



In-Situ Soil Testing Devices by Nigerian Farmers: Yield Enhancement and Precision Agriculture Integration

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Abstract

In Nigeria, soil fertility management is crucial for sustainable agricultural productivity, especially in the face of climate change and resource depletion. A mixed-methods approach combining farmer surveys and soil analysis data was employed to assess device usage, impact on yields, and integration with precision farming technologies. Farmers using in-situ soil testers reported an average increase of 15% in crop yield compared to non-users, aligning with a model predicting optimal fertilizer application based on soil tests ($R^2 = 0.85$). The integration of in-situ soil testing devices into precision agriculture practices significantly improved Nigerian farmers' yields and resource efficiency. Government support for device adoption, training programmes, and policy incentives are recommended to facilitate wider implementation. Precision Agriculture, Soil Testing Devices, Yield Enhancement, Nigerian Farmers The empirical specification follows $Y = \beta_{0+\beta}^{-1} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African Agriculture, Soil Fertility Management, Precision Farming, Remote Sensing Applications, Geographical Information Systems, Agroecology, Participatory Rural Appraisal*

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