



Bayesian Hierarchical Model for Measuring Adoption Rates in Senegalese Manufacturing Plants Systems

Toure Ndiaye^{1,2}, Sow Gueye³, Mamy Diop²

¹ Department of Soil Science, Université Gaston Berger (UGB), Saint-Louis

² Institut Pasteur de Dakar

³ Université Gaston Berger (UGB), Saint-Louis

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Correspondence: tndiaye@hotmail.com

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Author notes

Toure Ndiaye is affiliated with Department of Soil Science, Université Gaston Berger (UGB), Saint-Louis and focuses on Agriculture research in Africa.

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

Mamy Diop is affiliated with Institut Pasteur de Dakar and focuses on Agriculture research in Africa.

Abstract

The adoption of advanced manufacturing systems in Senegalese agricultural settings is crucial for enhancing productivity and sustainability. A Bayesian hierarchical model was applied to analyse data from multiple plants across different regions in Senegal. This approach accounts for both plant-specific and regional variability. The analysis revealed a significant difference ($p < 0.05$) in adoption rates between large-scale and small-scale operations, suggesting that scale is a critical determinant of system uptake. This study provides insights into the factors affecting the diffusion of advanced manufacturing systems in Senegal's agricultural sector. Further research should explore targeted interventions to increase adoption among smaller-scale operations. The empirical specification follows $Y = \beta_{0+\beta}^{-1} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agriculture, Bayesian statistics, hierarchical modelling, adoption rates, quantitative methods, econometrics, predictive analytics*

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