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Precision Agriculture Techniques in Ethiopian Highlands: A Two-Year Field Trial Assessment and Economic Evaluations

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Abstract

Precision agriculture techniques have shown promise in increasing crop yields and reducing resource inputs in various regions. The Ethiopian Highlands present a suitable environment for such interventions due to their diverse agricultural practices and climate conditions. The research employed a randomized controlled trial design, where plots were divided into treatment (precision agriculture) and control groups. Data on crop yields, input usage, and financial performance were collected using statistical models to evaluate precision agriculture's impact on key variables such as water use efficiency and nitrogen application rates. Precision agriculture techniques demonstrated a consistent yield increase of 15% in maize crops compared to conventional practices, with significant reductions in water usage by approximately 20%. The study provides robust evidence supporting the adoption of precision agriculture for sustainable agricultural development in the Ethiopian Highlands. Policy makers should consider promoting precision agriculture through subsidies and training programmes to maximise its benefits across different farming communities. Model estimation used $\hat{\{\theta\}}=argmin\{\theta\}sumiell(yi,f\theta(\xi))+\lambda lVert\theta rVert2^{2}$, with performance evaluated using out-of-sample error.

Keywords: *Ethiopia, GIS, GPS, SMART, econometrics, precision farming, agroecosystems*

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