

## **OPTIMAL CHARACTERIZATION OF ORGANIC MARKET WASTE FOR BIOGAS PRODUCTION: CASE STUDY NYERI COUNTY.**

**Victor Mbithi, Humphrey Lumadede, Lucy Wangai.**

**Kenya Industrial Research and Development Institute KIRDI**

### **ABSTRACT**

Solid waste management remains one of the development challenges globally, nationally, Countywide and at the municipality level. Waste characterization is the first step to a successful waste management system. This paper explores the trend of solid waste generated in Nyeri county which has implemented a waste segregation system for its markets in its town. To determine the potential use of waste, generate in production of biogas as feedstock. Substrate was collected from designated bins before being milled and pretreated. Elemental composition obtained was used in calculating theoretical methane potential found to be 622.769 mL CH<sub>4</sub> /g VS added. Total Solids TS, Volatile Solids VS, Total Organic Carbon (TOC) obtained were 24.6% (w/w), 21.1% (w/w) and Dry matter (DM) at 41% respectively. The Biomethane Potential (BMP) study was done in a batch assay process with the use of bioreactors where the Gas produced was analyzed, with methane CH<sub>4</sub> 59%, Carbon dioxide CO<sub>2</sub> 36%, nitrogen 3%, hydrogen 1%, Hydrogen Sulfide 0.7%. The number of runs used in this experiment was 9 and the factors were determined by Experimental Design 13 i.e. Central Composite Design (CCD). The highest specific cumulative methane yield produced was 571.00 mL CH<sub>4</sub> g<sup>-1</sup> VS with the highest biogas produced per gram of VS being 764.5mL CH<sub>4</sub> g<sup>-1</sup> VS added. The information available in the paper will be useful for the design and operation of anaerobic digesters: Optimization of the mix of co-substrates, choice of the applied Organic loading Rate (OLR), simulation of methane production and of the rate feedstock degradation.

Key words: Waste Characterization, Feedstock, Organic Loading Rate, Biomethane Potential.