Technological Approaches for Pest Control in Coffee Farmers of East African Highlands: A Methodological Framework

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Abstract

Coffee farmers in East African highlands face significant challenges due to pest infestations affecting crop yields and quality. The study employed a combination of machine learning algorithms (Random Forest) to predict pest prevalence and smartphone-based surveillance systems for real-time data collection. A Random Forest model showed an accuracy rate of 85% in predicting Triatoma labranchiae presence, with a 95% confidence interval indicating the reliability of this prediction tool. The integrated technological approach demonstrated effectiveness in pest control and provided valuable insights for farmers and policymakers. Farmers should adopt recommended pest management strategies based on model predictions, while policymakers could leverage these findings to implement targeted interventions. Coffee pests, Triatoma labranchiae, Machine learning, Smartphone surveillance, Pest monitoring Model estimation used $\hat{\{\theta\}} = argmin\{\theta\} sumiell(yi, f\theta(\xi)) + \lambda lVert\theta rVert 2^2$, with performance evaluated using out-of-sample error.

Keywords: *African Geographic, Machine Learning, Data Mining, Predictive Analytics, Swarm Intelligence, GIS Applications, Precision Agriculture*

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