African Topology Studies (Pure Science)

Bayesian Inference Dynamics in Agricultural Yield Prediction: A Stability Analysis and Convergence Proof Framework in Rwanda

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Published: 28 April 2008 | **Received:** 18 December 2007 | **Accepted:** 28 March 2008

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DOI: 10.5281/zenodo.18870463

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Abstract

This study addresses a current research gap in Mathematics concerning Bayesian Inference for agricultural yield prediction in Rwanda: stability analysis and convergence proofs in Rwanda. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A theorem-driven mathematical framework was developed under explicit regularity assumptions, with stability and convergence analysis of the proposed estimator. The main results show stability of the proposed functional under bounded perturbations and convergence of the estimator to a well-defined limit, characterised by $R(x)=argmin_{\theta} L(\theta;x)$. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Bayesian Inference for agricultural yield prediction in Rwanda: stability analysis and convergence proofs, Rwanda, Africa, Mathematics, theoretical This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims.

Keywords: *African geography, Bayesian networks, Markov chains, Monte Carlo methods, predictive stability, convergence theory, stochastic models*