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Does integrated soil fertility management improve the food security of Ethiopian farmers? Empirical evidence in the context of climate change

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Abstract

Integrated soil fertility management (ISFM) has been increasingly promoted as a sustainable, climate-smart agricultural solution. It jointly abates land degradation, climate shocks, productivity decline and food insecurity. At the smallholder level, adoption is still quite low despite its tremendous benefits. So far, there is insufficient evidence of the effect of ISFM on food security, especially at the household level. Therefore, we examine the drivers of smallholder farmers' adoption of ISFM and the impact of adoption on their food security outcomes based on two alternative food security measures (i.e., food consumption expenditure per adult equivalent and food insecurity experience scale). We use data obtained from the Ethiopian Socioeconomic Survey conducted in 2021/22. For our empirical analysis, we employ an endogenous switching regression (ESR) that accounts for both heterogeneity in adoption decisions and unobservable farm characteristics. As a robustness check, we also use pooled and fixed-effect instrumental variable models using additional data from the 2018/19 survey. The results from the first stage of the ESR model clearly show that land size, livestock size, access to credit, access to extension services, land tenure, off-farm activities and community watershed activities significantly enhance ISFM adoption. The treatment effect analysis reveals positive and significant gains in food security for both adopters and non-adopters, with the Average Treatment Effect on the Untreated (ATU) exceeding the Average Treatment Effect on the Treated (ATT). This indicates that overcoming adoption barriers yields the highest marginal returns to food security for current non-adopters. To unlock these benefits, policy interventions should prioritize formal credit access, tenure security, income diversification, and tailored extension training.

Keywords: Adoption, ESR, Ethiopia, food security, impact, integrated soil fertility management

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