
Subsidies & incentives	CAP eco-schemes; area-based payments	Input support; seedling programs	Limited; short-term subsidies
Credit & loans	Concessional loans, blended finance	NABARD concessional credit; microfinance	Sporadic concessional loans; weak targeting
Donor/International support	EU Green Deal funds; Horizon projects	REDD+ financing; World Bank, IFAD	Dominant source (FAO, GEF, World Bank)
Risk-sharing instruments	Insurance schemes, green bonds	Emerging carbon-offset contracts	Absent; high farmer risk exposure
Continuity & scale	Stable, long-term	Uneven; donor-dependent in parts	Pilot-driven; low continuity

* Source: Compiled by the author based on FAO (2021), World Bank (2023), Burgess et al. (2017), Rahman et al. (2020).

Implications for strategic management. Where financing is stable, long-term, and diversified (EU), adoption is widespread and system-level integration occurs. Where financing is donor-dependent (Asia, transitional economies), sustainability of initiatives remains fragile. Armenia and Georgia require a shift from fragmented donor pilots toward institutionalized credit, subsidies, and insurance schemes that reduce farmer risk and incentivize long-term investment in agroforestry (FAO, 2021; World Bank, 2023).

3.4 Monitoring and Evaluation (M&E) Frameworks

Effective monitoring and evaluation (M&E) systems are essential for ensuring that agroforestry initiatives deliver both economic and ecological benefits. They serve as the backbone of accountability, guiding policymakers in assessing whether investments align with sustainability objectives and enabling course corrections when needed (FAO, 2021; World Bank, 2023).

European Union. The EU relies on highly institutionalized M&E frameworks, primarily through the Integrated Administration and Control System (IACS) and the Land Parcel Identification System (LPIS). These tools employ satellite imagery, remote sensing, and digital reporting to track compliance with CAP measures. The results are integrated into multi-annual performance reviews, providing transparency and allowing civil society to verify outcomes.

Asia (India/Indonesia). India has developed mixed M&E capacity: while national missions track agroforestry expansion, data is fragmented across states and not always interoperable. In Indonesia, monitoring is embedded in community forestry programs, but reporting remains inconsistent and heavily donor-dependent. Remote sensing adoption is growing but lacks integration with local data systems.

Transitional economies (Armenia/Georgia). Armenia and Georgia still face weak institutional capacity in M&E. Data collection is sporadic, often project-specific, and lacks continuity. Indicators tend to focus on inputs (e.g., number of seedlings distributed) rather than outcomes (e.g., survival rates, carbon sequestration, income effects). There is minimal use of remote sensing or digital dashboards. Weak feedback loops between monitoring bodies and policymaking further undermine effectiveness (World Bank, 2023).

Table 4. M&E frameworks for agroforestry (comparative snapshot)*

Dimension	EU (Germany/France)	Asia (India/Indonesia)	Transitional (Armenia/Georgia)
Data sources	Monitoring relies on remote sensing, the Integrated Administration and Control System (IACS), the Land Parcel Identification System (LPIS), and periodic farm-level surveys.	Combines provincial reports and satellite imagery; data collection remains fragmented and varies across regions.	Data are mostly project-based and fragmented, with limited continuity or national integration.
Indicator focus	Emphasis is placed on outcome indicators such as biodiversity, soil quality, and farm income.	A mix of input and output indicators is used, depending on program design and available data.	Monitoring mainly records inputs (e.g., number of seedlings or hectares planted) rather than measurable environmental or economic outcomes.
Institutional capacity	Strong institutional capacity, supported by specialized agencies and long-term budget commitments.	Capacity is uneven and often reliant on donor-funded programs or external expertise.	Weak institutional base with underfunded agencies and limited technical expertise
Transparency & access	High degree of transparency through open databases, public dashboards, and regular performance reporting.	Moderate transparency; public access to data is partial and varies across initiatives.	Limited transparency; most information remains inaccessible to the public or confined within donor reports.

Feedback to policy	M&E results are systematically integrated into Common Agricultural Policy (CAP) review cycles and used for policy adjustment.	Feedback mechanisms exist but are inconsistently applied, depending on program governance.	Minimal linkage between monitoring outcomes and policymaking; feedback loops remain largely absent.

***** Source: Compiled by the author based on FAO (2021), World Bank (2023), Burgess et al. (2017), Kay et al. (2019), Rahman et al. (2020).

Implications for strategic management. Effective agroforestry governance requires moving beyond input-based reporting toward outcome-driven evaluation. Without strong M&E, financing and policy reforms risk becoming symbolic rather than transformative. Armenia and Georgia urgently need to institutionalize independent monitoring bodies, digital data integration, and transparent reporting platforms. Lessons from the EU highlight that credible M&E not only improves efficiency but also builds farmer trust and investor confidence (Burgess et al., 2017; FAO, 2021).

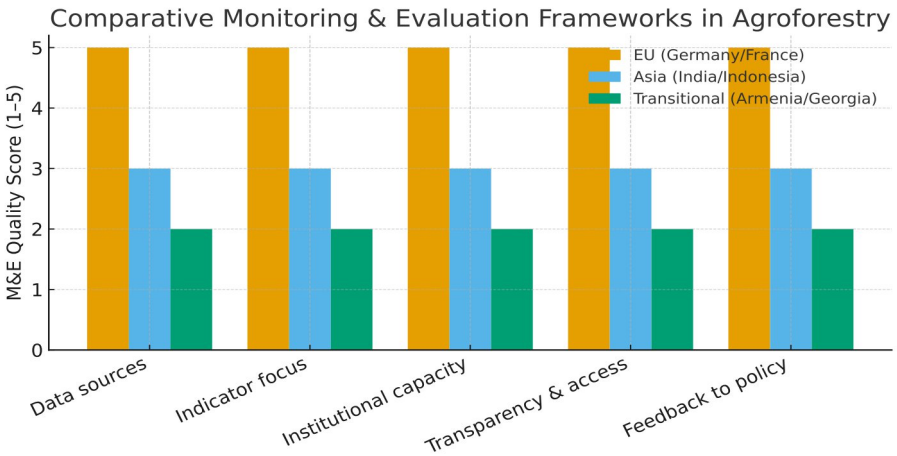

Fig. 1. Comparative bar chart of M&E quality scores across EU, Asia, and transitional economies Source: Compiled by the author based on FAO (2021), World Bank (2023), Burgess et al. (2017), Kay et al. (2019), Rahman et al. (2020)

4 Discussion

The comparative analysis across the EU, Asia, and transitional economies highlights the multidimensional nature of agroforestry governance. While all regions recognize agroforestry as a tool for balancing food security and ecological sustainability, the strategic pathways and institutional foundations diverge significantly. This section synthesizes the key findings from institutional design, stakeholder engagement, financing, and monitoring, with a view to identifying lessons relevant for transitional contexts such as Armenia and Georgia.

Institutional arrangements and coherence. In the EU, agroforestry is embedded within broader agricultural and environmental policy frameworks, particularly the Common Agricultural Policy (CAP) and the European Green Deal. This coherence reduces fragmentation and ensures that agroforestry is not treated as a marginal practice but as a mainstream land-use option. By contrast, in transitional economies agroforestry remains

outside formal policy agendas, with no dedicated legal definitions or long-term strategies. The absence of such institutional anchoring results in fragmented implementation and weak scaling potential (FAO, 2021).

Stakeholder engagement as a driver of legitimacy. A recurring theme is that meaningful stakeholder participation enhances adoption and compliance. The EU and parts of Asia have institutionalized consultative mechanisms that give farmers, cooperatives, and NGOs a voice in policy formulation and monitoring. This creates trust and shared ownership of outcomes. Transitional economies, however, exhibit a top-down approach where farmers and local communities are largely excluded from decision-making. This not only reduces legitimacy but also undermines the practical relevance of policy interventions (World Bank, 2023).

Financing as an enabling condition. Agroforestry requires patient capital due to its long gestation period. The EU illustrates how stable subsidies, concessional loans, and risk-sharing instruments can create predictable incentives for farmers. Asia provides innovative models, particularly through REDD+ and concessional credit schemes, but still depends heavily on external donor support. In Armenia and Georgia, reliance on fragmented donor projects without systemic financing mechanisms generates high uncertainty, discouraging long-term investment. Strategic management must therefore prioritize integrating agroforestry into national rural finance policies to ensure sustainability (FAO, 2021).

Monitoring and evaluation as governance feedback. Robust M&E frameworks are critical to translating policies into measurable outcomes. EU systems demonstrate how remote sensing, digital dashboards, and compliance audits create transparency and accountability. Asia's mixed capacity illustrates the importance of linking local data to national systems, while transitional economies show how weak M&E results in input-based reporting with little evidence of impact. Without credible data, policymakers in Armenia and Georgia risk making symbolic reforms that lack substance. Building independent monitoring agencies and linking them to policy cycles could be transformative (World Bank, 2023).

Cross-cutting governance lessons. The evidence points to three overarching insights. First, policy coherence is essential: agroforestry thrives when embedded in broader strategies for agriculture, climate, and rural development. Second, institutional independence and stakeholder inclusion are critical for legitimacy and sustainability. Third, long-term financing and credible M&E determine whether reforms remain symbolic or become transformative. For Armenia, these findings suggest that agroforestry adoption cannot be reduced to technical fixes but requires a rethinking of governance structures.

Ultimately, the discussion underscores that agroforestry is not merely a technical land-use practice but a governance challenge. Effective systems emerge when legal frameworks, financial incentives, monitoring tools, and participatory structures align to create enabling environments. Transitional economies face the dual challenge of building institutions while simultaneously addressing ecological pressures and food security concerns. The Armenian case illustrates both the risks of fragmented reform and the opportunities for selective policy borrowing from international best practices.

4.1 Policy Recommendations for Armenia

The Armenian case demonstrates that agroforestry development is constrained less by technical knowledge than by institutional and governance gaps. To move beyond fragmented donor-driven initiatives, several strategic recommendations emerge:

1. **Institutionalization of agroforestry in national legislation.** Agroforestry should be explicitly defined in Armenia's agricultural and environmental codes, with clear provisions for land-use rights, tenure security, and eligibility for subsidies. Legal recognition would signal political commitment and reduce uncertainty for farmers and investors.

2. **Creation of a dedicated financing framework.** Current agricultural subsidies and credit lines should be expanded to cover tree-crop systems. Introducing long-term concessional loans, blended finance models, and risk-sharing mechanisms (e.g., insurance against crop/tree loss) would lower adoption barriers.
3. **Strengthening monitoring capacity.** Establishing an independent agroforestry monitoring unit within the Ministry of Environment or Agriculture, equipped with remote sensing tools and open-access dashboards, would ensure data-driven policy implementation and build public trust.
4. **Empowering cooperatives and civil society.** Farmer cooperatives, NGOs, and local councils should be systematically involved in program design and monitoring. Building consultative platforms at regional levels would enhance legitimacy, improve compliance, and encourage innovation.
5. **Integrating agroforestry into broader rural development strategies.** Agroforestry should not be treated as a niche intervention but linked to Armenia's climate adaptation plans, biodiversity conservation goals, and rural livelihood strategies. Embedding agroforestry in multi-sectoral strategies would maximize synergies and resource mobilization.

By adopting these measures, Armenia could transition from fragmented, project-based agroforestry initiatives toward a sustainable, nationally owned governance system. Such reforms would not only enhance food security and ecological resilience but also strengthen rural development in line with international best practices.

5 Conclusion

This study has examined the strategic management of agroforestry systems through a comparative perspective, focusing on institutional design, stakeholder engagement, financing mechanisms, and monitoring frameworks across the EU, Asia, and transitional economies such as Armenia and Georgia. The analysis demonstrates that agroforestry success depends less on technical innovation and more on the alignment of governance structures that support long-term adoption and sustainability.

The findings highlight three overarching lessons. First, **policy coherence** is indispensable. The EU experience shows that agroforestry gains legitimacy and scale when integrated into broader agricultural, environmental, and rural development policies. Second, **stakeholder participation and institutional independence** enhance legitimacy, farmer trust, and compliance. Without inclusive platforms, reforms remain top-down and fragile. Third, **long-term financing and credible monitoring systems** are critical enablers, transforming agroforestry from isolated pilot projects into sustainable national strategies.

For transitional economies, and particularly Armenia, the research underscores both risks and opportunities. On one hand, the absence of legal codification, fragmented financing, and weak monitoring perpetuate uncertainty and limit scaling potential. On the other, Armenia has demonstrated gradual progress in digitalization and policy harmonization, creating a foundation for reform. By selectively adapting lessons from the EU and Asia—such as stable financing schemes, independent monitoring, and participatory governance—Armenia can develop an agroforestry model tailored to its socio-economic and ecological realities.

Ultimately, agroforestry must be approached as a **strategic governance challenge rather than a technical fix**. Effective systems emerge when governments commit to legal clarity, stable financing, participatory platforms, and robust monitoring. Such alignment not only enhances food security and ecological integrity but also strengthens rural livelihoods and resilience in the face of climate change. For Armenia, this transition offers an opportunity to position agroforestry at the intersection of sustainability and rural development, turning fragmented initiatives into a coherent national strategy.

References

1. D. Evan Mercer. Adoption of agroforestry innovations in the tropics: A review. Agroforestry Systems **61**, 311-328 (2004). https://doi.org/10.1023/B:AGFO.0000029007.85754.70
2. M. Den Herder et.al., Current extent and stratification of agroforestry in the European Union. Agriculture Ecosystems & Environment. **241(1):**121-132 (2017). https://doi.org/10.1016/j.agee.2017.03.005
3. J. Rubio-Delgado et.al., Recent spatiotemporal dynamics of agroforestry systems in Europe. Agricultural Systems. **229**, 104437 (2025). https://doi.org/10.1016/j.agsy.2025.104437
4. J. H .N .Palma et.al., Modeling environmental benefits of silvoarable agroforestry in Europe. Agriculture, Ecosystems & Environment. **119**, Issues 3–4, 320-334 (2007). https://doi.org/10.1016/j.agee.2006.07.021
5. J. Rubio-Delgado et.al., Reduced grazing and changes in the area of agroforestry in Europe. Front. Environ. Sci., Sec. Land Use Dynamics **11** (2023). https://doi.org/10.3389/fenvs.2023.1258697
6. M.R. Mosquera-Losada, et al. Agroforestry in the European common agricultural policy. Agroforest Syst **92**, 1117–1127 (2018). https://doi.org/10.1007/S10457-018-0251-5
7. N. Paikra et.al., Agroforestry systems: A sustainable approach to land use rural development. International Journal of Research in Agronomy **8** (9) (2025). https://doi.org/10.33545/2618060X.2025.v8.i9Sd.3817
8. J. Crous-Duram et.al., Assessing food sustainable intensification potential of agroforestry using a carbon balance method. iForest - Biogeosciences and Forestry **12**, 1, 85-91 (2019). https://doi.org/10.3832/ifor2578-011
9. S. Kay et.al., Agroforestry creates carbon sinks whilst enhancing the environment in agricultural landscapes in Europe **83**, 581-593 (2019). https://doi.org/10.1016/j.landusepol.2019.02.025
10. V. Rolo et.al., Mixtures of forest and agroforestry alleviate trade-offs between ecosystem services in European rural landscapes. Ecosystem Services **50**, 101318 (2021). https://doi.org/10.1016/j.ecoser.2021.101318
11. V. Saraev et.al., The potential for agroforestry to reduce net GHG emissions in Scotland through the Woodland Carbon Code. Published by Forest Research, 2022 on behalf of Climate X Change. DOI: http://dx.doi.org/10.7488/era/2526
12. V. Marco. Organizational Studies: Implications for the Strategic Management. December 2021. Publisher: Springer Cham. https://doi.org/10.1007/978-3-030-87148-2
13. S. Rahman et.al., Facilitating smallholder tree farming in fragmented tropical landscapes: Challenges and potentials for sustainable land management. Journal of Environmental Management **198**, 1, 110-121 (2017). https://doi.org/10.1016/j.jenvman.2017.04.047
14. S. Mohana et.al., Impact of strategic management practices on employee performance in higher education sector. International Journal of Health Sciences **6,** S2 (2022). https://doi.org/10.53730/ijhs.v6nS2.8532
15. E. Khalaf. Effect of Strategic Management Practices on Organizational Excellence. Journal of Hunan University Natural Sciences **49(4)** (2022). https://doi.org/10.55463/issn.1674-2974.49.4.26