Waste to Treasure: Vegetable Waste Decomposition for Organic Fertiliser Production

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Abstract

Globally, about 1.3 billion tons of food waste is generated annually from production to consumption stage. The phenomenon is attributed to increasing population rate and consumption dynamics with implication for the quantity and forms of waste generated. While sustainable waste disposal is a problem globally, in Sub Saharan Africa, the situation is stark. In this region, waste management issues intercept with food security, agricultural production and health. In this paper, I try to integrate waste management and agriculture development through vegetable waste decomposition approach. The findings from the experiment showed that vegetable waste can be useful for agricultural production. By using vermicomposting method, selected vegetables were processed into liquid organic fertilizer. With the availability of vegetable waste in communities, the experiment can be replicated using other types of food waste. This means that, we can achieve triple developmental objectives, namely agricultural, health and environmental, from vegetable waste recycling.

Keywords: Vegetable Waste, decomposition, worm Culture, fertilizer, food security.

Introduction

Food waste is one of the leading developmental issues of this era as 1.3 billion tons of food waste annually (FAO, 2011). These tons of waste generated are produced from the agriculture production stage through to consumption. Food waste comes from different sources including, restaurants, markets, schools, homes and even farms (Thyberg and Tonjes, 2016). The increasing population growth is in tandem with food consumption rate. Both processes lead to food waste generation in terms of quantity and form. In current environmental debates, food waste has also been associated with greenhouse gas emission, which affects climate conditions. These changes in weather do negatively impact crop yield and the food supply chain (Goddey

et al., 2021). The socioeconomic dynamic of food waste affect food security in a broader sense (Safdie, 2024).

Sustainable waste disposal is a problem globally where less than 20 percent of global waste is estimated to be recycled (Alves, 2023). The linkage between food waste and recycling is however stark in Sub Saharan Africa where climate crisis, food insecurity and agrarian stress result into development issues. Vegetable waste makes up the majority of the food waste category. Vegetable waste is so widespread that it causes an imbalance in the allocation of food resources. Due to consumer preferences and market inefficiencies (HLPE,2014), large amounts of vegetables are wasted in certain locations, yet in others there are severe shortages, which makes people more likely to suffer hunger and malnutrition.

The discarding of edible parts of vegetables becomes a critical problem as the globe navigates the dynamic terrain characterised by population expansions (Salvador, 2019), evolving food trends, and environmental difficulties. The demand for fresh vegetables rises in conjunction with population growth. Consequently, a significant portion of vegetables never make it to the plates. This in turn leads to food insecurity and hunger. In SSA region, waste management issues intercept with food security, agricultural production (McLaughlin and Kinzelback,2015) and health. In this paper, I integrate waste management and agriculture development through vegetable waste decomposition approach. This is an approach in which vegetable waste is used to produce liquid organic fertiliser using worm culture. The argument is that, the processing of vegetable is useful for the agricultural sector which is already undergoing many production difficulties on the African continent.

Methodology

This paper incorporates the issue of food waste, waste management and agriculture development through decomposition of vegetable waste. This experimental procedure utilised vegetable waste from various sources which included market and household. The main mechanism used for decomposition was worm culture known as vermicomposting. Vermicomposting is when worms are used to decompose organic waste to breakdown its nutrient components.

Aside vegetable waste which was used as the main source of producing organic fertiliser, other materials were added to enhance the nutrient concentration. The experiment used cabbage, lettuce, taro leaves and spring onions. The other materials used in the experiment were saw

dust, green trimmings, poultry manure and black soil. Ilangovan *et al*. (2022) also used vermicomposting technique where fish waste was the main material.

Vermicomposting entails the use of various materials collected layered in a gallon where the decomposition process occurs. The first material used for the layering was saw dust, after which the vegetable waste collected was added. The worms collected from the environment were then placed on top of the vegetables. These worms were collected from the environment. Following that, some poultry manure was introduced. Plant waste such as trimmings and trimmed grass were then added to it. Black soil was added to complete the layering process. An adequate amount of water was added which did not make the material set-up excessively droopy, and this was constantly done for the entire period of the set-up.

The set-up was kept for exactly for six weeks to ensure that adequate amount of leachate would be produced as organic fertiliser. Laboratory analysis was performed on the leachate produced to check the nutrient concentration in the organic fertiliser produced.

Results

Leachate was produced from the decomposition process, and this was used as organic fertiliser. The analysis of the leachate showed the following results for plant nutrients concentration (mg/L); P = 0.02, Ca = 1230, Zn= 0.173, N = 805.20, Co = <0.002, Cr= 0.023, K = 60800, Mn= 0.581, Mg =214.57, Fe= 1.238 and Cu=0.070.

Some nutrient concentration from the laboratory analysis were not high due to the fact that the amount of vegetable waste used was not sufficient and this was also associated to limited variety of vegetable waste used (see Patel, 2023) for more discussion on the process.

Conclusion

Although food waste cannot be stopped completely, it can be recycled to be a treasure. Liquid organic fertiliser produced from the decomposition of vegetable waste can be used in crop production and environmentally sustainable manner. Agriculture production uses fertiliser for soil fertility improvement to improve crop growth and health. This would help a long way in producing yields to reduce food insecurity. Again, this entire procedure becomes a cyclical process since some amount of food waste will always be produced. Hence, it can be argued that vegetable waste use should be a policy priority in liquid organic fertiliser production to solve agriculture and food security needs.

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