



Methodological Evaluation of Process-Control Systems in South Africa: A Randomized Field Trial on Yield Improvement

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Abstract

This study evaluates process-control systems in South African agricultural settings to enhance yield improvement. A randomized controlled trial was conducted across multiple farms, with a focus on implementing precision agriculture technologies. Data collection included pre- and post-trial yield measurements, weather data, and operational process controls. In one of the trials, there was an observed increase in maize yields by 12% when using adaptive irrigation systems compared to traditional methods, with a 95% confidence interval for this improvement. The study validated the effectiveness of adaptive irrigation systems in enhancing crop yield under controlled conditions. Future research should focus on broader adoption and integration of these technologies across various crops and farming regions in South Africa. Precision agriculture, process control systems, randomized field trial, yield improvement The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: African Agriculture, Randomized Control Trial, Process-Of-Change, Quality Function Deployment, Lean Six Sigma, Precision Farming, Statistical Process Control

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