Intelligent Irrigation Systems on Coffee Plantations: A Case Study in Costa Rica and Madagascar

Razanandehy Andriamaina[1,2]**, Antoine Rakotoharinirina**[3]

[1] University of Fianarantsoa

[2] National Centre for Applied Research on Rural Development (FOFIFA)

[3] Department of Civil Engineering, University of Fianarantsoa

Correspondence: randriamaina@aol.com

Author notes

Razanandehy Andriamaina is affiliated with University of Fianarantsoa and focuses on Engineering research in Africa. Antoine Rakotoharinirina is affiliated with Department of Civil Engineering, University of Fianarantsoa and focuses on Engineering research in Africa.

Abstract

Coffee production in Costa Rica and Madagascar is significantly affected by climate variability and water scarcity during critical growth stages. Inadequate irrigation leads to reduced yields and quality, necessitating innovative solutions. A mixed-methods approach combining quantitative data analysis and qualitative interviews was employed. In Costa Rica, a randomized controlled trial tested different watering schedules; in Madagascar, surveys assessed farmers' perceptions of the system's effectiveness. In both regions, intelligent irrigation systems led to an average increase of 15% in coffee yield compared to traditional methods, with significant reductions in water usage. Farmers in Madagascar reported a 20% improvement in soil moisture levels post-implementation. Intelligent irrigation systems have proven effective in enhancing coffee yields and resource efficiency without compromising environmental sustainability. Farmer training played a crucial role in system adoption and success. Communities should be provided with ongoing support to ensure sustained benefits from the technology, including technical assistance and financial incentives for farmers adopting these systems. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

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