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Smart Irrigation System Deployment on Senegalese Maize Farms: Water Conservation and Yield Enhancement in Guinea-Bissau

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Abstract

Smart irrigation systems are increasingly adopted to enhance agricultural productivity in arid regions where water management is critical for crop yield and sustainability. A randomized controlled trial was conducted across 20 smallholder farms in Senegal. Farmers received training on system operation and maintenance. Yield data were collected over three seasons, including pre- and post-intervention periods. The smart irrigation system demonstrated a significant increase of 15% in maize yield compared to traditional methods, with a coefficient estimate of $\beta = 0.15$ from the regression model. This represents a robust improvement within the uncertainty interval (95% CI: [0.08, 0.22]). The smart irrigation system showed substantial potential for improving water efficiency and crop yields in Senegalese smallholder farms. Further research should be conducted to assess scalability of the system across different climatic conditions and socio-economic contexts.

Keywords: *Geographic, Africa, Senegal, Guinea-Bissau, Irrigation, Systems, Controlled, Experimental*

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