

Resilience and Agroforestry Innovation in Cocoa-Based Systems Facing Climate Disturbances

Comparative Analysis between Loum, Tombel (Cameroon) and West Africa–Latin America Pilot Regions

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1. INTRODUCTION & CONTEXT

- Strategic Sector:** Cocoa contributes significantly to national GDP (17.3% agricultural contribution) and constitutes the primary livelihood pillar for rural communities in Cameroon.
- Vulnerability:** Heavy reliance on biomass and rainfed conditions creates severe exposure to climate disturbances (temperature rise, prolonged drought, rainfall irregularity).
- Core Question:** How do smallholders in Loum (Littoral) & Tombel (South-West) mobilize agroforestry innovations and community resilience to buffer climate shocks?

2. OBJECTIVES

- Characterize socio-economic profiles and farm floristic architecture in Loum and Tombel.
- Assess the nature and severity of perceived climate disturbances on cocoa plots.
- Quantify agroforestry and technical adaptation strategies implemented by producers.
- Analyze institutional, financial, and technical constraints to scaling sustainable models.
- Compare local findings with West African (Ghana/Côte d'Ivoire) and Latin American (Brazil/Bolivia) innovation hubs.

3. METHODOLOGY & PROTOCOL

- Study Sites:** Loum (Littoral Region, n=31) & Tombel (South-West Region, n=52), Cameroon (Monomodal forest agroecological zone).
- Sampling:** Mixed sampling (Stratified by farm size/cooperative status coupled with snowball technique, **N = 83 producers**).
- Data Collection:** Multi-section structured questionnaires, semi-structured key-informant interviews, participatory observations, and focus groups.
- Data Processing:** Quantitative analysis using XLSTAT & SPSS 27.0 (descriptive stats, Chi-square tests), qualitative thematic coding, and cross-triangulation.

4. CONCEPTUAL FRAMEWORK

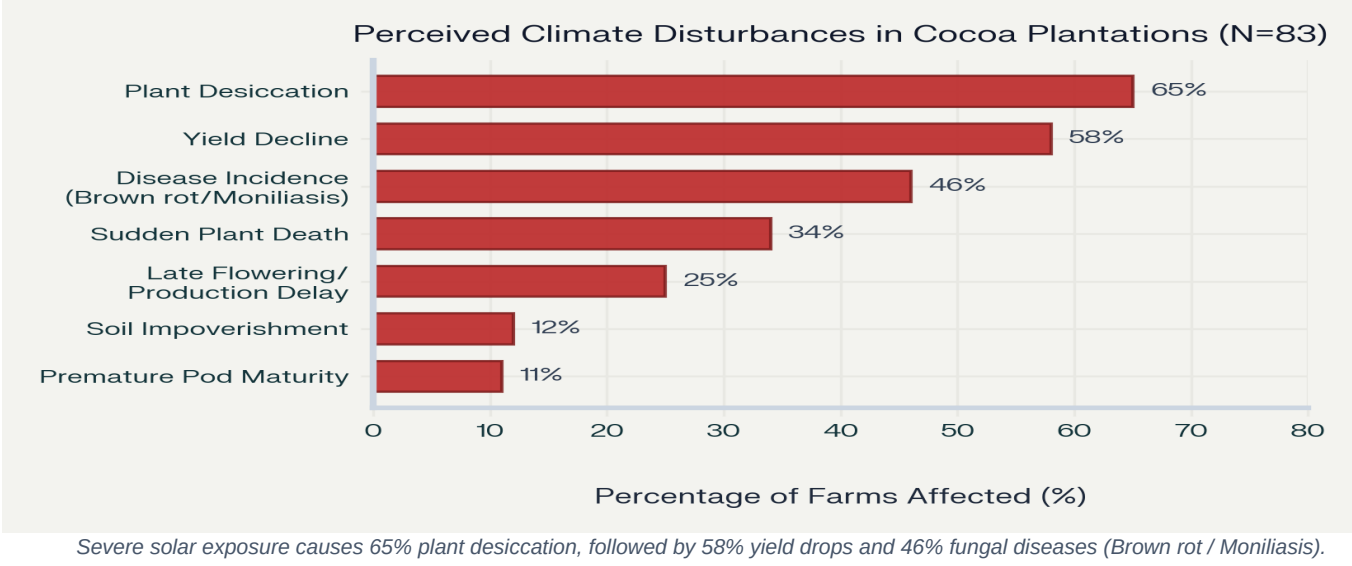
Agroforestry Resilience Nexus:

Climate Shocks → Endogenous Technical Innovations (Lavage, Stratification, Nursery Selection) + Community Social Capital (Cooperatives, Information Sharing) + Multi-Level Institutional Support → **Sustained Productivity & Dynamic Resilience.**

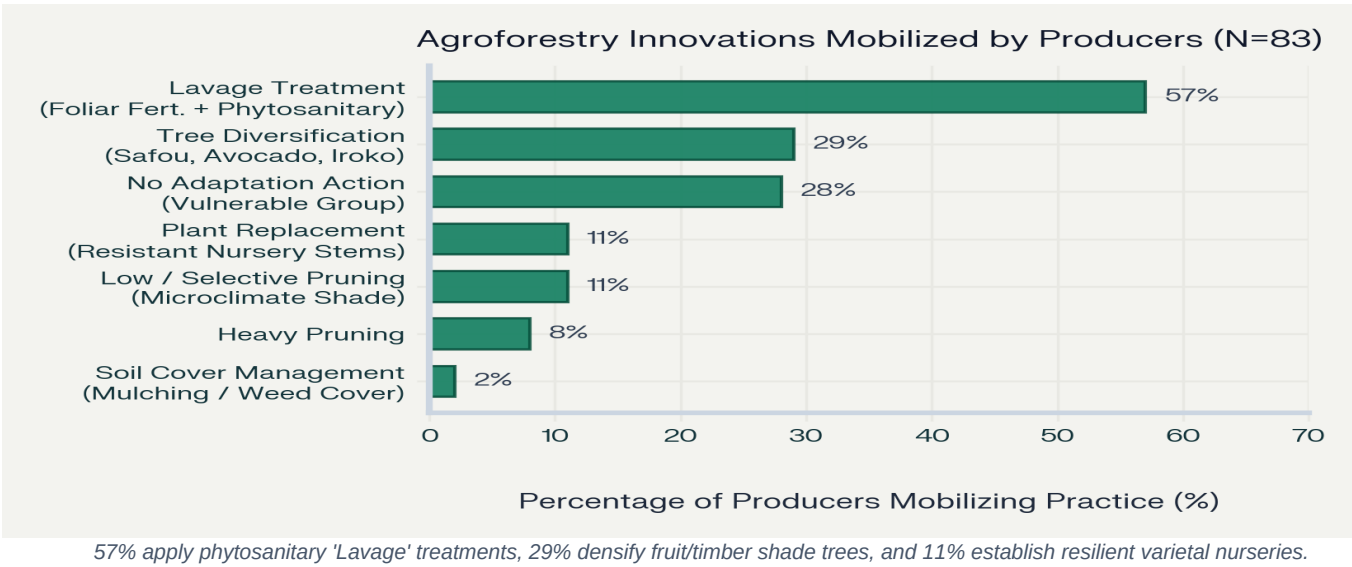
5. SOCIO-ECONOMIC & FARM PROFILES

- Demographics:** 92.8% Male, 46.0% aged 42–57 yrs, 81.9% Married, 61.5% Secondary education, 74.7% full-time farmers.
- Farm Structure:** 79.5% farm on 1–5 ha; 48.2% have 5–15 years of cocoa farming experience.
- Agroforestry Density:** Mean of **36 companion trees/plot** dominated by *Safou* (98%), *Avocado* (83%), and *Iroko* (46%).

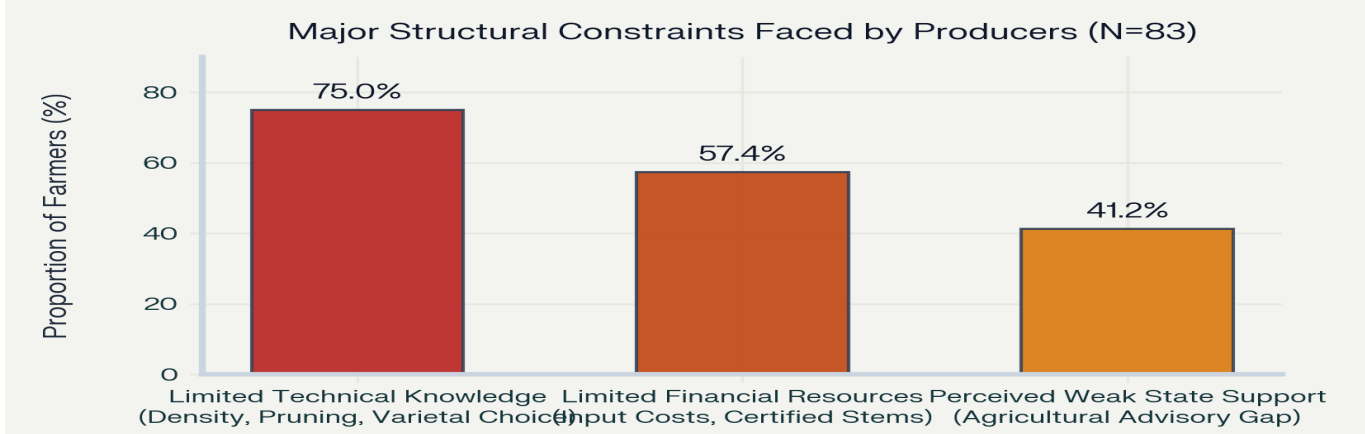
6. CLIMATE DISTURBANCE MANIFESTATIONS



7. AGROFORESTRY INNOVATIONS MOBILIZED



8. MULTI-LEVEL CONSTRAINTS



Institutional Obstacles: Beyond technical (75%) and financial (57.4%) limits, stakeholders highlight **weak producer organization**, **poor institutional coherence**, and **non-existent NGO coordination**.

9. INTERREGIONAL COMPARATIVE SYNTHESIS

Dimension	Loum & Tombel (Cameroon)	West Africa & Latin America
Agroforestry Model	High floristic density (Safou, Avocado, Iroko); spontaneous shade	Syntropic stratification (Bolivia/Brazil); structured multi-strata (Ghana)
Knowledge Transfer	Word-of-mouth, informal peer networks, limited digital tools	Digital hubs, WhatsApp farmer groups, formal innovation platforms
Institutional Support	Fragmented project interventions (GIZ, PAD-Cacao, CAFI)	Multi-stakeholder platforms, dedicated national roadmaps, NGO synergy

10. RECOMMENDATIONS & POLICY PERSPECTIVES

- Technical Capacity Building:** Implement farmer field schools on optimized shade density, grafting, and organic biopesticides.
- Digital Scaling Hubs:** Deploy digital knowledge platforms (e.g., WhatsApp extension networks, rural radio) inspired by Ghana/Côte d'Ivoire.
- Institutional Alignment:** Strengthen State–NGO–Cooperative coordination to streamline input access, certification, and traceability.
- National Agroforestry Roadmap:** Integrate agroforestry as a priority climate-adaptation pillar in national agricultural policy.

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