



# Methodological Evaluation of Manufacturing Plant Systems in Ethiopia: A Randomized Field Trial on Efficiency Gains

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## Abstract

Recent studies have highlighted the need for methodological improvements in evaluating manufacturing plant systems across Ethiopia. The research employs a randomized field trial design with a sample of 120 manufacturing units. Data collection includes production output measurements, operational costs, and input variables such as labour and materials. A significant proportion (35%) of the variance in output efficiency is attributed to variations in plant management strategies, with an average improvement rate of 18% noted across randomized groups. The study concludes that adopting more efficient management methodologies can lead to substantial productivity improvements in Ethiopian manufacturing sectors. Manufacturers and policymakers are recommended to implement evidence-based management practices to enhance efficiency and competitiveness. The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u_i + \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Ethiopia, Geographic Information Systems (GIS), Lean Manufacturing, Simulation Modelling, Benchmarking, Quality Function Deployment (QFD), Process Mapping

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