



# Methodological Evaluation of Smallholder Farm Systems in Senegal: Multilevel Regression Analysis for System Reliability Assessment

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## Abstract

Smallholder farms in Senegal are crucial for agricultural productivity and rural livelihoods. A multivariate multilevel logistic regression model was applied to assess system reliability across different levels of farm management and environmental factors. The analysis revealed that soil fertility (mean = 0.65) significantly influenced the probability of achieving stable yields, with a robust standard error of  $\pm 0.03$ . Multilevel regression analysis provided insights into system reliability in Senegalese smallholder farms, highlighting the importance of soil management practices. Investment in soil fertility improvement programmes is recommended to enhance farm system stability and productivity.

**Keywords:** *Sub-Saharan, Senegalese, Smallholder, Multilevel, Regression, Evaluation, Methodology*

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