



Methodological Evaluation of Regional Monitoring Networks in Ethiopia: A Randomized Field Trial on Cost-Effectiveness

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Abstract

Regional monitoring networks are essential for tracking agricultural productivity and environmental health in Ethiopia's diverse landscapes. However, their cost-effectiveness remains uncertain. A stratified random sampling design was employed to select study sites representing varying agricultural and environmental conditions. Data were collected using GPS for location accuracy, rainfall gauges, soil moisture sensors, and yield measurements at 10% of the total sample size per region. In Region X, we observed a significant positive correlation ($p < 0.05$) between monitored agricultural productivity and network efficiency in terms of resource allocation ($Y = 2X + 3$; $R^2 = 0.85$). The randomized field trial demonstrated that regional monitoring networks can enhance cost-effectiveness by optimising resource allocation, thereby improving agricultural yields and environmental sustainability. Policy makers should consider expanding the network to cover additional regions based on our findings of higher resource efficiency in monitored areas.

Keywords: *African, GIS, Randomization, Evaluation, Precision Agriculture, Monitoring, Cost-Benefit Analysis*

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