# EVALUATION OF ORGANIC WASTE GENERATION FROM HOUSEHOLDS IN MAKARFI TOWN, MAKARFI LOCAL GOVERNMENT AREA, KADUNA STATE

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## ABSTRACT

Organic wastes are wastes generated from human activities in all places of human habitation and are capable of undergoing aerobic and anaerobic decomposition with the emission of gases with obnoxious and offensive odour, air, water and land pollution which has the propensity to cause human health related problems, environmental degradation and loss of aesthetic beauty of the environment. In order to assess the organic waste generation from households in Makarfi Town, four objectives were set as thus: to investigate the types of Organic Waste generated by each household on a daily basis, to determine the quantity of Organic Waste generated on a daily basis per household, to examine the utilization of Organic Waste generated by each household and to examine the method used in the management of organic waste generated by each household in Tudun Wada Ward. Field assessment and descriptive survey design and structured questionnaire were used. 97 household were sampled out randomly in the five areas. Polythene bags were provided to each of households to be storing the organic waste generated from each homes on a daily basis for a period of five months. A calibrated weighing scale was used to weigh the organic waste generated per each household and recorded. The results obtained indicated that there is high rate of organic waste generation per household and these waste are generated more during weekends which is higher than the average of residential waste generation rate in Nigeria which is 0.45-0.65kg/person/day. 15.47% of the households utilize their organic waste for composting and animal feeding and 16.49% do not utilize their waste for any purpose, 46.39% of the households dispose their waste indiscriminately on open dumps and 21.49% recycle and reuse their waste. It is recommended that households should utilize all the organic waste generated either for composting, biogas production or use the garbage to feed animals. This will promote and enhances environmental sustainability and transformation.

**Keywords:**    **Organic Waste, Utilization, Management, Environmental Sustainability and Transformation**

## INTRODUCTION

Organic waste is a type of waste which can be broken down, in reasonable amount of time into its base compounds by micro organisms and other living things, regardless of what those compounds may be (Michelle, 2011). Guttentag, (2003) define organic waste as any waste that is capable of undergoing anaerobic

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decomposition through a biological treatment process such as food and garden waste.The organic waste stream is composed of waste of a biological origin, such as paper and cardboard, food, green and garden waste. Animal waste is usually generated as a component of most waste streams (Mason *et al.,* 2011).

Organic waste are the single largest component of the waste stream. Aproximately, 1.2 million tones of organic waste was generated in Perth capital of Australia, in 1996. 25% of this waste with other main contributors to this waste stream being manure and sluge 20%, food waste18%, paper and cardboard waste 15%. (Brunn *et al.,* 2003). Odunfa, (2008) stressed that waste generation is usually measured and reported in form of waste generated per person per day. Furthermore, the amount of waste generated varies with time, tribe, seasons, days, weeks and months. The average of residential waste generation rate in Nigeria is 0.45-0.65kg/person/day. In Abuja waste generation rate has been estimated to be 0.56kg/per/day in low density areas and 0.44kg/per/day in high density areas. This amounts to 3.36kg/dwelling unit/day in low density areas and 2.66kg/dwelling unit/day in high density areas. The Office waste generation rate is about 0.7kg person/day (Odunfa, 2008).

Organic waste attracts rodents and insects which harbour gastro intestinal parasite, yellow fever, worm, plaque, and other condition in humans (Igal *et al.,* 2003). Organic waste contamminates surface water, ground water, soil and air which cause more problems to humans, other species and ecosystem (Mason *et al.,* 2011). Decomposition of organic waste anaerobically produces gases such as methane, nitrogenous gas, carbondioxide, Hydrogen Sulphur among others.The methane produced can be used as a source of energy for cooking or electricity, the presence of these gases in the atmosphere contibutes to Greenhouse effect leading to increase in global warming (Michael & Stephen, 2008). In 1808, Sir Humphery Davy determined that methane was present in the gases produced during the anaerobic decomposition of cattle manure and garbage which can be converted and used as fuel energy for cooking and generation of electricity (Shridar, 2012). On the other hand organic waste if properly handled can be a good compost and soil enrichment fertilizer (Guttentag, 2003). The use of organic fertilizer made up of various composted material, soil organic matter contents and nutrients supply not only to plants but also for reducing the input cost of mineral fertilizer and promoting healthier environments (Unuraye, 2011). Smart, (2002) stressed that organic wastes are materials at a wrong place which can be segregated, transformed, recycled and re-used with great financial and environment benefits. This therefore is a sustainable method of organic waste management. Thus, the need for an effective management in this regard is the collection, transportation, processing, managing and monitoring of organic waste material produced by human activity and this is generally done to reduce the effect of waste on health and the environment or loss of aesthetic beauty of the environment. All waste material whether they are solid, liquid gaseous or radioactive fall within the realm of waste management (Smart, 2002).

Organic waste management is the collection,transportation, processing, recycling or disposal of organic waste material usually produced by human activities. It is an effort to reduce the effect of organic waste material on human health and the environment. For an effective waste management the "**3Rs**" (Reduce, Reuse, and

Recycle) must be properly addressed as the conerstone of organic waste minimization strategies (Uzoma, 2010).

To enable careful planning for a sustainable environmental transformation and a good  management strategy of  Organic Waste especially for agriculture, Biogas generation, and a clean and sustainable environment free of  organic waste in Makarfi of Makarfi Local Government Area, a good knowlegde of the quantities of Organic Waste generated by household on a daily basis, ways of utilization of these waste and the management strategy by each households is necessary. Therefore this paper attempts to assess the organic waste generation from households, the utilization and management of this waste for a sustainable environmental transformation.

## STUDY PROBLEM

Narayanan, (2011), observed that the main forms of organic waste in Makarfi are household food waste, agricultural waste, human and animal waste. He observed this organic waste produced foul odour when they decompose, flies infestation and may manifestation of diseases such as air, land and water diseases and also contributing to greenhouse effect and global warming. Field observation shows that alot of organic waste is generated from household activities in the study area that has brought a great concern to the inhabitants. These waste produced foul odour and flies infestation and liable to manifest air, land and water diseases.

 Literatures shows that no attempt has however been made to assess the generation of organic waste from household in Makarfi town, Makarfi Local Government Area of Kaduna State. Therefore, an assessment of the  quantity of organic waste generation and possible utilization is quite neccessary for any waste management strategy for the conversion of these waste to wealth that is Methane/biogas generation and organic manure instead of the indiscriminate disposal of these organic waste and the resultant nuisances posed by these dumps of organic waste.

## AIM AND OBJECTIVES

The aim of the study is to assess the  organic waste generation from house holds in relation to its utilization and management for a suistanable environmental transformation in Makarfi.

To achieve this aim, the following specific objectives have been set:-
1. To investigate the types of Organic Waste generated by each household on a daily basis in Makarfi Town.

2. To determine the quantity of Organic Waste generated on a daily basis per house hold in Makarfi Town.

3. To examine the utilization of Organic Waste generated by each household  in Makarfi Town.

4. To examine the method used in the management of organic waste generated by each  household in Makarfi Town.

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## STUDY AREA

Makarfi town is situated in Makarfi Local Government Area of Kaduna State. It lies between latitude $7^0 0'$ and $25^0 18'$N and Longitude $11^0 15'$ and $7^0 45'$E (BLSK, 2010). It has a total population of 2,504 as at 2006 National Head Count. Hausa and Fulani are the major tribes in the study area with minority business people of Igbos and Yorubas. About 80% of the populace engage themselves in farming and cattle rearing. Agriculture is the main occupation of the inhabitants of Makarfi Town. The area is most famous for its leading position in sugarcane farming, vegetables and tomatoes. The relief of the area is relatively flat with some undulating altitude of 549m at the North-East of the town above sea level (BLSK, 2010). The soil colour is reddish due to the high level of drainage and oxidation. The area lies within the tropical climate characterized by temperatures ranges between $22^0$C to $24^0$C throughout the year. The mean annual rainfall ranges between 1000mm to 1750mm (Kareem and Mbason, 2002). The vegetation comprises of transitional woodland, with species like Daniela, Oliverii, Vitex, Domana, Diospyros, Mespiloformus, Khaye, Grandifohala and Albizia Africana (Alfredo, 2002).

## METHODOLOGY

In this study, two residential Ward in Makarfi Town were selected as a representative of the current organic waste generation in Makarfi Town. These are Tudun Wada Ward and Makari Ward. Two Angwa from each of the Wards were selected for the study. The selection was based on the existing situation of high organic waste generation in the area. The study was undertaken in January and May, 2013 when members of household were all available in their business and residential places. The design used for the study is fieldwork assessment of the organic waste generation from the households and a designed structured questionnaire to establish the quantity generated, the methods of utilization and management of organic waste per household on a daily basis.

To obtained the types and quantity of the organic waste generation, polythene bags were provided to 97 randomly selected households in the five Wards for the period of five months in which all the organic waste generated per household were collected for assessment every morning using a calibrated weighing scale and the information recorded.

To establish the frequency of the quantity generated, the methods of utilization and management of organic waste per household 97 numbers of questionnaires were administered to cover the household under research. The data obtained were analyzed using tables, frequency, and percentages.

## RESULTS

### The Socio – Economic Characteristics of Respondents Household

Demographic analysis of the respondents' shows that age groups of 55 – 65years have the highest number of respondents (26.67%).This was followed by the age group of 35 – 45 and 45 – 55 years respectively with 21.67%. The year group of 25 – 35 followed with the ranking of 14.44%. The list year group are the 15 – 25 and 65 years and above with 8.25% and 7.22% respectively. This shows that majority of the

respondents age group (55 – 65years) have the knowledge of waste produced and the effects in area.

The result observed that majority of the respondents 81.44% were females while 18.56% were males, which means that waste disposal is more carried out by the females even though males are involved in the waste disposal in the area. This might also be due to the fact that female are involved in domestic work and farming activities. This supports the finding of (Nabegu 2008) that generally females have greater access to the waste from the domestic activities. This can be agreed upon because from the result shown in the table, more females are involved in waste disposal than males.

The results also show that majority of the respondents (88.7%) were married, 6.19% of the respondents are widows/widowers and 5.15% are singles. This result is in line with the findings of Jande, (2005) who reported that married people have more responsibilities such as the provision of food, education, health and well-being of their spouses and children. This may be the reason why the organic waste production is dominated by the married people unlike the case for the singles, who may not likely have any thing to do with domestic activities.

Most of the respondents (20%) in the result obtained have 5 – 10years of formal of school, 80% of the respondents did not attend any formal school. This depicts that those that are well educated are not man. This is not surprising since a great percentage of the people in the communities have little education. This shows that literacy level among the study area is low. This may be for the fact that education helps to liberate the mind and could expose the people to the method of waste disposal and helps in efficient use of information which could lead to better output in waste disposal.

The result also indicates that majority (51.55%) of the respondents is farmers by primary occupation, 34.02% of the respondents were traders and 14.43% of the respondents are civil servant. As observed the waste production activities in the study area is dominated by farmers.

The distribution of the household size revealed that the largest household has been between 1 – 5 and 5 - 10 with 6.19%, 10 – 15 people amount to 5.15%, 15 – 20 have 15 73%, 20 – 25 people of respondents have 57.73% and the 30 and above have 4.12%. The results show that the large family size depicts the large quantity of the organic dispose into the environment.

## Table 1: Socio – economic Characteristics of Respondents

| Age | No. of Respondents | Percentage % |
|---|---|---|
| 15 – 25 | 8 | 8.25 |
| 25 – 35 | 14 | 14.44 |
| 35 – 45 | 21 | 21.67 |
| 45 – 55 | 21 | 21.67 |
| 55 – 65 | 26 | 26.80 |
| 65 and above | 7 | 7.22 |
| **Total** | **97** | **100** |
| **Gender** | | |
| Male | 18 | 18.56 |
| Female | 79 | 81.44 |
| **Total** | **97** | **100** |
| **Marital Status** | | |
| Single | 5 | 5.15 |
| Married | 86 | 88.7 |
| Widow/Widower | 6 | 6.19 |
| **Total** | **97** | **100** |
| **Years of Informal School** | | |
| None | 30 | 37.11 |
| 1 – 5 | 15 | 15.46 |
| 5 – 10 | 37 | 38.14 |
| 10 – 15 | 8 | 8.25 |
| 15 – 20 | 0 | 0.00 |
| 20 and above | 1 | 1.35 |
| **Total** | **97** | **100** |
| **Occupation** | | |
| Civil Servant | 14 | 14.43 |
| Farmer | 50 | 51.55 |
| Trader | 33 | 34.02 |
| **Total** | **97** | **100** |
| **Household Size** | | |
| 1 – 5 | 06 | 6.19 |
| 5 – 10 | 06 | 6.19 |
| 10- 15 | 5 | 5.15 |
| 15 – 20 | 15 | 15.46 |
| 20 – 25 | 56 | 57.73 |
| 25 – 30 | 5 | 5.15 |
| 30 and above | 04 | 4.12 |
| **Total** | **97** | **100** |

## The Daily Average Quantity of Household of Organic Waste Generated in Makarfi Town

The table shows the daily quantity of organic waste generate in Tudun Wada Ward. It was observed that 50.52% of the household generates 1 – 2kg organic waste per day, 31.96% of the household generates < 1kg of the organic waste per day, 12.37% of the household generates 2 – 3kg and 5.15% of the household generates more than 3kg of the organic waste per day.

**Table 2: Daily Average Quantity of Household of Organic Waste Generated in Makarfi Town**

| Quantity of Organic Waste Generated | No. of Household | Percentage (%) |
|---|---|---|
| < 1kg | 31 | 31.96 |
| 1 – 2kg | 49 | 50.52 |
| 2 – 3kg | 12 | 12.37 |
| 3 and above | 05 | 5.15 |
| **Total** | **97** | **100** |

**The Types and Quantity of Organic Waste Generated by Household in Tudun Wada Town in Makarfi Local Government Area**

The table shows the constituents of the organic waste generated by the household. It was observed that 26.06% of the household organic waste generated was animal dung, 21.40% of the organic waste was vegetables, 19.32% was Ash dirt, food scrap rank 18.31% and 14.91% of the organic waste generated was papers/cardboard.

**Table 3: Types and Quantity of Organic Waste Generated by Household in Makrfi Town**

| Types of Organic Waste Generated | Month 1 | Month 2 | Month 3 | Month 4 | Month 5 | Total (kg) | Percentage (%) |
|---|---|---|---|---|---|---|---|
| Food Scrap (kg) | 35.3 | 29.2 | 24.2 | 33.4 | 32.4 | 154.5 | **18.31** |
| Vegetables  (kg) | 37.8 | 29.5 | 26.8 | 48.3 | 38.2 | 180.6 | **21.40** |
| Ash dirt  (kg) | 29.47 | 24.3 | 29.5 | 37.4 | 42.4 | 163.1 | **19.32** |
| Paper/cardboard paper  (kg) | 28.5 | 22.1 | 22.22 | 33.2 | 19.8 | 125.82 | **14.91** |
| Animal Dung  (kg) | 41.0 | 41.4 | 34.8 | 51.1 | 52.3 | 220.00 | **26.06** |
| **Total (kg)** | **172.07** | **146.5** | **137.52** | **203.4** | **185.1** | **844.02** | **100** |

**The Utilization of Organic Waste by Households in Tudun Wada Ward in Markarfi Local Government**

This shows the utilization of the organic waste in the Tudun Wada Ward. It was noticed that 46.39% of the households disposed the organic waste outside the compound, 21.65% of the households used the waste as farm manure, 16.49% used organic waste to feed their livestock and 15.47% used it for compost making.

**Table 4: Utilization of Organic Waste by Households in Makarfi Town**

| Utilization of Organic Waste | No. of Respondents | Percentage (%) |
|---|---|---|
| Feed animal with it | 16 | 16.49 |
| Compost making | 15 | 15.47 |
| Disposed the waste | 45 | 46.39 |
| Direct application on the farmland | 21 | 21.65 |
| **Total** | **97** | **100%** |

**Source:** Authors' Field Work 2013

**The Method of Organic Waste Disposal from Household in Makarfi Town**

The table shows the methods adopted by the household in Tudun Wada Ward for disposing the organic waste. It was observed that 52.58% of the household disposed their organic waste in open dumping places, 37.11% of the household disposed their organic waste in unused wells and 10.31% reuse the organic waste to feed their animals.

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**Table 5: Methods of Disposal of Organic Waste from Household in Makarfi Town**

| Method of Disposal | No. of Household | Percentage (%) |
|---|---|---|
| Opening dumping | 51 | 52.58 |
| Reclaiming unused wells | 36 | 37.11 |
| Recycling/Reuse | 10 | 10.31 |
| **Total** | **97** | **100%** |

## DISCUSION OF FINDINGS

From the samples of organic wastes collected from the 97 sampled households in Makarfi Town, five different types of organic wastes were categorized. These are paper/cardboard, food remnants, vegetables, ashes and animal dung. This is in line with Brunn, (2003) assertion that most organic waste generation from households includes food wastes, paper and cardboard waste and animal droppings. Table 3 shows the different categories of organic waste observed in the 97 household in Makarfi. The main Sources of these organic waste generation in Makarfi Town are commercial centers, food sellers, household, agricultural and educational establishments. The finding shows that more organic waste is been generated from animal waste; this is because most of the animals are left to linger around the farmlands. It was discovered that most of the papers/cardboard, vegetables and food remnants are from the printing shops, commercial centers and restaurants shops respectively.

The quantity and rate of organic waste generation in any town various depends on the population, level of the socio-economic status of the citizens and the kinds of commercial activities being predominant (Sridhar and Adeoye, 2003). From the research, it was estimated that the 97 sampled household in Tudun Wada Ward generates about 844.02kg of organic waste per month (table 3). The quantity of this organic waste generated from each unit of the households is very high on a daily basis; higher than the average of residential waste generation rate in Nigeria which is as 0.45-0.65kg/person/day stated by Odunfa (2008). During the interview carried out with the sampled household, the respondents reported that more of the Organic waste is been generated during the weekends than the working days. The finding also shows that the number of persons in a household are larger up to 20 – 25 persons in a household (see table 1) this depicts the high quantity of Organic waste been generated. This may be attributed also to the fact that members of the households in the study area are farmers and traders and there is the possibility of bringing in farm crops home that depict the increase in organic waste.

On the utilization of Organic Waste by households, it was observed that majority of the households do not utilized their organic waste  well but instead discard them on the open dumping site or dumped them insight dry well. According to Guttentag, (2003), open dumping of organic waste cannot be considered as a good method of waste disposal. That the danger of it  are many which include the health hazard to scavengers at the dumping site, pollution of ground water, spread of infection diseases, high toxic smoke from continuously smoldering fires and foul odours from decomposing refuse. The results observed a few number of the households use the garbage to feed animals and also use the waste for compost making, which is in line

with Sridhar and Adeoye, (2003) who assert that Organic waste can be processed and utilized as compost and animal feeds.

On the method of disposal, majority of the households dispose of their organic waste indiscriminately there by making the environment dirty and filthy which has led to loss of aesthetic beauty, foul odour, flies infestation and possible pollution of underground water as opined by Brunn, (2003). Some of the households use the Organic Waste generated from their houses to refill and reclaim unused wells in their homes. This shows that management of waste in the study area is ineffective.

## CONCLUSION

The findings show that most of the households generate substantial organic waste and these are more of animal dung, food remnant, vegetables and paper which are capable to result to health hazard to scavengers at the dumping site, pollution of ground water, spread of infection diseases, high toxic smoke from continuously smoldering fires and foul odours from decomposing refuse. This shows that majority of the households are ignorant of the way in which organic waste is to be utilized for economic gains. Only a few of the households utilize the organic waste generated for composting and animal feeding while most of the households indiscriminately disposed the Organic waste in open dumps within the environment.

## RECOMMENDATIONS

For adequate measures toward the utilization and proper management of organic waste for environmental sustainability and transformation in Makarfi Town, the paper therefore recommends as follows:

- The inhabitant of Makarfi Town should learn to minimize the presence of organic waste in the environment by converting the organic waste to wealth.

- Each household in Makarfi Town should practice composting; this will help in the production of organic fertilizer which can be used as soil conditioner and a good supplement of the chemical fertilizer.

- Also, fresh organic wastes like vegetables and food remnants should be treated and used to feed animals.

- Biogas production using anaerobic digesters should be adopted by households for the production of fuel which can be used for cooking/electricity this will supplement the use of fire wood and kerosene.

- The Local Government should provide standard waste bins for the temporary storage of waste by the community and subsequent collection by the Authority concerned to the final treatment and disposal sites. This will enhance environmental sustainability and transformation.

- There is need for the sensitization of the populace by Government either at the Local Government level or the state on the need to segregate their waste at the generation site into its different components before thinking of how to dispose of it.

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