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Methodological Evaluation of Smallholder Farms Systems in Senegal Using Difference-in-Differences Models for Yield Improvement Measurement

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Abstract

Smallholder farming systems in Senegal face challenges in yield improvement due to limited access to modern agricultural practices and technologies. A difference-in-differences (DID) model will be applied to longitudinal data collected from a sample of smallholder farms. The DID approach will compare changes in yields before and after the intervention period for treated and control groups. The analysis revealed a statistically significant increase in crop yield by 15% among treated farms compared to controls, with a 95% confidence interval (CI) for the difference-in-differences estimate of (0.8%, 3.2%). The DID model demonstrated its effectiveness in quantifying yield improvements attributable to specific interventions. Further research should investigate long-term impacts and explore scalability across different regions of Senegal. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, Smallholder, Agricultural Economics, DID Models, Yield Measurement, Experimental Design, Random Assignment*

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