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Bayesian Hierarchical Model for Measuring System Reliability in Ethiopian Manufacturing Plants Systems

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Abstract

Manufacturing systems in Ethiopian agriculture often face challenges related to system reliability due to varying operational conditions and maintenance practices. A Bayesian hierarchical model was applied to analyse data from Ethiopian manufacturing plants. The model accounts for heterogeneity across different plants and incorporates uncertainty through credible intervals. The analysis revealed that plant-specific factors significantly influence system reliability, with a proportion of 70% of systems operating within acceptable performance levels. This study provides evidence supporting the effectiveness of the Bayesian hierarchical model in assessing system reliability in Ethiopian agricultural manufacturing environments. Policy makers are encouraged to use this method for ongoing monitoring and improvement of manufacturing plant reliability, aiming for consistent high-performance across all sites. Bayesian Hierarchical Model, System Reliability, Ethiopian Agriculture, Manufacturing Plants The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Ethiopia, Bayesian Hierarchical Model, Reliability Analysis, Manufacturing Systems, Quality Control, Statistical Methods, Geographic Information Systems*

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