



Solar-Powered Irrigation Adoptions Among Northern Nigerian Smallholder Farmers: A Multi-Year Impact Assessment

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Abstract

Solar-powered irrigation systems have been introduced to address water scarcity in northern Nigeria, where smallholder farmers face significant challenges with traditional irrigation methods. A mixed-method approach combining quantitative surveys and qualitative interviews was employed to gather data on farmer perceptions, practices, and outcomes from to . Solar-powered irrigation adoption showed a significant increase from 20% in the first year to 45% by the third year among surveyed farmers (confidence interval: 95%). The multi-year study reveals that solar-powered irrigation has positively impacted water usage, economic returns, and environmental sustainability for smallholder farmers. Policy makers should incentivize further adoption of these systems through subsidies and improved infrastructure to enhance agricultural productivity in the region. solar irrigation, smallholder farmers, Nigeria, impact assessment Model estimation used $\hat{\theta} = \operatorname{argmin}\{\theta\} \operatorname{sumiell}(y_i, f\theta(\xi)) + \lambda \operatorname{Vert}\theta \operatorname{rVert} 2^2$, with performance evaluated using out-of-sample error.

Keywords: Sub-Saharan, Smallholder, Solar-Powered, Irrigation, Adoption, Methodology, Sustainability

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