African Ocean Biology (Earth/Environmental Science)

Rainwater Harvesting Systems in Semi-Arid Niger: A Three-Year Impact Study on Agricultural Adoption

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Abstract

In semi-arid regions of northern Niger, rainfall is highly unpredictable, leading to significant agricultural challenges. A mixed-methods approach combining surveys with field observations was employed to evaluate system effectiveness and farmer perceptions. Significant increases in crop yields (25% higher) were observed in regions where farmers adopted the rainwater harvesting systems, particularly among women who reported improved water security and better soil moisture conditions. The study demonstrates that integrated water management strategies can enhance agricultural resilience in challenging environmental settings. Government policies should support the scaling-up of these practices through targeted subsidies and capacity-building programmes for rural communities. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African Geography, Semi-Arid, Rainwater Harvesting, Agricultural Adaptation, Sustainability Models, Participatory Methods, Longitudinal Analysis*

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