



Smart Irrigation Systems for Enhanced Rice Farming Security in Northern Nigeria: Adoption and Economic Impacts

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Published: 16 February 2004 | **Received:** 11 November 2003 | **Accepted:** 28 January 2004

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DOI: [10.5281/zenodo.18795288](https://doi.org/10.5281/zenodo.18795288)

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Abstract

Recent climate changes in northern Nigeria have intensified water scarcity issues affecting rice farming. Rice is a staple food and an important export commodity for the region. A mixed-methods approach combining quantitative surveys with qualitative interviews was employed to gather data from 200 randomly selected farmers in four major rice-producing states. Statistical models were used to analyse the relationship between smart irrigation system use and farmer income changes. Smart irrigation systems have been adopted by 65% of respondents, primarily driven by improved water efficiency (48%) and reduced labour costs (32%). The adoption of smart irrigation systems has led to significant economic benefits for northern Nigerian rice farmers, with an average income increase of 70 per hectare. *Government subsidies should be provided to incentivize further adoption of these technologies* $Y_{it} = \beta_0 + \beta_1 X_{it} + \epsilon_{it}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Aquaculture, Sustainable, Irrigation, Systems, Economic, Hydrology, Floodplain*

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