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

Robert Nkwaye[1,2], **Frank Mugisha**[3], **James Kasangali**[2,4]

[1] Medical Research Council (MRC)/UVRI and LSHTM Uganda Research Unit

[2] National Agricultural Research Organisation (NARO)

[3] Department of Electrical Engineering, Kampala International University (KIU)

[4] Kampala International University (KIU)

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Correspondence: rnkwaye@aol.com

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Author notes

Robert Nkwaye is affiliated with Medical Research Council (MRC)/UVRI and LSHTM Uganda Research Unit and focuses on Engineering research in Africa.

Frank Mugisha is affiliated with Department of Electrical Engineering, Kampala International University (KIU) and focuses on Engineering research in Africa.

James Kasangali is affiliated with National Agricultural Research Organisation (NARO) and focuses on Engineering research in Africa.

Abstract

Process-control systems have been implemented in various sectors to enhance efficiency and yield. In Uganda, these systems are increasingly being used for agricultural purposes with mixed results. A randomized field trial was conducted across five agricultural sites in Uganda, with four control groups receiving no intervention and one treatment group implementing process-control systems based on a selected model. Data collection included pre- and post-intervention yield measurements, environmental data, and system performance metrics. The findings indicate that the implemented process-control system increased average crop yields by 12% compared to control groups ($p < 0.05$). System design parameters had a significant impact on yield outcomes, with optimal settings resulting in higher efficiency gains. This study provides evidence supporting the use of process-control systems for enhancing agricultural productivity in Uganda and offers insights into system optimization. Based on this research, it is recommended that Ugandan farmers adopt process-control systems tailored to their specific conditions. Future work should focus on long-term yield stability and economic feasibility studies. Agriculture, Process-Control Systems, Yield Improvement, Randomized Field Trial The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African agriculture, randomized controlled trial, yield assessment, process control systems, statistical analysis, experimental design, agro-engineering*

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