RESEARCH ARTICLE
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Household Solid Waste Management in Different Income Levels in Eldoret Municipality -Kenya

B. O. Orori

Department of Forestry and Wood Science, University of Eldoret
P.O Box 1125 Eldoret; benorori@yahoo.com

Abstract

Solid wastes are materials that man and other animals discard after receiving the product utility. Solid waste materials include household garbage, food wastes, yard wastes, and demolition or construction debris. Solid waste generation is an inevitable consequence of production and consumption activities in any economy. The rate of generation of household solid waste in the developing countries is increasing with increase in population, technological development, and changes in the life styles of the people which is posing a great environmental and public health problem. With fast expansion of urban, agricultural and industrial activities spurred by rapid population growth has led to huge amount of solid wastes that pollute the environment and destroy resources. The study was conducted in Eldoret Municipality in three estates including Langas, Elgon View and Kimumu. The study aimed at determining quantity and rates of household solid wastes generated in three different residential areas of various income levels in Eldoret town. Data was collected through direct observation and use of questionnaires. The questionnaires contained both open ended and closed questions. The questionnaire was semi-structured to collect both qualitative and quantitative data. Data was analyzed using a statistical package for social scientists. The study found out that the main household solid waste materials in Eldoret are food scraps and plastics The study revealed that amounts of wastes generated increase significantly with income, with high income areas generating more waste than the low income areas. The study found out that most of the low income households had little knowledge on reduce, recover and reuse concept of waste management. The study also revealed that waste collection by the municipal council of Eldoret is still very low and people opt to individual disposal methods. The disposal methods available in Eldoret include burning in the open pits, landfills and leaving wastes scattered. The study therefore, recommended that the county government should come up with better waste collection and disposal methods and to create awareness on the importance of having a clean environment in Eldoret.

Key Words: Solid Waste, Income levels, Management and Household.

Study Background

Solid wastes are mainly by-products of materials arising from various industrial, human and animal activities that are discarded and regarded as useless or unwanted by the producer (Rana, 2007). Solid waste generation is an inevitable consequence of production and consumption activities in any economy (Eugenia *et al*., 2002: UNEP, 2005; Baud and Post, 2002). With fast expansion of urban, agricultural and industrial activities spurred by rapid population growth has led to huge amounts of solid wastes. Solid wastes are sources of pollution in the environment and destroy resources.

Generally, most of the problems in solid waste are pronounced in developed countries and per capita solid waste generation increased by nearly three times in the past two decades. Globally the per capita amounts of municipal solid waste generated on a daily basis vary significantly depending on a several factors(UNEP 2005). World-wide solid Waste generation, both domestic and industrial, continues to increase as growth and consumption increases. Apart from population growth and standards of living, poor resource utilization technology, lack of appropriate management knowledge, inadequate funding of solid waste projects among others have worsened the state of solid waste management in developing countries. Measures need to put in place including integrated approach to solid waste management to curb the rising trends, which is likely to increase solid waste generation by five times by the year 2025 (UNEP 2005: Wilson, *et al,* 2009).

Kenya and other African countries are facing serious problems in the management of solid wastes mainly because of inadequate resources. Research has indicated that solutions developed for the developed countries are grossly inappropriate to contexts in the developing countries (World Bank, 1999; UNEP, 2005; Agunwamba, 1998). Kenya's Vision 2030 envisages implementation of an integrated solid waste management system as a driver for sustainable development. Overburdened and ineffective solid waste management systems are congruent with the rapidly changing consumption patterns that plague urban centres in the developing world. The resulting discrepancy between the current solid waste management systems and the growing need for expanded collection and disposal facilities has left an accumulating amount of solid waste within the urban environment resulting into poor conditions aesthetically and unsanitary environment. Plates 1 and 2 show heaps of solid wastes at low income estates in Eldoret. This is sign of no proper systems in place for solid waste management in the area.

Plate 1. Solid waste heap at a low income estate of Eldoret town

Plate 2. Solid Waste at a low income estate of Eldoret town

Depending on a number of factors generally income levels and household size are the most significant factors affecting the quantity and characteristics of solid wastes from household consumption (Richardson and Havelock, 1974). Visvanathan, *et al.* (2004) reported that in a family with rich socioeconomic condition, daily waste generation rates were generally higher than the lower socioeconomic families. However, this depends also on the level of environmental education in each household as reported by Okalebo, *et al.* (2014).

Solid waste management has always been focused on collection and disposal in the recent past, which indeed has escalated their management problems. Therefore there is an urgent need to adopt a more realistic solutions including and not limited to integrated solid waste management (ISWM). Integrated solid wastes management brings on board reduce, reuse, recycle and recover among others. This approach takes the households as primary entities in solid waste management. It also requires that solid wastes be characterized and separated at the households to reduce the burden on the consecutive systems. The

paper aims at assessing the solid waste management in three distinct areas in Edoret including Langas (low income), Kimumu (middle income) and Elgon View (high income) estates. It focuses on identification of sources of solid wastes, rates of generation and disposal methods in place. The information obtained from this study is significant to the policy and decision makers in establishing better techniques for solid waste management. Provision of reliable solid waste services, particularly to an increasing urban population, requires an accurate and up to date database, which is consistently maintained. Knowledge of the composition of municipal waste streams has direct implications for the planning of collection, recovery and disposal activities and will enable the county authorities and those engaged in solid waste management to effectively address issues in solid waste management. The output of the study would aid policy makers and town planners reduce landfill waste, set up recycling programs, and conserve money and resources. Above all, waste characterization plays an important part in any waste treatment.

Materials and Methods

The study area included Langas (low income), Kimumu (middle income) and Elgon View (high income) estates. Data was collected through direct observation, and questionnaires. The questionnaires contained both open ended and closed questions. The questionnaire was semi-structured to collect both qualitative and quantitative data. These data collection techniques were chosen because they are cost-effective and relatively reliable. The data was analyzed quantitatively using descriptive technique using Statistical Package for Social Sciences computers aided program. Analysis involves the use of percentages, frequencies and mean and thereafter crosstabs. The quantitative data was then presented in form of frequency tables and percentages.

Results and Discussion

Amount and Sources of Solid Wastes

Figure 1 shows the sources and amounts of solid wastes in three estates of Eldoret town. The main types of solid wastes identified include food scraps, plastics glass electronics and crop wastes. The highest amount of solid wastes generated were food scraps, followed by plastics, crops wastes, electronics and least from glass. The highest amount of solid wastes generated by high and mid income households were plastics but for low income level households were food scraps. The probable reason for low income household generating more in form food scraps is that they use poor techniques of preparing their foods unlike the high income household that go for readymade food sources. Almost similar results were reported by Municipal Corporation of Delhi where the overall sample analysis depicted that food waste was a major component of household solid waste but in all the three socioeconomic groups of the society which was about 58.4 – 76. 6 % of the total waste component. Other waste includes recyclable 15.7 % in low income group, 21.2 5 in middle income group and 23.1 % in high income group.
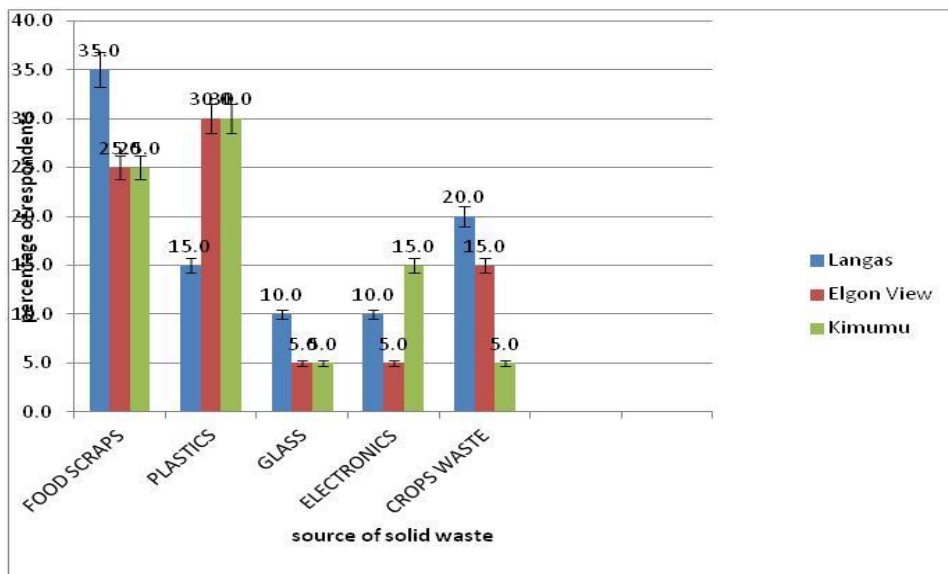

Figure 1. Main types of Solid Wastes generated by different income levels

The amounts of solid wastes generated from all sources vary significantly at all income levels. There was also a significant difference (p≤0.05) in amounts generated by each income level within each source of solid waste, apart from food scraps and plastics in mid and high income level households.

Rates of Solid Waste Generation
Figure 2 shows the rate of generation of solid waste per house per day in different household income levels. The figure shows that at a rate of less 0.5kg per day generation of solid waste, most of the low income household population (45%)

generated the highest. This was followed by high income levels household population (15%) and least by mid income level household population (10%). At a rate of 0.5-1kg of solid waste generation per day the highest population was from mid income level households population (45%), followed by high income levels and least from low income household population (25%). At rate of 1-2kg of solid waste generation per day, high income level household population (40%) indicated the highest followed by mid income level households population (20%) and least by low income level household population (10%).
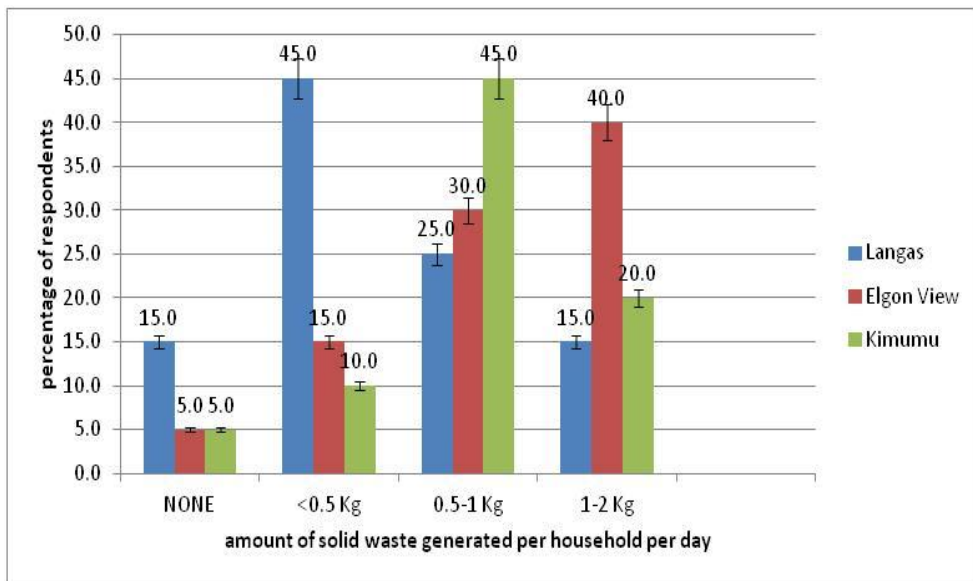

Figure 2. Rate of Solid Waste Generation per Household per Day

Statistically, there was a significant difference (p≤0.05) in the number of households in and within the various rates of solid waste generation. Figure 2 also indicates that 15% of the total number of the low and 5% for mid and high income level generated none. On yearly basis high income household generated at higher rate compared to low and mid income households. Okalebo *et al.* (2014) reported similar finding that wealthier individuals consumed more resources and therefore

contributed at a significantly high rates of solids wastes.

Solid Waste Disposal
The study found out that approximately 20%, 10% and less than 8% solid waste generated at Langas, Kimumu and Elgon view respectively is collected by either Municipal council or Private firms. The other four main means of solid wastes were indentified including burn in an open area, put in an open pit, dig landfill and burry and leave it scattered above the municipal

council of Eldoret and other private firms efforts to collect the solid wastes. Figure 3 shows the different means of solid waste disposal by various income levels households. A majority (55%) of the low income level households with 5% from both mid and high income level households leave their solid wastes scattered. Most of the high income level households (50%) while 35% of the mid and 5% of low income level households dispose their solid wastes in an open pit. On the other hand 25% of the high, 15% of the mid and 10% of the low income households dispose their solid wastes by digging a land fill and burying. This converts to an aesthetically good environment and explains why less of the solid wastes are scattered in areas inhabited by high income level households.
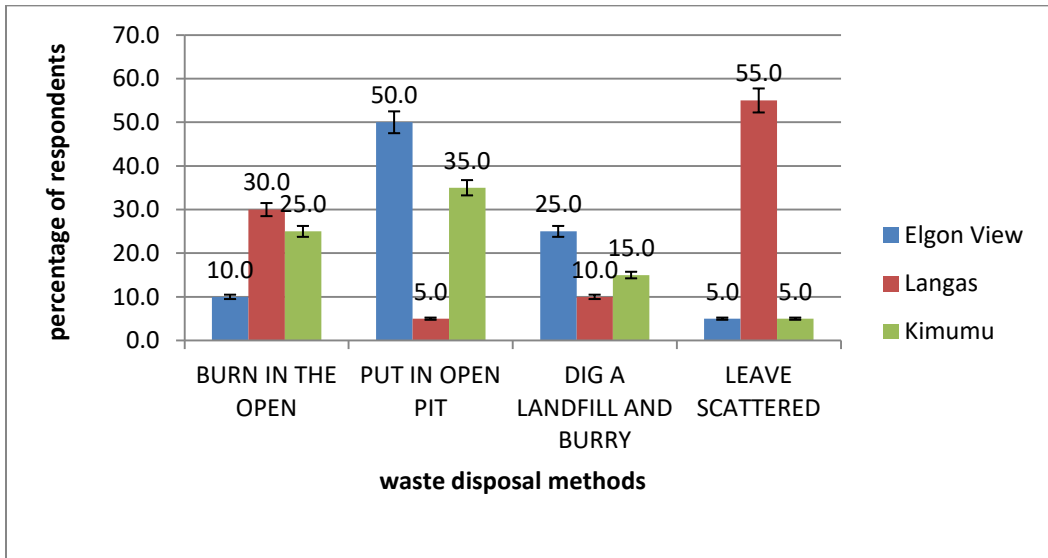

Figure 3: Solid Waste Disposal methods

Thirty percent (30%) of the high, 25% of the mid and 10% of the high income level households burn in the open. This is unacceptable method because it pollutes the atmosphere. Plate 3 shows solid waste crudely deposited on the roadside, which are conspicuous scenes at Langas estate of Eldoret town.

Plate 3: Solid wastes crudely disposed in Langas area

Conclusion and Recommendations

Household solid waste materials within Eldoret municipality include food scraps and plastics. The amount of solid waste generated in Eldoret municipality varies significantly with income, with the high income households producing more solid wastes compared to the low income households. Low income households generate about 180kg per household per annum with high income generating approximately 550kg per household per annum. Over 80% of solid wastes generated at Eldoret town are disposed off by burning, dumping in open pits, landfills and dumping in open while the rest is collected by county government and private firms. There is need to educate the inhabitants of Eldoret town of the benefits to reduce, reuse, recycle and recover. The study recommends that the county government to facilitate and encourage recycling including plastic recycling plants and discourage roadside dumping.

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