



**ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY
OFFICE OF GRADUATE STUDIES**

**Assessment on the Utilization of Plastic Bags, their Disposal and Knowledge of Adverse
Effects among Communities in Burayu city, Oromia Regional State, Ethiopia**

A Thesis

Submitted to the Department of Applied Biology

School of Applied Natural Science

**In Partial Fulfillment of the Requirement for the Degree of Master's in
Biology**

By

Nigatuwa Alemu Tola

Adama

September, 2017

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September, 2017

Approval of Board of Examiners

We, the undersigned, members of the Board of Examiners of the final open defense by

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_____ External Examiner	_____ Signature	_____ Date

Declaration

I hereby declare that this MSc Thesis is my original work and has not been presented for a degree in any other university, and all sources of material used for this thesis have been duly acknowledged.

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To: Applied Biology Department

Subject: Thesis Submission

This is to certify that the thesis entitled “Assessment on the Utilization of Plastic Bags, their Disposal and Knowledge on Adverse Effects among Communities in Burayu City, Oromia Regional State, Ethiopia submitted in partial fulfillment of the requirements for the degree of Master’s of in Biology, the Graduate program of the department of Applied Natural Science, and has been carried out by Nigatuwa Alemu Tola Id. No: GUS/0409/06, under my supervision. Therefore, I recommend that the student has fulfilled the requirements and hence hereby she can submit the thesis to the department of Applied Biology.

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Date

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ABBREVIATIONS/ACRONYMS

AAHB	Addis Ababa Health Bureau
AOR	Adjusted Odds Ratio
CI	Confidence Interval
ENDA	Environmental Development Action
EPA	Environmental Protection Agency
HDPE	High Density Polyethylene
LDPE	Low Density Polyethylene
MSW	Municipal Solid Waste
SPSS	Statistical Package for Social Sciences
UNEP	United Nations Environmental Programmer

ABSTRACT

A study on the assessment and utilization of plastic bags, their disposal practices and knowledge of the adverse effects among the community of Burayu city was conducted from February, 2017 to July, 2017. Data were collected using questionnaire from randomly selected households. A descriptive cross sectional study design was employed. A systematic random sampling method was used to select 305 households from three kebeles. Data were entered to SPSS version 22 for analysis. A descriptive analysis was used to select variables. Chi Square test was used to compare the association between socio-demographic variables, the level of awareness on plastic bags waste adverse effect with plastic bags utilization. Among the total respondents, 220 (72.1%) were aware of the adverse effects of plastic bags wastes while 69 (22.6%) were not aware. Mass media was the main sources of information 143 (65%) followed by health professionals 82 (37.35%). Burning 215 (38.5%) and open field dumping 135 (24.2%) were the main plastic bags waste disposal methods in the area. Though, there is no significant difference between knowledge of adverse effects of plastic bags waste and plastic bags usage, more than half of the respondents 170 (55.7%) were aware of its adverse effects. Age, sex and educational status of the respondents show significant relationship with plastic bags usage. The health bureau of the city should organize awareness campaigns in order to minimize the excessive accumulation of plastic bag wastes in the environment and the Burayu city Municipality has to educate the community to use environment-friendly by using alternative materials, such as cloth bags, paper bags and natural fiber bags. Moreover, that government should implement the plastic bags ban in order to have safe environment.

Keyword: Burayu city, disposal system, Knowledge, Solid Waste, Plastic bags

1. INTRODUCTION

1.1 Background of the study

The word plastic has its origin from the Greek word “plastikos”, which means able to be molded into different shapes. It is an organic amorphous solid, favored for its cheap production, mechanical and thermal abilities, stability, and durability (TARSC, 2010). Plastic or polythene bags commonly known as festal in Amharic language are in common uses as shopping bags for packaging food (Tyagi *et al.*, 2014).

The disposal of plastic bag waste has proved to be a major public health issue and a vital factor affecting the quality of the environment. This, especially in Ethiopian cities and citys has become one of the most intractable environmental problems today. One of the main problems facing the city of my study area is open and indiscriminate dumping. Piles of mixed plastic bag waste with MSW contain garbage are found in strategic locations in the heart of the city. Wastes in such places are obviously causes air and water pollution, land contamination and environmental degradation.

This study designed to explore and determine the increasing use of plastic bags and the environmental impacts they have on Organisms. It was also to recommend possible approaches that can be adopted to reduce the environmental impact of the plastic bag waste. The aim of the research was to investigate consumers’ attitudes towards the use of plastic bags, their level of awareness of the environmental hazards posed by the indiscriminate disposal and lack of management of the plastic bag waste.

Plastic bag usage has been increasing among consumers and retailers. They are available in huge numbers and varieties across the world. Currently the demands to use plastic bags are increasing due to their cheapness and convenience to use. It has been estimated that around five hundred billion plastic bags are being used every year throughout the world, the vast majority being discarded as wastes usually after the first use (Moharam and Al. Maqtari, 2014). 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 (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).

In developing countries such as Ethiopia, discarded plastic bags are major eyesore. Often carried from landfills by the wind, discarded plastic bags are often seen hanging in bushes, floating in lakes and rivers, flapping from fences, spoiling the environment and choking innocent animals. Blockage of sewerage systems is becoming a common problem in cities and cities 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 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 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.*, 2010). 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).

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 (UNEP, 2005b). However, different reports (Bjerkli, 2005; Tadesse *et al.*, 2008) showed that plastic bags are still causing severe environmental pollutions, human and animal health damages in urban and rural areas of the country. Some of the basic reasons could be poor waste management and lack of awareness about the negative impacts of plastic bags (Ramaswamy and Sharma, 2011).

1.2. Statement of the problem

Sustainable solid waste management is a crucial problem for both developing and developed countries. The Plastic waste component of the municipal solid waste is quite problematic because of their non-biodegradable nature. Trillions of plastic bags have been produced since their

introduction over thirty years ago. The production and inappropriate disposal of plastic bags deplete the earth's non-renewable resources. Once a plastic bag is disposed of, it takes over thousands of years to decompose. Plastics are known to be degraded by light reaction. As noted this process usually demands several years. In addition the degradation process releases toxic waste products into the environment: soil, air, and water. The environment that is unclean and polluted fails to attract visitors. Hence, it has a negative effect on the economy development of a particular region. For example, Bashir and Nabil, (2013) stated that plastic waste has a terrible impact on tourism in Africa. As a resident of Burayu city for the last five years I have been witnessing the adverse effect of plastic waste disposal in the entire neighborhoods' of Burayu city. This mal practice is either due to lack of knowledge and awareness about the effect of the plastic bags in proper disposal. Hence, this study intends to assess the awareness of the Burayu residents of Oromia Regional state.

1.3. Objectives of the study

1.3.1. General objective

- To assess the consumption of plastic bags, their disposal methods and knowledge gap on adverse effects among community of Burayu city.

1.3.2 Specific Objectives

- To investigate plastic bags utilization among community at Burayu city.
- To assess the awareness on plastic bag wastes adverse effects.
- To assess the attitude toward the plastic bag usage among Burayu city communities.
- To identify factors associated with practices of plastic bag utilization among the community of Burayu city.

1.4. Significant of the study

Plastic waste all over the world has become problematic. So, the finding from this study will help the Burayu city municipality to design sustainable innovations in order to reduce the impact of plastic bag disposal to the environment and the health of the people. Therefore, the finding of this stud will significantly help to create the level of awareness about adverse effects of plastic bag wastes for the communities and provide baseline data for further research on plastic bags waste in order to make the environments free from such wastes.

2. LITERATURE REVIEW

Plastic bags are a light weight, cheap, and hygienic way to transport products. Because of this convenience plastic bags use is common in virtually every aspect of life. The amount of plastic products has increased rapidly in cities of developing countries including Ethiopia. Several plastic manufacturing factories have started to produce various plastic products such as water bottles, various household items, and thin plastic bags that all shops give free to their customers to carry their groceries. Plastic bags have gained an increasing popularity among consumers and retailers. They are available in huge numbers and varieties across the world with its vast majority being discarded as wastes usually after the first use affecting environment and harming human health by creating conditions favorable for causing diseases (Chengula *et al.*, 2015).

The environmental costs of plastic bags are burdensome for communities and the planet. The lightweight properties of the plastic bag allow it escape from rubbish bins and landfill and, if littered, move around the natural environment causing miscellaneous problems (Tyagi *et al.*, 2014; Mushonga *et al.*, 2015).

2.1. Plastic Waste and types of Plastic waste

Plastic waste is often the most objectionable kind of litter and visible for long period in landfill sites without degrading (Ehrig, 1992). In industrialized countries, literally hundreds of plastic materials are available commercially but, in economically less developed countries fewer types of plastics tend to be used. In both economically less developed and industrialized countries, the four types of plastics that are most commonly reprocessed or recycled are polyethylene (PE), polypropylene (PP), polystyrene (PS) and polyvinyl chloride (PVC). Each of these can be subdivided according to their density, the type of process involved in their manufacture, and the additives they contain (Konings, 1989).

Polyethylene: Polyethylene plastics are two types. This includes low-density polyethylene (LDPE) and high-density polyethylene (HDPE). LDPE is soft, flexible and easy to cut, with the feel of candle wax. LDPE is used in the manufacture of film bags, sacks and sheeting, blow molded bottles, food boxes, flexible piping and hosepipes, household articles. HDPE is tougher and stiffer than LDPE and It used for bags and industrial wrappings, soft drinks bottles, detergents and cosmetics containers, toys and other household articles (Hopewell *et al.*, 2009)

Polypropylene : Polypropylene is more rigid and used for stools and chairs, high-quality home ware, strong moldings such as car battery housings, rope, woven sacking, food containers (Hopewell *et al* ., 2009).

Polystyrene: This type of plastic is unprocessed form which is brittle and usually transparent. It is often blended with other materials to obtain the desired properties. Polystyrene is used for cheap, transparent kitchen ware, light fittings, bottles, toys, food containers (Hopewell *et al.*, 2009).

Polyvinyl chloride: Polyvinyl chloride is a hard, rigid material and commonly used for making bottles, thin sheeting, transparent packaging materials, water and irrigation pipes, and window frames.

2.2. National and Local Policies on solid waste management

Ethiopia has Environmental policy that addresses different environmental issues including Solid Waste Management (SWM). Federal democratic republic of Ethiopia (FDRE) Proclamation No. 513/2007 on solid waste management developed to enhance at all level capacities to prevent the possible adverse impacts while creating economically and socially beneficial assets of solid waste.

Despite this rule and regulation on waste management, poor waste management practices, in particular, widespread dumping of waste in water bodies and uncontrolled dump sites aggravates the problems of low sanitation levels across the African continent. This is due to rising of urbanization, largely non-existence of waste management infrastructures, gap between waste management policy and legislation and actual waste management practices, increased waste generation as a result of industrialization, urbanization and modernization of agriculture in Africa including Ethiopia (UNECA, 2009).

2.3. Waste management Implementation challenges and constraints

According to United Nations Economic Commission for Africa (ECA), there are waste management implementation challenges and constraints. The single largest implementation challenge remains creating sufficient capacity for environmentally sound management, including, where appropriate, recovery and recycling of various waste streams across Africa. This is constrained by access to finance and technical know-how. The other is in most African

countries give responsibility for waste management to municipalities, which are often ill-equipped to deal with collection and disposal. Lack of good governance, transparency and prevalence of corruption in some cases, lack of awareness and appreciation of best practices for environmentally-sound management of wastes are major constraint of waste management implementation (UNECA, 2009).

2.4. Plastic waste management options

The amount of plastic products has increased rapidly in Addis Ababa as well as in other cities and city like Burayu. Several plastic manufacturing factories (about 170 registered plastic factories) have started to produce various plastic products such as water bottles, various household items, and thin plastic bags that all shops give free to their customers to carry their groceries goods. The wide spread use of this valuable materials demands proper management of used plastics, as they have become a large part of the municipal solid waste (MSW) stream in recent decades (Girma, 2004).

2.4.1. Landfills

Land filling has traditionally been seen as an easy and cheap method for disposing off all material generated by society and remains the dominant waste disposal option. Relatively high abundance of void space in many countries due to past and present excavation activities such as mining and quarrying gave rise to void space ideal for waste disposal at low cost. Land filling with plastic waste is not also desirable since plastic is non-degradable and no economic value would have been derived from the waste in that case (Joseph *et al.*, 1975; Williams, 2005).

However, open landfills is the most common disposal method for solid waste in Africa with no environmental control. Land filled Plastic bags can break down into tiny toxic particles that contaminate the soil and waterways and enter the food chain when animals accidentally ingest them. Therefore, final disposal of wastes at sanitary landfills is given the lowest priority in an integrated waste management approach (Tamronglak, 2005).

2.4.2 Incineration

Incineration is the process of burning solid waste under controlled conditions to reduce weight and volume of solid waste, and often to produce energy. This process can reduce wastes but not waste disposal, though following incineration ash must still be disposed. Incineration is

recognized as a practical method of disposing of certain hazardous waste materials (such as medical waste). Incineration can be carried out both on a small scale by individuals and on a large scale by industry. A benefit of incineration over landfill is that it can accept co-mingled waste without the requirement for extensive separation and reduces the waste volume. Burning of solid wastes can generate energy while reducing the amount of waste by up to 90 percent in volume and 75 percent in weight (Hui *et al.*, 2006).

Although plastics waste are beneficial in terms of increasing the overall calorific value of waste and in turn aiding the generation of electricity and district heating waters, they do also pose a number of challenges. High volumes of plastics ($\geq 70\%$ of waste feed) entering a mass burn incinerator at any one time can cause some problems within the combustion furnace. These include issues with controlling the burning rate and in turn the furnace temperature which should be fairly constant relative to the boiler optimum functional temperature, and the fact that if volumes of plastic are too high, they may melt and flow down the grate (utilized in certain plants) affecting the residence time combustion efficiency (Hogland, *et al.*, 1991; Williams, 2005).

During combustion of plastic the organic component can be destroyed leaving the chlorine to react with hydrogen to form hydrogen chloride and hydrochloric acid in solution, which may damage equipment (Jacquinot *et al.*, 2000). On comparison with other available treatment alternatives for plastics, waste incineration with energy recovery from an environmental impact perspective has been determined to be more advantageous than landfill; where high energy recovery ratios from waste calorific value to energy recovered is above 50% (Heyde & Kremer, 1998).

2.4.3. Recycling

Recycling is the recovery of the materials for melting them, re-pulping them and reincorporating them as raw materials (Onobokun and Kumuyi, 2003). Recycling save energy, water and generates less pollution than virgin raw materials, with lower operating cost (Bilitewski *et al.*, 1994). Recycling also reduces the amount of wastes that need to be collected, transported and disposed of, and extends the life of disposal facilities, which saves money to the municipalities (Kofoworola, 2006).

Recycling can be conducted by the number of ways. In developed world, municipalities have created recycling programs, which usually involve separation of recyclable materials at the source of generation. In this type of programs, individuals and businesses separate their recyclable materials in different container and before they are mixed with the rest of their garbage. The materials commonly separated at the source include metals, glass, paper and plastics (Onobokun and Kumuyi, 2003).

2.5. Plastic bag usage and its disposal practices

Plastic bag littering is prevalent in urban settings and one of the main sources of pollution in the world. A study conducted on community's perception of utilization and disposal of plastic bags in Eastern Ethiopia showed that about 51% of the residents mostly open dump their plastic bag wastes, 29.8% burn, 17.55% putting in municipal container (Negussie and Mustefa, 2017). Another study conducted at Peri-urban centers of Kenya on disposal methods of plastic bags showed that 49.2%, dispose their litter by discarding burning 21.7%, burying 20%, re-using their 9.2% of the respondents dispose their litter by discarding, This study also indicated that the plastic bags litters are most commonly found at open dumping sites, market places and road sides. The people in age range of 20-30 were most commonly used plastic bags followed by people in 30-40 years age group (Theuri *et al.*, 2014).

Study conducted by Verghese *et al.* (2006) reported that the main reasons for wide spread utilization of plastic bags by billions of customers throughout the world are due to its light-weight, cheap price, excellent fitness for use and resource efficiency (Verghese *et al.*, 2006).

In a study by Adane Legese and Mulet diriba (2011) on the usage of plastic bags, their disposal and adverse impacts on environment in Jimma City, Southwestern Ethiopia, 76.52% of respondents reported uses of plastic bags compared to other plastic products like plastic bottles 40%, plastic buckets, barrels and baskets 19.13% and plastic shoes 11.30%. Low price and easy availability was the main reasons for the widespread utilization of these products in the study area. This study also found out that burning, open dumping and burying were the main means of disposal of plastic bags waste in the city Among the practices used for disposal of plastic bag wastes, open dumping to surrounding areas (59.56%) was a practice widely used by almost all the residents of the jimma city (Adane Legese & Muleta Diriba, 2011).

Regarding the Social class and plastic Paper bag Usage, the study conducted at peri- urban centers of Kenya revealed that 42.5% of the respondents indicated all categories of classes use plastic bags, 29.2% indicated that plastic littering was associated with self-employed people, 23.3% indicated that plastic littering was associated with casual workers and 5% indicated plastic littering was associated with full time employed people (Theuri *et al.*, 2014).

Currently uses of plastic bags are increasing worldwide. The study conducted in peri- urban centers of Kenya revealed that the causes of plastic paper bag littering were increase of population and life style of the people, absence of well-organized waste disposal methods, its cheapness, urbanization, low public awareness on the responsible disposal of waste and absence of life cycle considerations amongst manufacturers (Theuri *et al.*, 2014).

Another study from Jimma City, Ethiopia also revealed that about 30% the respondents mentioned “lack of awareness” as a basic reason for the observed increasing trend of plastic bag usage. Regarding the sources of information about adverse impacts of plastic bag wastes, the study conducted at jimma city, southeast Ethiopia indicated that about 59% of respondents heard from Mass media (Radio & TV), 58.26% from health professionals, 27.82% from schools and 19.13% from newspapers and magazines. According to this study 52.17% of the respondents agreed to discontinue utilization of plastic bags whereas the rest 47.83% of them insisted on continuing their utilization of these products. The studies also showed that majority of female respondents were in favor of continuation of the plastic bags compared to male respondents. Among the respondents who were in favor of the discontinuation of utilization of plastic bags mentioned that nongovernmental organizations, government and members of the community themselves and health institutions as responsible bodies to prevent the negative impacts of plastic bag wastes (Adane & Muleta, 2011).

2.6. Impacts of plastic bags

As production and use of plastic has increased over the years, a large amount of plastic waste has accumulated in the environment. Plastic bag littering has also negative impacts on social, economic and environments. According to UNEP the report, plastic bag litter causes, visual, noise and thermal pollution that affects sectors like tourism. Plastic bag litter also blocks drainage that occasion “traffic clogging” and urban flooding (UNEP, 2005a).

According to (Owusu, 2010), poor living environments have particularly far-reaching consequences for children and adolescents as they are more vulnerable than adults to a range of environmental concerns and more likely to be affected in ways that have longer-term repercussions. It is widely acknowledged that clean and well-kept neighborhoods good for the health of children and affords them opportunities for companionship, recreation and social learning (UNFPA, 2005; Owusu, 2010). In addition, the environment serves as the arena for cultural rules and norms that guide the activities and behaviors which are reinforced and reproduced through the repetition of those daily activities in which people participate (Owusu, 2010). Research has adequately established the negative implications of plastic bag usage (Anthony, 2003) reports that accumulation of plastic bag wastes causes environmental pollution that can be manifested in a number of ways. One of the problems is deterioration of natural beauty of the environment. They are environmentally unfriendly in the extreme, take hundreds of years to degrade, and fill up landfills. Plastic litter can also lead to clogged drains resulting in sanitation and sewage problems, and to clogged soil, which hampers trees growth. In addition, animals have been known to often ingest plastic bags while its indiscriminate disposal by incineration pollutes the air and releases toxic substances. Most floods are also caused by choked drains by plastic bag waste, which endanger the lives of people (Anthony, 2003; Dikang *et al.*, 2010). The Study conducted at peri- urban centers of Kenya showed that most of the respondents reported that plastic bags are responsible for suffocation deaths of woodland animals as well as inhibiting soil nutrients, pollute the water and responsible for animal and human being illnesses (Theuri *et al.*, 2014).

Studies done in developing countries have identified several problems associated with plastic bag wastes (Girum, 2005; Seema, 2008). According to study conducted in jimma city; 72.6% of respondents reported that plastic bag waste can results in animal death, 70.43% reported blockage of sewage systems, 62.60% deterioration of natural beauty of environment (littering) and 51.73% human health problems (Adane & Muleta, 2011).

The several communal natural resources have lost their beauty due to the dumping of plastic bag waste in the environments. By clogging sewer pipes, plastic bags waste also create stagnant water; stagnant water produces the ideal habitat for mosquitoes and other parasites which have the potential to spread a large number of diseases.

Within the plastic bag waste management debate, much attention has been given to the minimization of plastic bag through legislations and the use of economic instruments. These have not been effective because alternatives to the use of plastic bags have not been properly introduced. Moreover with majority of the population of Africa living below the poverty level, outright bans in African countries are likely to face challenges due to the relative importance plastics have over other products such as paper. Hence this study is aimed to assess the knowledge and practices of Plastic Bags waste, their disposal and adverse effect among Burayu administration communities, in Oromia Region, Ethiopia.

3. MATERIALS AND METHODS

3.1. Study site

Burayu City is found in Oromia Regional State in the western fringe of Addis Ababa, along the Addis Ababa-Ambo road at about 15 km from the center of Addis Ababa (Piazza) and nearly 27 km east of Holeta city, the capital of Welmera District (Fig.1). It is situated at $9^{\circ}02'$ to $9^{\circ}02'30''$ N Latitudes and $38^{\circ}03'30''$ to $38^{\circ}41'30''$ E longitudes. According to the national census undertaken in 2005, the city has a total human population of 159,009 of which 80,897 were males and 78,112 were females (CSA, 2005). It is located in the surrounding areas of Finfine (Oromia Zone). The city has six kebeles and total households of 15,270. The main economic activities are commerce (trading and catering service) and manufacturing enterprises. (Finance and Economic Bureau of Burayu).

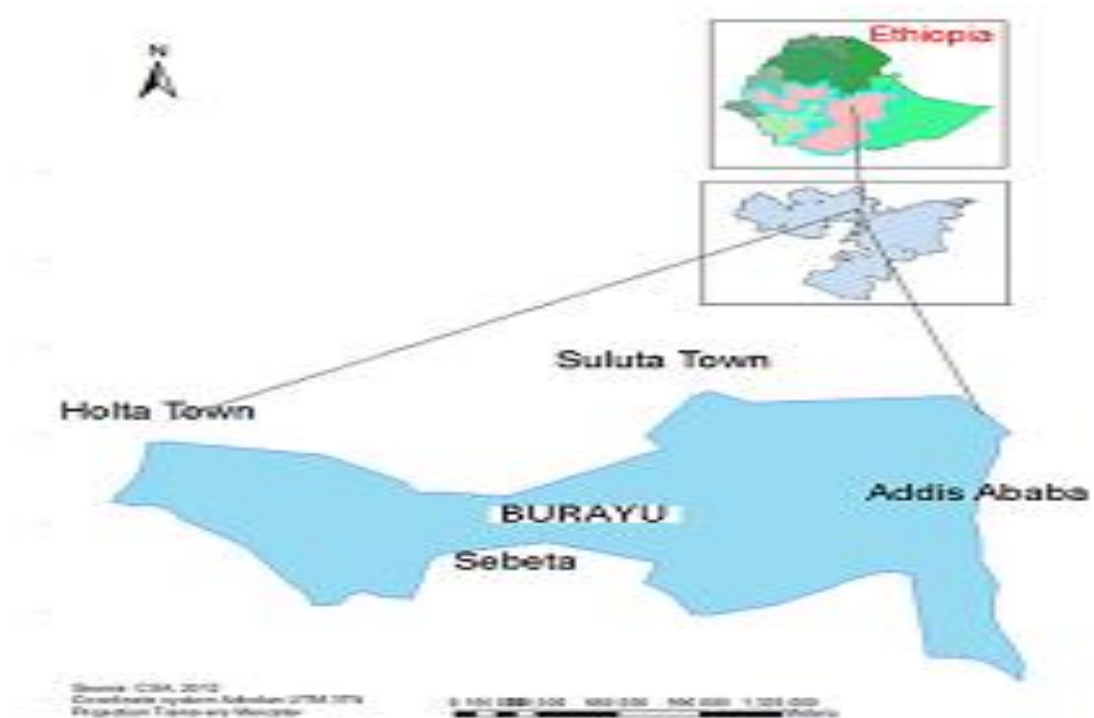


Figure 1: Map of the study site

3.1.1. Industrial development in Burayu city

The city is characterized by fast growth of industrial investment and currently there are about 105 manufacturing, 200 industries, 116 medium and 96 small scale industries (Ethiopian Herald, 20 August 2016).

3.1.2. Source and Study populations

The source populations were all households in the selected kebele of the Burayu city and the study populations were randomly selected households from the source populations.

3.2. Sample size determination and sampling procedures

3.2.1. Sample size determination

A single population proportion formula was used

$$n = \frac{Z^2 \frac{\alpha^2}{2} P(1-P)}{d^2} \qquad n = \frac{1.96^2 \times 0.765 \times (1-0.765)}{0.05^2} = 277$$

N = minimum sample size

P = expected proportion of plastic bag disposal practice at Jimma city (77%)

D = Sampling error is 5% that is, d = 0.05

Z = statistical value for 95% confidence interval (1.96)

Finally, by considering 10% non-response rate the final sample size become $277+28 = 305$.

3.2.2. Sampling procedures

From six total kebeles of the city, three kebeles were selected by lottery methods. Then a total household in the selected kebele were determined. Then after, the total sample size determined was proportionally allocated to each selected kebeles (Table 1). Finally systematic random sampling was used to get households that were included in the study after determining sampling interval. The sampling interval was determined by dividing the total households in the kebele by the total sample size. The starting household was selected randomly and then data was collected every selected house. In case if the selected household is closed, the next household was replaced. Among the visited households, a head of household was selected for the interview.

Table 1: Sample selection with proportional allocation from the three selected kebeles

No	Kebele	Number of households	Proportional percentage (%)	Sample size
1	Gefersa Burayu	2545	38%	116
2	Melka Gefersa	2140	32%	97
3	Gefersa Nonno	2025	30%	92
	Total	6710	100%	305

3.3. Study variables

Dependent variables: plastic bags utilization

Independent variables: knowledge on impacts of plastic bag wastes, attitudes toward plastic bag usage, educational status, age of the respondents, and sex of the respondents and sources of information about plastic bag wastes.

3.4. Data collection

The data were collected by structurally administered questionnaire and with intensive observations. The questionnaire was presented by the data collectors for respondents who had difficulty in reading. First the questionnaire was prepared in English and translated in to Afaan Oromo and Amharic languages to collect the data.

The tool has different components like background information, knowledge on plastic waste adverse effects, disposal methods, and outlooks of the community regarding current plastic bags utilization in the city.

Data was collected by employing grade 12 completed individuals after getting intensive training by the investigator on data collection methods and ethics during the data collection.

3.5. Data analysis

The data was analyzed by using computer software SPSS v22.0. Descriptive statistical tools such as frequency distribution and percentage were used. Chi square test was used to show association

between dependent and independent variables. Finally, Chi square test was used to assess the factors associated with uses of plastic bags. P-value of ≤ 0.05 was considered as a cut off value to declare statistically significant values.

3.6. Dissemination plan

The finding of this study will be presented to Adama Science and Technology University communities. The printed copy of the results will be given to Burayu City administration in order to use for implementation strategies. Finally, an effort will be made to publish on peer reviewed and reputable journals.

4. RESULTS

4.1. Demographic characteristics of the respondents.

Table 2: Demographic characteristics of the respondents of survey at Burayu city administration

Variables	Categories	Number	Frequency (%)
Age	≤ 20	82	26.9
	21 – 29	51	16.7
	30 – 39	91	29.8
	≥ 40	81	26.6
sex	Males	172	56.4
	Females	133	43.6
Educational status	Illiterate	30	9.8
	Primary school	51	16.7
	Secondary school	111	36.4
	Higher education	113	37.0
Income	High income	25	8.2.
	Medium income	197	64.6
	Lower income	83	27.2

4.2. Awareness of respondents on plastic bags waste adverse effects

Regarding perceived knowledge of respondent about plastic bags wastes adverse effects, 100 (32.8%) strongly agreed and 83 (27.2%) agreed that plastic bag wastes contain chemicals. Regarding the disposal methods of plastic bags wastes 98 (32.1%) strongly agreed that land filling is appropriate methods of plastic bags disposal methods. About 164 (54%) of the respondents strongly agree that plastic bags waste block drain/sewage systems (Table 3). The finding from the observation also showed that animals in the study area consuming/eating the plastic bag wastes while searching for left over foods 200 (65.6%) (Fig.2).



Figure 2: Domestic animals feeding on plastic bags waste when searching left over foods in Burayu city (Photo by Nigatuwa Alemu, June 2017).

Table 3: Awareness of respondents on plastic bag waste materials adverse effects at Burayu city

Variables	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Plastic may contain harmful chemicals	32.8% (100)	27.2% (83)	15.1% (46)	16.4% (50)	8.5% (26)
Open burning of plastic has impact on health of humans	31.8% (97)	18.4% (56)	9.2% (28)	29.5% (90)	11% (34)
Plastic bag waste can kill animals if ingested	65.6% (200)	21.9% (67)	6.9% (21)	3.3% (10)	2.3% (7)
Landfill is appropriate disposal method	32.1% (98)	12.5% (22)	10.3% (33)	31.1% (95)	13.4% (41)
Plastic bag waste can cause health problems	50.5% (154)	32.5% (99)	3.6% (11)	9.8% (30)	3.6 % (11)
Plastic bag wastes can block drain/sewage systems	53.8% (164)	33.1% (111)	3.6% (11)	6.6% (20)	2.9% (9)
Plastic bag wastes can cause deterioration of natural beauty of the environment	67.5% (206)	16.7% (51)	4.9% (15)	9.2% (28)	1.6% (5)
Plastic bag wastes have impact on tourism and tourist flows	32.8% (100)	23.9% (73)	16.1% (49)	17.4% (53)	9.8% (30)
Plastic bags are used to ignite charcoal for cooking is good practice	15.1% (46)	6.9% (21)	9.2% (28)	43.6% (133)	22.2% (77)
Plastic bag littering associated with Urbanization	42.9% (131)	9.2% (28)	14.8% (45)	27.2% (83)	5.9% (18)
Plastic bags waste disposed in woodlands can affect wildlife species	33.8% (103)	23.9% (73)	16.7% (51)	16.1% (49)	9.5% (29)

Regarding the comprehensive knowledge of respondents on plastic bags wastes adverse effects, a total of ten questions were asked to assess their awareness level. The mean score of these items was calculated after counting strongly agree and agree as correct answers and used to categorize the respondents as knowledgeable and not knowledgeable. Those who scored lowest 8.57 were categorized as not aware on plastic bag waste materials adverse effects whilst those who score 8.57 through the highest were categorized as aware. Accordingly, 170 (55.7%) were aware whereas, 135 (44.3%) were not aware.

4.3. Sources of information about plastic bags waste adverse effects

Out of the total respondents, 220 (72.1%) were aware of the adverse effects of plastic bags wastes while 69 (22.6%), 16 (5.2%) not aware and has no idea at all respectively. The main source of information was mass media 143 (65%) (Table 4).

Table 4: Respondents source of awareness about plastic bags waste adverse effects

Variables	Response Category	Frequency	Percentage (%)
Aware about effects of plastic bag wastes	Aware	220	72.1
	Not aware	69	22.6
	No idea	16	5.2
Sources of information	Mass Media	143	65.0
	Schools	48	21.8
	Health professionals	82	37.3
	Published materials	33	15.0
	City Municipality Promoters	33	15.0

4.4. Ways to minimizing Plastic bag wastes

Most 278 (91.0%) of the respondents stated that it was possible to minimize plastic bag wastes and about 116 (59%) of them reported that it could be achieved by using other non- plastic alternative materials (Table 5).

Table 5: Ways to minimize plastic bag waste

Variables	Response Category	Frequency	Percentage (%)
Possible to minimize plastic bag wastes	Possible	278	91.1
	Impossible	27	8.9
Ways of minimizing plastic bags wastes	Not buying	54	19.1
	Reduction of using plastic bags	115	40.8
	Re uses of plastic bags	82	29.1
	Recycling	102	36.2
	Using other alternative materials such as zembil (made from easily decomposable materials such as paper and grass baskets)	116	58.9

4.5. Plastic bags usage and disposal methods practiced by the community of Burayu city

About 224 (73%) of the respondents mentioned that they used plastic bags and about 177 (36%) of them stated that they used the bags because they were easy avail (Table 6). Most 215 (39%) of the respondents mentioned that they dispose the bags by burning while 101 (18%) stated that they reuse the plastics bags.

Table 6: plastic bags usage and disposal methods practiced by the community of Burayu city

Variables	Categories	Frequency	Percentage (%)
Plastic bags usages	Used plastic bags	224	73.4
	Not used plastic bags	60	18.7
Preference to use the plastic bags	Easy to handle	119	24.1
	Easy available	177	35.9
	Lack of alternatives	81	16.4
	cheap	116	23.5
Plastic bag wastes disposal methods	Open dumping	135	24.2
	Burying	107	19.2
	Burning	215	38.5
	Re use	101	18.1
Responsible individuals for waste disposal	Residents	252	33.6
	Municipality of the city	261	34.8
	Small micro-enterprise working on waste collection	236	31.5
Organized solid waste collection system is practiced	Yes	232	76.1
	No	43	14.1
	No idea	30	9.8
Are you willing to pay for waste collectors	Willing to pay	265	86.9
	Un willing to pay	30	9.8

4.6. Alternative use of other materials instead of plastic bags

Regarding the alternative use to plastic bags in order to reduce plastic bags waste and its adverse effects 141 (30.4%) of respondents reported using bags from plant materials 133 (28.7%) using cloth bags 87 (18.8%) reported usage of paper bags (Table 7).

Table 7: Response of respondents on alternative uses of plastic bags

Were they knowledgeable about the adverse effects of the plastics and used other materials instead of plastics	Frequency	Percentage (%)
Bags from plant materials	141	30.4 %
Cloth bags	133	28.7 %
Fiber bags	103	22.2 %
Paper bags	87	18.8 %
Total	464	100.0 %

4.7. Perceptions of the respondents about the trend of plastic bags usage

About 277(91%) of the respondents reported that current plastic bags usage is increasing while the possible reasons for the current increments in plastic bags usage were its easy availability 212 (37.5%). According to the respondents seriously polluted areas in the city, the waste dumping sites of the city 225 (34%), regarding whether the usage of plastic bags has to be ban 179 (58.7%) replied it has to be banned (Table 8).

Table 8: Outlooks of the respondent's on current plastic bags usage at Burayu city

Variables	Category	Frequency	Percentage (%)
Current status of Plastic bags uses	Increasing	277	90.8
	Decreasing	23	7.5
	No idea	5	1.6
Possible reasons of increasing plastic bag usage	Cheapness	183	32.3
	Durability	28	4.9
	Availability	212	37.5
	Lack of awareness	143	25.3
Site of Burayu city polluted by plastic bags waste	Waste dumping sites	225	34.0
	Market places	111	16.8
	Crowded Living area	103	15.6
	Road sides	105	15.9
	Any open place in the city	117	17.7
Opinion on plastic bags usage	Should be continued	76	24.9
	Should be discontinued	229	75.1
If should be discontinued, who is responsible	City Municipality	74	32.3
	Non-Governmental organization working on SWM	41	17.9
	Government	188	82.1
	Environmental agency	168	73.4
	Community	105	45.9
	Health institutions	176	76.9
Plastic bags usage Should be banned (after introducing alternative materials)	Yes	179	58.7
	No	85	27.9
	No idea	41	13.4

The finding of observation also confirms that dumping sites are highly polluted (Fig. 3).



Figure 3: Plastic waste near living area and dumping sites in Burayu city (Photo by Nigatuwa Alemu, June 2017)

4.8. Relation between socio demographic factors and plastic bags usage

4.8.1. Educational status and plastic bag users

Regarding the relationship between plastic bags usage and educational status of the respondents, 92 (41.1%) of respondents who completed higher education were utilized plastic bags than who were completed elementary school and illiterate (Table 9). The Chi-square test indicates that there is highly association between educational status of respondents and plastic bags utilization.

Table 9: Number of respondent's relationship of educational status to plastic bag utilization in Burayu city, 2017

Educational status	Plastic bags usage		X ²	df	P-value
	Used plastic bags	Not used plastic bags	8.986 ^a	3	< 0.05
illiterate	10.3% (23)	8.6% (7)			
primary school	17.0% (38)	16.0% (13)			
Secondary school	31.7% (71)	49.4% (40)			
Higher education	41.1% (92)	25.9% (21)			
Total	73.4% (224)	26.6% (81)			

4.8.2. Age of respondents and plastic bag uses

Regarding the relationship between plastic bags usage and age of the respondents, majority, (31%) of respondents at age category of 30-39 were utilized plastic bags followed by 64 (28.6%) of those 40 and above years old respondents (Table 10). The Chi-square taste reveals that there is highly association between age category of respondents and plastic bags.

Table 10: Plastic bag utilization by age of respondent's in Burayu city

Age of Respondents	Plastic bags usage		X ²	df	P-value
	Used plastic Bags	No used Plastic bags instead use non-plastic bags	13.984 ^a	3	P< 0.05
≤ 20	21.4% (48)	42.0% (34)			
21-29	19.2% (82)	9.9% (8)			
30-39	30.8% (69)	27.2% (22)			
≥ 40	28.6% (64)	21.0% (17)			
Total	73.4% (224)	26.6% (81)			

4.8.3. Sex of the respondents and plastic bags usage

Regarding the relationship between plastic bags usage and sex of the respondents, Male respondents were more utilized plastic bags 137 (61.2%) than 87 (38.8%) of the female respondents (Table 11). Chi square test shows that there is highly association between sex of respondents and plastic bags utilization.

Table 11: The relationship between plastic bags usage and sex of respondents

Respondents	Used plastic bags	Not used plastic bags	X ²	df	P- value
Male	61.2% (37)	43.2% (35)	13.984 ^a	3	< 0.05
Female	38.8% (87)	56.8% (46)			
Total	73.4% (2240)	26.6% (81)			

4.8.4. Perception of respondents by age on continuation of plastic bags usage

This research assessed the opinion of the respondents on whether plastic bag usage has to be continued or not. Sixty-one respondents of aged less than 20 years, 37 of respondents in 21-29 years, 69 respondents in 30-39 years and 62 of respondents aged 40 and above years reported that plastic bags usage should be discontinued (Fig. 4). The Chi-square taste reveals that there is highly significant difference on plastic bags usage continuation by the age of the respondents ($X^2 = 0.315^a$, $df = 3$, $P > 0.05$).

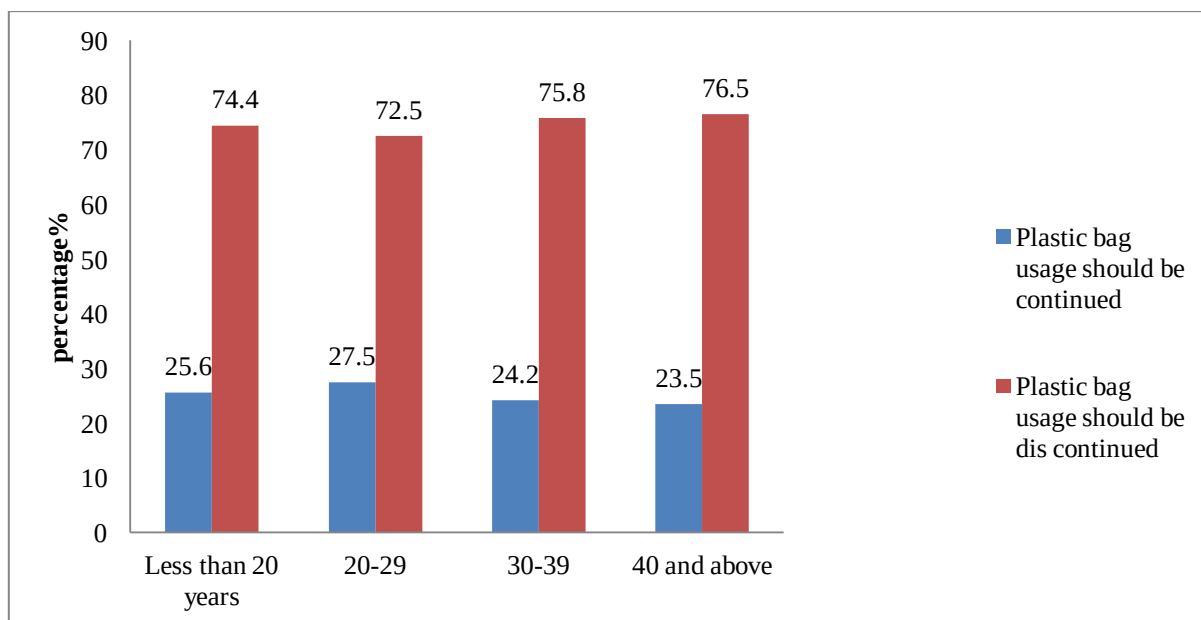


Figure 4: Perception of the respondents on continuation of plastic bags by their age

4.8.5. Perception of respondents by educational status on continuation of plastic bags usage

Regarding the relationship between the educational status of respondents and their view on continuation of plastic bags usage, about 63.3% of illiterate respondents replied that plastic bags usage should be continued. However, majority of the respondents who were completed secondary and higher education level were reported that plastic bags usage should be discontinued (Fig. 5). The Chi-square test shows that there is significant relationship between on plastic bags usage continuation by the education status of the respondents ($X^2 = 31.8$, $df = 3$, $P < 0.05$).

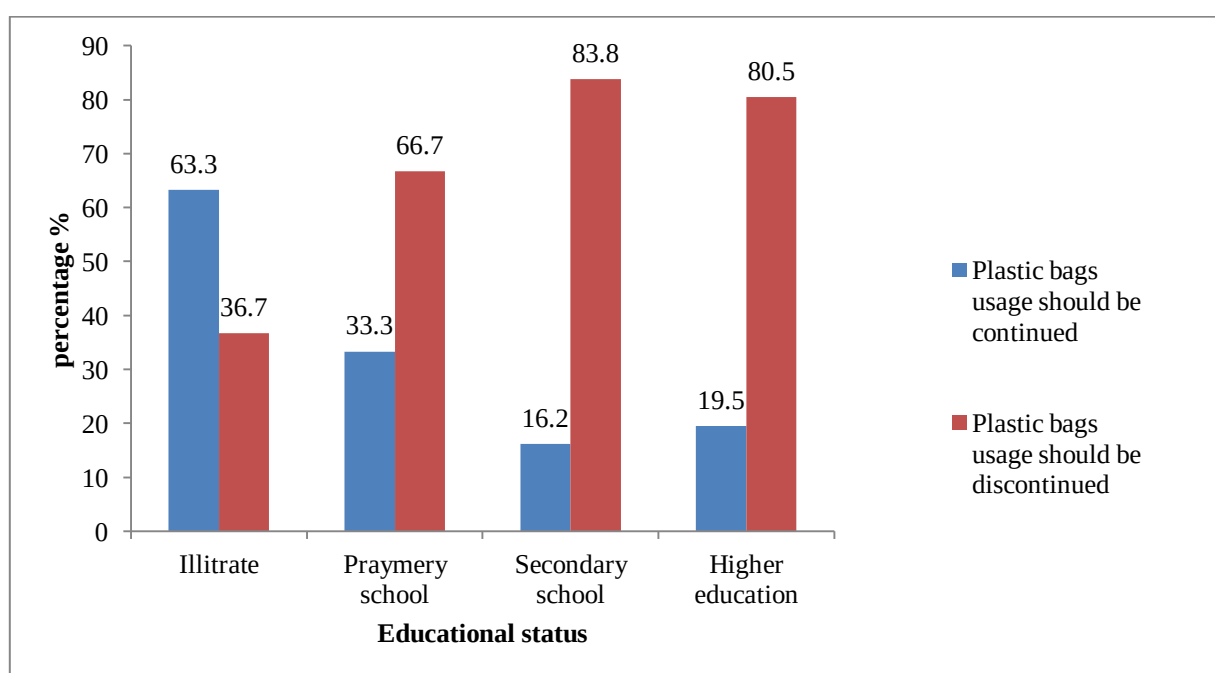


Figure 5: Perception of the respondents on continuation of plastic bag usage by their educational status

4.8.6. Perception of respondents by their sex on continuation of plastic bags usage

Regarding the relationship between the sexes of respondents and their view on continuation of plastic bags usage, about 76.2% of male respondents and 73.7% female respondents replied that plastic bags usage should be discontinued while 23.8% of male and 26.3% of female respondents replied that of plastic bags usage should be continued (Fig. 6). This research found that there is highly significant difference on plastic bags usage continuation by sexes of the respondents ($X^2 = 0.246^a$, $df = 1$, $P > 0.05$).

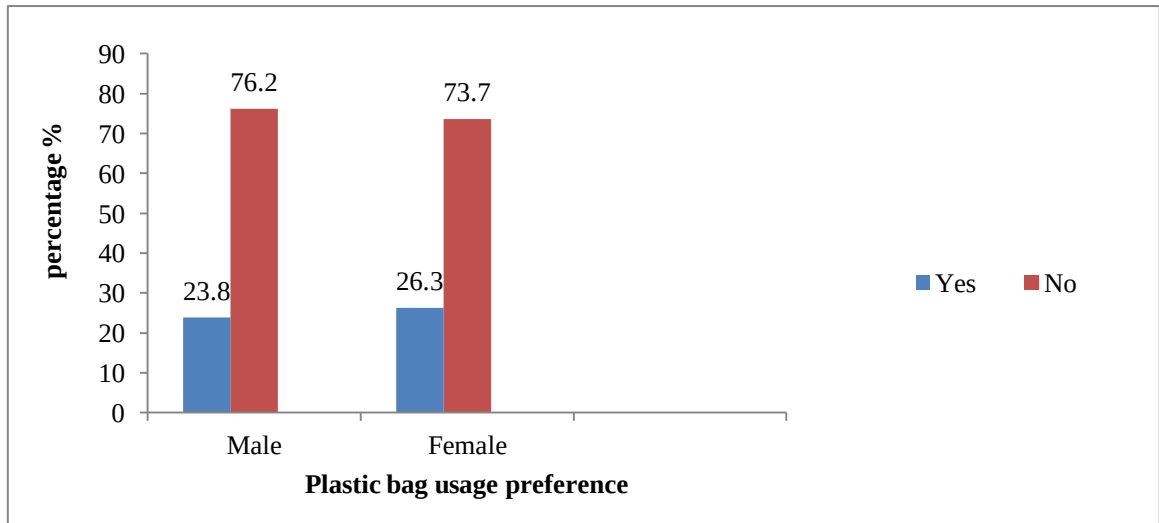


Figure 6: Perception of the respondents on continuation of plastic bags usage by their sexes

4.8.7. Perception of respondents on plastic bag usage ban by sex

This research found that among male respondents, 59.9% were reported that plastic bag usage has to be banned while 57.1% were reported has not banned. Among female respondents, about 43% were against plastic bag usage ban while about 40% were in favor of the plastic bag ban (Fig. 7). This study indicated that there is no significant relationship between sex of respondents and their perception on plastic bags usage ban ($\chi^2=1.985$, $df= 2$, $P> 0.05$)

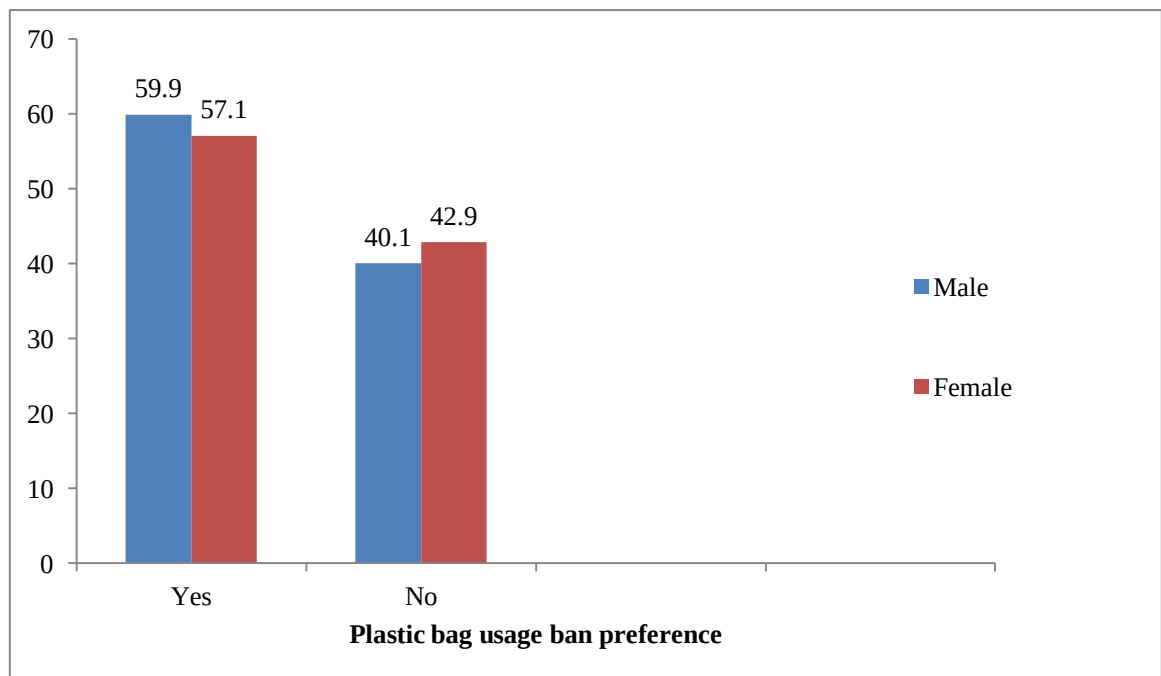


Figure 7: Perception of respondents on plastic bag ban on their sex

4.8.8. Perception of respondents on plastic bag usage ban their educational status

This research found that 63.3% illiterate respondents were against plastic bags usage ban while 67.3% of respondents with higher education, 60.4% respondents who completed secondary education are proportional to ban of plastic bags usage. Among primary school completed respondents, 49% were proportional to plastic bag usage ban while 51% were against plastic bags usage ban (Fig. 8). This study indicated that there is highly significant relationship between educational status of respondents and their perception on plastic bags usage ban ($X^2=21.406^a$, $df= 6$, $P< 0.05$).

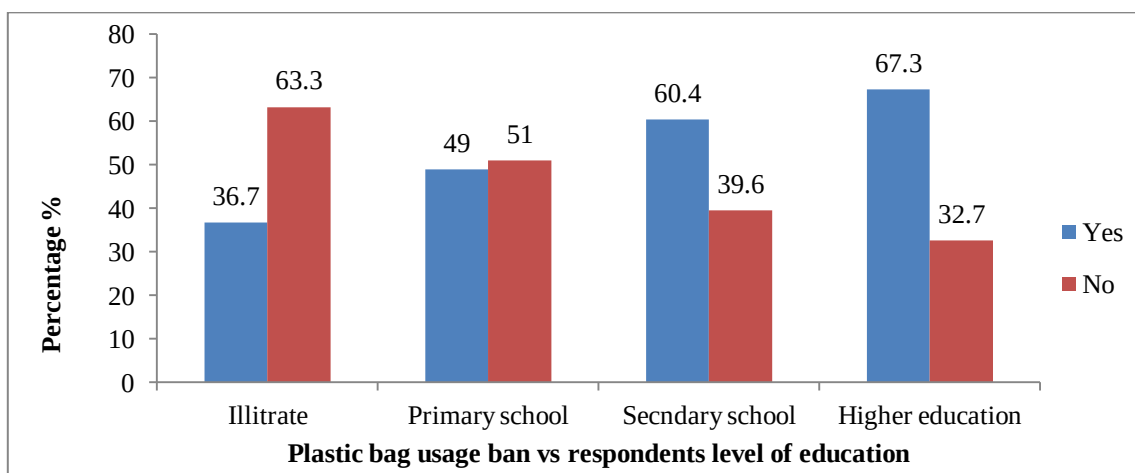


Figure 8: Perception of respondents on plastic bag usage ban and their educational status

4.8.9. Perception of respondents on plastic bag usage ban based on the age of respondents

This research indicated that among respondents of age less than 20 years, 52.4% were against plastic bag usage ban while 47.6% were in favor of the plastic bags ban. Of respondents at age group of 21-29 years, 54.9% were in favor of plastic bag ban while 45.1% were against. Similarly about 65.9% of the respondents at age group of 30-39 and 64.2% of respondents aged 40 and above were in favor of plastic bags usage ban while 34.1% of respondents in 30-39 age group and 35.8% of respondents aged 40 and above were against the plastic bags usage ban (Fig. 9). This study indicated that there is highly significant relationship between ages of respondents and their perception on plastic bags usage ban ($X^2 = 30.595^a$, $df = 6$, $P < 0.05$).

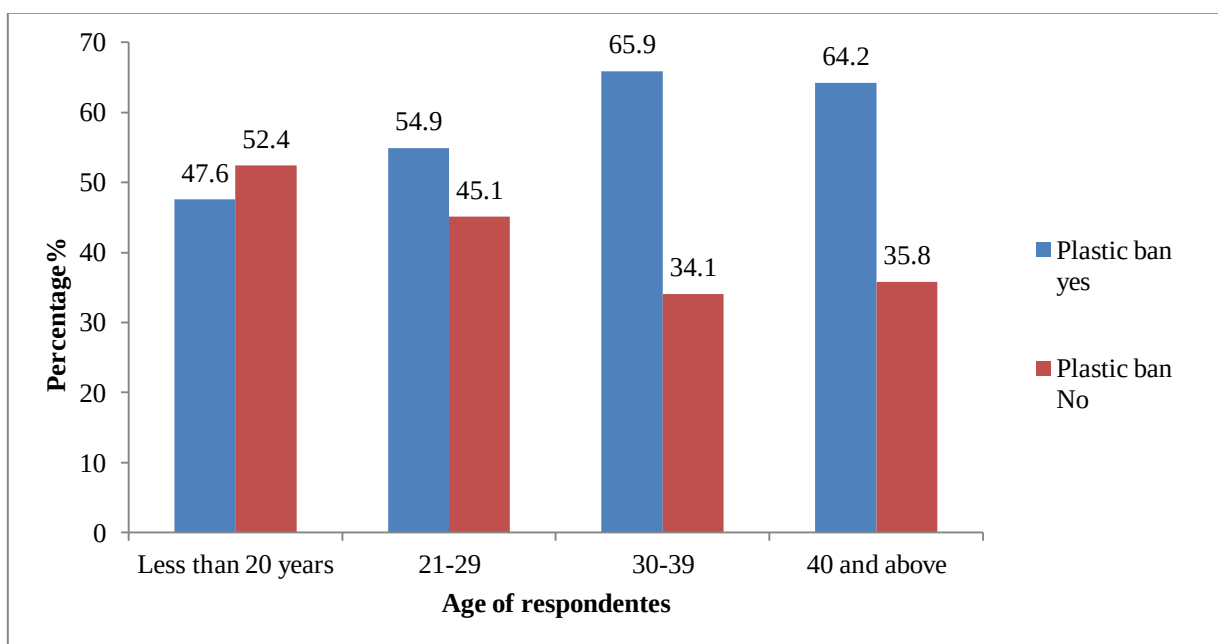


Figure 9: Perception of respondents on plastic bag usage ban by their ages

4.8.10. Association between awareness of respondents on plastic bags waste adverse effects and sex of the respondents

Among 26 (15 %) of male respondents were aware of about it adverse effects and 64 (96%) of female respondents were not aware (Table 12). This finding reveal that there is highly significant relationship between awareness of respondents on plastic bags waste adverse effects and sex of respondents ($X^2 = 26.575^a$, $df = 13$, $P < 0.05$).

Table 12: Distribution of the study subjects by their knowledge on adverse effects of plastic bags wastes and sex of the respondents, 2017

Sex of respondents	Respondents awareness on adverse effects of plastic bag			Total	X^2	df	P-value
	Yes	No	No idea				
Male	15 % (26)	64.0% (96)	44.6% (50)	56.4% (172)	26.575 ^a	13	< 0.05
Female	39.5% (17)	36% (54)	55.3% (62)	43.6% (133)			

5. DISCUSSION

Plastic products have become an integral part in our daily life. It produced as on a massive scale worldwide and its production is highly increased from time to time. This research revealed that 73.4 % of the respondents used plastic bags than other alternative materials and this indicated that usage of plastic bags is high among residents of Burayu city, and about 91% of the respondents noticed that the current uses of plastic bag materials are increasing in the city. This finding is consistent with finding from Jimma city and Gondar city which was done by Ramaswamy and Sharma, (2011). These facts suggest that plastic bags are widely utilized in different cities of Ethiopia.

This research indicated that majority of the Burayu city residents widely used plastic bags in their daily life activities. The main reasons attributed to the widespread usage were easily accessibility 177 (35.9%), low price 116 (23.5%), and easy to handle 119 (24.1%). This finding is in consistent to study conducted in Melbourne with Verghese *et al.*, 2006 which reported that low price and easy availability and light weight were the main reasons for widely usage of plastic bags. This finding is also similar to the findings of the study done in Delhi, where convenience for shopping was the common reason stated by most participants.

Another study done by Adane and Muleta (2011) in an urban area of Ethiopia reported that low price, easy availability and light weight were the main reasons for plastic bags users.

Plastic bags are difficult and costly to recycle and most end up on landfill sites where they take around it needs three hundred years to degrade. They break down into tiny toxic particles that contaminate the soil and waterways and enter the food chain when animals accidentally ingest them. This shows that land filling of plastic waste is not desirable since plastic is non-degradable and no economic value would have been derived from the waste.

Proper plastic waste management has a large part to play in preventing plastic waste becoming from harmful. However, in this study 32.1% of the respondents strongly agreed that land filling of plastic bag wastes is the appropriate disposal method. Likewise; it indicates that there is knowledge gap in the study area on the disposal methods of plastic bag wastes. This shows that the study population needs awareness creation program to understand the importance of managing plastic bags waste in an environmentally sound manner and informing people about the

dangers of dumping plastics into the environment. According to respondents additional suggestion, another option for sustainable plastic wastes management, conversion into artifacts things like bead and door mats, bags, hats, etc. that should target specific individuals, groups and sectors so as to enable them maximize the plastic waste recycling as opportunity for job creation. Generally, people aware of the environmental effects of the plastic bags waste.

Accumulation of plastic bag wastes causes environmental pollution that could results in deterioration of natural beauty of an environment and death of domestic and wild animals. Accordingly this research found that 87.5% of the respondents were agreed that plastic waste can kill animals when ingested. This is similar with the finding from jimma city that reported 72.5% of respondents said that plastic bag wastes can results in animal death, this is due to shortage of domestic animals food and consume plastic bags (especially those wastes containing food leftovers) indiscriminately. This results in complications of the digestive systems and health of animals. If untreated timely and also could lead to the death of animals and economic loss to their owners as it has been observed in developing countries of Africa.

This study showed that about 84.3% of the respondents responded that plastic bag wastes materials can results in deterioration of the environment. This could be attributed to the open dumping culture of the residents and the chemical stability of plastic bag wastes prevents them from decomposing at a rate comparable to the rate of waste generation.

It is obvious that thin plastic bags are single-use disposable products which cannot serve for long time and its frequency of consumption is high as compared with thick plastic bags. When once used they are disposed of in open environment. According to respondent's additional suggestions to solve this problem, using more environmental friendly alternatives and permanent shopping bags (such as cotton bags, paper bags and 'zenbel') can minimize the problem of thin plastic bag wastes. On the other hand using thick plastic bags have great impact in reducing the impact of plastic bag waste disposal on the environment by using reusing and recycling practice.

Therefore, the respondents were also asked about the ways on how they used to dispose plastic bag wastes. According to this finding burning is the commonly used method of disposal of plastic bag wastes which is consistent with the finding from Jimma City and

Alappuzha City, Kerala, that 42% of surveyed population used burning as disposal method of plastic bags wastes .

It is a fact that burning can help to get rid of plastic bag wastes or to reduce the volumes of these wastes in the environment. However, burning of the plastic bags waste should not be encouraged because it results in greenhouse gas emissions and releases of toxic organic compounds that affect human health according to Muthu *et al.* 2011 and Rayne, 2008. Thus, the communities of Burayu city must be aware concerning the impacts of burning plastic bags wastes on the health of human and animals. Blockage of sewerage systems is becoming a common problem in cities of developing countries creating foul smells and favorable habitats for mosquitoes that could spread a diseases like malaria according to Ellis *et al.*, 2005. This research tried to assess the awareness of the respondents on whether the plastic bag wastes block the sewerage systems and about 54% of them were strongly agreed and 33.1% were agreed. Then according to respondents result shows that blockage of sewage system by plastic bag is one of the problem of Burayu city.

Burying was one of the commonly used disposal practice for disposing of plastic bag wastes in the study area. Nevertheless, this method should not be considered 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.

Different measures like recycling and ban of plastic bags production must be employed to reduce the negative impacts of plastic bags. This research found that 59% of the respondents suggested that a complete ban on plastic could reduce the plastic use so that, plastic pollution could be controlled. A ban on plastic carry bags would force the people to bring their own paper/cloth carry bags to shop during shopping and could reduce the plastic use so that plastic pollution could be controlled. Finding of this research is consistent with finding from Alappuzha City, Kerala, that showed that 73.5% surveyed population said plastic should be completely banned.

For plastic bag waste management system the involvement of public participation is essential for its success. It should be noted that the success of any strategy will depend on a multi-stakeholder engagement. Accordingly, this research indicates that about 34% of the respondents replied that head of the households are responsible for disposing plastic bags wastes followed by the Municipality of the city 34.8% and 31.5% small micro-enterprise working on waste collection processes. The media should contribute to sensitizing residents of the city and its environs on proper disposal of plastic bag waste. Such efforts must be seen as part of their plastic waste management options.

6. CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

Plastic bag is still a relatively new material, which means the problem of plastic bag wastes has only recently been realized. Even more recent on the health and environmental effects, such as the impacts of the chemicals contained in plastics. The monitoring of plastic waste and research into its impacts are still in their infancy, but so far the implications are worrying. The result of the present study indicated that plastic bags are still widely used by the community of Burayu city, due to their easy availability and cheapness. Integrated Plastic Waste Management (IPWM) would be recommended method for developing countries due to its significantly higher environmental benefits. However, the study results and field observations indicated that the city was seriously polluted by plastic wastes particularly plastic bags wastes. Some of the community members do not have organized waste collection systems, waste loading or sorting and transfer facilities. Others may not possess waste treatment sites in their living areas and some of the respondents 40 (13.1%) as a result of financial problems cannot have willingness to pay for waste collectors as a result simply thrown house hold waste that containing plastics specially plastic bags into any open place in their city.

Burning and open field dumping were the common methods of plastic bags wastes disposal method in Burayu city. Majority of the respondents have aware effects of plastic bags wastes and mass media was the main sources of information.

More than half of the respondents, 55.7% were knowledgeable about plastic bags waste adverse effects on human beings and their environment. About 91% of respondents reported that the current uses of plastic bags are increasing in the city. Due to its adverse effects, its utilization has to be discontinued and the city municipality, government, environmental agencies and communities are responsible to minimize the plastic bags utilization. More than half of the respondents agree that plastic bags utilization has to be banned.

This study found that age, sex and educational status of respondents were significantly associated with plastic bags usage. However, there is no significant difference between knowledge level of respondents on plastic bags wastes adverse effect and its utilization.

Generally, majority of the respondents know some of the impacts of plastic bags to the environment. More over to save their environment, education on plastic bag waste management, on both formal and non-formal, is vital to changing people's attitudes by appreciating to live a clean and safe environment. But it needs additional public awareness creation programs in order to bring behavioral change in the community for managing and controlling of plastic bag pollution.

6.2. Recommendations

Based on the finding of this study the following recommendations were suggested:

- Various awareness creation campaign programs should be done by the Burayu city municipality and local administration to create awareness of plastic bags usage and to minimize its adverse effect to the environment.
- The public should be encouraged to use different non plastic alternative bags like jute bags, cloth bags, paper bags, etc.
- Throwing of plastic wastes in public places should be prohibited and controlled.
- Setting-up of systematic mechanism for plastic waste collection, segregation and disposal should be practiced.
- There is need for capacity building and strengthening of solid waste and plastic waste management infrastructure in the City.

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Annex I: Questionnaire

Adama Science and Technology University Department of Applied Biology

Dear respondents;

This survey is designed to assess the knowledge and practices of plastic bags, their disposal and impacts among Burayu city communities. The research work is in partial fulfillment of the requirements for the award of Master of Applied Biology. 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 bags waste.

Thus, are kindly requested to cooperate in giving responses to the items given in this questionnaire.

Do you participate in the study? **Yes** _____ **No** _____

If No, Go to the second household.

Circle on your preferred level of agreement

Section I. Backgrounds of the study subjects

1	Sex:	Male Female
2	Age:	<20 years 20-29 years 30-39 years 40 years
3	Educational background of your family	Illiterate Primary education High school education

		Higher education
4	Socioeconomic status of their family	High Middle Low

Section II. Questions regarding knowledge of respondents on Plastic bag waste materials

1	Do you know that Plastic bags contain chemicals that affect health?	Strongly agree Agree Neutral Disagree Strongly disagree
2	Do you think that the impact of open burning plastics on health of human?	Strongly agree Agree Neutral Disagree Strongly disagree
3	Do you think that the impact of plastic bag wastes can kill animals when ingested? when ingested animals?	Strongly agree Agree Neutral Disagree Strongly disagree

4	Do think that landfill of plastic bag is appropriate disposal methods?	Strongly agree Agree Neutral Disagree Strongly disagree
5	Do you think that plastic bag wastes can cause health problem?	Strongly agree Agree Neutral Disagree Strongly disagree
6	Do you think that plastic bag wastes can Blockage of sewage (drain) system?	Strongly agree Agree Neutral Disagree Strongly disagree
7	Do you think that plastic bag wastes can cause deterioration of natural beauty of environment?	Strongly agree Agree Neutral Disagree Strongly disagree

8	Do you think that plastic bag wastes have impact on tourism and tourist flows?	Strongly agree Agree Neutral Disagree Strongly disagree
9	Is Using plastic bags to ignite the charcoal for cooking is good practice	Strongly agree Agree Neutral Disagree Strongly disagree
10	Have you heard FDRE proclamation on Solid waste management?	Strongly agree Agree Neutral Disagree Strongly disagree
11	Is the spread of plastic bag littering is associated with urbanization?	Strongly agree Agree Neutral Disagree

		Strongly disagree
12	plastic bags are manufactured from non-biodegradable materials also adds to the overall environmental burden.	Strongly agree Agree Neutral Disagree Strongly disagree
13	Plastic wastes find their way into the water bodies thus polluting the water	Strongly agree Agree Neutral Disagree Strongly disagree
14	Every bag that ends up in the woodlands of the country threatens the natural progression of wildlife	Strongly agree Agree Neutral Disagree Strongly disagree

Part III: Question regarding usage of plastic bags and disposal methods

15	Have you ever used plastic bags?	Yes No
16	Why do you prefer to use the plastic product(s) especially plastic bags? More than one answers possible	They are cheap very easy to handle They are easily available Lack of alternative materials If others (Please, specify)
17	How you do dispose the plastic bag waste materials? More than one answers possible	Open dumping Burying Burning Re-use If others (Please, specify)
18	Who is responsible for disposing plastic bag wastes or other solid wastes? More than one answers possible	Head of household Municipality Small microenterprises All
20.	How do you see the current uses of plastic material?	Increasing Decreasing No idea about this

21.	If your answer for question 20 is “1”, what are the possible reasons? More than one answers possible	Cheapness (low cost) Durability Availability wherever and whenever required Lack of awareness about its negative impacts If others(specify)
22	If your answer is to question 20 is “2”, what are the possible reasons? More than one answers possible	Availability of alternative materials Awareness of the community on its effects Increasing prices of plastic-made materials Government ban If others (Please, specify)
23	Which parts of Burayu city are seriously polluted by plastic bag wastes? More than one answers possible	Waste dumping sites Market places Crowded residential areas Roads sides Any open places in the city Sewage(drain)lines

		7.If others(Please, specify)
24	Have you heard environmental impacts of plastic bag wastes?	Yes No No idea
25	If your answer to question number 24 is “Yes”, how or where? More than one answers possible	TV/radio School From professionals Published materials City municipality promoters If others (Please, specify)
26	Is it possible to minimize plastic bag waste?	possible impossible
27	If your answer is possible, by what mechanisms we can minimize plastic waste materials? More than one answers possible	Avoiding buying plastic products Reducing amount of plastic waste used Reuse plastic products Recycling plastic materials 5.Using Cloth bags 6.Usingbagsfromplantmaterials(zembil) 7.If others (Please, specify)
28	According to your opinion, What should you do to the utilization of plastic bags?	Should be continued

		Should be discontinued
29	If your answer in question number 28 is “should be discontinued”, who is responsible to do so? More than one answers possible	Municipality NGOs Government Environmental agencies The community itself Health institutions If others (Please, specify)
30	Do you think that plastic bag usage has to be banned?’	Yes No No idea on this
31	If yes to question 30, who is responsible to ban plastic bags?	1.Communities 2.Government body 3.If other specify
32	Do you know, is there Organized Solid Waste Collection Service in Burayu?	1.Yes 2.No 3.No idea on this
33	Are you Willingness to Pay for Solid Waste Collection?	1.Yes 2..No

34	If you say plastic bags should not be used, what alternatives can be used? More than one answers possible	1.Paper bags 2.Fiber bags 3. Cloth bags 4. Bags from plant materials
35	Do you think that Burayu communities have strong awareness of plastic bag waste effects?	Yes No No idea on this
36	How do you evaluate the Burayu city on solid waste management?	1.Good 2.Not good 3.No idea

Unkaa I: Gaaffiilee

Yuunvrsiiti Saayinsii fi Teekinolojii Adaama Mummee Applide Baayoolojii

Kabajamaa Hirmaataa;

Yeroo ammaa kana Barnootaa Digrii Lammaaffaa Kiyyaa Raawwachuuf Qorannoo Gaggeessuuf jedha. Unki Qorannoon Kun Waa`ee Hubannoo Feestaalaa, Haala itti fayyadama isaa, tooftaa itti gataanii fi Midhaa isaa Qorachuuf Qophaa, `e. Kanaafuu, Deebiin Keessaan Qorannoo Kanaaf Bu`uraa Waanta`eef Qorannoo Kana Keessaatti Akka Hirmaataniif filatamtaniitu.

Hirmaanaan Keessanii Kun Fedha Irraatti Hundaa`eedha.

Gaaffiileef deebii Keenuun Hirmaachuuf Fedha Qabaachuu Keessaniif Onnee Irraa Isiin Galatteefadhaa.

Ni hirmaattuu? **Eeyyee** _____ **Lekk** _____

Yoo, eeyyee jedhan garagaaffiilee itti anaaniiti ce`i.

Yoo Lakkii Jedhan Gara Mana Ittii Aanuutti Darbi.

Kutaa I. Odeeffannoo dhunfaa kan hirmaataa

1	Saala	1. Dhiira 2. Dhalaa
2	Umrii	1. Waggaa 20 gadii 2. Waggaa 21-29 3. Waggaa 30-39 4. Waggaa 40 fi isaaoli
3	Sadarkaa barnootaa	1. Hin barannee 2. Sadarkaa tokkoffaa 3. Sadarkaa lammaaffaa 4. Kolleejjii fi isaaolii
4	Haala galii maatii	1. Olaanaa 2. Giddugaleessa 3. Gadi`aanaa

Kutaa II. Gaaffiilee Haala Hubannoo Feestaalaa Ilaalchisee Qophaayee;

1	Meeshaalee plaastiikaa keessaa baayiinaan isa kamii fayyadamtaa?	1.Korojoo plaastikaa(festaalaa) 2.Plaastic bottles 3.plaastic,buckets,bins andbarrels 4.If use others (please,specify)
2	Balfaan feestala Keemikaala fayyaa namaa miidhu ni qabaa?	1.Eeyyee 2.Lakkii 3.Hubannoo hin qabu
3	Balfaa feestala dirree irratti gubuun fayyaa namaa hin miidhu?	1.Eeyyee 2.Lakkii 3.Hubannoo hin qabu
4	Balfaan feestalaa yoo horiin nyaatte ni ajjeesa/ajjeesuu danda'a?	1.Eeyyee 2.Lakkii
5	Balfaan feestala akkaataa itti gatamuu qabuu ni beekata?	1.Eeyyee 2.Lakkii 3.Hubannoo hin qabu
6	Balfaan feestalaa rakkoo fayyaa ni fidaa?	1.Eeyyee 2.Lakkii 3.Hubannoo hin qabu
7	Balfaan feestaala karaa lolaa ni cufa?	1.Eeyyee 2.Lakkii 3.Hubannoo hin qabu
8	Balfaan feestaala miidhagina naannoo ni huba/miidha?	1.Eeyyee 2.Lakkii 3.Hubannoo hin qabu
9	Balfaan feestaala tuurizimii biyyaa irraati miidha ni qaba?	1.Eeyyee 2.Lakkii 3.Hubannoo hin qabu
10	Feestaali kasala qabsiisuf ykn nyaata bilchessuf bobeessun gochaa gaarii dhaa?	1.Eeyyee 2.Lakkii 3.Hubannoo hin qabu
11	Labsii motummaa itoopiyaa balfaa gogogaa/solid waste/ilaalchisee labsee dhageesseertaa?	1.Eeyyee 2.Lakkii 3.Hubannoo hin qabu

12	Faffaca,iinsi balfaa feestalaala guddina magaala waliin wal qabataa?	1.Eeyyee 2.Lakkii 3.Hubanoo hin qabu
13	Feestaalii wantoota bosbosan irraa waan hin hojatomneef rakkoo inni naannoo irrattii fiduu daran nihaamaataa?	1.Eeyyee 2.Lakkii 3.Hubanoo hin qabu
14	Balfaan feestaalaa qaama bishaanii keessaa yoo seenee bishaan nifaalaa?	1.Eeyyee 2.Lakkii 3.Hubanoo hin qabu
15	Balfii feestaalaa kamiyyuu bosona biyyatti keessatti yoo gatame gudina binesoota umammaa irratti dhibbaa qabaa?	1.Eeyyee 2.Lakkii 3.Hubanoo hin qabu
Kutaa III Gaaffillee haala itti fayyadama feestala fi itti gatan ilaalchisee qophaa'ee		
16	Feestaala gara fuldurattii fayyadamu barbaadaa? Deebii tokkoo caalaa ni dandeessuu.	1.Eyyee 2.Lakki 3. Ama murtesu hindanda`u
17	Yoo Gaaffii 16f eeyyee jette, maalif? Deebii tokkoo caalaa ni dandeessuu.	1.Gatiin rakasaa 2.Qabachuf salphaa waan ta`eef 3.Haala salphaan argama 4.Filanoo biro waan hin jireef 5.Kan biroo yoo jiraatee ibsii
18	Balfaan feestala akkaataa itti gatamuu qabuu ni beekata?Deebii tokkoo caalaa ni dandeessuu.	1. Dirree irraatti gatuu 2.Awwaaluu 3.Gubuu 4.Irraa deebi'ani Fayyadamuu 5.Kan biroo yoo jiraatee ibsii
19	Balfaa goggogaa/balfa feestala gatuu/to'achuu irratti ittii gaafatamummaa kan qabuu eenyu?	1.Abbaa warraa 2.Mana qophessaa 3.Micro xixiqaa 4.Hunduu
20	Yeroo ammaa kana itti fayyadama feestaala akkamin ilaalta?	1.Dabalaa jira 2.Hir'achaa jira 3.Yaada kana irratti hin qabu
21	Yoo dabalaa jira jette sababn'isaa maali?Deebii tokkoo caalaa dandaa`ama.	1. Gattin isaa salphaa waan ta'eef 2.Yeroo dheeraa waan turuuf/fayyaduuf 3.Bakkahedduuti argachuun/bituun waan danda'amuuf 4.Miidhaa inni geesisuu irratti hubannoo waan hin qabneef

		5.Yaada biroo yoo qabaatte ibsii
22	Yoo gaafii 20 dabalaa hin jiru/hir'achaa jira jette sababn'isaamaali? Deebii tokkoo caalaa dandaa`ama.	1. Bakka isaa meshaa biro fayyadamun waan danda`amuf 2. Haawaasni miidha isaa waan hubateef 3.Gattin isaa waan dabaleef 4.Motummaan waan dhorkeef 5. Kan biro yoo jiraate ibsi
23	Magaala burayyuutti bakka/iddoo kamtuu balfaa feestalan faalame? Deebii tokkoo caalaa dandaa`ama.	1.Bakka balfaa itti gatan 2.Iddoo gabaa 3.Naannoo mana jireenya 4.Karaa Maddii 5.Bakka duwaa magaalaa kessaa 6.Booyii balfaa dhangala'oo 7. Kan biro yoo jiraate ibsi
24	Miidhaa balfaan feestala naannoo irraatti qabu dhageessee beektaa?	1.Eeyyee 2.Lakkii 3. Yaada biraa hin qabu
25	Yoo gaafii 24 Eeyyee jeettee maddi odeefannoo kee maali?	1.Raadiyoo/Televeziyoona 2.Mana barnoota 3.Ogeessaa fayyaa irraa 4.Maxxansaa garaagaraa irraa 5.Bulchinsa magaalaa irraa 6.Kan biro yoo qabaatee ibsii
26	Balfaa feestaala hir'isun ni danda'amaa?	1.Eeyyee 2.Lakkii
27	Yoo eeyyee jeette haala kamiin hir'issun danda'ama? Deebii tokkoo caalaa dandaa`ama.	1.Bituu dhiissun 2.Itti fayyadamaa isaa hir'isuu 3. Irra deebi'anii fayyadamuu 4.Irra deebii`anii hojjachuu 5.Boorsaa uuffata irra hojjetame fayyadamuu 6.Zambiila/gessoo fayyadamuu 7.Yoo kan biroo yoo jiraate ibsi
28	Akka yaada keeti itti fayyadamni feestaala itti fufuu qabaa jettee nii yaaddaa?	1.Itti fufuu qaba 2.Itti fufuu hin qabu

29	Yoo gaafii 28ffaaf deebiin kee itti fufuu hin qabu yoo ta'e, enyuutuu itti gaafatamummaan hojjachuu qabaa ? Deebii tokkoo caalaa ni dandeessuu.	1.Bulchinsamaga 2.Dhabbata miti mottummaa 3. Mottummaa 4.Dhaabata egumsa naannoo umammaa 5.Hawaasa 6.Buufata fayyaa 7.Kan biraa yoo ta'ee ibsi
30	Itti fayyadamni feestalaa dhorkamuu qaba jettee ni yaaddaa?	1.Eyyee 2.Lakki 3.Kana irratti hubannoo hin qabu
31	Yoo dhorkamuu qabaa jette, qaama kamtu dhorkuu qaba?	1.Hawaasa/Uummata 2.Mottummaa 3.Kan biro yoo jiraate ibsi
32	Qaamni gurmaaye balfaa gogaa walitti qabuu/collect/ magaala Buraayyuu ni jiraa?	1.Eyyee 2.Lakki 3.kanarratti hubannoo hin qabu
33	Qaama Gurmaa'ee balfaa walitti qabuuf qarshii kaffaaluuf fedhii qabdaa?	1.Eyyee 2.Lakki 3.Yaada kana hin deegaru 4.Kan biro yoo jiraate ibsi
34	Yoo feestaalaa fayadamuu hin barbaachisu jete, filanno kam fayyadamtaa? Deebii tokkoo caalaa ni dandeessuu.	1.Korojoo waraqaa irraa hojjatame 2. Korojoo fo'a irraa hojjataman 3. Korojoo hucuu irraa hojjataman 4.Korojoo biqiloota irraa hojjataman 5. Kan biro yoo jiraate ibsi
35	Haawasi magaala Burrayuu wa'ee midhaa balfaa feestala hubbannoo ga'aa qabaa?	1.Eyyee 2.Lakkii 3.Hubbanno kana rraatti hin qabu
36	Haala qabinsa balfa gogaa magaala Burraayyuu akkamiin madaaltuu?	1.Gaarii 2.Gaarii miti 3.Kana irratti hubannoo hin qabu

GALATOMAA!

