African Poultry Veterinary Science

Bayesian Hierarchical Model for Cost-Effectiveness Evaluation of Manufacturing Plants in Nigerian Agricultural Systems

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Abstract

The Nigerian agricultural sector is characterized by a high number of small-scale manufacturing plants that often struggle with cost-effectiveness issues. A Bayesian hierarchical model was developed to analyse data on production costs, output efficiency, and financial performance of various Nigerian manufacturing plants. The model accounts for heterogeneity across different regions and plant sizes. The analysis revealed that smaller-scale plants in the north-west region had significantly higher cost-effectiveness ratios (CER) compared to larger plants in other regions, indicating a need for tailored interventions to optimise resource use. This study provides evidence-based insights into the cost-effectiveness of manufacturing plants across Nigeria's agricultural landscape and offers recommendations for policymakers aiming to enhance productivity and sustainability. Policymakers should prioritise support for small-scale, high-cost-effectiveness plants in the north-west region, while also considering regional-specific factors affecting plant performance. Bayesian hierarchical model, manufacturing plants, cost-effectiveness evaluation, Nigerian agriculture The empirical specification follows $Y = \vec{\beta_{0+\beta}} \, p \, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agriculture, Bayesian statistics, Hierarchical modelling, Cost-effectiveness analysis, Manufacturing systems, Nigeria, Econometrics*

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