



Enhancing Drip Irrigation Efficiency in Northern Ghanaian Drylands: Adoption Strategies and Engineering Approaches

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Abstract

Drip irrigation is a water-saving technique that has been increasingly adopted in various arid regions to enhance agricultural productivity and sustainability. A mixed-methods approach was employed, integrating surveys, interviews, and observational data collection to identify factors influencing drip irrigation adoption in the field of engineering. Data analysis revealed that initial investment costs and perceived reliability were key barriers to adoption, with a proportion (35%) of respondents indicating significant concerns about system longevity and performance. This study provides insights into the challenges faced by farmers adopting drip irrigation in northern Ghanaian drylands, highlighting the importance of addressing financial and technical uncertainties for wider implementation. Recommendations include targeted subsidies to reduce initial investment costs and enhanced training programmes on system maintenance and repair to increase reliability and farmer confidence. The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u + \text{varepsilon}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Dryland Systems, Precision Agriculture, GIS Applications, Remote Sensing, Participatory Rural Appraisal, System Dynamics*

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