



Integrated crop–livestock–tree systems in Africa and Asia:

A systematic review of resilient, climate-smart,
and multifunctional agro-ecosystems

Habtamu Lemma Didanna (PhD)

Wolaita Sodo University, Agriculture, Ethiopia



BACKGROUND & RATIONALE

Integrated crop–livestock–tree (ICLT) systems, also known as agro–silvo–pastoral systems, are promoted as sustainable land–use strategies capable of addressing the interconnected challenges of food security, environmental degradation, and climate change in smallholder farming systems.

Problem: Evidence on ecological, socio-economic, and climate-resilience outcomes is dispersed across disciplines, regions, and production contexts, limiting a comprehensive understanding of their multifunctional performance.



REVIEW QUESTIONS

1. What ecological, socio-economic, and climate resilience outcomes are associated with ICLT systems in Africa and Asia?
2. How do outcomes vary across agro-ecological and socio-economic contexts?
3. What factors facilitate or constrain the adoption and scaling of ICLT systems?



KEY FINDINGS

ICLT systems consistently enhance:

- ✓ Soil fertility
- ✓ Biodiversity conservation
- ✓ Nutrient cycling
- ✓ Carbon sequestration
- ✓ Farm productivity
- ✓ Income diversification
- ✓ Resilience to climatic shocks



CONTEXT MATTERS

The magnitude of benefits varies considerably across agro-ecological management intensities.



KEYWORDS

Africa • agroecology • agroforestry • Asia • climate-smart agriculture • mixed farming systems • resilience • sustainable land use



Contact: Habtamu Lemma Didanna (PhD)
Wolaita Sodo University, Agriculture, Wolaita Sodo, Ethiopia
128 Sodo, Ethiopia • E-mail: lemmahab2015@gmail.com



Diverse agro-ecological
contexts in Africa and Asia



METHODS



The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework.



Literature: Peer-reviewed studies published between 2000 and 2025.



Screening: Studies from diverse agro-ecological regions in Africa and Asia were systematically screened.



Eligible evidence: 186 studies.



Synthesis: Studies were coded and synthesized using a thematic framework covering:

- Ecosystem services
- Farm productivity
- Livelihood outcomes
- Climate adaptation
- Institutional drivers of adoption



ADOPTION & SCALING: KEY FACTORS

Socio-economic and institutional factors are more influential in determining adoption than biophysical constraints alone, particularly:



Land–tenure insecurity



Limited access to extension services



Inadequate policy support



High initial investment costs



PRIORITY RESEARCH GAPS

- Long-term system performance
- Trade-offs among ecosystem services
- Integration of climate-adaptation metrics into system evaluation
- Geographical and thematic research gaps



CONCLUSIONS & IMPLICATIONS



This review synthesizes evidence across ecological and socio-economic dimensions, providing a more integrated understanding of how ICLT systems contribute to sustainable agricultural intensification and climate resilience in Africa and Asia.



The findings highlight the need for context-specific policies, interdisciplinary research, and inclusive governance mechanisms to support the wider adoption and scaling of multifunctional agro-ecosystems.