



Solar-Powered Irrigation in Maize Farmers of Northern Ethiopia: Adoption Rates and Socio-Economic Implications

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Abstract

Solar-powered irrigation is an innovative technology that can significantly improve agricultural productivity in arid regions such as northern Ethiopia where rainfall is unpredictable and water resources are scarce. A structured questionnaire was administered to a representative sample of 300 maize farmers across four major districts in northern Ethiopia. Data were collected on farmer demographics, current irrigation practices, perceived benefits, and barriers to adopting solar-powered systems. Solar-powered irrigation adoption rates among sampled farmers varied significantly (45% vs. 28%, $p < 0.05$) between male and female farmers, with higher adoption observed in districts with better access to solar energy infrastructure. The socio-economic benefits of solar-powered irrigation are substantial but unevenly distributed across different farmer groups and geographic areas. Policy recommendations include targeted awareness campaigns for female farmers and investment in rural electricity networks. Develop tailored agricultural extension programmes, provide subsidies for low-income farmers, and integrate solar energy into national development plans to enhance the diffusion of this technology.

Keywords: Ethiopia, Solar-Powered Irrigation, Adoption Rates, Maize Farmers, Arid Regions, Techno-economic Analysis, Sustainability Models

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