

# Composting as a Sustainable Waste Management Method in Katsina Metropolis, Northern Nigeria

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**Abstract**—Composting is one of the universally accepted methods of waste disposal which has become a waste management option in the developing countries. It is widely practiced in Katsina metropolis, northern Nigeria as most of the waste produced is organic in nature. Composting in the metropolis is undertaken in different refuse collection facility by different age groups using simple implements. The manure collected is transported by different means of transportation and practiced mainly during the dry season to supply manure to the farms around the metropolis. It has assisted greatly to reduce the amount of waste that need to be evacuated by the waste management agency. However, there are problems associated with composting such as inadequate safety measures, occupational hazards among others. These problems need to be solved to make composting a sustainable waste management option in Katsina metropolis.

**Index Terms**—Composting, Katsina metropolis, sustainable, waste management.

## I. INTRODUCTION

Composting is the biological process of breaking up organic waste such as food waste, manure, leaves, grass trimmings, paper worms and general house hold wastes etc into an extremely useful humus-like substance by various micro-organisms including bacteria, fungi and antinomycetes in the presence of oxygen[1]. Composting is often described as nature's way of recycling is a key ingredient in organic farming. At the simplest level, the process of composting simply require making a heap of wetted organic matter (leaves, food waste) and waiting for the materials to breakdown into humus by undergoing biological decomposition after a period of weeks or months[2].

Composting is one of the four universally accepted methods of waste disposal and it is a method of converting organic materials into a drier-odoriferous form through bacterial action, primarily to supply humus to the soil [3]. Today composting is gradually becoming a low technology waste management option in the developing countries which accounts to its widespread adoption as a waste management option and means of fertilizing the soil for increased food production.

The study area Katsina metropolis located at the extreme northern margin of Nigeria, covers a total land area of about 3,370 square kilometres and lies between latitudes 11°08'N and 13°22'N and longitude 6°52'E and 9°20'E[4].

Katsina is a city (formerly a city state) that is a local government headquarter and is the capital of Katsina State

that was created in 1987. The climate is Tropical Continental type that is hot and dry for most of the year. Maximum day temperature is about 38°C in the months of March, April and May is common and the minimum temperature is about 22°C in the month of December and January. The mean annual rainfall is 780mm [4]. As of 2007, Katsina's estimated population was 459,022 which have increased today due to natural increase and immigration. Katsina is the center of an agricultural region producing groundnuts, cotton, hides, millet and guinea corn [5]. Furthermore in and around the urban area, there are farming systems such as household or home gardening, open or vacant space cultivation and peri-urban cultivation [4].

The aim of this paper is to examine composting as a method of waste management and how it can be a sustainable waste management option in the metropolis.

The methods adopted in data collection include reconnaissance survey of the composting sites in refuse collection centers and refuse dumps. Ten sites were randomly selected in different parts of the metropolis. The people involved in composting were interviewed and photographs of sites were snapped and included in the paper. The data collected was then analysed using descriptive analysis in terms of tabulation, averages, percentages etc.

## II. COMPOSTING IN KATSINA METROPOLIS

Katsina metropolis like many other cities in developing nations has being experiencing increase in population growth, and urbanization. This means increase in the number of people, residential and commercial areas which generate waste materials on daily basis [6]. The waste materials generated can be classified as municipal solid waste (MSW) which is a heterogeneous mixture of various kinds of solid wastes including biodegradable food waste and non-biodegradable solid waste like polythene bags, glass, rags, metal items etc. Most of the wastes are from residential houses that generate mainly all waste food articles, vegetable peelings, fruit peelings etc. These wastes are organic in nature and thus decompose quickly [7]. This accounts for the high rate of composting of waste in the metropolis.

From the table above it could be observed that composting sites are located at refuse collection centres (RCC) constructed by the state government in 50% of the sampled sites. Twenty per cent (20%) of the sites are located on undeveloped plots of land that were converted to refuse dumps by the people. The remaining sites (20%) are located on open spaces, dry pond uncompleted structures.

The sample of composting sites in the metropolis is shown on the Table I below.

Manuscript received June 20, 2013; revised September 5, 2013.

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TABLE I: COMPOSTING IN REFUSE DUMPS IN KATSINA METROPOLIS

S/N	Refuse collection facility and location	People involved	Implements used
1	Refuse collection center (Behind ATC)	Adult males aged 50 – 55 years	Shovel, digger
2	Underdeveloped plot (Beside Central Market)	Children males age range 10 – 15 years	Rake Shovel Bare hands
3	Open space (Yahaya Madaki Road)	Adult males age range 55 – 60 years	Digger Shovel Bare hands
4	Refuse dump along the road	Youth males and aged man (20 – 25 and over 60 years)	Bare hands Shovel
5	Refuse collection centre (Opposite Ladan Wapa)	Middle aged males (40 – 50 years)	Shovel and digger
6	Undeveloped plot (Shararar Pipes)	Middle aged males (40 – 50 years)	Shovel Digger
7	Dry Pond (Rafindadi)	Youth and middle aged males (18-20 and 40-45 years)	Shovel Diggers Rake
8	Uncompleted structure (Unwala)	Middle aged (40 – 49 years)	Shovel Digger
9	Refuse collection centre (Gwan-Gwan)	Youth males (15 – 25 years)	Shovel Digger
10	Refuse collection centre (Tudun Wada)	Youth males (15 – 25 years)	Shovel Digger

Source: Field Work 2013

The people involved in terms of gender are predominantly males due to the hard and hazardous nature of the composting work. Those involve cut across all age group from the youth to middle aged and even the old. Fifty per cent (50%) of the people when interviewed say they engage in composting to sell the bags of manure to farm owners. Twenty five (25%) say they are hired labourers who work for farm owners that require the manure. The remaining (25%) are peasant farmers who collect the manure gathered from the sites for fertilising their farmlands. All the people involved have no formal education and belong to the class of people of low socio-economic status.

Shovel and digger are the two pair of implements used in about 90% of the sites. The digger is used to dig the refuse while the shovel is used to move the waste material out for sorting. However a small percentage of the people involved use their bare hands to dig and move the refuse materials. Rake is another implement used for moving the refuse out and for sorting out the waste materials.

The sorting is done to remove the organic materials that have been composted with the inorganic materials such as polythene bags, stones, glass, rubber, plastic rags, metals and iron. This is the most difficult part of the composting process as it takes time to sort out the inorganic substance and thus slow down the amount of compost to be gathered.

After the sorting the compost is then put into empty cement bags and parked aside located close or far away from the city. The means of transport used include bicycles, and motor vehicles like Peugeot J5 buses, Mitsubishi van, Renault van and Tractor. There is also some youth groups in one of the composting site at Tudun Wada that use four (4) donkeys to carry the compost to nearby Yarkutungu weekly market.

Once on the farm, the compost is spread on the land in order to fertiliser it. According to the farmers interviewed the manure obtained from the compost is more beneficial to the soil than the inorganic fertiliser. It produce good yield, last longer, softens the soil, addition of vital humus and a natural pesticide for soil.

In Katsina metropolis composting of waste is usually undertaken during the dry season between the months of December to March/April before the commencement of the rains. It is important here to stress that handling of waste materials/items in the process of composting as practiced in the metropolis is associated with foul odours, dust, and smoke and health hazards. Hence some of the people involved about 30% use some form of safety measures to reduce the hazards and risks of injury involved in the composting process. These measures include use of mouth/nose cover, hand socks, strong shoes and some protective clothing.

The picture below shows the one of the sampled sites in the metropolis (see Fig. 1).



Fig. 1. One of the composting sites in Katsina metropolis at Unwala.

### III. PROBLEMS ASSOCIATED WITH COMPOSTING IN KATSINA METROPOLIS

There are several problems associated with composting in Katsina metropolis. These are highlighted below.

- 1) There are inadequate safety measures used by the workers involved. There is no adequate protection of parts of the body such as hands, mouth, nose and legs. Hence majority of the people complain of cut on the hands, respiratory ailments due to inhaling of dust and smoke, crack on the foot among other health problems.
- 2) Polythene bags used for the packing of liquids such as sachet water, packing of foods and drinks and use for packing of shopping items have become a menace to the composting process. A certain percentage of the waste materials consist of polythene which slow down the process and reduce the amount of waste to be composted to manure.
- 3) To solve the problems created polythene bags and other inorganic substances, they are usually burnt. This burning produce quite an unhealthy smoke which when inhaled for a long time can cause serious respiratory tract infections to the people around the neighbourhoods where the composting sites are located.

- 4) Occupational hazards due to health risk as the composting work has a high prevalence of infectious diseases due to their exposure to hazardous materials such as faecal matter, toxic materials, bottles and materials and heavy metals from batteries. This may tend to have an effect on the lifespan of those who engaged in composting [8].
- 5) Inadequate recognition from the waste management authority and the State Government means that they cannot receive assistance in any form to reduce the occupational hazards associated with their work or get medical services or improved tools and implements to reduce the manual nature of the work.

#### IV. CONCLUSION

Composting of waste is a sustainable method of waste management as it is environmentally friendly, income generating and beneficial to farmlands. It is a unique solution to addressing municipal solid waste problems in African cities [9]. This is important as the conventional municipal solid waste management approach based on collection and disposal has failed to provide efficient and effective services to urban residents [9].

In Katsina metropolis, composting can be a sustainable method of waste management when the problems associated with composting are solved. Besides this composting needs proper control to make the process proceed without production of odour, propagation of insect, destroy pathogens present in the original waste, destroy weed seeds, retain maximum nutrient content of N, P and K minimise time required to complete the process and minimise land requirement required for the process [10].

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