

Suitability of Kibuye Market Organic Waste for Composting as a Means of Solid Waste Management for Kisumu City John O Oloo

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Abstract

Purpose: Organic waste comprises most of the waste in dumpsites in Kenya and this causes environmental challenges at such sites. With Kisumu as a case study, the purpose of this work was to explore the suitability of organic wastes from Kibuye market, hotels and livestock farms for compost manure making as a means of organic solid waste management.

Methods: The study was cross-sectional in design. Compost manure was prepared from organic market waste, hotel food remains and livestock dung. Samples were then taken to a laboratory to test for the content of nitrogen, phosphorous (P₂O₅) using TES/06/TM/21 and TES/06/TM/24 methods respectively and potassium (K₂O) using Atomic Absorption Spectrometry (AAS) method as well as for heavy metals (Cd, Cu, Fe, Pb) while the Ph of the compost was tested by KS-158 method.

Results: Laboratory tests for the presence of important crop elements were Nitrogen (0.4%), Phosphorous (0.4%), and Potassium (0.9%) whereas for heavy metals were Cd=Nil, Cu=10.1, Fe=1.08, Pb=Nil, and pH=8.4.

Conclusion: It is safe to use organic waste from Kibuye as augmented by those from hotels and livestock farms for composting as a means of organic solid waste management if other supporting systems are in place. **Keywords:** Organic solid waste; Composting; Organic manure; Dumpsites; Heavy metals contaminants; Hotel food waste

Sustainable Integrated Solid Waste Management (ISWM) is one of the important obligatory functions of any Urban or City authority. It refers to all activities pertaining to the control, collection, transportation, processing, treatment and disposal of wastes in accordance with sustainability principles. The fundamental objective of solid waste management is to protect the health of the public, promote environmental quality, and create employment through a circular economy of waste resources. Many urban centers in Kenya, including Kisumu City, generate a lot of organic matter. However, proper management of such wastes have proved a challenge nationally. Consequently, a larger proportion of such waste end up in drainage channels, open spaces and municipal dumpsites where they are poorly managed thus clogging them. Even though the advantages of organic manure are widely known; advantages which include increasing soil fertility, improving soil physical conditions and microbiological conditions as well as crop yield, lack of knowledge of their exact nutritive value and possible

contaminants deter farmers from utilizing them on their farms. Consequently, they are left to fill dumpsites, be fed on by scavenging livestock and birds or left to decay thereby emitting repugnant odours and greenhouse gases which cause air pollution. These gases contribute to global warming with its attendant environmental hazards. In order to contribute to the mitigation of these effects, this study sought to determine the suitability of organic wastes from Kibuye market for compost manure as a means of solid waste management in Kisumu City. Specifically, this study assessed the nutritive value of such manure and the presence of heavy metal contaminants.

Organic wastes from markets and hotels, when captured at source, often escape this contamination. Even though heavy metals occur naturally in the environment, when their concentrations exceed a certain limit, they become toxic to plants and humans. The availability of heavy metals for plant uptake and the actual uptake by plants is greatly a function of soil pH besides other factors such as plant absorption and metabolism characteristics. Studies indicate that the lower the pH value, the more available heavy metals are for plant uptake. Our findings indicated that the pH for the compost was 8.4, which is within the acceptable range (6.5-8.5) for most plants to grow and limit the availability of heavy metals according to Kenyan standards. Even though pH may fluctuate in soil overtime, the value of our compost is suitable for farms and limits the availability of heavy metals for plant uptake in a manner not to cause toxicity.

Since the compost manure was free from heavy metal pollution according to Kenyan and International standards, it can be utilized as a means of solid waste management in Kisumu City. This will have the triple advantage of: 1) sustainably managing organic solid waste which comprise the greater percentage of solid wastes reaching Kisumu's dumpsite, 2) creating business and 3) improving food production through improved soil quality in the region. This is particularly important noting that a greater proportion the organic waste reaching the dumpsite comes from Kibuye market and hotels. Their utilization for compost making, therefore, is a viable and promising way to sustainably manage them. Furthermore, almost all of the city's waste can be managed this way if separation at household can be achieved, as is recommended by other studies. Already, the City, through its manager, Doris Ombara, has indicated that the City plans to manage its organic waste through composting and

biodigesters. However, in order for such initiatives to succeed, as the objective of this study envisions, further steps need to take place. Such include waste separation at source to avoid contamination, awareness creation among farmers regarding the importance of compost or organic manure, regular testing of

compost for nutrient content and possible contamination, creation of space(s) for composting at the City level and proper marketing of the composts.

Keywords: Organic solid waste; Composting; Organic manure; Dumpsites; Heavy metals contaminants; Hotel food waste.