

ASSESSMENT OF SOLID WASTE MANAGEMENT PRACTICES IN BEDELE TOWN, OROMIA, ETHIOPIA

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Abstract

Solid waste management is a basic activity and requires the participation of everyone to increase the quality of environment and health. The aim of this study was to assess solid waste management practice of Bedele town, Oromia, Ethiopia. The data was collected through sampled households and key informant interview, field observations and focus group discussion. Food waste, plastic bags, plastic bottles, papers and cartons, cans and glass were some of solid waste released from each household and disposed to inappropriate disposal site and environment. Majority of the respondents (60.4%) practiced open field disposal and incineration (21.7%) mechanisms. The disposal sites used by the urban dwellers were open land (38.8%), road side (26.7%), river side (22%) and public centre (12.1%), respectively. The common identified diseases associated with poor solid waste management were common cold (52.9%), respiratory track and shyness (27%), and typhoid and cholera (4.6%) respectively. Television, radio, formal and informal meeting were reported as the information source for the communities on solid waste management. For the overall solid wastes generated by households, only 2.1% of the respondent responded as communities applied composting mechanisms. Containers such as plastic bag (61.25%), carton (30.83%), dust-pin (1.67%) and other local materials (6.25%) was used to collect solid wastes. Lack of appropriate disposal site and environmental awareness were the major factors affecting solid waste management as reported by 51.2% and 42.1% of the respondents respectively. Mean daily solid waste generation rate per day per household in the town based on the current finding was 0.3240 kg/day/house hold. Therefore, the municipality should have trained the communities to aware on effective and efficient solid waste management practices.

Key Words: *Disposal, Generation rate, Management, Solid waste*

Introduction

Solid wastes are non-liquid, non-soluble and non-decomposable or decomposable materials ranging from municipal garbage to industrial wastes

that contain complex and sometimes hazardous substances. It is all inclusive, encompassing the heterogeneous mass of throw away from the urban community such as vegetables, food items, paper,

plastics, rags, glass as well as more homogeneous accumulation of agricultural, industrial and mineral wastes (Mundhe *et al.*, 2014). Solid waste is unwanted matter or material of any type (non-liquid), often that which is left after useful substances or parts have been removed (Williams, 2005). Both domestic and industrial waste generation continues to increase world-wide in tandem with growth in consumption (Okalebo *et al.*, 2014) while quantity generated depends on the socioeconomic conditions, cultural habits of the people, urban structure, density of population, extent of commercial activity, and degree of salvaging at source (Ladu *et al.*, 2011). Solid waste management includes the entire process of dealing with solid waste, starting from the collection to ultimately disposing off it hygienically (Kumar and Pandit, 2013). Proper solid waste management reduces health risks to the public and lessens adverse environmental impacts, such as air, water and land pollution (Williams, 2005). Ladu *et al.*, 2011 reported that a waste management system should not only ensure human health and safety, but it also environmentally and economically suitable. However, inappropriate methods of waste generation, handling, storage and disposal may pose serious risks to the environment and to public health (Asefa, 2017). Increasing population, booming economy, rapid urbanization and the rise in community living standards have greatly accelerated the municipal solid waste generation rate in developing countries (Minghua *et al.*, 2009). In the last few decades, there was a significant increase in solid waste generation in some cities of Ethiopia. This is largely because of rapid urbanization coupled with increased urban population and a rather

economic development in the country (Mengist and Assegid, 2014; EPA, 2015). Bedele town is one among, where there is rapid growth of urban population as well as constraint in the management of solid wastes and its improper management gravely affects the public health and degrades environment. Thus, this study was carried out to investigate the issue of solid waste management practices in Bedele town.

Materials and Methods

Study Area

Bedele woreda lies between 8°20'-80 35' N and 36°15'-36°30' E at about 480 km road distance south-west of Addis Ababa. Administratively the woreda is located in Buno Bedele Zone at about 120km from Metu, Ilu Ababor zone capital. It is bounded by Borecha woreda in the east, Chora woreda in the west, Gachi woreda in the south and Dabo woreda in the north. It has 43 Kebeles, 41 rural and 2 towns. The total population in the woreda is 118,157 (male 58,510 and female 59, 647). Agroecologically, the woreda is divided into three ecological zones namely mid-altitude (81.34%), low-land (18.6%) and highland (0.06%). Altitude in the woreda ranges from 1300 to 2000 m a.s.l. The woreda is characterized as mixed farming system of coffee-crop-livestock production with a total area of 88,049 ha of land used for different purposes; annual crops (35801 ha), perennial crops (16549 ha), forest land (10047 ha), grazing land (10120 ha), wetland (1112 ha) and area not used for any purpose (14420 ha) (ADARDO, 2012).

Data Source and Collection

The town was classified in to two sub-administrative kebeles using stratified sampling technique. A total of 8

household head for key informant interview, 16 household head for focus group discussion and 240 household head were randomly selected for structured, unstructured and semi-structured interview from each sub-city administrations. Data was collected from primary and secondary sources. The primary data was collected from sampled households' respondents, researchers' observation, focus group discussions and key informants. Closed and open-ended questionnaires were prepared to gather information on basic household economic and demographic characteristics, participation, acceptance, and awareness about solid waste management. Field observation was conducted throughout the whole process of the research in order to ensure the validity of information obtained from the urban dwellers. Two focus group discussions were held in each of the sub-city administration. The discussion was carried out with group of dwellers comprising 16 members that consists of Kebeles leaders, religious leaders, and targets dwellers with indigenous knowledge of waste management methods, teachers and development agents. Secondary data were collected from published materials such as

reports, official records, census records, project reports, research papers and data files from web sites.

Sampling Technique

Bedele town was purposively selected based on the intensive solid waste generation as a result of rapidly over population through the flow of the community from different districts in the zone and from other zones and regions. Hence, waste disposal and management is a serious problem in the town due to population density, lack of awareness, absences of appropriate landfills and socio-economic condition. The study population was stratified into three groups based on job categories (namely farmer, trader, and civil servants). After stratification, simple random sampling was employed to select the representative households. The sample size was determined following the Yamane (1967) standard for sample size determination formula. A total of households living in the study were obtained from the city municipalities and sub-city administration. A total of 240 households (130 and 110 households from 01 and 02 kebele) was selected following the Yamane (1967) standard formula and calculated as:

$$n = \frac{N}{1+N(e)}$$

Where;

n=desired sample size, N= the estimated population size and e = is level of precision (0.05).

Data Analysis

The data collected from structured interview was systematically coded and analyzed using descriptive statistics by

employing Statistical Package for Social Sciences (SPSS version 20) and presented using figure, pictures, tables and narration.

Results and Discussion

Household Characteristics

Table 5: Households information by sex, age, education level, religion and occupation

Back ground	Distinction	Frequency	Percent (%)
Sex	Male	159	66.3
	Female	81	33.8
Age	18-30	56	23.3
	31-40	73	30.4
	41-50	54	22.5
	51-60	31	12.9
	>60	26	10.8
Educational status	Informal education	29	12.1
	Elementary school	51	21.3
	High school	65	27.1
	Diploma holder	42	17.5
	BSc and above	53	22.1
Religion	Orthodox	93	38.8
	Muslim	61	25.4
	Protestant	84	35.0
	Wakefata	1	0.4
	Other	1	0.4
Occupation	Trader	45	18.8
	Government employer	91	37.9
	Daily labor	89	37.1
	NGO	2	0.8
	Farmer	13	5.4
Business activities	Hotel	12	5.0
	Shop	20	8.3
	Retailers	13	5.4
	Others	3	1.3

The percentage of male and female household heads respondents expressed as 66.3% and 33.8% respectively. The data recorded on the age category of the respondent shown that about 30.4% of the respondents had lie between 31-40 age interval, while 23.3% and 22.5% were found at 18-30 and 41-50 age intervals respectively. A small number of respondents (10.8%) had recorded in age above 60 years old. The table 1 also revealed that about 27.1%, 22.1%, 21.3%, 17.5 and 12.1% of respondents' educational level was high school,

Bachelor degree, elementary school, diploma holder and basic education/informal education respectively. The religion of the respondents was Orthodox (38.8%), Muslim (25.4%), Protestant (35%), and Wakefata (0.4%) (Table1).

The job category assessment of the respondents indicated that, trader (18.8%), government employers (37.9%), Daily labourers (37.1%), NGO workers (0.8%) and Farmers (5.4%) (Table 1). Out of 18.8% traders 5.0% of them were invested on hotel, whereas, 8.3%, 5.4% and 1.3%

of them were invested on hotel, shop, retailers and others respectively. In the table below, majority of the surveyed households 62 (26%) had 3 families, 19% had 4 families, and 16% and 15% had

family sizes of 2 and 5 members per households respectively. However, less percentage 3% and 2% were recorded in family sizes of 7 and 8 families per households (Table, 2).

Table 6: Family size distribution of the study area respondents

Number of Family size	Frequency	Percent (%)
1	24	10
2	38	16
3	62	26
4	45	19
5	35	15
6	25	10
7	7	3
8	4	2

Types and Rank of Solid Waste Generated from Bedele Town

Table 7: Types and rank of municipal solid waste released to the town

	Items	Frequency	Percent
Types of solid waste released by the residents	Plastic bags and bottles	45	18.8
	Food waste	145	60.4
	Tins, cans and glass	17	7.1
	Papers and cartons	32	13.3
	No response	1	0.4
	Rank of solid waste released	Plastic bags and bottles	48
Food waste		146	60.8
Tins, cans and glass		17	7.1
Papers and cartons		27	11.3
Others		1	0.4
No response		1	0.4

Food waste, plastic bags and bottles are the three major types of solid waste generated from the town reported by 60.4%, 18.8% and 13.3% interviewed households respectively. The finding compares with findings by Mengist and Assegid (2014) reported from Adama, Ethiopia that 42% of the household reported food and food related wastes constituted larger portion of the SW generated followed by SW from plastics materials reported by 29% of the total

respondents. The researcher field guide tour also clearly shows that plastic bags and bottles were predominant in waste disposed sites on the field by the town residents. The reason why these types of solid waste boldly observed in the area is due to its high resistivity to the decomposers of soil micro-organism. The rest solid waste substances like tins, cans and glasses contributed little to the refuse in the area (Table 3).

The overall results of the finding indicated that about 99.6% of the communities released solid waste to their neighbouring environment like road sides and nearby open spaces. Generally, in its aspect it is possible to realize that, food waste had the lion’s share from the types

of solid waste in the study area. Regarding the quantity it contributed to the environment, food waste ranked the first 146 (60.8%), followed by plastic bags and bottles, and papers and cartons as the second and the third respectively (Table, 3).

Table 8: Respondents awareness and sources of information on solid waste management

	Response	Frequency	Percent
Do you have information on solid waste?	Yes	201	83.7
	No	39	16.3
What are your sources of solid waste information?	By watching tv	97	40.4
	Over radio	57	23.8
	No response	39	16.3
	In meeting	29	12.1
	In school	12	5.0
	On poster	5	2.1
	Other	1	0.4

About households (83.7%) had an awareness of the municipal solid waste management while only 16.3% has no information about the solid waste management (Table, 4). The finding against the study conducted by (Kumar and Pandit, 2013) revealed that about 14.2% of the households are aware and 85.2% are not aware about the solid waste generation and their disposal in Bangalore city, Karnataka, India. As the information gathered through focus group discussion, even though the community had information on the issue of solid waste management, majority of them does not gave due attention on the management practice of solid waste. The reason is why the information was simply from different sources of media and oral communication, rather than created through purposive training and practical work suited in the town. As it indicated above, the major sources of municipal waste management information were obtained through media channel. Accordingly, majority of the respondents (40.4%) had got the

awareness on solid waste management through watching the television, while 23.3%, 12.1% and 5% were informed through hearing on radio, community meeting and in school respectively (Table, 4).

Solid Waste Disposal Mechanism and Disposal Site

The information gathered from household interview and the researcher’s field observation approved that there is no well managed solid waste disposal mechanism in the study area. However, the solid waste disposal mechanisms applied by the town dwellers are land filling, home deposited, open field, composting and incineration. Of these mechanisms, 60.4% respondents replied that open field disposal methods were highly practiced. From the overall disposal mechanisms, only 2.1% respondent responded as communities applied composting to dispose the house generated solid wastes in the town (Figure 1).

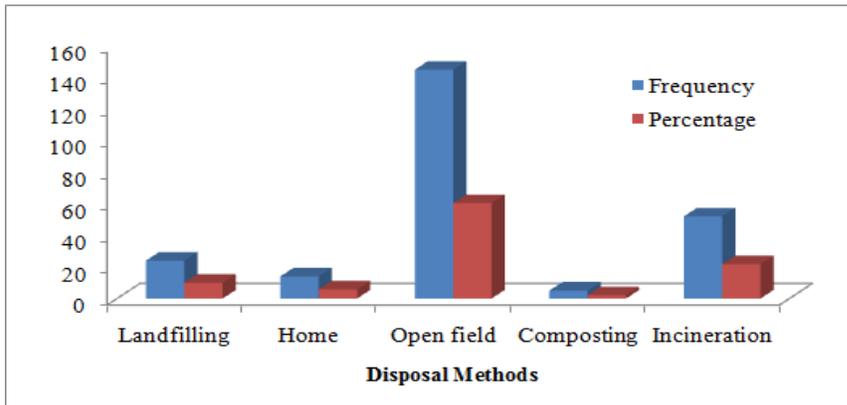


Fig. 1: Solid Waste Disposal Systems Practiced in the study Area

Based on the information gathered from the respondents and the researchers field observation, there is no common disposal site for solid waste management in Bedele town. About 93 (38.8%) of the

respondents raised that the residents dispose solid waste on open lands, 26.7% at road side, 22.1% near river side, 12.1% at public centre (Table, 5).

Table 9: Solid waste disposal site of the study area

	Disposal site	Frequency	Percent
Where do you dispose solid waste collected from your home?	Open land	93	38.8
	Road side	64	26.7
	River side	53	22.1
	Public centre	29	12.1
	Others	1	0.4

The information gathered from the respondents indicated that 61.25% of the households use plastic bag as a container for solid waste substance collection. However, some residents raised the disadvantage of this type of materials for solid waste collection from the human being health point of view. Majority of the households (68.3%) were used basket, carton or wheat bag containers followed by metal or plastic containers for storing the solid waste in the town (Yimer and Sahu, 2014). From the collection and disposal frequency point of view, 47.08% respondents reported that the waste collection containers emptied once per week. About 33.75% and 14.58% respond

once per month and per day respectively (Table, 6). The study is similar with study conducted by Yohanis and Genemo (2015) who identified the frequency of solid wastes collection and transfer to the junk and report wastes from residential households are collected using door to door service weekly (87.5 %) while the rest 9.5 % and 3 % are done so monthly and daily, respectively. Additionally, the respondents revealed that the frequency disposal of the solid waste in the containers of the study area was determined by the size of the container and amount of solid waste generated from the home per day/week.

Table 10: Types of containers used for solid waste collection and disposal frequency of solid waste in the study area

	Containers	Frequency	Percent
Type of containers used to collect solid waste	Carton	74	30.83
	Dust pin	4	1.67
	Plastic bag	147	61.25
	Others	15	6.25
	Disposal periods	Frequency	Percent
Frequency to emptied the solid waste containers	Once a day	35	14.58
	Once a week	113	47.08
	Once a month	81	33.75
	Others	11	4.58

Factors Influencing Solid Waste Management Systems

Table 11: Factors affecting solid waste management of the study area

N ^o	Factors	Frequency	Percent
1	Lack of appropriate disposal site	123	51.2
2	Lack of environmental awareness	101	42.1
3	Low educational level	13	5.4
4	Lack of high income	2	0.8
5	I do not know	1	0.4

Based on the data gathered through household interview, 51.2% of the respondents raised that lack of appropriate disposal site is the main constraint affecting community solid waste management system. The next most influential factor is lack of environmental awareness towards waste management. Low level of educational status and economic condition also affect solid waste

management in the area (Table, 7). The researcher’s observation made using check lists signifies the reality mentioned by the respondents in the town. The observation indicated that the residents of the town not properly using the available disposal sites and it’s common to seen accumulation of SWs in near distance of disposal sites and in any open spaces in the study area.

Waste Generation Rate by Urban Dwellers at Bedele Town

Table 8: Solid Waste Generation Rate in Bedele Town (one-year data, 2018)

Sub-Urban city/Kebele	Waste Generated (KG/Day/house hold)	Waste Generated (KG/Year/house hold)
01 Kebele	0.351	128.203
02 Kebele	0.2965	108.297
Total mean of solid waste generated per day/year	0.3240	236.50

Urban waste generation increased in Bedele Town due to affluence and population development. The solid waste

generation rate was found to be 0.2965kg/household/day in Bedele town due to absence of awareness on solid

waste management and minimization, lack of waste segregation /pit hall/ for individual solid waste dumping.

Conclusion and Recommendation

Solid wastes dominantly of food waste, plastic bags and bottles were highly generated from every household in day-to-day activities in Bedele town. Television, radio, community meeting and school are sources of information on solid waste management the local community. The community use open field and incineration methods for the disposal of solid wastes while lack of appropriate disposal site, environmental effect awareness, low level of education and economic conditions mainly affect solid waste management in the study area. Many respondents reported the health problem of solid waste mismanagement while some didn't aware on the health problem of unmanaged solid waste. The municipality should have trained the communities to aware them towards the effective and efficient solid waste management techniques and further investigation must be carried out to effectively deal out the socio-economic effects of improper solid waste managements.

Acknowledgement

We are deeply thankful to Mettu University, specifically Bedele Collage of Agriculture and Forestry for the financial support for the success of this paper.

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