Enhancing Solar Irrigation Efficiency in Ethiopian Highlands: An Economic Impact Analysis

Mekonnen Abraha[1]

[1] Department of Research, Ethiopian Public Health Institute (EPHI)

Published: 23 April 2012 | **Received:** 24 December 2011 | **Accepted:** 04 April 2012

Correspondence: mabraha@yahoo.com

DOI: 10.5281/zenodo.18974768

Author notes

Mekonnen Abraha is affiliated with Department of Research, Ethiopian Public Health Institute (EPHI) and focuses on Energy research in Africa.

Abstract

Solar irrigation has emerged as a critical solution for enhancing agricultural productivity in arid and semi-arid regions of Ethiopia's highlands, where water scarcity is prevalent. The methodology involves a comparative analysis of data from 50 randomly selected farms equipped with solar irrigation systems versus those using conventional water pumps over two growing seasons. Data on yield, input costs, and profitability were collected and analysed using a mixed-effects model. Solar irrigation systems demonstrated an average increase in crop yields by 20% compared to traditional methods, primarily in crops like maize and beans. The findings suggest that solar irrigation significantly reduces operational costs for farmers while increasing their profitability. The mixed-effects regression model estimated a mean effect size of the solar system on yield improvement at 19% with robust standard errors around ±2%. Given these results, policymakers should prioritise the deployment of solar irrigation systems to smallholder farmers in Ethiopia's highlands, considering both financial and environmental benefits. The empirical specification follows $Y = \vec{\beta}_{0+\beta} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African Geography, Solar Energy, Irrigation Systems, Economic Modelling, Smallholder Agriculture, Renewable Resources, Technological Assessment*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

✉ REQUEST FULL PAPER

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa

Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge