Environmental and Socio-Economic Impacts of Organic Waste Generation in Eldoret Vegetable Market, Uasin Gishu County, Kenya

Samoei Faith
Department of Applied Environmental Social Sciences
University of Eldoret

Christopher Saina
Department of Applied Environmental Social Sciences
University of Eldoret
sainachris@yahoo.com

Eudia Arusei
Department of Applied Environmental Social Sciences
University of Eldoret

Mark Kiptui
Department of Applied Environmental Social Sciences
University of Eldoret

Abstract

Efficient delivery of public services and infrastructure are pressing issues for county governments in most developing countries; and in many countries, solid waste has become a top priority. Solid waste management (SWM) is costly and complex for local governments, but it is so essential to the health, environment, and quality of life of the people—in particular, the poor—that county governments cannot afford to get it wrong. Bad waste collection practices and improper solid waste disposal contribute to local episodes of disease, regional water resource pollution, and global greenhouse gases. It has become increasingly necessary for county governments to get insight to some of these challenges and develop models that could be useful in decision-making. This paper seeks to examine the environmental and socioeconomic impacts of organic waste generation in a vegetable market and focused on the vegetable market of Eldoret town Uasin-Gishu County. An exploratory design was employed to probe the targeted population to provide basic information by use of structured questionnaires and interviews. Structured questionnaires were used to gather the required data from county government staff and the buyers and sellers of the vegetable products in the market. The author also used personal observations and informal discussions with the sellers and buyers of fruits and vegetables in the market. The study established that organic waste generation in the vegetable market was associated with a set of positive and negative impacts. The county government has an elaborate plan to utilize the organic waste generated in the market.There was inadequacy in implementation and follow up of the plan by the county government. The market players had not established a working plan on alternative use for organic waste but depended on individual efforts of livestock farmers to purchase the waste and use it as animal fodder. The county government collects transports and disposes organic waste generated within Eldoret market in a landfill situated at Huruma Estate.

Key Words: Organic Waste, Landfill, Collection of Waste

INTRODUCTION

Urban centers attract people from rural areas seeking employment and better services such as access to better health facilities, water, housing, and generally improved living conditions. Unfortunately, these human settlements referred to as urban areas, make heavy demands on resources available and generate huge amounts of waste that adversely affect the health and cause deterioration/degradation of environmental integrity (Otieno, 2012). The challenge of waste management brings along social and economic challenges to the residents of such settlements. The town of Eldoret situated in Uasin-Gishu County in Western Kenya is one such urban settlement.

Organic waste management has been a major developmental challenge associated with most Kenyan urban centers in recent times. These environmental and socio-economic concerns deserve not only the attention of the concerned county governments and the waste management institutions but also that of corporate organizations and individuals. Despite the immensity of the problem, very little research has been carried out in Eldoret market with respect to organic waste management. The study informs the policy makers and other key players on alternative measures of organic waste management through understanding of challenges against available mitigation strategies. Additionally, the study will contribute to existing body of knowledge on organic waste management and perhaps stimulate further research in other county governments in Kenya.

Organic vegetables and fruits are considered important food sources. They are generally inexpensive and though naturally low in fat and calories, they are packed with important nutrients. However, their tendency to spoil easily in their fresh and unpreserved state results in organic waste (Boco *et al.*, 2013)

Boco *et al.* (2013) defines Organic waste as a type of biodegradable solid waste that comes from plants or animals. Markets that sell organic produce usually generate a high volume of waste from spoiled fruits and vegetables. Like other forms of waste, organic waste must be properly disposed of in order to avoid adverse consequences to the general public‘s health and to existing environmental conditions. The CSL London Olympic waste Review defines organic waste as a type of waste which can be broken down, in a reasonable amount of time, into its base compounds by micro-organisms and other living things, regardless of what those compounds may be.

Studies have revealed many challenges accompanying poor waste management in vegetable markets around the world. While Wetende (2011) and Boco *et al*. (2011) stresses bad attitude of the vendors towards organic waste management, Edward (2010) views it as a failure in commitment by the tripartite stakeholders involved in the markets .i.e the vendors, buyers and the county government. He further observed that although the county government provides waste disposal bins, there is inadequate emptying and transportation thus there is often bad smell, pests and birds.

Like other parts of the country (Kenya), Eldoret town is engulfed in the filth of both conspicuous and inconspicuous places because it has serious problems with its solid waste management from generation, through storage, treatment, to disposal (Wetende, 2013). Many studies in Eldoret town have indicated that solid waste remains a huge

challenge to the growing town. The studies have revealed that the biggest challenge in management of solid waste is organic portion of the waste**.** Although county government has provided containers used for storing solid wastes within the central business district such as din containers, plastic containers, boxes, sacks, and even polythene bags, which in most cases are left uncovered, waste spills are all over the place before it reaches the sanitary sites. Well treated solid waste can be converted into a useful resource, but most of the organic waste generated in Eldoret CBD seems not to undergo any treatment before final disposal. The waste is usually left in piles for several days which create unsanitary scenes; smell bad and harbor disease causing vectors. Due to inadequate solid waste management equipment such as the waste trucks from the county government, waste collection is not done effectively. Therefore some solid waste is disposed off in gutters and in open areas by whenever county government trucks fail to show up.

Without sufficient environmental planning, and management, development control, poor development in Eldoret town will continue to pose serious challenges to the residents and nearby rural residents. The challenge of solid waste management is worsened by the famous vegetable market located at the town's central business district which generates tones of biodegradable waste each day. According to Geoffrey (2005), farm produce in most vegetable markets are season dependent, hence carry along seasonal challenges in management. The wastes of these products pose a threat to the environment, public health and social well-being of the residents.

It is against this background therefore that this paper sought to establish environmental and socio-economic impacts associated with organic waste generation in the vegetable market of Eldoret town. This research sought to investigate these observations with respect to organic waste generation in Eldoret vegetable market, approaches that have been put in place and find out initiatives and roles played by the public and the county government in organic waste management. The main objectives of the study were to assess the environmental impacts of organic waste generation in the vegetable market of Eldoret town. It specifically sought to establish the socio-economic issues associated with organic waste in vegetable markets, find out the collection, storage and disposal of organic waste and establish the likelihood of alternative use and other mitigation measures of organic waste generation.

MATERIALS AND METHODS

The study employed an exploratory design in a survey method that probed the environmental and socio- economic concerns associated with organic waste generation in Eldoret vegetable market. In addition, it employed observational techniques of data collection. The study relied on qualitative and quantitative techniques of data analysis. The study site was operational vegetable market in Eldoret Town of Uasin-Gishu County.

The study was a survey conducted by the authors using structured interviews and focused discussions with the target population. A structured questionnaire was used to collect data from a section of the target population. A purposive sampling technique was used to identify the sample population to be interviewed. This was due to the nature of the study population in vegetable markets characterized by illiterate persons. It was therefore the researcher's initiative to identify the most appropriate respondents with respect to

knowledge and willingness to provide the required information. A target sample of 45 respondents was used as the base line.

The target population consisted of over 250 vendors, buyers and County government staff at the vegetable market in the CBD of Eldoret town. The baseline sample mentioned above was obtained from this study population.

Data analysis included a summary of essential features and relationships in order to generalize from the analysis to determine patterns of behaviour and particular outcomes. Before processing the responses, the completed questionnaires were edited for completeness and consistency. A content analysis and descriptive analysis was employed. The content analysis was used to analyze the respondents' views about the impact of the organic waste generation in Eldoret vegetable market. Data was grouped into frequency distribution to indicate variable values and number of occurrences in terms of frequency. Frequency distribution table was informative to summarize the data from respondents. The organized data was interpreted on account of concurrence and standard deviation to objectives using a computer package SPSS version 17.0.

RESULTS AND DISCUSSIONS

The sample population consisted of 45 respondents randomly selected from a population of over 250 people who undertook various activities in the market. The response rate for this survey was 100% perhaps due to the sampling technique employed by the researchers and the relatively low number of respondents involved.

The study realized gender participation of 48.9% (22/45) male and 51.1% (23/45) women (Table 1). The mean and standard deviation for gender was 1.511 and 0.505 respectively. Although the difference in gender participation was not statistically significant, it was observed that male respondents were more readily approachable and were more willing to share information compared to their female counterparts. Sampled respondents were characterized by higher proportion of female than male buyers (62.5% and 37.5%) whereas seller participation was comparable in both gender (48% for females and 52% for males respectively).

Table 1. Gender participation

Gender	Frequency	Percent
Male	22	48.9
Female	23	51.1
Total	45	100.0

Respondent category varied significantly in the study 64.4% being sellers, 17.8% buyers 8.9% market neighbors and 8.9% municipal workers (Table 2).

Table 2. Respondent category

Category	Frequency	Percent
Buyers	8	17.8
Sellers	29	64.4
Market neighbours	4	8.9
Countystaff	4	8.9
Total	45	100.0

Concerning respondent satisfaction with respect to organic waste management by the municipal authority, 41.9% of the respondents were not satisfied with the way organic waste was being managed, a significant 37.2% of the respondents were fairly well satisfied while 20.9% were strongly satisfied with the authorities interventions on organic waste management.

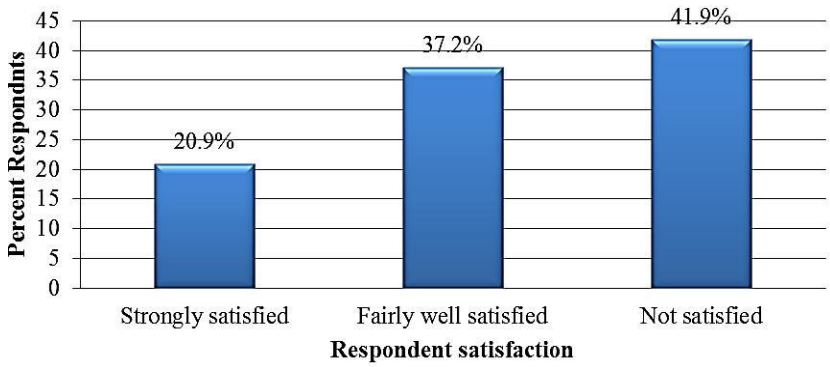

Figure1. Respondent satisfaction

Environmental Impact of Organic Waste Generation

The study established that the environmental impacts of organic waste generation in the vegetable market were mainly negative impacts as presented in figure 2 below. The study results show that 42.22% of the respondents explained that waste generation lead to dirty environment; 31.1% linked waste generation to occurrence of pests such as rats, flies; 33.33% organic waste generation to the reduction of aesthetic value of land; 22.2% associated waste generation to ground water pollution. Physical obstruction of sewage, foot paths, roads and other social facilities like play grounds was a remarkable concern to 44.4% of the respondents. A high percentage of the respondents; 84.4% of the majority (90%) being sellers pointed out that improper organic waste management lead to reduction in income mainly through loss of customers. It was observed that customers preferred buying their vegetable products from cleaner and safer sources. This observation also featured strongly in key informant interviews with County government staff whose observations are more constant than those of the researchers due to their constant contact with most buyers who were willing to pay more for products acquired in cleaner environments. Some of the respondents 38% confirmed that they were irritated

and disgusted by hips of organic waste while 11.1 % associated it to occurrence of accidents. About half the respondents, 48.9% thought that poor waste management lead to food contamination in the markets thus posing health risks to the buyers of the fruits and vegetables.The results shows that 48.9% of the respondents expressed their views that improper managed waste was an obstruction of market space that was highly associated with unhealthy competition for the little available space.

The results of the study show that a majority of the respondents were aware of the poor management of the organic waste generated in the market and impacts of the waste on their health and environment.

Odour concerns topped the list as indicated by a significant majority (91.1% 41/45) whereas 57.8% associated waste generation to diseases such as colds and flu, diarrhea due to the likelihood of food contamination and dirty environment.

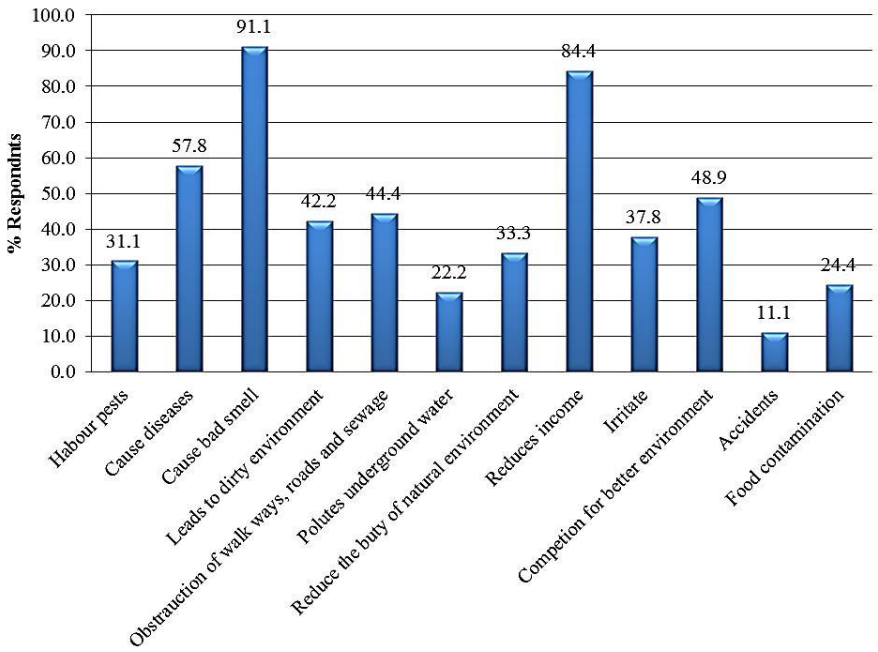

Figure 2. Negative impacts of organic waste of generation in Eldoret vegetable market

The study established a set of positive impacts associated with organic waste generation. Job creation topped the list as indicated by 82.2 % of respondents. A source of animal feed was a significant impact pointed out by 77.8% of the respondents while 73.3% associated organic waste generation to a source of organic manure when composted. Interviews with County Government staff revealed that an estimated 3% (by volume) of organic waste generated was collected as feeds by small scale livestock farmers. The authors established that there is a huge untapped potential for organic waste market to support livestock industry in Eldoret town. Eleven percent of the respondents linked organic waste generation to a source of income particularly to the street children, through

sales derived from compost manure, fruit seeds and seedlings, bio energy generation as well as animal feeds. Organic waste generation was thought to provoke other useful support groups like none governmental organizations who empowered sellers and other market players with knowledge on reuse, recycle and reduction of waste generation. Art Youth research center featured prominently in this respect as a major player in providing innovative solutions to organic waste generation through recycling to organic manure.

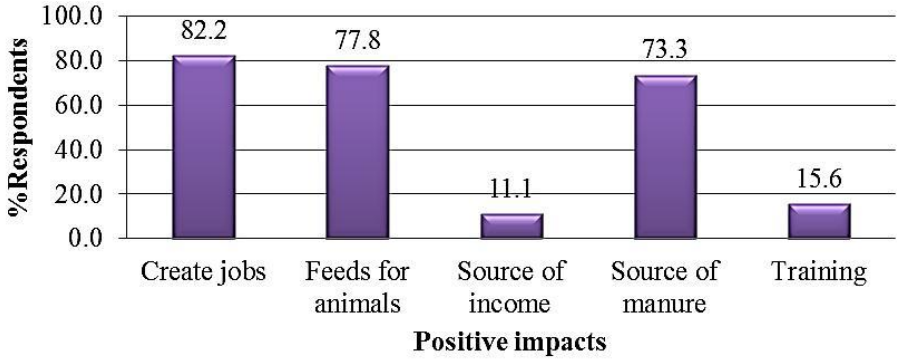

Figure 3. Positive impacts associated with organic waste generation

Socio-Economic Impacts of Organic Waste Generation

As mentioned earlier, organic waste generation was highly associated with loss of income for the market players, the County Government staff as well as business persons as indicated by 84% of respondents. It was pointed out that middle and high income earners would pay more at other places like supermarkets for the same commodities to avoid buying from dirty environment. The price of doing business in a cleaner environment was much higher compared to that of dirtier environment hence disammenity effect. This carried with it income class differences between those who could afford doing business in cleaner environments versus those who could not afford. Bad odour was thought to be a customer hindrance as indicated by 91.1% of the respondents. It was thought that obstruction of walk ways and sewage made the economic and social situation even harder especially during wet seasons. The fear of food contamination was thought to deprive the market buyers and sellers significant amount of income. Organic waste that found its way to play grounds was a hindrance to social gatherings as those who benefited from the use of play grounds could avoid the use of dirty grounds and seek alternative grounds.

Handling, Storage and Collection of Organic Waste

Organic waste handling, storage and transportation were significant processes in waste management for the market. The current practice by the key players in this respect was satisfactory though there could be room for improvement. Interviews revealed that the most significant waste generated in the market place was organic in nature as indicated by 95.6% of the respondents. A significant 73.3% collected organic waste daily, 22.2% collected weekly, whereas 2.2 collected hourly. 37.8% were equipped with waste

collection bins while a significant majority (55.6%) relied on designated waste collection points in the market for disposal. A small percentage of the respondents, 6.7% did not respond to the question as shown in table 3 below.

Table 3. Frequency of organic waste collection

	Frequency	Percent
Hourly	1	2.2
Daily	33	73.3
Weekly	10	22.2
Monthly	1	2.2
Total	45	100.0

Table 4.Where do you take the waste after collection?

	Frequency	Percent
Waste collection bins	17	37.8
Waste collection site at the market	25	55.6
No response	3	6.7
Total	45	100.0

The market suffers a weak waste separation plan as indicated by 80% of the respondents who did not separate organic waste at the source. 13% separated waste at the source whereas 4.4% were not sure (Table 5). When asked where the waste is taken after transportation, the respondents pointed a land fill site at Huruma Estate. When asked whether the waste was separated by the municipal workers at the land fill, most respondents (90%) did not seem to know the point at which waste was separated. A visit to the landfill indicated that no waste separation was done during waste dumping by municipal authority however; an insignificant proportion of the waste was separated by other players who benefitted from the waste mostly street children and members of support groups. The study established that municipal authority had an elaborate waste collection schedule that ensured waste collection daily to weekly depending on the waste situation which was further a function of the season.

Table 5. Do you separate organic waste from other types of waste?

	Frequency	Percent
Yes	6	13.3
No	36	80.0
Not Sure	2	4.4
Total	44	97.8
Missing	1	2.2
Total	45	
100		

Alternative uses for Organic Waste Generated from the Market

The study revealed that the most significant waste generated from the vegetable market was organic in nature as indicated by 96% of the respondents (Table 6). Interviews with market players revealed that the bulk of organic waste generated from the vegetable market is disposed of at the Huruma landfill. An insignificant quantity is reused for the livestock industry, organic fertilizer and raising of seedlings. There was insufficient data from municipal authority to establish how much waste was reused for the reasons mentioned above. Art youth research center provided education to scores of unemployed youths on the reuse of organic waste. This youth research Centre has been carrying out a regional organic waste collection, recovery and recycling into organic fertilizer around the slums of Eldoret. Interviews with Art youth research members revealed that the youths have been able to provide waste management services to more than 5000 households in the past 6 years in Eldoret town and its environs. The action is focused in collection of waste for organic fertilizer and creating awareness among small farmers in the slums. Organic waste from the vegetable market finding its way to Huruma land fill has been a high target for the youths. Unfortunately, though, for the lack of proper waste separation at the source, recyclable waste at the landfill is usually an insignificant amount. Scores of youths alsoderive their livelihood from collection of fruit seed from the waste and establishment of tree nurseries. Attempts to get the number of youths involved in these activities could not yield fruit as municipal authority data base could not be accessed at the time of the study.

Table 6. Which type of waste do you feel is highly generated in this market?

Type of waste	Frequency	Percent
Organic	43	95.6
Inorganic	2	4.4
Total	45	100.0

Mitigation Strategies

The findings noted that 37.8% of respondents had waste collection bins, which they used to store waste. This was personal initiative by the traders as part of their waste management strategy. County Government staff has provided one waste collection area at the eastern side of the market where all waste generated from the market is disposed prior to transportation to the Huruma landfill. The findings also revealed that County Government staff have been assigned duties at strategic points in the market to assist in waste collection and disposal. This strategy has many challenges ranging from attitude concerns on the part of County Government staff, improper supervision coupled with the fact that the number of County Staff deployed in the market area is inadequate.

Environmental impacts of organic waste mentioned in this study were similar to those observed by Boco *et al.* (2013) due to the perishable nature of the fruits and vegetables. A significant number of respondents associated organic waste generation to health concerns emanating from the likelihood of food contamination and environmental pollution. This observation was similar to that of George (2012) which described

contamination of environment and ground water by organic waste as a compromise to community health. Similar results were cited by Freduah, (2004). As regards social effects, the results were similar to those pointed out by George (2012), Brookshire *et al.* (1982) Case *et al.* (2006) and Decker *et al.,* (2005) who indicated that disammenity effect and housing price differences associated with environmental degradation. Like Wetende (2011), the study found negative attitude on the part of key market players with respect to organic waste collection and separation. A significant 20.9% of the respondents were very satisfied with the waste management strategy in place despite the fact that the said strategy did not yield much result. Similarly, with respect to inadequate resources to facilitate waste collection, transportation and disposal, the study agreed with that of Wetende (2011), Wong (2004) and Puopiel (2010) as inadequate facilities were significant concern in Eldoret metropolis. Based on focused discussions and respondent perceptions, the study found a significant impact of organic waste generation on economic activities in the vegetable market. This observation was consistent with that of George (2012), Davis (2004) Gayer *et al.,* (2000) Legget and Bockstael (2000) Chay and Greenstone, (2000). Waste collection practices undertaken by the municipality of Eldoret were found to be similar to those cited by Freduah (2004) in Accra city and Wetende (2011). In both scenarios, the waste collection strategy was traditional and lacking in creativity. There was no waste separation at the source while initiatives to enhance alternative uses were informal and inadequate.

Although the municipal authority has a set of rules on the management of organic waste in the vegetable markets, implementation is inadequate due to inadequate personnel to facilitate requisite training and follow up.

CONCLUSIONS

The municipality of Eldoret is far from streamlining organic waste management. The challenge of waste management brings along social, economic and environmental challenges, such as decrease in income, decrease in aesthetic value of land, higher prices of doing business.

This study has established that there is a set of positive impacts associated with waste management as there are negative impacts.A few hiccups still need to be addressed in order to fully control the waste management situation in the municipality of Eldoret.

RECOMMENDATIONS

1. The County Government of Uasin - Gishu needs to streamline organic waste management in Eldoret market.
2. The municipality of Eldoret is far from streamlining organic wastemanagement. The challenge of waste management brings along social, economic and environmental challenges, such as decrease in income, decrease in aesthetic value of land, higher prices of doing business. This study has established that there is a set of positive impacts associated with waste management as there are negative impacts.
3. The municipality has to implement the acquisition of more land for sanitary land fill as stated in their management strategy.

4. It should equip market players with more equipments and tools as well as raise awareness amongst the municipal staff, customers and the public about the policies by organizing open day awareness creations.
5. It is necessary to take audit of the current status of the practice because this will help in monitoring and setting targets in the future.
6. Municipality of Eldoret should emphasize more on benchmarking visits to town with successful practices like Paris.

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