



A Framework for Evaluating Water Scarcity Mitigation Strategies in Nigerian Irrigated Agriculture: Farmer Adoption and Economic Outcomes

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Abstract

This study addresses a current research gap in Computer Science concerning Evaluation of Water Scarcity Mitigation Strategies in Northern Nigerian Irrigated Farms: Farmer Adoption and Revenue Outcomes in Nigeria. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A structured analytical approach was used, integrating formal modelling with domain evidence. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Evaluation of Water Scarcity Mitigation Strategies in Northern Nigerian Irrigated Farms: Farmer Adoption and Revenue Outcomes, Nigeria, Africa, Computer Science, theoretical This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. Model estimation used $\hat{\theta} = \operatorname{argmin}_{\theta} \sum_{i=1}^n (y_i - f_{\theta}(\xi_i))^2 + \lambda \|\theta\|_2^2$, with performance evaluated using out-of-sample error.

Keywords: African Geography, Irrigation Economics, Water Scarcity, Stochastic Modelling, Agricultural Policy Analysis, Econometrics, Sustainability Metrics

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