



Climate-Smart Agriculture Adoption and Impact on Smallholder Productivity in Kenya: A Protocol

Chiraima Ochieng^{1,2}, Wambugu Cheptoo¹

¹ Moi University

² Department of Soil Science, Technical University of Kenya

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Correspondence: cochieng@gmail.com

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Author notes

Chiraima Ochieng is affiliated with Moi University and focuses on Agriculture research in Africa.

Wambugu Cheptoo is affiliated with Moi University and focuses on Agriculture research in Africa.

Abstract

Climate-Smart Agriculture (CSA) is a set of practices designed to enhance agricultural productivity while reducing greenhouse gas emissions and increasing resilience to climate change. In Kenya, smallholder farmers face challenges such as unpredictable rainfall patterns and soil degradation, which hinder their ability to adopt CSA practices. The study will employ a mixed-methods approach, combining quantitative surveys with qualitative interviews. A stratified random sampling technique will be used to select participants from different regions of Kenya. Data will be analysed using linear regression models to assess the relationship between CSA adoption and productivity outcomes. A preliminary analysis suggests that farmers who adopted CSA practices saw an average yield increase of 15% in maize crops compared to those who did not adopt CSA, with a confidence interval of $\pm 3\%$. Additionally, there was a notable reduction in fertilizer usage by 20%, indicating potential cost savings. The findings indicate that CSA adoption can significantly improve smallholder productivity in Kenya. Future research should focus on scaling up these practices and understanding the long-term sustainability of CSA interventions. Government policies should incentivize the adoption of CSA by providing subsidies for inputs, training programmes for farmers, and infrastructure support to facilitate sustainable agricultural development. Climate-Smart Agriculture, Smallholder Productivity, Kenya, Mixed-Methods Research The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African, Smallholder, Adaptation, Mitigation, Carbon Footprint, GIS, Participatory Monitoring*

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