



A Framework for Sustainable Land Management Practices Enhancing Soil Health in Semi-Arid East African Regions: A Farmer Participatory Action Research Perspective

Sulemana Camara¹, Ibrahiman Diallo², Yasmine Barry¹, Maguelone Sow³

¹ Institut Supérieur des Sciences et Médecine Vétérinaire

² Department of Crop Sciences, Gamal Abdel Nasser University of Conakry

³ Department of Soil Science, Institut Supérieur des Sciences et Médecine Vétérinaire

Published: 17 April 2011 | **Received:** 18 January 2011 | **Accepted:** 07 March 2011

Correspondence: scamara@outlook.com

DOI: [10.5281/zenodo.18925998](https://doi.org/10.5281/zenodo.18925998)

Author notes

Sulemana Camara is affiliated with Institut Supérieur des Sciences et Médecine Vétérinaire and focuses on Agriculture research in Africa.

Ibrahiman Diallo is affiliated with Department of Crop Sciences, Gamal Abdel Nasser University of Conakry and focuses on Agriculture research in Africa.

Yasmine Barry is affiliated with Institut Supérieur des Sciences et Médecine Vétérinaire and focuses on Agriculture research in Africa.

Maguelone Sow is affiliated with Department of Soil Science, Institut Supérieur des Sciences et Médecine Vétérinaire and focuses on Agriculture research in Africa.

Abstract

This study addresses a current research gap in Agriculture concerning Sustainable Land Management Practices for Soil Health Improvement in Semi-Arid Regions of East Africa: Farmer Participatory Action Research Project in Guinea. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A structured analytical approach was used, integrating formal modelling with domain evidence. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Sustainable Land Management Practices for Soil Health Improvement in Semi-Arid Regions of East Africa: Farmer Participatory Action Research Project, Guinea, Africa, Agriculture, theoretical This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. The empirical specification follows $Y = \beta_{0+\beta}^{-1} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: Sahelian, agroforestry, resilience, participatory, sustainability, conservation, intercropping

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