

Stress-Tolerant Rice Adoption and Productivity Outcomes for Smallholders in the Senegal River Valley

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ABSTRACT

The Senegal River Valley is a critical rice-producing region, yet smallholder farmers face persistent yield losses due to abiotic stresses such as salinity and drought. Despite the development of stress-tolerant rice varieties (STRVs), their adoption rates and actual on-farm productivity impacts in this socio-ecological context remain inadequately understood. This working paper analyses the determinants of STRV adoption among smallholders in the valley and quantifies the causal impact of adoption on rice productivity. It aims to identify key constraints to uptake and measure yield differentials under real farming conditions. We employ a mixed-methods approach, combining a structured survey of smallholder households with agronomic yield measurements. Propensity score matching is used to control for selection bias and estimate the average treatment effect on the treated (ATT) for adopters. Adoption is significantly influenced by access to extension services and seed availability. Adopters of STRVs achieved, on average, a 22% higher paddy yield per hectare compared to matched non-adopters cultivating conventional varieties, with the yield gap most pronounced in plots with higher observed soil salinity. STRVs present a viable pathway for enhancing smallholder resilience and productivity in stress-prone environments. However, their potential is currently constrained by systemic bottlenecks in seed systems and knowledge dissemination. Policy should prioritise strengthening decentralised seed multiplication and distribution networks. Extension programmes require refocusing to demonstrate the management practices that maximise STRV performance under local biotic and abiotic pressures. climate-resilient agriculture, technology adoption, impact evaluation, propensity score matching, seed systems This paper provides novel empirical evidence on the causal productivity gain from STRV adoption in the region, using a robust quasi-experimental design paired with biophysical data, and introduces a refined framework for analysing adoption barriers specific to fragmented irrigated peri-urban systems.

Keywords: *Senegal River Valley, smallholder farmers, agricultural technology adoption, abiotic stress, rice productivity, sub-Saharan Africa, impact evaluation*

Article Highlights

- Adoption driven by access to extension services and seed availability.
- 22% average yield gain for adopters versus matched non-adopters.
- Yield advantage is most significant in plots with higher soil salinity.
- Systemic bottlenecks in seed systems constrain broader potential.

Policy Imperative

Strengthen decentralised seed networks and refocus extension programmes on management practices for local stress conditions.

Presents causal evidence on productivity gains using a quasi-experimental design paired with biophysical data.

ABSTRACT-ONLY PUBLICATION

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