African Small Animal Veterinary Practice

Methodological Evaluation of Regional Monitoring Networks in Rwanda: Multilevel Regression Analysis for System Reliability Assessment

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Abstract

Regional monitoring networks in Rwanda have been established to enhance agricultural productivity through improved data collection and analysis. A multilevel regression analysis was employed to assess system reliability. The model includes fixed effects for region and random intercepts for farms within each region to account for spatial variability. The multilevel regression analysis revealed that the proportion of correctly identified anomalies in agricultural practices varied significantly across regions, ranging from 72% to 85%. This indicates a need for targeted interventions to improve consistency. The findings suggest that while regional monitoring networks are effective overall, they require localized adjustments to ensure consistent and reliable data collection. Specific recommendations include the implementation of standard operating procedures (SOPs) tailored to each region's unique conditions and the development of a continuous improvement plan based on the identified variations in anomaly detection accuracy. Regional Monitoring Networks, Multilevel Regression Analysis, System Reliability, Agricultural Practices, Rwanda The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, agricultural productivity, multilevel analysis, system reliability, regression modelling, geographic information systems, spatial statistics*

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