DESIGN, FABRICATION, AND PERFORMANCE EVALUATION OF AN INTERMEDIATE BULK CONTAINER (IBC) BIOGAS DIGESTER USING FRUIT AND VEGETABLE CUTTINGS AS WASTE MATERIALS

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ABSTRACT

GASPAR, JASPHER JAKE A. and MATIC, JOHN GLENN L., Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Munoz, Nueva Ecija, **July 2023. DESIGN, FABRICATION, AND PERFORMANCE EVALUATION OF AN INTERMEDIATE BULK CONTAINER (IBC) BIOGAS DIGESTER USING FRUIT AND VEGETABLE CUTTINGS AS WASTE MATERIALS.**

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Biogas technology offers a sustainable solution for converting agricultural wastes into energy. This study focuses on utilizing fruit and vegetable cuttings (FVCs), often discarded improperly after the harvesting season, as substrates in a biogas digester. The research aims to develop and construct an Intermediate Bulk Container (IBC) biogas digester with an incorporated stirring mechanism. The main objective is to assess the impact of different stirring intervals on various parameters, including temperature, pH, biogas yield, and biogas flame.

The study was conducted at the CEn Engineering Farm over a period of three months, from March to May 2023. The digester's retention time and performance were influenced by factors such as digester volume, loading rate, and substrate characterization. The stirring intervals investigated were 6hr, 12hr, and 18hr at 1000 rpm.

The results revealed that stirring at intervals of 6hr and 12hr did not show significant variations in the assessed parameters. However, the treatment with an 18hr stirring interval exhibited notable differences. The biogas production rate for the IBC digesters using the 6hr, 12hr, and 18hr intervals was measured at 7.09 L/day, 6.85 L/day,

and 5.44 L/day, respectively. Remarkably, the biogas flame exhibited a blue hue across all treatments, indicating the presence of methane, as confirmed by the flame test.

This study provides valuable insights into the design and fabrication of an IBC biogas digester and the influence of stirring intervals on biogas yield and related parameters. The findings contribute to the optimization of biogas production from FVCs and highlight the importance of considering stirring intervals for enhanced digester performance. Future research can focus on exploring other factors and optimization techniques to further improve biogas production efficiency and sustainability.

Keywords: biogas technology; fruit and vegetable cuttings; biogas yield; waste utilization; stirring mechanism

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