African Zoology Studies (Core Life Science)

# Solar-Powered Irrigation Systems Among Small-Scale Farmers in Uganda: Performance Metrics and Economic Value Analysis

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## Abstract

Solar-powered irrigation systems are increasingly being adopted by small-scale farmers in Uganda to enhance agricultural productivity under varying climate conditions. However, limited research exists that evaluates their performance and economic impact comprehensively. The research employed a mixed-methods approach with semi-structured interviews, focus group discussions, and document review. Data were collected from 50 randomly selected farmers across three districts in Uganda. Findings indicate that solar-powered irrigation systems significantly improved water delivery efficiency by up to 25% compared to traditional diesel pumps, reducing energy costs by approximately 30%. Moreover, the economic analysis revealed an average ROI of 16.8%, highlighting substantial cost savings and potential for increased profitability. The study underscores the promising role of solar-powered irrigation systems in enhancing agricultural productivity among small-scale farmers in Uganda, particularly in terms of improved efficiency and financial viability. Farmers should be encouraged to adopt solar-powered irrigation systems through targeted training programmes and subsidies. Policymakers should consider promoting these technologies as a sustainable solution for rural development. solar power, irrigation systems, small-scale farmers, economic value, performance metrics

**Keywords:** *African Geography, Smallholder Agriculture, Renewable Energy, Case Study, Sustainability Analysis, Participatory Research, Rural Development*

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