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Methodological Evaluation of Regional Monitoring Networks in South Africa: Multilevel Regression Analysis for Yield Improvement Assessment

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Abstract

Regional monitoring networks are essential for assessing environmental changes in South Africa. However, their effectiveness in measuring yield improvements is not well understood. A comprehensive evaluation was conducted using multilevel regression models to assess the impact of regional monitoring systems on agricultural yields. The analysis considers both fixed effects (e.g., geographical location) and random effects (e.g., variability within regions). The multilevel regression model revealed that while monitoring networks significantly influenced yield improvement, there was considerable variation among different regions. This study provides a robust framework for the evaluation of regional monitoring systems in South Africa using multilevel regression analysis. Further research should focus on identifying specific factors within regions that contribute to higher yields and on improving data collection methods to enhance network effectiveness. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, econometrics, spatial analysis, panel data, multilevel modelling, stochastic frontier, GIS*

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