African Swine Science (Agri/Animal Science)

Methodological Assessment of Manufacturing Plant Systems Reliability in Ethiopian Swine Enterprises Using Quasi-Experimental Design

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Abstract

The reliability of manufacturing plant systems in swine enterprises is critical for maintaining consistent productivity and profitability. A mixed-method approach combining quantitative data analysis with qualitative interviews was employed to assess system reliability across 10 randomly selected pig farming enterprises. The Quasi-Newton method was used for model fitting in the statistical analysis. The system reliability scores averaged at 85%, indicating moderate performance variability among different farms, with some plants experiencing up to 20% downtime per month. This study provides a robust framework for evaluating manufacturing plant systems' reliability in Ethiopian swine enterprises and offers recommendations for improving system stability and efficiency. Implementing predictive maintenance strategies can reduce downtime by 15%, leading to significant improvements in farm productivity and financial outcomes. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Ethiopia, Quasi-experimental, Manufacturing Systems, Reliability Assessment, SWIFTS, Methodology, Quality Control*

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