

*Full Length Research Paper*

# Survey on the usage of plastic bags, their disposal and adverse impacts on environment: A case study in Jimma City, Southwestern Ethiopia

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Plastic bag wastes pose serious environmental pollutions and health problems in humans and animals. The situation is worsened in economically disadvantaged countries like Ethiopia. The objective of this survey was to assess usage of plastic bags and their environmental impacts in Jimma City of Ethiopia. A semi-structured questionnaire was used to collect data from 230 randomly selected respondents. The results indicated that the larger proportion (176, 76.52%) of the respondents used plastic bags more frequently than any other plastic products regardless of their age, occupation, and economic and educational status. Low price (159, 69.13%) and easy availability (152, 66.08%) were the main reasons for the widespread utilization of these products. Among the practices used for disposal of plastic bag wastes, open dumping to surrounding areas (137, 59.56%) was a practice widely used by almost all the residents of the city. Some of the major problems were animal death (167, 72.60%), blockage of sewage lines (162, 70.43%), deterioration of natural beauty of an environment (144, 62.60%) and human health problems (119, 51.73%). The findings of the present study also indicated that the trend of utilization of plastic bags is increasing from time to time in spite of a good deal of awareness of the residents about the adverse effects of these products. In order to reduce the problems associated with plastic bag wastes, it is recommended to educate the public (1) not to use plastic bags, and (2) to use eco-friendly alternative materials (bags) made from clothes, natural fibers and paper. City level legislation is also highly recommended against indiscriminate use and disposal of plastic bag wastes as well as to end free distribution of plastic bags by retailers.

**Key words:** Plastic waste, Jimma, plastic bags, environmental pollution, plastic bag waste, plastic products, waste disposal, flying toilets, plastic bag ban.

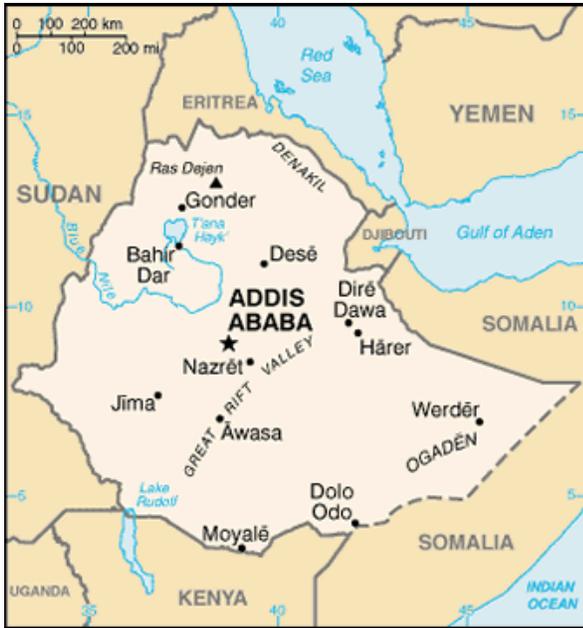
## INTRODUCTION

Plastic bags have been introduced in 1970's (Williamson, 2003) and gained an increasing popularity amongst consumers and retailers. They are available in huge numbers and varieties across the world. It is estimated that around 500 billion plastic bags are used every year worldwide (Spokas, 2007; Geographical, 2005). This widespread utilization is attributed to their cheapness and convenience to use. The vast majority of these bags are discarded as wastes usually after a single use. It is also believed that after their entry into environment, plastic

bags can persist up to 1000 years without being decomposed by sun light and/or microorganisms (Stevens, 2001; UNEP, 2005a).

Accumulation of plastic bag wastes causes environmental pollution that can be manifested in number of ways. One of the problems is deterioration of natural beauty of an environment (Anthony, 2003). Another common problem associated with these wastes is death of domestic and wild animals. This necessitates for proactive measures in order to safeguard animal species against extinction (EPHC, 2002; Brown, 2003; Flores, 2008; UNEP, 2006; Verghese et al., 2009a; Macur and Pudlowski, 2009; Narayan, 2001). Blockage of sewerage systems is becoming a common problem in cities and

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**Figure 1.** Map showing the relative position of the study area.

towns of developing countries. This, in turn, creates foul smells and favorable habitats for mosquitoes and other vectors that could spread a large number of diseases such as encephalitis, dengue fever and malaria (Ellis et al., 2005). If plastic bags get access to agricultural fields, they reduce percolation of water and proper aeration in soil. This results in reduction of productivities of such fields (Njeru, 2006). Furthermore, in several poor and developing countries, these bags are frequently used to carry food items. This practice can cause serious health problems since some carcinogenic agents could be generated during the chemical reactions that take place in plastic materials (for example, colouring agents) and the food items due to temperature variations (Narayan, 2001). In recent reports, it has been mentioned that reuse of plastic bags can cause cross contamination of foods by microorganisms (Gerba et al., 2009; Cliver, 2006; Maule, 2000). Moreover, plastic bags are also used for disposing of human and other domestic wastes which makes human health more risky as compared to "open" disposal of these wastes (Njeru, 2006; Subramanian, 2000).

Several measures are being employed to reduce the negative impacts of plastic bags. These measures include recycling and ban of the production and distribution of these products. For economic and quality reasons, recycling has been found to be impractical (McKinney and Schoch, 2003; Miller, 2005). This results in the build-up of plastic bag wastes in environment, and has mounted the concern of many governments and environmentalists. The problem also prompted many countries to pass legislations to ban or impose economic

instruments such as levies and taxes to restrict the use and production of plastic bags (Convery, 2007; Hasson et al., 2007; Rayne, 2008; Ayalona et al., 2009; Clapp and Swanston, 2009; Xing, 2009). Though, they are not as such effective, voluntary initiatives have also been attempted in some countries to reduce plastic bag use and/or plastic bag problems in environment (UNEP, 2005b).

Ethiopia is one of those African countries that partially have banned plastic bags by setting a minimum thickness of the bags to be manufactured in the country and/ or imported into the country (Solid waste management, 2007, 2007; UNEP, 2005b). However, different reports (Bjerkli, 2005; Tadesse, 2008) showed that plastic bags are still causing severe environmental pollutions and also human and animal health damages in urban and rural areas of the country. Some of the basic reasons could be poor waste management and perhaps lack of awareness about the negative impacts of plastic bags (Tiruneh and Yesuwork, 2010; Ramaswamy and Sharma, 2011). For instance, a retrospective study by Ramaswamy and Sharma (2011) that was conducted in Gondar City of Ethiopia, on impacts of plastic bag usage on environment and cattle health, indicated that plastic bag wastes were dumped near road sides, open plots, riversides, in drains and public places. Consequently, over flowing of water was reported to be a common problem during rainy seasons as a result of blockage of drains. The study also demonstrated that plastic bag wastes posed several cattle health problems including deaths. Moreover, ingestion of plastic bags (along with other foreign bodies) was reported to cause reduction in milk yield (Ramaswamy and Sharma, 2011). Similar problems are also expected to be common in other big cities of the country such as Jimma City due to the aforementioned reasons. The present study was, therefore, initiated to assess usage of plastic bags, their disposal and adverse impacts on environment in Jimma City, south western Ethiopia.

## MATERIALS AND METHODS

### Description of the study area

The study was conducted in Jimma City, southwestern Ethiopia (Figure 1). It is located at 345 km away from Addis Ababa. The latitude and longitude of Jimma City are 7°40'N and 36°50'E, respectively. The average altitude of the city is 1760 m above sea level with a temperature range of 11 to 27°C (Mossie, 2002). According to the national census undertaken in 2005, the city has a total human population of 159,009 of which 80,897 were men and 78,112 were women (CSA, 2005). Various forms of Christianity (Orthodox, Protestant and Catholic), Islam and other beliefs are commonly practiced in the city. The main economic activities are commerce (trading and catering service) and manufacturing enterprises.

### Sampling techniques, data collection and analysis

Data were collected from 230 respondents that consisted of 167

**Table 1.** Demographic profiles of respondents of survey (Jimma City).

Variable	Categories	No.	%
Sex	Male	167	72.61
	Female	63	27.39
Age	< 20 years	41	17.83
	20-29 years	94	40.87
	30-39 years	58	25.22
	≥ 40 years	37	16.09
Educational status	Illiterate	2	0.87
	Primary education	27	11.74
	High school education	77	33.48
	Higher education	124	54.91
Occupation	Students	77	33.48
	Government employees	116	50.43
	Private	25	10.78
	Others*	12	5.22

\* Daily laborers and house wives.

males and 63 females. The study subjects were selected using random sampling technique (Marshall, 1996). The selection was made from neighboring households which were in the distance of 100 to 200 m far from each other. Among the visited households, at least one member of the family was picked randomly for the study regardless of his/her age, educational status, sex and occupation as long as he/she was willing. The number of male respondents was higher than female respondents due to the fact that males showed more readiness to be interviewed and fill the questionnaires provided. To collect the data, semi-structured questionnaires were prepared in English (Appendix 1). Prior to the administration of the questionnaires, conversations were held with the selected respondents to explain the objective of the study. Those respondents who were willing but not able to attend the questionnaires by themselves were helped by data collectors. Based on the collected data, the respondents were grouped into different categories (Table 1). Analysis of the collected data was carried out using SPSS software version 16.

## RESULTS AND DISCUSSION

### Plastic bags and factors responsible for increasing trend of their usage

Of the 230 respondents, the largest proportion of them (176, 76.52%) used plastic bags in high frequency as compared to other plastic products. This was followed by the usage of plastic bottles (92, 40%), plastic buckets, barrels and baskets (44, 19.13%) and plastic shoes (26, 11.30%) (Table 2). These results revealed that majority of the respondents in each category use plastic bags in their daily life. The results also indicated that usage of plastic bags is high among residents of Jimma City, and the residents noticed the increasing trend of usage of plastic

bags from time to time. This observation is consistent with the report of Ramaswamy and Sharma (2011) from Gondar City of Ethiopia that states increasing trends of usage of plastic bags among Gondar City residents. All these facts suggest that plastic bags are also widely utilized products in other big cities of the country.

The survey results indicated that regardless of sex, educational level, age group and occupation, majority of the city residents widely used plastic bags in their daily life activities. Some of the main reasons attributed to the widespread usage were low price (159, 69.13%), easy availability (152, 66.08%) and light weight (95, 41.30%) (Table 3). These findings are consistent with other reports describing that light-weight, cheap price, excellent fitness for use and resource efficiency as main reasons for widespread utilization of plastic bags by billions of customers throughout the world (Verghese et al., 2006). Though lack of alternative materials (62, 26.95%) and durability (32, 13.91%) were mentioned as additional contributing factors for excessive utilization of plastic bags in the city, their contribution was found to be less important as compared to the above mentioned reasons (Table 3). During the course of our survey, we also observed many shopkeepers and retailers distributing plastic bags free of charge to their customers for carrying other sold items. This suggests that cheapness and free distribution of these materials by retailers or supermarket owners are believed to be the main reasons for the widespread usage and problems of plastic. This argument is consistent with the results of similar surveys in other big cities of the world (Environment Victoria, 2006; Ayalona, 2009; TEC, 2007; Li et al., 2010).

**Table 2.** Types of plastic products commonly used (Jimma City).

Variable/category <sup>a</sup>	Plastic bags {No. (%)}	Plastic bottles {No. (%)}	Plastic buckets, barrels and baskets {No. (%)}	Plastic shoes {No. (%)}
<b>Sex</b>				
Male	125 (56.34)	67 (29.13)	29 (12.61)	17 (7.39)
Female	51 (22.18)	25 (10.87)	15 (6.52)	9 (3.91)
Total	176 (76.52)	92 (40)	44 (19.13)	26 (11.30)
<b>Educational status</b>				
Illiterate	2 (0.87)	0 (0)	0 (0)	0 (0)
Primary education	18 (7.82)	4 (1.73)	5 (2.17)	3 (1.30)
High school education	54 (23.47)	28 (12.17)	20 (8.69)	10 (4.34)
Higher education	102 (44.34)	60 (26.08)	19 (8.26)	13 (5.65)
Total	176 (76.52)	92 (40)	44 (19.13)	26 (11.30)
<b>Age group</b>				
< 20	24 (10.43)	16 (6.95)	11 (4.78)	6 (2.60)
20-29	72 (31.30)	29 (12.60)	15 (6.52)	11 (4.78)
30-39	49 (21.30)	32 (13.91)	12 (5.21)	5 (2.17)
≥ 40	31 (13.47)	15 (6.52)	6 (2.60)	4 (1.73)
Total	176 (76.52)	92 (40)	44 (19.13)	26 (11.30)
<b>Occupation</b>				
Student	55 (23.91)	30 (13.04)	13 (5.65)	9 (3.91)
Gov't employee	92 (40)	52 (22.60)	25 (10.86)	14 (6.08)
Private	18 (7.82)	4 (1.73)	5 (2.17)	2 (0.86)
Others <sup>b</sup>	11 (4.78)	6 (2.60)	1 (0.43)	1 (0.43)
Total	176 (76.52)	92 (40)	44 (19.13)	26 (11.30)

<sup>a</sup> Multiple responses were possible; <sup>b</sup> daily laborers and house wives.

For instance, a survey in the city of Sydney, Australia, showed that 64% of customers of supermarkets use free plastic bags (TEC, 2007). Similarly Li et al. (2010) demonstrated that the modern society show high preference to plastic bags over other possible alternatives.

### Practices of disposal of plastic bag wastes and their environmental impacts

It is obvious that at the end of their short service life, plastic bags become wastes (Clapp et al., 2008). Therefore, the respondents were also asked about the ways on how they used to dispose plastic bag wastes. The results indicated that throwing to the surrounding areas (open dumping) (137, 59.56%), burning (94, 40.86%) and burying (43, 18.69%) to be the common practices to dispose plastic bag wastes (Table 4). Of these practices, indiscriminate throwing of the wastes to the surrounding open areas was used by majority of the residents. This suggests that "use and throw-away" to be a custom among the residents of Jimma City. Of the 124

respondents, who were students or graduates of higher institutions, only 35 (28.22%) and 20 (16.13%) of them used burying and burning, respectively, as means of post-use disposal of plastic bags. Most of these respondents (91, 73.38%) used open dumping (Table 4). Our field observations showed that plastic bag wastes constituted a larger share of plastic wastes in several residential areas in the city and its outskirts (Figure 2). The results (and observations) are consistent with other reports stating that in several cities of the country and also in cities of other parts of the world, especially in developing countries people prefer open dumping as a preferred means of disposal of plastic bag wastes, usually after a single use (Clapp et al., 2008). As indicated in Table 4, burning is also the commonly used method of disposal of plastic bag wastes in the study area. Of the female respondents, those respondents (36, 15.65%) who burn plastic bag wastes were slightly larger as compared to those females (30, 13.04%) who throw the wastes to the environment (Table 4). The possible reason could be that many women use the plastic bag wastes for carrying fire in kitchens. It is a fact that burning can help to get rid of plastic bag wastes or to reduce the

**Table 3.** Factors attributed for widespread utilization of plastic bags (Jimma City).

Variable/category <sup>a</sup>	Low price {No. (%)}	Easy availability {No. (%)}	Light weight {No. (%)}	Lack of alternative materials {No. (%)}	Durability {No. (%)}
<b>Sex</b>					
Male	117 (50.87)	111 (48.26)	71(30.87 )	45 (19.56)	24 (10.44)
Female	42 (18.26)	41 (17.82)	24 (10.43 )	17 (7.39)	8 (3.47)
Total	159 (69.13)	152 (66.08)	95 (41.30)	62 (26.95)	32 (13.91)
<b>Educational status</b>					
Illiterate	2 (0.86)	1 (0.43)	0 (0)	0 (0)	0 (0)
Primary education	15 (6.52)	16 (6.95)	11 (4.78)	5 (2.17)	2 (0.86)
High school education	48 (20.86)	41 (17.82)	25 (10.86)	32 (13.92)	10 (4.34)
Higher education	94 (40.86)	94 (40.86)	59 (25.65)	25 (10.56)	20 (8.69)
Total	159 (69.13)	152 (66.08)	95 (41.30)	62 (26.95)	32 (13.91)
<b>Age group</b>					
< 20	25 (10.86)	16 (6.95)	17 (7.39)	11 (4.78)	4 (1.73)
20-29	68 (29.86)	67 (29.13)	44 (19.13)	20 (8.69)	12 (5.21)
30-39	41 (17.82)	43 (18.69)	21 (9.13)	15 (6.52)	8 (3.47)
≥ 40	25 (10.86)	26 (11.30)	13 (5.65)	16 (6.95)	8 (3.47)
Total	159 (69.13)	152 (66.08)	95 (41.30)	62 (26.95)	32 (13.91)
<b>Occupation</b>					
Student	56 (24.34)	47 (20.43)	40 (17.35)	13 (5.65)	10 (4.34)
Gov't employee	83 (36.08)	85 (36.95)	44 (19.13)	34 (14.78)	22 (9.56)
Private	11 (4.78)	12 (5.21)	8 (3.47)	12 (5.21)	0 (0)
Others <sup>b</sup>	9 (3.91)	8 (3.43)	3 (1.30)	3 (1.30)	0 (0)
Total	159 (69.13)	152 (66.08)	95 (41.30)	62 (26.95)	32 (13.91)

<sup>a</sup> Multiple responses were possible; <sup>b</sup> daily laborers and house wives.

volumes of these wastes in the environment. However, this burning should not be encouraged for several reasons such as greenhouse gas emissions that cause climate change (Vehrgese et al., 2006; Muthu et al., 2011) and release of toxic organic compounds into the environment that cause different health risks, such as

respiratory health problems (Boadi and Kuitunen, 2005; Rayne, 2008). Thus, the public should be educated or informed regarding the impact of burning of plastic bag wastes.

Burying was mentioned as one of the commonly used disposal practice for disposing of plastic bag wastes in the study area (Table 4). However, this

method should not be considered as an alternative means to avoid problems associated with plastic bags. This is because the plastic wastes have potentials to leach their chemical components and toxins into soil and water sources, which can be passed to humans, resulting in serious health hazards. In the long-run

**Table 4.** Practices of plastic bag waste disposal (Jimma City).

Variable/category <sup>a</sup>	Open dumping {No. (%)}	Burning {No. (%)}	Burying {No. (%)}
<b>Sex</b>			
Male	107 (46.52)	58 (25.21)	29 (12.61)
Female	30 (13.04)	36 (15.65)	14 (6.08)
Total	137 (59.56)	94 (40.86)	43 (18.69)
<b>Educational status</b>			
Illiterate	0 (0)	1 (0.43)	1 (0.43)
Primary education	8 (3.47)	17 (7.39)	7 (3.04)
High school education	38 (16.52)	41 (17.82)	15 (6.52)
Higher education	91 (39.56)	35 (15.21)	20 (8.69)
Total	137 (59.56)	94 (40.86)	43 (18.69)
<b>Age group</b>			
< 20	15 (6.52)	26 (11.30)	13 (5.65)
20-29	56 (24.34)	34 (14.78)	19 (8.26)
30-39	43 (18.69)	19 (8.26)	6 (2.60)
≥ 40	23 (10)	15 (6.52)	5 (2.17)
Total	137 (59.56)	94 (40.86)	43 (18.69)
<b>Occupation</b>			
Student	44 (19.13)	35 (15.21)	18 (7.82)
Gov't employee	73 (31.73)	42 (18.26)	17 (7.39)
Private	13 (5.65)	11 (4.78)	5 (2.17)
Others <sup>b</sup>	7 (3.04)	6 (2.60)	3 (1.30)
Total	137 (59.56)	94 (40.86)	43 (18.69)

<sup>a</sup> Multiple responses were possible; <sup>b</sup> daily laborers and house wives.

**Figure 2.** Open areas with high accumulation of plastic bag wastes in Jimma City.

they can also reduce plant growth near sites where used to bury them as a result of reduced water and air movement in the soil (Butte Environmental Council, 2001;

IRIN, 2005; Lane, 2003). It is expected that educated members of the society to have a better concern about environment. However, the results of our survey indicated

**Table 5.** Problems associated with plastic bag wastes (Jimma City).

<b>Variables/categories<sup>a</sup></b>	<b>Animal death {No. (%)}</b>	<b>Blockage of sewage systems {No. (%)}</b>	<b>Destruction of natural beauty of environment {No. (%)}</b>	<b>Human health problems {No. (%)}</b>
<b>Sex</b>				
Male	126 (54.78)	115 (50)	104 (45.21)	85 (36.95)
Female	41 (17.82)	47 (20.43)	40 (17.39)	34 (14.78)
Total	167 (72.60)	162 (70.43)	144 (62.60)	119 (51.73)
<b>Educational status</b>				
Illiterate	1 (0.43)	1 (0.43)	2 (0.86)	0 (0)
Primary education	14 (6.08)	16 (6.95)	6 (2.60)	13 (5.65)
High school education	49 (21.30)	51 (22.17)	49 (21.30)	43 (18.69)
Higher education	103 (44.78)	94 (40.86)	87 (37.82)	63 (27.39)
Total	167 (72.60)	162 (70.43)	144 (62.60)	119 (51.73)
<b>Age group</b>				
< 20	19 (8.26)	24 (10.43)	22 (9.56)	18 (7.82)
20-29	77 (33.47)	70 (30.43)	58 (25.21)	49 (21.30)
30-39	43 (18.69)	42 (18.26)	41 (17.82)	27 (11.73)
≥ 40	28 (12.17)	26 (11.30)	23 (10)	25 (10.86)
Total	167 (72.60)	162 (70.43)	144 (62.60)	119 (51.73)
<b>Occupation</b>				
Student	55 (23.91)	51 (22.17)	50 (21.73)	40 (17.59)
Gov't employee	87 (37.82)	84 (36.52)	76 (33.04)	63 (27.39)
Private	15 (6.52)	16 (6.95)	12 (5.21)	10 (4.34)
Others <sup>b</sup>	10 (4.34)	11 (4.78)	6 (2.60)	6 (2.60)
Total	167 (72.60)	162 (70.43)	144 (62.60)	119 (51.73)

<sup>a</sup> Multiple responses were possible; <sup>b</sup> daily laborers and house wives.

that these members of the society seem to have low concern about environment. Therefore, efforts are needed to sensitize every member of the community about the many-fold problems caused as a result of plastic bag wastes indiscriminately introduced into the environment.

Similar to other cities of developing countries (Girum, 2005; Seema, 2008; Boadi and Kuitunen, 2005) there are several problems associated with plastic bag wastes in Jimma City. The data given in Table 5 indicated that animal death (167, 72.60%), blockage of sewage systems (162, 70.43%), deterioration of natural beauty of environment (littering) (144, 62.60%) and human health problems (119, 51.73%) were some of the problems stressed by the respondents. The data also indicated that all the factors are equally important problems in the city (Figures 2 and 3). These observations are consistent with reports on environmental problems of plastic bag wastes in other countries (UNEP, 2005b). Among domestic animals most affected ones were stray cattle, ruminants and dogs. Recent reports (Tiruneh and Yesuwork, 2010; Ramaswamy and Sharma, 2011) by other authors showed the recovery of large quantity of plastic products

particularly plastic shopping bags from domestic animals after rumentonomy and/or slaughtering. It has also been reported that during the time of shortage of food, such domestic animals eat plastic bags (especially those wastes containing food leftovers) indiscriminately. This results in complications of the digestive systems and health of animals. If untreated timely, this could lead to the death of animals and economic loss to their owners as it has been observed in developing countries of Africa and India (World Watch, 2004; Edwards, 2000; Forum for Environment, 2010; Ryan and Rice, 1996).

Another problem identified from the survey was blockage of drain systems and over flowing of liquid wastes in different parts of the city (Figure 2). This observation was in line with other reports on consequence of blockade of sewerage systems by plastic bag wastes (Seema, 2008; Boadi and Kuitunen, 2005, Smith, 2009). For instance, the 2005 Mumbai flooding incidence, that killed over 1000 people and at least 1000 animals and livestock, was attributed to plastic bags clogged the city's storm drains and prevented the monsoon rains from leaving the city (Smith, 2009). Moreover, the blocked storm drains also created pools of



**Figure 3.** Plastic bag wastes clogging sewerage lines (or drains) (in Jimma City).

stagnant water, allowing mosquitoes and other insects to breed more easily within a city, and transmit a variety of lethal diseases such as dengue, malaria, yellow fever and several forms of encephalitis (Boadi and Kuitunen, 2005; Rayne, 2008). Therefore, a due attention should be paid to proper disposal of plastic bag wastes in order to avoid clogging of drainage systems of the city. This, in turn, would help to avoid flooding problems which have been observed in many cities having no proper plastic waste disposal (Smith, 2009).

Deterioration of environmental beauty (or littering) (144, 62.60%) was also mentioned as a serious problem next to animal death (167, 72.60%) and blockage of sewage lines of the city (162, 70.43%) (Table 5). This could be attributed to the open dumping culture of the residents (Table 4). The chemical stability of plastic bag wastes prevents them from decomposing at a rate comparable to the rate of waste generation. Once they enter into environment, plastic bags can be carried by wind to distant places due to their lightness in weight, and can create serious damages in large urbanized areas of the

world (Flores, 2008; Seema, 2008; Macur and Pudlowski, 2009). This problem is also similar in the case of Jimma City. Observation of seriously polluted landscapes and unhygienic sites in several places of the city can confirm this point. The results of the current survey indicated that majority of the respondents, regardless of their background, understand the problems of plastic bag wastes on animals and environment (Table 5).

Nowadays, plastic bags are usually used for the storage of solid wastes generated within households including human fecal matter “flying toilets” (Tekola, 2006; Boadi and Kuitunen, 2005). Similar practices were observed in many residential areas and commercial centers of the Jimma City. This is in agreement with previous reports (ELCI, 2005; Njeru, 2006; Cointreau, 2006; Tekola, 2006; WHO, 2010) demonstrating that in several cities of developing (low-income) countries, human fecal matters often placed in plastic bags and thrown to the surrounding open areas. This could be attributed to lack of adequate toilet facilities. Many residents of these cities are forced to relieve themselves



**Figure 4.** Plastic bag wastes are common near farm lands and river sides (Jimma City).

in plastic bags which they then throw away. Though the frequency of the observation of “flying toilet” in the city was low, it is recommended that the concerned authorities should think in advance in order to avoid problems associated with the “flying toilets” at an early stage. This can be done through construction of public (communal) toilets. A recent sanitary survey of residential areas in the city showed that the living yards of the households were seriously contaminated with helminthes (*Ascaris lumbricoides*) ova with prevalence of 41.5% indicating the ill-impact of plastic bag wastes on human health (Legesse and Gebre-Selassie, 2007). This suggests a lack of public awareness about the direct and long-term impacts of these wastes on human health. Recent research findings also indicated that reusable plastic bags posed serious human health problems (Cliver, 2006; Maule, 2000; Gerba, 2010). The studies showed that reusable plastic bags can become habitats for pathogenic microorganisms. For instance, Gerba et al. (2010) reported that reuse of plastic bags to carry groceries could cause a significant risk of cross-contamination of food by pathogenic bacteria. Their survey revealed the presence of a large number of

bacteria in almost all the tested reused bags and coliform bacteria in half of them. *E. coli* has also been identified in 12% of the reused bags and a wide range of enteric bacteria including several opportunistic pathogens from the reused plastic bags (Gerba et al., 2010). These facts and results of the present study suggest the need of an urgent action to educate the community about the human health risk of plastic bags.

The places with high accumulation of plastic bag wastes included roadsides, parks, densely populated residential areas, solid waste disposal sites, sewerage lines, riversides and farm lands at the periphery of the city (Figures 2, 3 and 4). These observations could indicate that the pollution caused by plastic bag wastes is serious in the city. As discussed in the previous sections, plastic bags are resistant to decomposition, and stay long in the environment. If they exist in large quantity in soil, they prevent air and water circulation which results in reduction of productivity of farm lands (Ellis et al., 2005; Rayne, 2008; Njeru, 2006). However, from our field visits, it was observed that the city municipality disposed solid waste near farm lands indicating the marginality of the problems related to plastic bag wastes' improper disposal.

**Table 6.** Media exposure of the community to get information about plastic bag wastes (Jimma City).

Variable/category <sup>a</sup>	Radio/TV {No. (%)}	Professionals {No. (%)}	School {No. (%)}	Published materials {No. (%)}
<b>Sex</b>				
Male	98 (42.60)	51 (22.17)	48 (20.87)	30 (13.04)
Female	36 (15.65)	15 (6.52)	16 (6.95)	14 (6.09)
Total	134 (58.26)	66 (28.69)	64 (27.82)	44 (19.13)
<b>Educational status</b>				
Illiterate	2 (0.43)	0 (0)	0 (0)	0 (0)
Primary education	18 (7.82)	3 (1.30)	8 (3.47)	2 (0.43)
High school education	49 (21.30)	22 (9.56)	14 (6.08)	8 (3.47)
Higher education	65 (28.26)	41 (17.82)	42 (18.26)	34 (14.78)
Total	134 (58.26)	66 (28.69)	64 (27.82)	44 (19.13)
<b>Age group</b>				
< 20	21 (9.13)	10 (4.34)	20 (20.86)	2 (0.86)
20-29	56 (24.34)	25 (10.86)	33 (14.34)	14 (6.08)
30-39	34 (14.78)	25 (10.86)	8 (3.47)	16 (6.95)
≥ 40	23 (10)	6 (2.60)	3 (1.30)	12 (5.21)
Total	134 (58.26)	66 (28.69)	64 (27.82)	44 (19.13)
<b>Occupation</b>				
Student	40 (17.39)	29 (12.60)	36 (15.56)	11 (4.78)
Gov't employee	67 (29.13)	32 (13.91)	18 (7.82)	33 (14.34)
Private	16 (6.95)	3 (1.30)	6 (2.60)	0 (0)
Others <sup>b</sup>	11 (4.78)	2 (0.86)	4 (1.73)	0 (0)
Total	134 (58.26)	66 (28.69)	64 (27.82)	44 (19.13)

<sup>a</sup> Multiple responses are possible; <sup>b</sup> daily laborers and house wives.

### Media exposure of the community and trends in the use of plastic bags

Majority of the respondents (134, 58.26%) appreciated the important roles of radio and TV in dissemination of information about adverse impacts of plastic bag wastes (Table 6). Other sources of information included health professionals (134, 58.26%), schools (64, 27.82%) and published materials (44, 19.13%) (Table 6).

The results in Table 6 suggest that it is possible to use these media to inform people about the seriousness of problems posed by plastic bag wastes and also to change their shopping habits. Though not quantified, it is believed that a large number of people have access to radio and TV. Moreover, regardless of the educational status or/and, age level, people can get messages from TV and radio. Thus, educating the community via these media can help to a better understanding of the negative effects of plastic bags. As shown in Table 6, only 44 (19.13%) of the respondents used to get information from published materials (news papers and magazines). This could be attributed to lack of these materials having coverage on these wastes. This fact was consistent with

the authors' survey on some popular magazines and newspapers sold by the city venders. No information was found regarding the impacts of plastic bags on environment.

Surprisingly, only about 30% the respondents mentioned "lack of awareness" as a basic reason for the observed increasing trend of plastic bag usage (Table 7). Except the illiterates, majority of the respondents in each category had good awareness about the problems associated with plastic bag wastes (Tables 5 and 7). This suggests that it needs only a little effort to mobilize the residents to take action against post-use disposal and utilization of plastic bags. However, much has to be done in order to change plastic bag using habit of the residents.

The information collected from respondents showed that more than half (120, 52.17%) of the respondents agreed to discontinue utilization of plastic bags whereas the rest (110, 47.83%) of them insisted on continuing their utilization of these products (Table 8). This suggests that intensive and extensive awareness raising campaigns are required to educate the residents of the study area. Among the female respondents majority of

**Table 7.** Factors responsible for increasing trend of plastic bag usage (Jimma City).

<b>Variable/category<sup>a</sup></b>	<b>Lack of awareness {No. (%)}</b>
<b>Sex</b>	
Male	51 (22.17)
Female	17 (7.39)
Total	68 (29.56)
<b>Educational status</b>	
Illiterate	2 (0.86)
Primary education	4 (1.73)
High school education	20 (8.69)
Higher education	42 (18.26)
Total	68 (29.56)
<b>Age group</b>	
< 20	6 (2.60)
20-29	28 (12.17)
30-39	21 (9.13)
≥ 40	13 (5.65)
Total	68 (29.56)
<b>Occupation</b>	
Student	20 (8.69)
Gov't employee	37 (16.08)
Private	8 (3.47)
Others <sup>b</sup>	3 (1.30)
Total	68 (29.56)

<sup>a</sup> Multiple responses are possible; <sup>b</sup> daily laborers and house wives.

them were in favor of continuation of plastic bag usage (Table 8). This could be attributed to the fact that Ethiopian females are mostly responsible for shopping of items for household consumptions. Among the respondents who were in favor of the discontinuation of utilization of plastic bags mentioned that non-governmental organizations, government and members of the community themselves and health institutions as responsible bodies to take initiatives in this aspect. This information indicated that it could be possible to minimize and ultimately discontinue the plastic bag usage among the city residents by joint effort of non-governmental organizations and government through mobilizing the community. This could be done through encouraging (1) Shopkeepers/retailers, the main source of plastic bags, not to provide plastic bags to their customers; (2) the public to abstain from using plastic bags; and (3) investors to manufacture and distribute of low-priced alternative reusable materials or bags made of natural fibers, paper and clothes which have low impact on environment (Smith, 2009; Li et al., 2010; Muthu et al., 2010). It has been reported that different cities in the world implemented city-level strategies and policies that ban the use and production of plastic bags (Clapp, 2008;

KNPCPC, 2006; Watson, 2009; Metropolitan Washington COG, 2009; AECOM, 2010). These can potentially be adapted to the Ethiopian context.

## Conclusions

The result of the present study indicated that most of the respondents, regardless of their demographic background, are (1) in favor of banning of production, distribution and use of these plastic products, and (2) aware of the adverse effects of plastic bag wastes on environment, animal and human health. However, plastic bags are still widely used by the community more than any other plastic products mainly due to their cheapness. The survey results and field observations indicated that the city was seriously polluted by plastic wastes particularly plastic bags wastes. By and large, it can be recommended that various campaigns need to be organized in order to mobilize the public and other stakeholders (Government agencies, business associations, retailers, research institutions, non-governmental organizations (NGOs), youth associations, women associations, religious institutions, donors and the

**Table 8.** Preference of the study population for and against utilization of plastic bags (Jimma City).

Variable/category <sup>a</sup>	Utilization of plastic bags should be discontinued {No. (%)}	Utilization of plastic bags should be continued {No. (%)}
<b>Sex</b>		
Male	93 (40.43)	74 (32.17)
Female	27 (11.74)	36 (15.65)
Total	120 (52.17)	110 (47.82)
<b>Educational status</b>		
Illiterate	0 (0)	2 (0.86)
Primary education	8 (3.47)	19 (8.26)
High school education	39 (16.95)	38 (16.52)
Higher education	67 (29.13)	57 (24.78)
Total	120 (52.17)	110 (47.82)
<b>Age group</b>		
< 20	12 (5.21)	27 (11.73)
20-29	50 (21.73)	44 (19.13)
30-39	34 (14.78)	22 (9.56)
≥ 40	22 (9.56)	15 (6.52)
Total	120 (52.17)	110 (47.82)
<b>Occupation</b>		
Student	35 (15.21)	42 (18.26)
Gov't employee	65 (28.26)	51 (22.17)
Private	12 (5.21)	13 (5.65)
Others <sup>b</sup>	7 (3.04)	5 (2.17)
Total	120 (52.17)	110 (47.82)

<sup>a</sup> Multiple responses were possible; <sup>b</sup> daily laborers and house wives.

media) against indiscriminate use and disposal of plastic bags in order to minimize the excessive accumulation of plastic bag wastes in the environment. Moreover, passing legislations alone is not sufficient condition to curb the problem of plastic bag wastes. Therefore, the central government in collaboration with other concerned authorities of the city should encourage people to use environment-friendly alternative materials, such as cloth bags, paper bags and natural fiber bags.

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## REFERENCES

- AECOM Technical Services (AECOM) (2010). Economic impact analysis proposed ban on plastic carryout bags in Los Angeles County. A report prepared for Sapphos Environmental, Inc. Pasadena, California. Project No. 18373, pp. 5-24. www.aecom.com [Accessed on February 2011].
- Anthony A (2003). *Plastics and the environment*. New Jersey: John Wiley & Sons, Inc. Hoboken, New Jersey, pp. 379-397
- Ayalona O, Goldratha T, Rosenthal G, Grossman M (2009). Reduction of plastic carrier bag use: An analysis of alternatives in Israel. *Waste Manage.*, 29(7): 2025-2032.
- Bjerkli CL (2005). *The cycle of plastic waste: an analysis on the informal plastic recovery system in Addis Ababa, Ethiopia*. Master thesis. Norwegian Univ. Sci. Technol., pp. 40-49
- Boadi KO, Kuitunen M (2005). Environmental and health impacts of household solid waste handling and disposal practices in third world cities: the case of the Accra Metropolitan Area, Ghana. *J. Environ. Health*, 68(4): 32-36.
- Brown S (2003). 'Seven Billion Bags a Year'. *Habitat Australia*, 31(5): 28.
- Butte Environmental Council (2001). "Reducing plastic waste tops 2001 legislative agenda." *Environmental news* (Spring). [http://www.becnet.org/ENews/01sp\\_plastic.html](http://www.becnet.org/ENews/01sp_plastic.html), p. 10.
- Clapp J, Swanston L (2009). Doing away with plastic shopping bags: international patterns of norm emergence and policy implementation. *Environ. Politics*, 18(3): 315-332.
- Clapp J, Swanston L, Williams J (2008). Single-use plastic shopping bags: Issues for the region of Waterloo to consider University of Waterloo, Faculty of Environmental Studies, Waterloo, USA, pp. 2-13
- Cliver DO (2006). Cutting boards in *Salmonella* cross-contamination. *JAOAC Int.*, 89: 538-542.
- Cointreau S (2006). Occupational and environmental health issues of solid waste management special emphasis on middle- and lower-

- income countries. The International bank for reconstruction and development/The World Bank, Washington, DC, pp. 3-7.
- Convery F, McDonnell S, Ferreira S (2007). The most popular tax in Europe? Lessons from the Irish plastic bags levy. *Environ. Resour. Econ.*, 38: 1-11.
- CSA (2005) National Statistics. Obtained through internet: <http://www.csa.gov.et> [Accessed on 14 June, 2010].
- Edwards R (2000). "Bags of rubbish." *The Ecologist*, 30(8): 52.
- Ellis S, Kantner S, Saab A, Watson M (2005). Plastic grocery bags: The ecological footprint. Environmental changes are spreading infectious diseases-UN study, Victoria, pp. 1-19.
- Environment Liaison Centre International (ELCI) (2005). Breaking free from plastics. Ecoforum environmental solutions. Nairobi, p. 18.
- Environment Victoria (2006) The Great Plastic Bag Checkout: Are major supermarkets making the cut? pp. 1-15.
- EPHC (2002). "Plastic shopping bags in Australia", National plastic bags working group report to the national packing covenant council. Environment protection and heritage council, Australia, pp. 9-11.
- Flores MC (2008) Plastic materials and environmental externalities: Structural causes and corrective policy. *Lethbridge Undergraduate Res. J.*, 3(2).
- Forum for Environment (2010). Assessment of the solid waste management System of Bahir dar town and the gaps Identified for the development of an ISWM plan, Bahirdar, Ethiopia, p. 10.
- Geographical (2005). "Waste: An Overview." *Geographical*, 77(9): 34-35.
- Gerba CP, Williams D, Sinclair RG (2010). Assessment of the potential for cross contamination of food products by reusable shopping bags. Obtained through internet: <http://uanews.org> [Accessed on 26 August, 2010].
- Girum B (2005) Sustainable management of plastic bag waste. The case of Nairobi, Kenya. Lund, Sweden, pp. 3-52.
- Hasson R, Leiman A, Visser M (2007). The Economics of plastic bag legislation in south Africa. *South African J. Econ.*, 75 (1): 66-83.
- IRIN (2005a). "Kenya: Researchers Recommend Ban on Use of Thin Plastic Bags." IRIN news. (UN office for the Coordination of Humanitarian Affairs).
- KNPC (Kenya National Cleaner Production Centre) (2006). A Comprehensive plastic waste management strategy for the city of Nairobi prepared for the pilot project on plastic waste management in Nairobi, pp. 1-26.
- Lane M (2003). "Why Can't We Recycle All This Plastic?" *BBC News* September 19. Accessed on December 18, 2010. <http://news.bbc.co.uk/1/hi/magazine/3116318.stm>.
- Legesse W, Gebre-Selassie S (2007). Sanitary survey of residential areas using *Ascaris lumbricoides* ova as indicators of environmental hygiene, Jimma, Ethiopia. *Ethiop. J. Health Dev.*, 21(1): 18-24.
- Li Y, Muthu SS, Hu JY, Mok PY, Ding X, Wang L (2010). Eco-impact of shopping bags: consumer attitude and governmental policies. *J. Sustainable Dev.*, 3(2): 71-83.
- Macur BM, Pudlowski ZJ (2009). Plastic bags- a hazard for the environment and a challenge for contemporary engineering educators. *World Trans. Engineer. Technol. Educ.*, 7(2): 122-126.
- Marshall MN (1996). Sampling for qualitative research. *Fam. Pract.*, 13(6): 522-525.
- Maule A (2000). Survival of verocytotoxicogenic *Escherichia coli* O157 in soil, water and on surfaces. *Symp. Ser. Soc. Appl. Microbiol.*, 29: 71S-78S.
- McKinney ML, Schoch RN (2003) *Environmental Science: Systems and solutions*. Mississauga, ON: Jones and Bartlett Publishers.
- Miller GT (2005). *Sustaining the Earth: An integrated approach*, Pacific Grove, CA: Thomson Brooks/Cole.
- Mossie A (2002). The prevalence and socio-demographic characteristics of khat chewing in Jimma town, south western Ethiopia. *Ethiop. J. Health Sci.*, 12(2): 69-80.
- Muthu SS, Li Y, Hu JY, Mok PY (2010). An exploratory comparative study on eco-impact of paper and plastic bags. *J. Fiber Bioeng. Inf.*, 1: 307-320.
- Muthu SS, Li Y, Hu JY, Mok PY (2011). Carbon footprint of shopping (grocery) bags in China, Hong Kong and India. *Atmospheric Environ.*, 45(2): 469-475.
- Narayan P (2001). Analysing plastic waste management in India: Case study of poly bags and PET bottles. Lund: Lund University, pp. 37-49.
- Njeru J (2006). The urban political economy of plastic bag waste problem in Nairobi, Kenya'. *Geoforum*, 37: 1046-1058.
- Plastic bag report prepared for metropolitan Washington Council of Governments Chesapeake bay and water resources policy committee. Prepared by COG Staff, Department of Environmental Programs October 14, 2009, pp. 5-24.
- Solid waste management proclamation (2007). *Negarit Gazetta of the Federal Democratic Republic of Ethiopia*, Addis Ababa, p. 3524.
- Ramaswamy V, Sharma HR (2011). Plastic bags – threat to environment and cattle health: A retrospective study from Gondar city of Ethiopia. *The Official J. Inst. Integr. Omics Appl. Biotech. J.*, 2(1): 7-12.
- Rayne S (2008). The need for reducing plastic shopping bag use and disposal in Africa. *Afr. J. Environ. Sci. Technol.*, 3: 1-3.
- Ryan PG, Rice N (1996). The 'free' shopping-bag debate: costs and attitudes. *South Afr. J. Sci.*, 92(4): 163-164.
- Seema S (2008). Ecologically oriented behavior in consumers. (Report). Abhigyan. Foundation for Organizational Research and Education, the Gale Group, Farmington Hills, Michigan, USA.
- Smith LC (2009). Paper or plastic? The economic implications of plastic carrier bag legislation in the United States. A Thesis presented to the faculty of the Department of Economics and Business, The Colorado College, In Partial Fulfillment of the Requirements for the Degree Bachelor of Arts, pp. 34-36.
- Spokas KA (2007). Plastics: still young, but having a mature impact. *Waste Manage.*, 28(3): 473-474.
- Stevens E (2001). *Green Plastics: An introduction to the new science of biodegradable plastics*. Princeton, NJ: Princeton University Press, pp. 15-30.
- Tadesse T, Ruijs A, Hagos F (2008). Household waste disposal in Mekelle city, Northern Ethiopia. *Waste Manage.*, 28(10): 2003-2012.
- Tekola B, Tefalet D, Mhreteab E, Mussie R, Tefera T, Tafere Y (2006). Ethiopian urban studies, Kolfe Area, Addis Ababa, pp. 11-23.
- Total environment centre (TEC)(2007). *Supermarket Shame: City of Sydney plastic bag survey 2007*, Liverpool Street, Sydney.
- United Nations Environment Programme (UNEP) (2005a). Plastic bag ban in Kenya proposed as part of a new waste strategy. UNEP press release.
- United Nations Environment Programme (UNEP) (2005b). Report on employing economic instruments in solid waste management in Kenya, UNEP, New York, USA.
- Vergheze K, Jollands M, Allan M (2006). The Litterability of plastic bags: Key design criteria. A report presented on 5<sup>th</sup> Australian Conference on Life Cycle Assessment: Achieving business benefits from managing life cycle impacts, Melbourne, pp. 1-10.
- Vergheze K, Lewis H, Fitzpatrick L, Hayes GM (2009a). Environmental impacts of shopping bags. Report for Woolworths Limited, Ref. number: SPA1039WOW-01. pp. 1-36.
- Watson A (2009). Plastic shopping bag reduction and recycling (PW07155b), (City of Hamilton - City Wide), pp.1-8.
- WHO (2010). Somalia's Situational Environmental Health Assessment of Three Zones Somaliland, Punt land and South Central-Mogadishu Prepared for: WHO Office for Somalia Project Period: From June 21st –September 20th, 2010, pp. 5-10.
- Williamson LJ (2003) It's Not My Bag, Baby. *On Earth: Environmental Politics People*, 25(2): 32-34.
- World Watch (2004). 'The ubiquitous plastic bag. *World Watch*. 17(1) preceding 1.
- Xing X (2009). Study on the ban on free plastic bags in China. *J. Sustain. Dev.*, 2: 156-158.

## APPENDIX

### Appendix 1. Jimma University, College of Agriculture and Veterinary Medicine

Dear Respondents,

The objective of this survey is to assess the use of plastic bags, their disposal and adverse impacts on environment in Jimma City of Ethiopia. Your views are extremely important to the success of the survey as well as to the efforts being made to minimize environmental impacts of plastic bag wastes. Thus, are kindly requested to cooperate in giving responses to the items given in this questionnaire. Multiple responses are possible for the items. Please use “√” mark.

#### Section I. Profiles of respondents

**Sex:** Male \_\_\_ Female \_\_\_

**Age:** <20 years \_\_\_ 20-29 years \_\_\_ 30-39 years \_\_\_ ≥ 40 years

#### Educational background

Illiterate \_\_\_ Primary education \_\_\_ High school education \_\_\_ Higher education \_\_\_

**Occupation:** student \_\_\_ Gov't employee \_\_\_ Private business \_\_\_ Others (Please, specify) \_\_\_

#### Section II. Survey questions

1. Which plastic products do you use excessively?

Plastic bags \_\_\_ Plastic liquid containers (bottles) \_\_\_ Plastic buckets, bins and barrels \_\_\_  
Plastic shoes \_\_\_ Others (Please, specify) \_\_\_

2. Why do you prefer to use the plastic product(s) especially plastic bags?

They are cheap \_\_\_ They are light in weight \_\_\_ They are easily available \_\_\_  
Lack of alternative materials \_\_\_ Others (Please, specify) \_\_\_

3. Do you think that plastic bag wastes cause problems?

Yes \_\_\_ No \_\_\_ No idea \_\_\_

4. How do you dispose the plastic bag waste of the plastic materials?

Open dumping \_\_\_ Burying \_\_\_ Burning \_\_\_ Others (Please, specify) \_\_\_

5. If your answer to question 4 is 'Yes', what are the problems?

Animal death \_\_\_ Human health problem \_\_\_ Blockage of sewage (drain) systems \_\_\_  
Deterioration of natural beauty of environment \_\_\_ Others (Please, specify) \_\_\_

6. Which parts of Jimma city are seriously polluted by plastic bag wastes?

Parks \_\_\_ Waste dumping sites \_\_\_ Market places \_\_\_ Crowded residential areas \_\_\_  
Roadsides \_\_\_ any open places in the city \_\_\_ sewage (drain) lines \_\_\_  
Others (Please, specify) \_\_\_

7. Have you heard environmental impacts of plastic bag wastes on environment?

Yes \_\_\_ No \_\_\_ No idea \_\_\_

8. If your answer to question number 7 is "Yes", how or where?

TV/radio \_\_\_ School \_\_\_ From professionals \_\_\_ Published materials \_\_\_  
Others (Please, specify) \_\_\_

9. Is the trend of utilization of plastic bags increasing or decreasing?

Increasing \_\_\_ Decreasing \_\_\_ Others (Please, specify) \_\_\_

10. If your answer is to question 9 is "Increasing", what are the possible reasons?

Cheapness (low cost) \_\_\_ Durability \_\_\_ Availability wherever and whenever required \_\_\_ Lack of awareness of the community \_\_\_ Others (Please, specify) \_\_\_

11. If your answer is to question 9 is "Decreasing", what are the possible reasons?

Availability of alternative materials \_\_\_ Awareness of the community \_\_\_  
Increasing prices of plastic-made materials \_\_\_ Others (Please, specify) \_\_\_

12. According to your opinion, should the utilization of plastic bags be continued or discontinued?

Should be continued \_\_\_ Should be discontinued \_\_\_

13. If your answer in question number 15 is "should be discontinued", who is responsible to do so?

Municipality \_\_\_\_\_ NGOs \_\_\_\_\_ Government \_\_\_\_\_ Environmental agencies \_\_\_\_\_

The community itself \_\_\_\_\_ Others (Please, specify) \_\_\_\_\_

14. If you say plastic bags should not be used, what alternatives can be used?

Paper bags \_\_\_\_\_ Fiber bags \_\_\_\_\_ Cloth bags \_\_\_\_\_ Others (Please, specify)

7. Additional comments (if any) \_\_\_\_\_