



Methodological Evaluation of Smallholder Farm Systems in Senegal Using Quasi-Experimental Design for Adoption Rate Measurement Over Time

Mamadou Sène^{1,2}, Awa Sylla^{2,3}, Saidou Niangba⁴, Abdoulaye Diop^{1,5}

¹ Université Gaston Berger (UGB), Saint-Louis

² Department of Soil Science, African Institute for Mathematical Sciences (AIMS) Senegal

³ Department of Agricultural Economics, Council for the Development of Social Science Research in Africa (CODESRIA), Dakar

⁴ Department of Animal Science, African Institute for Mathematical Sciences (AIMS) Senegal

⁵ Council for the Development of Social Science Research in Africa (CODESRIA), Dakar

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Correspondence: msne@gmail.com

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Author notes

Mamadou Sène is affiliated with Université Gaston Berger (UGB), Saint-Louis and focuses on Agriculture research in Africa.

Awa Sylla is affiliated with Department of Soil Science, African Institute for Mathematical Sciences (AIMS) Senegal and focuses on Agriculture research in Africa.

Saidou Niangba is affiliated with Department of Animal Science, African Institute for Mathematical Sciences (AIMS) Senegal and focuses on Agriculture research in Africa.

Abdoulaye Diop is affiliated with Council for the Development of Social Science Research in Africa (CODESRIA), Dakar and focuses on Agriculture research in Africa.

Abstract

Smallholder agriculture in Senegal faces challenges such as climate variability and market access, necessitating innovative policy solutions to enhance productivity and sustainability. A mixed-method approach combining surveys and qualitative interviews was employed. Quasi-experimental techniques were applied to measure adoption rates while controlling for confounding variables. In the first year, 35% of respondents adopted conservation agriculture practices; by the fifth year this increased to 48%, indicating a significant trend towards more sustainable farming methods. The quasi-experimental design proved robust in measuring adoption rates over time, with confidence intervals providing reliable estimates of practice uptake among smallholders. Policy interventions should focus on education and extension services tailored to local conditions, complemented by financial incentives for adopting conservation practices. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: African geography, smallholder farming, econometrics, longitudinal analysis, intervention studies, sustainability indicators, qualitative methods

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