ADDIS ABABA UNIVERSITY COLLEGE OF NATURAL SCIENCE
DEPARTMENT OF ZOOLOGICAL SCIENCE

IMPACT OF MUNICIPAL SOLID WASTE ON LIVESTOCK HEALTH IN WOREDA 4 (GORA) AKAKI KALITI SUB-CITY, ADDIS ABABA, ETHIOPIA

BY

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DECLARATION

I, Fantahun Hayluye do declare to the senate of AAU College of Natural Science Department of Zoology Science that this dissertation “Impacts of municipal solid wastes on the health of Livestock in Woreda 4 Gora in Akaki Kaliti Sub-city Addis Ababa, Ethiopia” is my original work done within the period of registration and that it has neither been submitted nor being concurrently in any other institution.

Name of Candidate_____ Signature_____ Date_____

DEDICATION

I dedicate this to my late Aunt Belaynesh Dessiye, contribution laid down the foundation of my education

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ACRONYMS AND ABBREVIATIONS

AASWMA:	Addis Ababa Solid Waste Management Agency
AAU:	Addis Ababa University
CAO:	City Agriculture Office
FAO:	Food and Agriculture Organization of the United Nations
FMOH:	Federal Ministry of Health
GHG:	Green House Gas
MSW:	Municipal Solid Waste
PD:	Population Division
SAC:	Scottish Agricultural College
UN:	United Nation
UNCHS:	United Nations Commission on Human Settlements (Habitat)
UNDESA:	United Nations Department of Economics and Social Authority
UNEP:	United Nations Environment Program
URT:	United Republic of Tanzania
US:	United States
WHO:	World Health Organization

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ABSTRACT

Unmanaged Municipal solid waste (MSW) is a major pollutant of environment in cities and surroundings. The objective of this study was to assessthe impact of MunicipalSolid Wastes on the health of Livestock in Akaki Kaliti Woreda 4 specifically called Gora at the boundary of Oromia Regional State, Addis Ababa, Ethiopia based on the information obtained through questionnaires. From this Woreda,34 respondents who were cattle owners purposely selected. The objective was to assess the major impact of solid municipal wastes on the health of livestock. Data collection was done using structured questionnaire and Field observation.The study showed that Municipal Solid Waste hadimpact on health of Livestock. When they requested28 (88.4%) of respondents were found to be aware of the impact of MSW, 6(17.6%) weren't sure its impact; 27(79.4%)respondents responded that MSW caused Livestock to be sick, 7(20.6%) had no livestock gotten sick; regarding the types of Livestock highly affected 20(74.1%) responded all types of livestock could have got affected, 7(25.9%) responded that horses and donkeys were highly affected. It was recommended that the Akaki Kaliti Woreda 4 and Addis Ababa Solid Waste Management Agency (AASWMA) work and put guidelines on Municipal Solid Wastes management. Additionally, livestock owners should be aware and be trained how to feed quality and safe foodto livestock to eliminate health problem of Livestock.

***Key words/ phrases**: Livestock, Livestock owners, Municipal solid waste. Akaki-Kaliti Sub-city*

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the study

The amount of solid waste generated in developing countries is rising over time due to many factors such as economic growth, change in consumer behavior, and lifestyles of people. In many developing countries wastes accumulate mainly due to the magnitude of rapid urbanization and increasing population growth which in turn have greatly accelerated the municipal solid waste generation rate in the urban environment (Williams, 2000; Zhang *et al*., 2010; Guerrero *et al*., 2013). Global population urbanizes at unprecedented rate and cities continue to witness, growth, particularly in developing countries. In Megacities of the developing world, urban sprawl is a common problem and a substantial amount of city dwellers live in slams, within the city or in urban periphery in poverty and degraded environment (Cohen, 2006).

Developing countries have undergone a rapid urbanization during the past many years and the number of residents is expected to increase to 39.5% by the end of this century and to 56.9% by 2025 (Haphan*et al,1991*). For example, according to United Nations Department of Economic and Social Affairs/Population DivisionAfrica's urban population which previously was 400 million in 2010, is estimated to increase to about 1.3 billion by 2050(UNDESA/PD, 2012).

According to World Bank (2019) around the world, waste generation rates are rising. In 2016, the worlds´ cities generated 2.01 billion tones of solid waste, amounting to a footprint of 0.74 kilograms per person per day. With rapid population growth and urbanization, annual waste generation is expected to increase by 70% from 2016 levels to 3.40 billion tones in 2050. Due to huge generation; management of municipal solid waste is one of the most crucial health and environmental problems facing governments of Africa cities. The uncontrolled or illegally dumped wastes constitute a disaster for human health and the environment degradation(Rakodi, 1977). Many countries in developing countries face serious

environmental degradation and health risks due to the weakly developed municipal solid waste management system (Nguyen*et al*., 2011).

Huge generation of MSW coupled with unbalanced waste management services is the major challenges facing the City of Addis Ababa (Hayal Desta*et al.,* 2014). According to the same source there are generic factors contributing to the poor management of solid waste. These drivers include: lack of sufficient budget, inadequate and malfunctioning operation equipment, illegal dumping on undesignated sites, open disposals, poor condition of the final dump site, lack of effective public participation and in adequate governance in waste management system. In addition, the diverse sources of solid waste generation and the complex nature of its composition make it difficult to manage(Hayal Desta*et al.,* 2014).

Solid waste disposal sites are found both within and on the outskirts of developing urban sites. In many developing countries Solid waste disposal sites are found on the outskirts of urban areas. Open dumpsites in developing urban cities involve indiscriminate disposal of waste. They are uncontrolled and therefore, pose major health threats which affect the landscape cities (Sood, 2004) with increase in the global population and the rising demand for food and other essentials, there has been rise in the amount of waste being generated daily by each household. In Addis Ababa the daily generation of solid waste is estimated to be 0.5 kg per capita per day and the density of solid waste ranges from 205 to 370 kg m^{-3} (Hayal Desta *et al*, 2014).

This waste is ultimately thrown to municipal disposal sites and due to poor and inefficient management, the dump sites turn to sources of environmental and health hazards to people and animals in the vicinity of such dumps. One of the main aspects of concern is the pollution caused earth-be it land, air or water. Studies have led to an increasing interest of researchers in the study relating to environmental pollution as well as its effects on plants and animals. Few of these studies identified the environmental and health implications of solid waste disposal to people and animals living in close proximity of waste dumpsites (Boardi and Kuitun, 2005). The Over Increasing consumption of resources also results in huge amounts of municipal wastes from industrial and domestic activities, which poses significant threats to human and animal healthand inappropriately disposal municipal solid wastes are quite numerous to be mentioned(Frosch, 1996).

UNEPA stated that wastes that are not managed properly especially solid waste from households and the community are serious health hazards and lead to the spread of infectious diseases (UNEPA, 2013).

In the dumpsites dumping of toxic waste is highly illegal, owing to the serious risks associated with it. Although the risks are well documented for humans, the detrimental health effects on animals are far less frequently discussed. What is more `worrying still is that the likelihood of a stray animal coming across toxic waste is far greater than a human. Wild or stray animals are unaware of what they are coming across, and could therefore ingest toxic waste. Themunicipal solid waste consists of organic waste, waste paper, plastic waste, tin cans, aluminum cans, textile, glass; etc. Animals can also ingest these wastes especially plastic, which is severely harmful. Animals especially cows, oxen ingest the plastic and develop complications, which finally result in their death(Haggar, 2007).

Therefore, the general objective of this study will investigate the impacts of msw in the study area. Whereas the specific objectives include: Identify the impact of municipal solid wastes on livestock health: Identify the type of livestock highly affected by releases of municipal solid wastes: Assess the attitude of the community towards impacts of municipal solid wastes on livestock health. Identify the way to create awareness to the community about municipal solid wastes regarding with livestock health.

1.2 Objectives

1.2.1 General Objective

The main objective was to assess the major impact of solid municipal wastes on the health of livestock

1.2.2 Specific Objectives

- Investigate the impact of municipal solid wastes on livestock.
- Identify type of livestock highly affected by releases from municipal wastes
- Indicate the way to create awareness to the community about impact of municipal solid wastes.
- Assess the attitude of the community towards impact of Municipal Solid Wastes on the health of Livestock.

1.3. Ethical Consideration

All information will be obtained on the free will of target groups. No questionnaire will involve too personal or sensitive questions whatsoever. This will confirm by the first explaining the objectives of the thesis & asking if each individual is willing to answer each questions interview or photography.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1 Definition of Municipal Solid Waste

Municipal solid waste is defined as the materials discarded in the urban areas for which municipalities are usually held responsible for collection, transport, and final disposal. That is why they are called municipal solid wastes. It encompasses household refuse, institutional wastes, street sweeping and commercial waste, as well as construction and demolition debris (Charlotte, 2009). In developing countries municipal solid waste also contains varying amounts of industrial waste from small industries as well as dead animals and fecal matter. Municipal solid Waste has also been defined by Tchobanoglous *et al*. (1993) and Weitz *et al*. (2002) as any solid or semi-solid substance or object resulting from human or animal activities which the holder discards or intends or is required to discard and constitutes a hazard for living beings and all that sustains life.Municipal solid waste is a pool of various wastes by towns and cities from different types of household activities. It may include biodegradable wastes, and composite wastes such as clothing, hazardous waste (paints, spray and chemicals) and medical wastes (Naiazi*et al*., 2016).

UN Environmental Protection Agency defined Municipal solid waste; as more commonly known as trash or garbage consists of everyday items we use them and throw away such as product packaging, grass clipping, furniture, clothing, bottles, food scrapes, news papers, appliances, paints, and batteries .These comes from our homes, schools, hospitals, and businesses(UNEP, 1996).

2.2 Composition of Municipal Solid Wastes

Municipal solid waste is composed of different wastes generated by households, commercial and industrial premises, institutions such as schools, hospitals, car homes, prisons and from public spaces such as streets, markets, slaughter houses, public toilets, bus stops, parks, gardens. The composition of msw varies greatly from municipalities to municipalities and it changes significantly with time (Kumar *et al.*, 2016).

In municipalities which have a well-developed waste recycling system; the waste stream mainly consists of intractable wastes such as plastic films and non-recyclable packaging

materials. In developed areas without significant recycling activity it predominantly includes food wastes, market wastes, yard wastes, plastic containers and products packaging materials, and other miscellaneous solid wastes. Even though many definitions of municipal solid wastes do not include the following components, it also consists of industrial wastes, agricultural wastes, medical wastes, radioactive wastes sewage sludge according to U.S Energy Informatin Administration (2010).

In developing countries there is much higher proportion of organics, and considerably less plastics (Cointreau, 1982). According to Cointreau the large amount of organic material makes the waste denser with greater moisture and smaller particle size.

The typical content of municipal solid wastes include paper, Glass, Ferrous metals, Aluminum, Tin, Copper, Lead, Textiles, Rubber, (Food, animal, plant, and other wastes) & Miscellaneous materials (Ravi& Diana, 2012).

2.3 Source and Types of Municipal solid Wastes

Municipal solid waste categorized as household (residential) refuse, institutional waste, Street sweepings, Commercial waste, as well as construction and demolition debris; In developing countries msw also contains various amount of industrial wastes from scale industries(Medina, 2004). In these sources there are diverse types of solid wastes. But some of typical solid wastes of those sources are described by Dereje Tadesse (2001).

Commercial waste or refuse: This category consists of wastes from shops, offices, hotels, store offices, fuel services stations, ware houses, restaurants, etc and typically consists of packaging materials, office supplies(Dereje Tadesse, 2001).

Household waste: - It is also referred to as residential refuse on domestic waste; this category comprises wastes that are the consequence of household activities. These include: food preparation, sweeping cleaning, fuel burning & gardening wastes. It also includes old clothing, old furnishing, retired appliances, packaging & reading material.Household waste further contains a few other hazardous materials, such as electric and electronic items, cooking oil, batteries, fluorescent lamps, or other materials which bare specific health risks. Very few recycling centers and cooperatives are equipped to deal with these materials(Dereje Tadesse, 2001).

Table 1Typical waste generator and types of solid waste

Source: - Daniel Laura Thomas, 1999.

Source	Typical waste generator	Types of Solid Waste
Residential	Single & multifamily dwellings	Food waste, paper, cardboard, plastics, textiles, leather, wood, yard waste, glass, metals, ashes, special wastes (e.g., bulk items, consumer electronics, white good, batteries, oil, tires), households, hazardous-wastes
Industrial	Light and heavy manufacturing, fabrication, construction sites, power & chemical plants.	Housekeeping wastes, packaging, food wastes, construction & demolition materials, hazardous wastes, ashes, special wastes.
Commercial	Stores, hotels, restraints, markets, office building...etc	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes.
Institutional	Schools, hospitals, prisons, government centers.	Same as commercial
Construction & demolition	New construction sites, road repair, renovation sites, demolition of building	Wood, steel, concrete, dirt,…etc
Municipal services	Street cleaning landscaping, parks, beaches, other recreational areas, water & waste water treatment plants.	Street sweepings; landscape and tree trimmings; general wastes from parks, beaches & other recreational areas, sludge.
Process (manufacturing etc)	Heavy light manufacturing, refines, chemical-plants, power plants, mineral extraction & processing.	Industrial process wastes scrap materials of specification products, slay tailings.
Agriculture	Crops, orchards, vineyards, dairies feedlots, farms.	Spoiled food wastes, agricultural wastes, (e.g., pesticides)

Cited in: Solomon Kibrekidusan (2017)

Figure 1: Source and types of Municipal solid wastes around woreda 4 Gora, at boundary of Oromia regional state, Addis Ababa, Ethiopia.

Source: Akaki Kaliti solid waste management office, 2018.

Institutional waste:- Waste from schools, hospitals, clinics, and government offices, police, barracks, religious buildings, military bases…etc and comprise hospital and clinical wastes including potentially infectious & hazardous materials (Dereje Tadesse, 2001).

Street sweepings: - This type of waste always includes dusts dirt, litter, soil, paper…etc. However; in developing countries it may also contain appreciable amounts of household refuse, street sweeping also involves fruit and vegetable residues as household wastes, dumped along roads, drain, cleanings, human fecal, animal manure and remains(Dereje Tadesse, 2001).

Figure 2: Street sweeping activitiesand collection methods of solid wastes around Woreda 4 at boundary of Oromia regional state, Addis Ababa, Ethiopia.

Source: AkakiKaliti solid waste management office, 2018.

Construction & demolition wastes: - its composition depends on type of construction materials used. It typically includes soil, brick, stone, concrete, ceramic materials, wood, packaging materials & the like(Dereje Tadesse, 2001).

Table 2 Types of Municipal Solid Wastes in Low, Middle and High income Countries.

Source: Cointreau 1982, Cited in Dinka Chalchisa, 2017

Composition (%by weight)	Low income countries	Middle-income countries	High-income countries
Paper	1-10	15-40	15-40
Plastics	1-5	2-6	2-10
Metals	1-3	1-5	3-13
Glass, Ceramics	1-10	1-10	4-12
Leather, Rubber	1-5	-	-
Wood, bones, straw	1-5	-	-
Textile	1-5	2-10	2-10
Vegetable/organic matter	40-85	20-65	20-50
Miscellaneous	1-40	1-30	1-20

Developing countries have 40-85 percent waste made up of household‘s organic matter with a high density of 450-500 kg/m3 with a high proportion of moisture content (40-80 %) and small particle size ranging between 5-35 percent(Cointreau,1992). From table 2 it can be concluded that density of waste as reflected in humid weight is high in developing countries and low in developed countries(Dinka Chalchisa, 2017).

The quantity of waste generated is increasing because of rapid population growth, economic development, urbanization and improved living condition in cities and towns. However, in most developing countries like Ethiopia the increasing of solid waste generation is resulted from rapid urbanization and population booming. This has outpaced financial and man power resource of municipalities to deal with provision and management of service solid waste. In most cities of the developing world inappropriate handling and disposal of municipal solid waste is the most visible cause of environmental degradation, which means air pollution, soil

contamination, surface and ground water pollution, etc. resulted from improper disposal of msw (WHO, 1996).

Food waste: -a food that is discarded or lost uneaten. The causes of food waste or loss are numerous and occur at the stages of producing, processing retailing and consuming(Dereje Tadesse, 2001).

FAO,UNEP and stakeholders under the UN's Save Food Initiatives have agreed on the definition of food waste as any removal of food from the food supply chain which is or was at some point fit for human consumption, or which has spoiled or expired mainly caused by economic behavior, poor stock management or neglect(UNEP,2004).

In the European Union, Food waste was defined as "any food substance, raw or cooked which is discarded or intended or required to be discarded". Modernization and progress has had it share of disadvantage and one of the main aspects of concern is the population it is causing to the earth be it land, air and water with increase in the global population and the rising demand for food and other essentials there has been a rise in the amount of waste being generated by each household (Zhang *et al*., 2010; Guerrero *et al*.,2013).

2.4. Impact of Municipal Solid Wastes in Developing Countries

In most urban centers of developing countries, municipal solid waste management is highly unsatisfactory (SKAT,1996;Henry*et al*., 2006) and beyond the capabilities of their economic setup for handling and disposal (WHO, 1996; Seik, 1997; Rakodi, 1997 and World Bank, 1997).

Municipal solid waste management is one of the most fundamental issues in the contemporary urban environments particularly in developing countries like Ethiopia. Solid waste management is becoming a big challenge for the cities administrations many developing countries mainly due to the magnitude of rapid urbanization and increasing population growth which in turn have greatly accelerated the municipal solid waste generated rate in the urban environment (Williams, 2000; Zhang *et al*., 2010; Guerrero *et al*., 2013).

Particularly low income countries are characterized by poor methods and low capacities of municipal solid waste management (Agunwamba, 1998). UNCHS (1996) stated that between one-third and one-half of the solid wastes generated within most cities of low income countries are not collected and the waste generated is dumped at many undesignated sites (Haan*et al*., 1998; Bartone, 2001).

The existing solid waste collection system of the city is in adequate and covers only 60% of the waste generated. This is due to transportation facilities and financial matters as well as geographic inconvenience for collection signifying the unreliability the system for waste items like easily decaying fruit and vegetable wastes (Regassa*et al*., 2011).

In Ethiopia, from the increasing of human population, uncontrolled urbanization, industrialization and inadequate sanitation infrastructure cause serious quality degradation of surface water. There is a high amount of waste disposal in the river and river banks from municipal source (municipal solid, and liquid wastes), liquid waste from toilet, open urination and defecation(Mulu*et al.*, 2013).

Today's waste pollution from disposal of industrial wastewater is becoming an environmental concern in Addis Ababa City and its vicinity areas, where more than 40% of large and medium scale manufacturing industries is located (Mulu*et al.*, 2013).

Addis Ababa hosts about 65% industries of the country and more than 90% of the industries discharge their waste to nearby river without proper treatment (Hamere Yohannes &Eyasu Elias, 2017). As a result, many rivers and streams are heavily polluted as they flow through major cities and town (Wassie Anteneh, 2008).

2.5 Environmental Problems of Municipal Solid Wastes

Rapid population growth and uncontrolled industrial development are seriously degrading the urban environment in many countries. One of the most serious environmental consequences of the process of urbanization is the ever-growing amount of solid and liquid wastes generated by cities (UNCHS, 1994).

The decomposition of waste into constituent chemicals a common source of local environmental pollution. This problem is especially acute in developing nations. Very few existing landfills in the world's poorest countries would meet environmental standards accepted in industrialized nations and with limited budgets there are likely to be few sites rigorously evaluated prior to use in the future. A major environmental concern is gas released by decomposing garbage (Cointreau-Levine, 1994).

The impact of solid wastes on environment is immense, from release of harmful greenhouse gases (GHGs) to contamination of ground water. Improper solid waste can cause widespread on the environmental health. The most serious environmental problem in terms of solid wastes is the emission of GHGs. The waste management sector represents 4% of total anthropogenic GHG emissions and landfills contribute the largest anthropogenic source of methane, contributing 90% to the total GHGs release from the waste sector in the United States (Thorneloe*et al*., 2002).

2.6 Impact of Municipal Solid Waste on Human Health

Serious public health problems arise due to uncontrolled solid waste often leading to many infectious diseases such as cholera and dysentery, such incidences of diseases puts additional burden on the scantly health services available in resource poorest developing countries. The U.S public Health Services identified 22 human diseases that are linked to improper solid waste management (Hanks, 1967 Cited in Hoorn Weg*et al*., 1999).

The most immediate health threat due to solid waste in developing countries is the waste workers, rag pickers and scavengers. Waste workers and rag pickers in developing countries are seldom protected from direct contact and injury. The co-disposal of hazardous and medical wastes with municipal wastes poses serious health threat. Exhaust fumes from waste collection, vehicles, dust stemming from disposal practices and pen burning of waste also contribute to overallhealth problems (Hoornweg*et al*., 1999).

The magnitude of health problems due to solid waste in case of developing countries are particularly alarming where the proper collection and disposal of solid waste is impeded by paucity of funds and technological capacity. The areas which are not serviced are left with

clogged sewers and litters which create serious health problems for the resident population (Khawas, 2003).

2.7 Impacts of Municipal Solid Waste on Animal Health

Toxic wastes from municipal solid waste is the potentially dangerous byproduct of wide range of activities including manufacturing, farming, water treatment systems, constructions, automotive garages, laboratories, hospitals and other equipments. Even households generate hazardous waste, from items such as batteries, used computer equipment, and left over paints or pesticides (Claire, 2019).

According to the same source toxic waste can harm people, animals & plants whether it ends up in the ground in streams or even in the air, some toxins such as mercury and lead, persist in the environment for many years and accumulate overtime. Humans or wildlife often absorb those toxic substances when they eat fish or other prey(Claire, 2019).

CHAPTER THREE

3. MATERIALS AND METHODES

3.1. Description of the study area

The study was conducted in Woreda 4 (Gora) of Akaki Kaliti sub-city at the boundary of Oromia regional state, Addis Ababa, Ethiopia. Woreda 4 (Gora) is located 31-33 km south west of the center of the City. It is located in Akaki Kaliti sub-city which is bordered on the East by woreda 8& 9, on the North by woreda 12, on the West by Oromia Regional State, on the south Akaki River separated from woreda 2&3. The absolute location of Woreda 4 lied between 38°45’0’’to 38°47’0’’ Longitude to 8°52’0’’ to 8°54’0’’ Latitude.

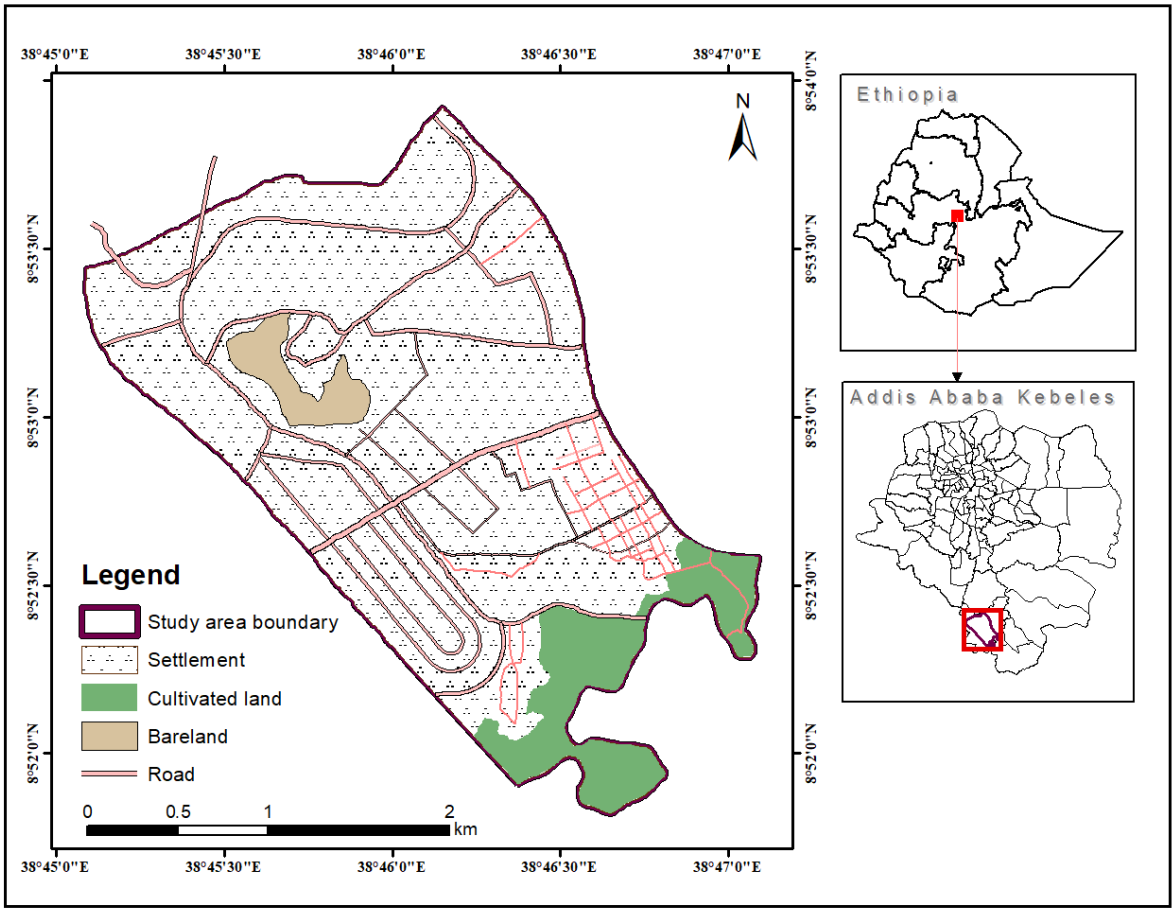

Figure 3 Location of the Study area.

Source: Fantahun, 2019

3.2 The Study Population

According to Woreda head office (CSA, 2007) the total population could be estimated to 72,000 residents of which 35,000were males and 37,000 females. More than half of the population was Condominium residents. In the study area the agricultural land is being converted to other purposes such as housing (particularly condominium site),apartment buildings, and highways(CSA, 2007).

3.3 Research design

3.3.1 Source of Data

The data were collected from primary sources. The primary data were collected from Livestock owners and field observations.

3.3.2. Sampling Technique

The numbers of livestock owners who raised and domesticated livestock for different purpose were too small. There are 34 livestock owners obtained from Woreda 4 Gora City Agricultural Office (CAO) livestock owners were taken as a sample size all of them were considered for this study.

3.4. Sample Size

The residents of this Kebele provided intended information about this Municipal Solid Waste impact on the health of livestock. Based on the data obtained from this woreda (Gora) City Agricultural Office (CAO),the total number of livestock owners was 34. The target population of this research was the total population of Livestock owners in the study area.

3.5. Methods of Data Collection

3.5.1. Data Collection Procedures & Instruments

3.5.1.1 Questionnaires

The main instrument used for data collection was a structured questionnaires designed to address specific objectives of the study. Pre-test of the questionnaire was conducted prior to

livestock owners' survey. The pre-test was done in Woreda 4 with similar conditions to the study area. This was used to check the appropriateness of the instrument. Based on the results of the pre-test the questionnaires were adjusted accordingly. Open and closed ended questions were included in the Livestock owners' questionnaire. Data were collected from 34 livestock owners in Woreda 4 (Gora) of the Akaki Kaliti sub-city (Appendices I). Regarding to educational background, from 34 respondents 15 respondents responded to the questionnaire by the help of the research assistant.

3.5.1.2. Field Observation

The observation method was the most commonly used technique in collecting primary data. The main advantage of this method was that subjective bias was eliminated and the information obtained under this method related to what and how is currently happening the situation in its natural environment. It was not complicated by either the past behavior or future intentions (Kothari, 2004), this technique was employed to understand the natural behavior and impact of municipal solid waste on the health of livestock, discarded wastes from the households and surroundings, the types of livestock highly affected, and what problems really exist and faced livestock which feed on the area in which municipal solid waste available and on illegal dump sites.

Plate 1: Different types of Livestock feed on disposed wastes.

Source: Fantahun, 2019.

Plate 2: A photo showing Livestock feed on plastic bag with other food disposals

Source: Fantahun, 2019.

Plate3:A young, sick, and depressed Foal in the study area.

Source: Fantahun, 2019.

3.6. Data Quality Correction

The appropriate method for data collection was well structured questionnaires to get the information from Livestock owners. After questionnaires were prepared in English Language they were translated in to Amharic and Afan Oromo in which Livestock owners can understand easily.

The majority of Livestock owners in the study area were Afan Oromo speakers and some can read and speak Amharic. Sothe questionnaires were prepared accordingly.

3.7. Method of Data Analysis

The data was processed, analyzed and interpreted in both qualitative and quantitative methods. In the qualitative method, the existing situation of the problem was organized, summarized and explained mathematically for the comparison and analysis of attributes. The quantitative data was analyzed and interpreted by using different statistical techniques like descriptive statistics (frequency, percentages, means, graphs, tables …etc). Finally conclusion and recommendation were drawn based on the finding.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1. Sex of the Respondents

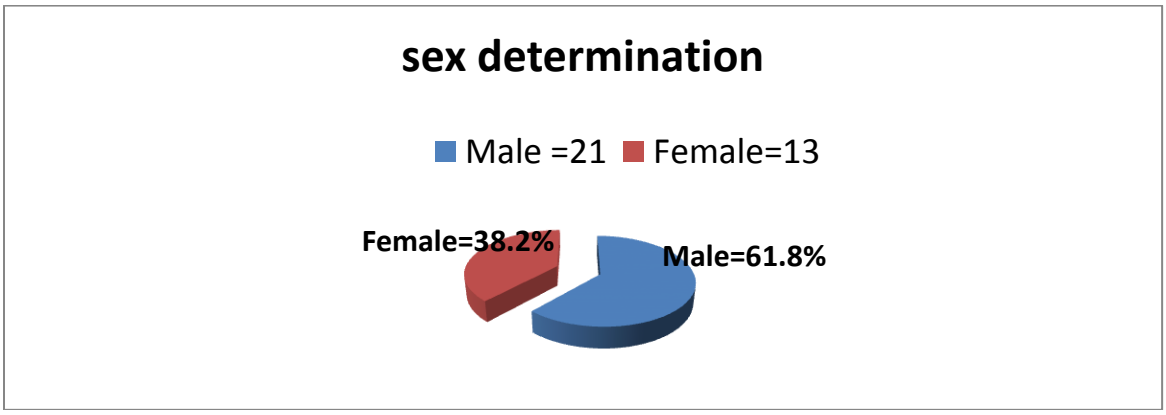

Figure 4: Sex Distribution of respondents.

4.2 Age category of respondents

Age is an important demographic variable and is a primary basis of demographic classification in vital statistics, censuses, Surveys (URT, 2005). Different age groups that participated in grazing and domesticating livestock ranged from 18-71 years and above. As a result about 13(38.2%) of respondents were in the age category of 35-53 years followed by12(35.3%) of respondents were in the age group between 18-35 years and 7(20.6%) of respondents were in the age group of 54-71 years. Only 2(5.9%) of the respondents were 72 years and above. In general, the age group of structured indicated that high proportion of the respondents find in the age of 36-53years. This age category is commonly known as active age of people; indicated that most of the age groups were within this category of 36-53 years.

The result showed also that the mean age of respondents was 46.47years, indicated adults contributed more in Livestock grazing and rearing. This finding was almost similar to the report that showed the age group of 26-57 years is the active and creative labor forces that participate in many social and economic activities (URT, 2005c).

4.3 Marital Status of the Respondents

Phillip and Abdillahi (2003) reported that married couples showed a high level of participation in community development.

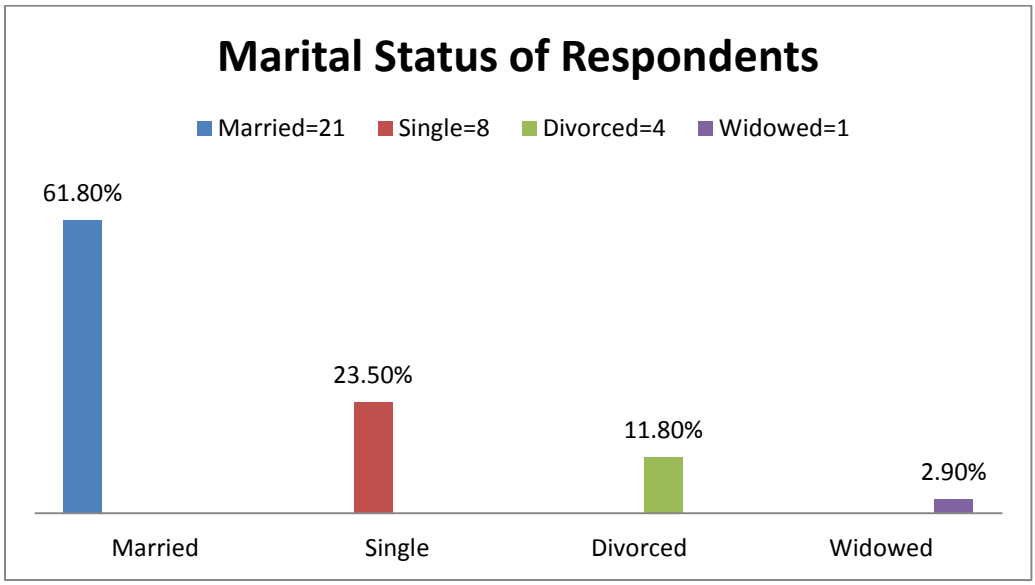

Figure5: Marital Status of Respondents

4.4 Educational Background of the Respondents

Education is always valued as a means of deliverance from ignorance and enables one to perform effectively to any given task within a specific period (Kasanga, 2005). This suggests that more than half of the community members had basic education and therefore likely to choose to take up new practices ideas and could feed better food for livestock. Most of the respondents in the study area were therefore expected to actively feed and graze their livestock in the study area.

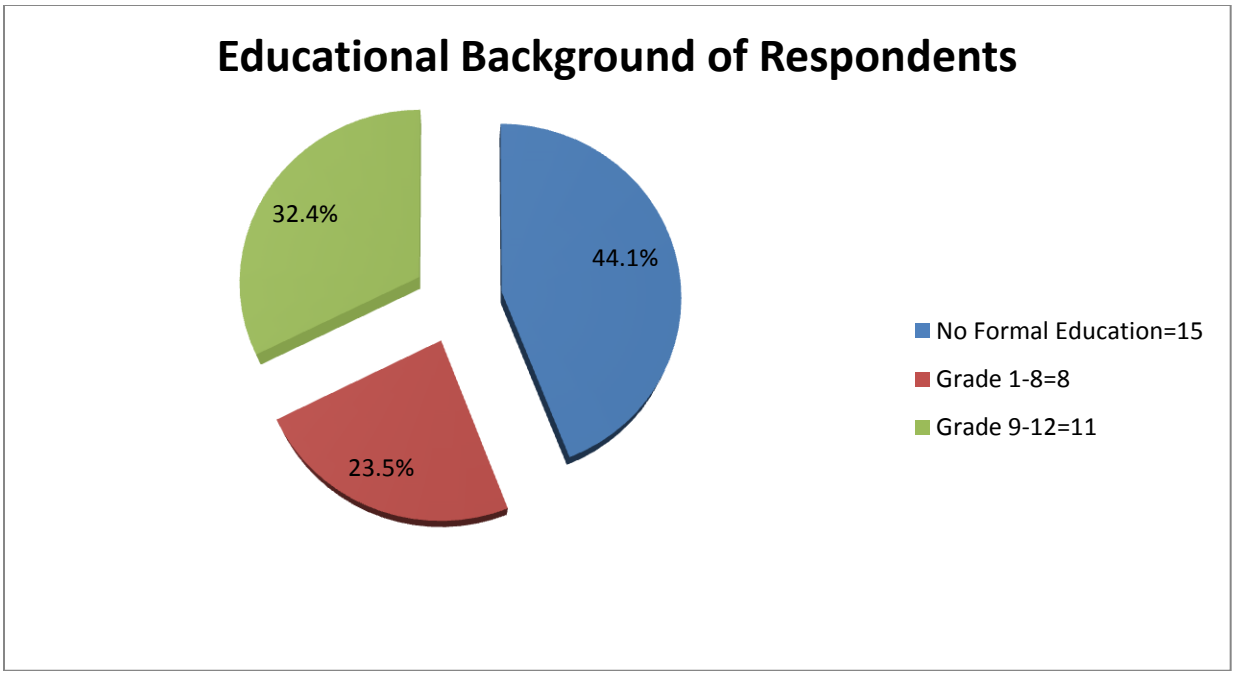

Figure 6: Distribution of Respondents by Level of Education

4.5.Purpose of Grazing Livestock by Livestock owners

Livestock owners graze livestock for different purposes like agriculture(ploughing,widowing, transporting, drafting), dairy products, slaughter and marketing to get profit by selling. This suggests that the majority of the community members grazed livestock for the process of milk production, drawing heavy loads, for farming and pulling vehicles.

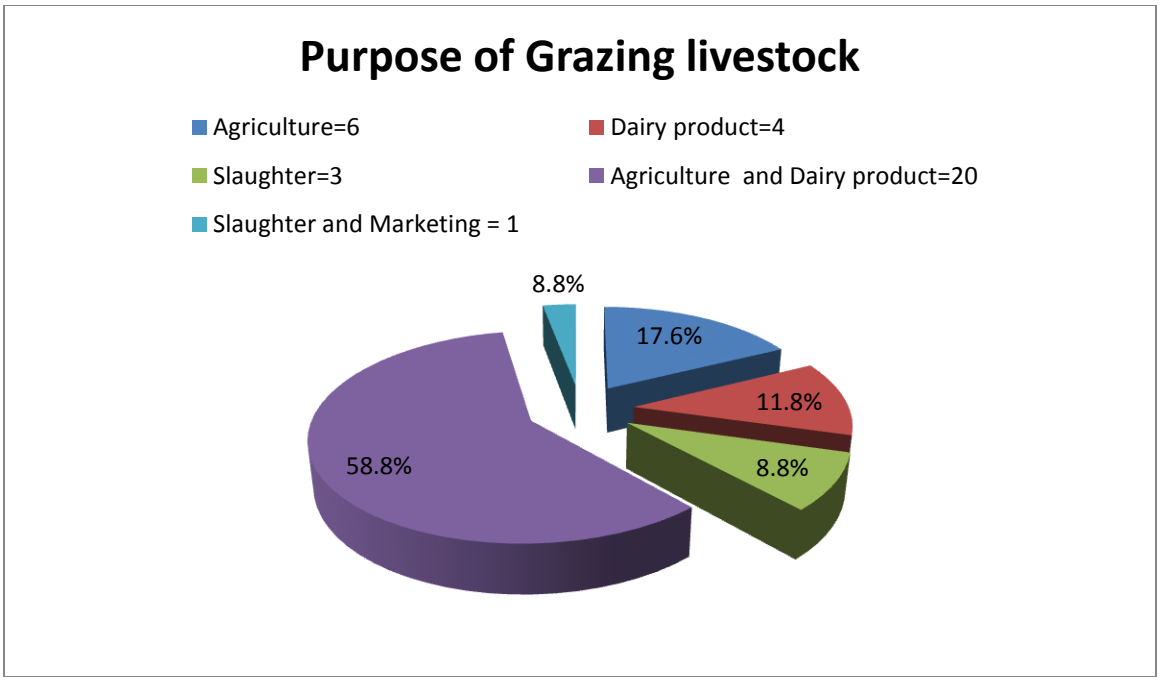

Figure 7: Main purpose of Livestock grazing

4.6 Types of Feed of Livestock supplied by Livestock owners

Providing animals with adequate, balanceddiets, free of toxins and contaminates are essential to enhancing their productivity and welfare. Good quality feed also increases the incomes of producers, ensures a better quality product. The safety and quality of animal feed is also vital for preventing hazardous substances entering the food(AGA Webmaster FAO,2014). Livestock nutrition is primarily concerned with all types of food groups to maintain Livestock health, weight & product viability (Bentoil, 2017).When requested about the types of food to feed livestock and source where found, almost the majority of respondents responded that they got and fed their livestock any food available in their surroundings. The types of animal feed used by livestock owners to feed their livestock are listed and shown on figure 8 It was indicated that the majority of the community members (58.8%) feed their livestock whatever food in their surroundings, this is followed by (17.6%)fenced closed lands (forage), (14.7%) feed food additives and supplements, while (8.8%) of the respondents feed their livestock all types of available feed for livestock. In general the types of feed for livestock in the study area were not quality and safe.

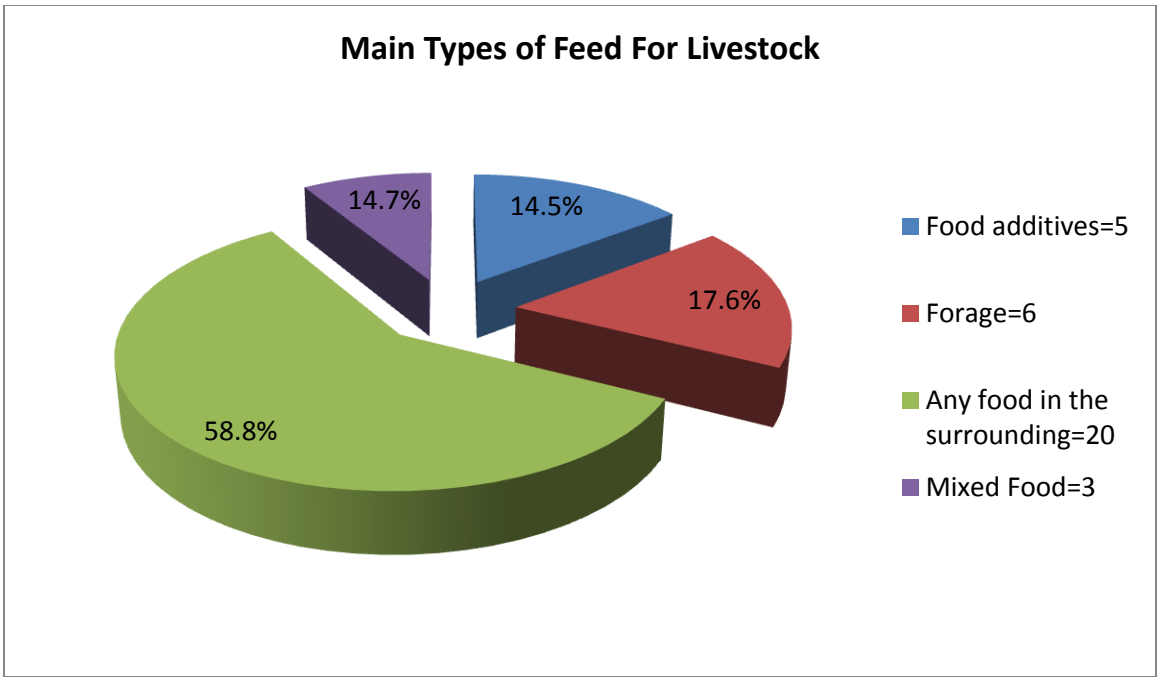

Figure 8: Types of Livestock Feed in the area

4.7 Awareness of Livestock owners on the impactof Municipal Solid waste

An increased quality of technical knowledge and support to full-grazing farmers from consultancy and research levels was needed (Noble Research Institution, 2014). When the respondents requested about the negative effect of municipal solid wastes on the health of livestock almost all the respondents responded that municipal solid waste in one way or another had bad effects on the health of livestock.28(82.4%) of the total respondents believed and wereawared of municipal solid waste effects on livestock, the remaining 6(17.6%) of the respondents were not sure whether municipal solid waste affects livestock or not. This suggests the majority of the livestock owners believed and awared bad effects of municipal solid waste on livestock.

4.8 Livestock exposure to Municipal Solid Wastes as a source of food

Animal feeds are special food for domesticated animals that keep their body healthy and improve the quality of their products. Each types of animal have their own category of animal feed which contain all the essential nutrients required for their well being. Livestock owners keep livestock for obtaining milk, meat, wool, work etc. Food is the source for production for

all such products as well for producing offspring. Also a nutritionally balanced ration is a must for keeping the animals healthy and strong. In urban areas, livestock owners left their livestock freely for grazing to find their food and were at risk of feeding.Due to non-availability of feed and indiscriminate disposal with food remnants on, livestock grown in this waste leading would ingest and feed wastes(Kohli et al, 1998).From the requested respondents 25 (73.5%) of them answered livestock in the study area were exposed to municipal solid waste thrown in to waste collection sites, garbage (Genda), illegal dump sites, plastic wastes and other wastes disposed in the study area, the rest (26.5%) did not observed while livestock fed on municipal solid wastes.

4.9 Impact of Municipal Solid Wastes on the Health of Livestock

In global terms,animal feed and Forages contain a wide range of contaminants and toxins arising from anthropogenic and natural sources. Awide range of organic and inorganic compounds may occur in food stuffs, including pesticides, industrial pollutants, radionuclide's and heavy metals.

From the sample requested two-third 23(67.6%) of respondents responded that municipal solid waste released from the center of the city and disposals from households and surroundings affect the health of their livestock. The researcher asked to the livestock owners what impacts were seen on the health of livestock. Rapid loss of body weight, depression, unable to eat properly, reduced milk production, restlessness, loss energy to work and draft materials, head bobbing, ear twitching were mentioned by respondents. The rest 11(32.4%) of respondents didn't observe impacts of municipal solid waste on the health of livestock.

4.10 Sickness of Livestock Due to Municipal solid wastes

The result of this assessment indicated that (79.4%) of livestock owners complained the presence of municipal solid wastes and inappropriate disposal of wastes from the center of the city and surroundings made sick their livestock in the study area. When respondents requested (20.6%) weren't complained.

Table 3: Back ground information of Livestock owners related with sickness of livestock

No	Did your Livestock have gotten sick before?	Frequency	Percentage (%)
1	Yes	27	79.4
2	No	7	20.6
Total		34	100

4.11 Types of Livestock Highly Affected by Municipal Solid Wastes

Animal feeds are routinely subject to contamination from diverse sources including environmental pollution and activities of insects, microbes (D'Mello J.P.F, 2016). Toxins from municipal solid wastes affect and kill livestock. The researcher had deep discussion with few livestock owners which type of livestock were highly affected by municipal solid wastes. When the respondents requested to respond about which type of livestock are commonly affected by municipal solid waste toxins 20(74.1%) of respondents responded that almost all types of livestock they graze were affected and even died due to toxins from solid wastes,7(25.9%) of the respondents told horses and donkeys were the most common types of animal died and affected by municipal solid waste.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1. CONCLUSION

This study aimed to address Municipal Solid Waste impact on livestock health. Accordingly, municipal solid waste released from the center of the city, disposal of solid wastes from the surroundings and households, constructions, common houses (condominium) affected Livestock health in Woreda 4 “Gora” Akaki Kaliti sub city at the boundary of Oromia regional state.

The majority of respondents who lived in this Woreda feed their livestock with different types of food include forage in closed fenced area, any feed on their surroundings, and graze livestock in disposal sites and let the livestock to eat different hazardous wastes.

This study has also shown all types of Livestock raised and domesticated by livestock owners were affected by municipal solid waste. Horsed and donkeys were the most common livestock died in every year.

5.2 RECOMMENDATION

Based on the findings of the study the following are recommended to keep livestock healthy.

- Quality and safe foods should be given to livestock.
- Efforts should be directed towards sensitizing community residents and stakeholders about their role in keeping livestock away from the areas of municipal solid wastes.
- The Akaki Kaliti sub city woreda 4 Administrationshould work with solid waste management Administration of Addis Ababa.

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http://wwwCrossRef | PubMed | Direct Link

APPENDICES

Appendix I Questionnaires in Afan Oromo

ADDIS ABAABAA YUUNIVERSITII KOOLEEJII SAAYINSII UUMAMAATTI KUTAA BARNOOTA ZU´OOLOOJII

Addis Abaabaa yuuniversitiitti,kooleejii saayinsii uumamaa Kutaa Barnoota Zu´oolojikaal Saayinsii Kutaa magaala Aqaaqii Qaalitti aanaa 4 (Bakka Goraa): Aanoolee Oromiyaa ollaa finifinneetti argaman magaala Finifinnee keessaa Balfa Industrii, dhangala´aa Ijaarsa fi mana balfa gatamaniifi gadhiifaman horii gaanfaa irratti hubaatii ga´u Addis Abaabaa, Itiyoophiyaa mata duree Jedhuun qorannoo taasifamu dha. Qorannoon Kun Uummata bakka kana Jiraataniif Uummata aannaniif bu´aa horiigaanfaa Kan fayadamanif baay´ee barbaachiisa dha. Kanaafuu, odeeffannoo yeroo guutan miira itti gaafafumaa dhaan, haqaan akka guutan kabajaan isin gaafadhaa. Tumsaa naa gootaniif durseen isin galateefadha. Gaaffii gaafatamaniif deebii Kan jettan saanduqa keessatti malattoo (√) gochuun deebisaa. Galatoomaa.

Kutaa tokko (1) Odeeffannoo dhuunfaa

Umurii: A. 18-35 ☐ B. 36-53 ☐ C. 54-71 ☐ D. 72 ol ☐

Saala: - A.dhiira ☐ B. dhalaa ☐

Gaa´ela: A.Kan fuudhe/fuute ☐ B. Kan hinfunee ☐ C. Kan wal hiike ☐

Barnoota: A. Kan hin barannee ☐ B. 1—8 ☐ C. 9—12 ☐
D. Kooleejii/yuuniverissiitii ☐

Kutaa Lammaffaa: Gaaffii qonnaan bultootaaf qophaa´e

1. Horii Maalif horsiifituu?
   A.Qonnaaf ☐ B.Aananiif ☐ C. Fooniif Furdisuu ☐ D. Nagadaaf ☐
2. Nyaata horis eessaa argatu? A. Nyaata madaala´aa qophaa´e nannoti ☐
   B. Kaloo naanno irraa argamu ☐
   C. Magaalaa keessatti gadhiisuun waan nyaatamu kamiyuu akka nyaatan godhuun ☐
3. Balfi gidu galeessaa magaala irraa gadhiifamu horii keessan irratti hubaatii ni geesisa jatanii ni amantuu? A. Eeyyee ☐ C. Lakki ☐

4. Horiin keessan mana jireenyaa irra laasitikii feestaaliitti marame gatamu ni sooratuu?
   A. Eeyyee ☐ B. Lakki ☐
5. Balfi bakka adda addaa irraa gadhisamu horii keessan irratti hubaatii geesisee beekaa?
   A. Eeyyee ☐ B. Lakki ☐
6. Deebii lakkoofasa shanafaa eeyyee yoo ta´e hubaatii akkamiiti----------
   ----
   ----

7. Kanaan dure horii dukubsatee qabdu ture A. Eeyyee ☐ B. Lakki ☐

8. Deebiin Lakoofsa torbaffaa Eeyyee yoo tale horii akkamitu isin Jalaa dhukkubsatee beekaa? ----------
   ----

Appendix II Questionnaires in English

ADDIS ABABA UNIVERSITY COLLEGE OF NATURAL SCIENCE DEPARTMENT OF ZOOLOGICAL SCIENCE

The aim of this questionnaire is to gather information which provides me to do research on assessing the impacts of municipal solid wastes on the health of livestock in Woreda 4 "Gora" for the fulfillment of my master of science in general biology. Put (√) in the box provided for close ended questions and write your responses on the space provided for open ended questions. There is no needed to write your name.

Part I Personal Information of the Respondent

Age: - A 18—35 ☐ B. 36—53 ☐ C. 54-71 ☐ D. Above 71 ☐

Sex: - A. Male ☐ B. Female ☐

Marital Status: - A. Married ☐ B. Single ☐ C. Divorced ☐

Educational Background
A. Didn't attend school ☐ B. Grade 1—8 ☐ C. Grade 9—12 ☐
D. College/University ☐
\

Part II Questionnaires used to collect data impacts of Municipal Solid Wastes on Livestock.

Questionnaires for Livestock Owners

1. For what purpose you graze livestock? A. Agriculture ☐ B. Dairy product ☐
   C. Slaughter ☐ D. Marketing/trading ☐
2. What type of fodder you feed you feed your livestock?
   A. Food additions & supplements ☐ B. Fenced closed lands (forage) ☐
   C. Road side, rubbish damps ☐
3. Do municipal solid wastes released from the center of the city & surroundings disposed affect your livestock?
   A. Yes ☐ B. NO ☐
4. Have you ever seen your livestock eating municipal solid wastes like food waste, plastic wastes?
   A. Yes many times ☐ B. Sometimes ☐ C. I haven't seen ☐
5. Have you ever seen municipal solid wastes impacts on the health of your livestock?
   ☐

A. Yes B. No ☐

6. If your response is yes what kind of impacts? ----------

---.

7. Have you ever experienced that your livestock sick?
   A. Yes ☐ B. No ☐

8. If your response is yes which type of Livestock highly felt sick? ----------
---

Appendix IIII Questionnaires in Amharic

በአድስ አበባ ዩኒቨረስቲ በተፈጥሮ ሳይንስ ኮሌጅ በዞሎጂካል ሳይንስ ትምህርት ክፍል በአድስ አበባ ዩኒቨረስቲ በተፈጥሮ ሳይንስ ኮሌጅ በዞሎጂካል ሳይንስ ትምህርት ክፍል

በአቃቂ ቃሊቲ ክፍለ ከተማ ወረዳ 4(ጎራ) በአሮሚያ አጎራባች በሚገኘዉ ወረዳ ከተለያዩ (በተለይም ከመሀል ከተማ) በሚለቀቅና ከንግድ ተቀማት፤ከኢንዱስትሪ፤ግንባታና ፍርስራሽ፣ እንድሁም ከቤትና ከአካባቢ በየቦታዉ የሚጣለዉ ቆሻሻ በቀንድ ከብቶች ላይ ያለዉ ተጽዕኖ በአድስ አበባ፤ኢተዮጵያ በሚል ርዕስ ላይ መሰረትየሚያደርግ፡፡ ይህ ጥናት ለአካባቢዉ ማህበረሰብና የእንስሳት ዉጤቶችን ተጠቃሚ ለሆነዉ ህብረተሰብ በጣም አስፈላጊ ነዉ፡፡ ስለዚህ ይህን መረጃ ሲሞሉ በጥንቃቄ ይሁን ለትብብረዎ እጅግ በጣም አመሰግናለሁ፡፡ ለተጠየቀዉ ጥያቄ መልስ ነዉ የምትሉትን በተሰጠዉ ሳጥን ዉስጥ የራይት (√) ምልክት በማድረግ መልሱ አመሰግናለሁ፡፡

<u>ክፍል አንድ፤ ሁኔታን በተመለከተ</u>

እድሜ፤ ሀ. 18—36 ☐ ለ. 36-53 ☐ ሐ 54-71 ☐ መ. ከ 71 በላይ ☐

ፆታ፤ ሀ. ወንደ ☐ ለ. ሴት ☐

የጋብቻ ሁኔታ፤ ሀ. ያገባ/ች ☐ ለ. ያላገባ/ች ☐ ሐ. የተፋታ/ች ☐ መ. የሞተበት/ችበት ☐

የትምህርት ሁኔታ፤ ሀ. ምንም የትምህርት እድል ያለገኘ/ች ☐ ለ. ከ1—8 ☐ ሐ. ከ 9—12 ☐

መ. ኮሌጅ/ዩኒቨርሲቲ ☐

<u>ክፍል ሁለት ለእርብቶና እርሶ አደሮችና ለእንስሳት ባለቤቶች የሚቀርብ መጠይቅ</u>

1. እንስታቶቻችሁን ለምን ተግባር ነዉ የምታረቡት? ሀ. ለእርሻ ☐ ለ. ለወተት ☐ ሐ. ለስጋ ማድለብ መ. ለንግድ ☐

2. ለእንስታቶቻችሁ የሚሆነዉን ምግብ ከየት ታገኛላችሁ? ሀ. ተቀምሞ የተዘጋጀ ምግብ ☐ ለ. ታጥሮ በተዘጋጀ ☐ ግጦሽ ☐

ሐ. በአካባቢዉ በሚገኝ ማንኛዉንም የሚመገቡትን

3. በአካበቢና ከመሀል ከተማ የሚጣለዉና የሚለቀቀዉ ቆሻሻ በእንስሳቶቻችሁ የጤና ችግር ያስከትላል ብላችሁ ታስባላችሁ ሀ. አዎ ☐ ሐ. ያስከትላል ብየ አላስብም ☐

4. የእረስዎ እንስሳ ከቤትና በአካባቢ እንደ ምግብ ትራፊ በፈስታል የሚጣሉ ቆሻሻዎችን ይመገባሉ?

ሀ. አዎ ☐ ለ. አይመገቡም ☐

5. በአካባቢና ከተለያዩ ምንጮች የሚጣለዉ ቆሻሻ በከብቶቻችሁ ላይ ጉዳት አምጥቶ ያዉቃል

ሀ. አዎ ☐ ለ. አላስብም ☐

6. በተራ ቁጥር 5 መልሳችሁ አዎ ከሆነ ምን አይነት ጉዳት ----------

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7. ከዚህ በፊት የታመመ እንስሳት ነብራችሁ? ሀ. አዎ ☐ ለ. የለም ☐

8. በተራ ቁጥር 7 ላይ አዎ ብላችሁ ከመለሳችሁ የትኛዉ እንስሳት ታሞባችሁ ያዉቃል? ----------

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