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Solar-Powered Irrigation Systems in Tanzanian Villages: An Economic and Environmental Assessment

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Abstract

Solar-powered irrigation systems (SPIs) have been introduced in Tanzanian villages to improve agricultural productivity and sustainability. Despite their potential benefits, adoption rates remain low, highlighting a need for comprehensive assessments. The study employed a combination of household survey data collected from 150 farmers using an online platform, alongside semi-structured interviews with 20 village leaders. Data analysis included econometric modelling for economic outcomes and thematic analysis for environmental impacts. A significant proportion (43%) of surveyed households reported increased crop yields due to SPIs, while over half observed reduced water usage from traditional irrigation methods. The findings suggest that SPIs can be economically beneficial with potential environmental savings, though higher initial costs and technological challenges need addressing for wider adoption. Policy makers should consider subsidies or grants to reduce upfront investment barriers. Farmers require training on maintenance and operation to maximise benefits.

Keywords: *Tanzania, Geospatial Analysis, Participatory Action Research, Renewable Energy, Sustainability Studies, Rural Development, Quantitative Methods, Qualitative Inquiry*

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