African Ecology and Conservation (Environmental/Earth Science)

Methodological Evaluation of Smallholder Farms Systems in South Africa Using Panel Data for Adoption Rate Measurement

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Abstract

Smallholder farms in South Africa face diverse challenges related to resource management and market access. A mixed-methods approach combining qualitative interviews and quantitative survey data was employed. Panel data from 50 randomly selected farms over three consecutive seasons were analysed using a fixed effects model to account for unobserved heterogeneity. The adoption rate of conservation tillage practices varied significantly across different farm types, with an average adoption rate of 42% in the first season and increasing to 58% by the third season. Panel data analysis revealed that socio-economic factors such as farm size and access to credit influenced the adoption rates of sustainable farming methods more than environmental conditions alone. Investment in extension services tailored to specific farmer needs could enhance the diffusion of these practices, particularly among smaller-scale operations with limited financial resources. Smallholder farms, South Africa, panel data, sustainable agriculture, adoption rate The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Geographic Terms: Sub-Saharan*

Methodological Terms: Panel data, Econometrics, Socioeconomic indicators, Resource management, Market access, Theoretical Concepts: Adoption rates, Smallholder agriculture, Development economics

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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