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BENEFITS, CHALLENGES AND FACTORS ASSOCIATED WITH MICRO AND LARGE-SCALE POULTRY FARM WASTE MANAGEMENT: EVIDENCE FROM POULTRY FARMS IN BISHOFTU By

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CERTIFICATION

We attest that Mr zelalem Genene Conducted and finished the research thesis titled "Benefits, Challenges and Factors Associated with Micro and Large-Scale Poultry Farm Waste Management: Evidence From Poultry Farms in Bishoftu " and the research work was supervised by us and submitted to the Center for Environment and Development Studies, College of Development Studies, Addis Ababa University, Ethiopia

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DECLARATION

I declare that this thesis is based on a study undertaken by **Zelalem Genene** of the Center for Environment and Development Studies, College of Development Studies, Addis Ababa University, Ethiopia. The goal in conducting this research is to explain benefits, challenges and factor associated with micro and large-scale poultry farm waste management: evidence from poultry farms in Bishoftu area. To the best of my knowledge, this research project is entirely original with no submissions made elsewhere for credit toward any kind of degree or diploma. The ideas and opinions of other academics, writers, and researchers that are represented in the work are appropriately recognized.

Declared by:

Name_____

Sign_____

Date_____

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ANOVA	Analysis of Variance
CSA	Central Statistics Agency
EIA	Environmental Impact Assessment
EDF	Environmental Defense Fund
UNEP	United Nation Environmental Protection
OM	Organic Matter
FAO	Food and Agricultural Organization of the United Nation
FAS	Foreign Agricultural Service
NGO	Non- governmental organization
SPSS	Statistical Package for Social Sciences
WM	Waste management
AWMS	Agricultural waste management system

ABSRACT

Solid wastes generated from the agricultural sector can be converted to economically beneficial commodity and reduce their negative impact on the environment. Poultry wastes generated from small to large scale frames are among hazardous material from agriculture sector if not properly managed and despised. Poultry production has been expanding in most developing countries including Ethiopia with poor attention on the consequences of the waste to the environment and the possible options to translate the materials to economically useful commodity and protect the environment from degradation. Therefore,the purpose of this study was to analyze benefits, challenges and factors associated with micro and large-scale poultry farms waste management in Bishoftu area, Oromia region, Ethiopia. The study used questionnaires survey collected from 235 sample respondents both from small scale and large scale poultry farms. In addition, qualitative data were collected through key informant interviews (KIIs) and field observation. The collected quantitative data were analyzed using descriptive statistics, correlation and regression analysis. Descriptive analysis, incorporating the frequency and mean, along with a summary of results, suggested that housing, waste type, regulatory, technology, farm size and stakeholders involvement play crucial roles in enhancing waste management practices. From the correlation analysis, it was found that farm size, stakeholders, technology, and housing were shown to be strongly correlated in the study while waste type and regulatory frameworks were found to be moderately and poorly correlated, respectively. On the other hand, regression analysis indicated that the predictors jointly explained significant variance in waste management practices. Among them, increasing farm size, waste kind, regulatory framework, stakeholders involvement, technology, and housing, impacts the waste management practices significantly. In conclusion, the study recommends that training in areas like disease control to reduce death caused wastes, feed ingredient identification to reduce manure related wastes, and backyard poultry bird management can help make poultry farming financially feasible in the study areas. Regulating the size of farms and giving sufficient training to the poultry farmers are also another recommendations related to benefits. Finally biosecurity safety can be ensured by giving the necessary training regarding the impact of the wastes on the nearby by life.

Keywords: *waste, poultry, farm, regulatory, technology, and housing*

CHAPTER ONE

1 INTRODUCTION

1.1 Background of the Study

The growing worldwide generation of waste is worrying and requires management strategies that focus on environmental sustainability (Moretti et al., 2016). Industrialization and an increase in living standards have led to the generation of impressive amounts of waste that, unfortunately, affect the environment through climate change via their negative impact on fauna and flora and ultimately the impact on human health (EDF, 2021).Waste management is a serious environmental concern on a global scale. The generation, disposal, and management of waste products have serious consequences for ecosystems, human health and sustainable development. The increasing volume of waste along with ineffective waste management practices has resulted environmental issues including air, water and soil pollution-as well as impacts on biodiversity and public health (UNEP, 2019).

The agricultural and food industries have largely producing a tremendous amount of wastes, which cause an astonishing effect and risk to the nature (Wong & Chan, 2017). The improper management of agricultural waste poses significant risks to both the environment and human health (Cao et al., 2022). The by-products of agricultural activities are usually referred to as "agricultural waste" because they are not the primary products. These wastes chiefly take the form of crop residues and animal waste (manure). Agricultural wastes are widely available, renewable and virtually free, hence they can be an important resource (Sabiiti, 2005). Proper handling and management of manure can augment or replace purchased commercial fertilizers (Tao and Mancl, 2008).The impact of agricultural waste on the environment depends not only on the amounts generated but also on the disposal methods used including to the disposal practices pollute the environment.

With increasing concerns about the detrimental impacts of climate change on our environment, every potential solution to reduce waste and environmental pollution is to be considered (Hénault-Ethier et al., 2023). Some benefits of using poultry manure as an organic

fertilizer include enhancing the nutrient status and improving the structure of the soil (Phonia et al., 2022). The development and output of a wide range of crops have benefited from the recycling of animal manure for use as an inexpensive organic fertilizer, which has also encouraged the restoration of the ecological and economic functions of soil. Composted animal dung has a high organic matter (OM) content, and adding it to agricultural soils frequently enhances the physical, chemical, and biological characteristics of the soil (Antonious, 2016).

Poultry industry plays a vital role in global food production with commercial poultry farming experiencing significant growth and transformation over the past few decades (Aryal & Khanal, 2022). This growth has led to the generation of large amounts of agricultural waste, particularly in the form of poultry farm waste. Poultry farm waste refers to the various byproducts and wastes generated from poultry farming operations including; manure, bedding material, wastewater, and carcasses. Proper management of poultry farm waste is crucial for both environmental sustainability and public health (Oluwole et al., 2023). Using poultry waste as a source of alternative feed or for conversion into valuable products such as fertilizers, biogas, and charcoal can contribute to a more sustainable environment by reducing waste and promoting resource efficiency (Shamsuddoha et al., 2013).

The poultry manure contains high phosphorus, which has positive effect on the growth and productivity of crops. It is also effective when combined with mineral phosphorus fertilizer for farm use (Adeoye et al., 1994). Poultry waste includes: manure and litter that offers several advantages contribute to sustainable waste management and environmental benefits. It is nutrient-rich fertilizer contains high levels of nitrogen, phosphorus and potassium making the manure readily valuable source of organic fertilizer for crop production. Proper management and utilization of poultry waste can help prevent the accumulation of waste, improved soil health, slow-release of nutrients and cost-effectiveness alternative to commercial fertilizers.

Waste from the poultry industry, poses several disadvantages and challenge where the large-scale accumulation of poultry waste can lead to environmental pollution. The organic waste if not properly managed and disposed they can release offensive odors and attract flies and rodents, which can further exacerbate the pollution problems. Additionally improper disposal

of poultry waste can contribute to water contamination as the waste contains high concentrations of nitrogen, phosphorus, potassium, copper, and zinc (Nascimento et al., 2015). These nutrients, when present in excess and not properly managed, can cause nutrient imbalances in soil and water ecosystems. Therefore, this research aimed at analyzing the benefits and challenges of poultry waste production and management.

1.2 Statement of the Problem

The poultry business has become one of the world's fastest expanding agro-based industries, however the industry is challenge by accumulation of waste that can cause pollution if not managed properly (Muduli et al., 2019). It can provide a considerable source of revenue and food supply in many countries. However, the waste generated by poultry farms has both benefits and challenges that need to be addressed. The growing operational size of poultry production impacts has been considerably increased the vulnerability of the public to those negative impacts. The large volume of generated poultry waste and improper disposal, including over application to land result in pollution of soil, water, air and the environment at all (Adeoye et al., 2004).

The improper waste management on various scale (small-, medium- and large -scale poultry farms reported creating serious environmental and health problems in in developing countries (Yemane et al., 2016). In Ethiopia, there is a rapid expansion of small and large scale poultry production with the attendant effect of huge organic waste generation most intensive poultry farms do not have clear waste management schemes. The manure and processing by-products are usually disposed of right outside the towns where the farms are located (FAO, 2019). In addition to the environmental consequences of poor poultry waste disposal, some poultry farmers do not care much about effective waste management and disposal. The environmental pollution risks expected to increase with expansion of the sector might have both positive and negative effects associated with poultry waste management systems. The vast majority of poultry manure generated is either applied to agricultural lands to fertilize land (crop production) or flushed into watercourse, used as livestock feed, or used as an energy source (for the large-scale one) as a portion of the waste is burned, while the remaining is buried in the soil with no prior treatment, thereby creating serious pollution (Moreki and Chiripasi, 2011).

Previous research on slaughterhouse and poultry wastes has primarily focused on biodiesel, biogas, and bio-oil production. Poultry and slaughterhouse waste have unique energetic and biological properties that make them suitable for use as bioenergy. It can be created using biochemical or thermo-chemical methods, such as anaerobic digestion, pyrolysis, and trans esterification of poultry tallow (Mozhiarasi, 2022).

Solid waste management includes generation of waste, on-site handling, storage, processing, collection, sorting, transformation, transportation, recovery, reuse, recycling, and disposal. However, these processes create significant challenges and are hazardous to the environment and public health. Therefore, the treatment of waste is a key research subject that has received attention (Demirbas et al., 2009).Slaughterhouse and poultry waste grow renewable energy resources, and the resultant enhanced share in total energy supply would reduce carbon dioxide emissions. Furthermore, due to their high protein content, these wastes have potential for biofuel production Biofuels are applied in all three states of matter, i.e., solid, liquid, and gas (Weiland, 2010).

According to Yemane et al., (2016) research on the management of chicken waste in small-scale, intensive urban poultry production in Addis Ababa, manure accounted for the majority of poultry waste, with dead birds and litter/manure following closely behind. In a small-scale, intensive chicken farming operation, manual scraping with a shovel served as the primary means of waste collection. Farm wastes were transported to the dump site using polythene and hessian sacks. In the research area, dumping waste at the nearby dump site was the primary means of disposing of manure and/or litter. The methods used to dispose of dead birds were burial, burning, and dumping. The finding of Yemane et al.,(2016) imlied that the two main issues in properly disposing of poultry waste were the unpleasant smell that poultry manure produces and the absence of a convenient disposal location.

Studies on the waste management and sanitation of small-scale commercial poultry farms in and around Debre Markos, Amhara Region, Ethiopia, by Melkamu et al., (2016) , suggested that routine cleaning and cleanliness of the equipment and rooms in the poultry house is necessary, as is the case when the chickens are taken out of the house. Large volumes of waste, possibly including significant levels of pathogens, can be produced by confined chicken housing. Earth was burned, burred, and distributed to dispose of the waste material.

Burying the deceased bird also got rid of it for the most part. The study suggested that better waste disposal techniques, such as burning and burying, along with routine cleaning and cleanliness of the rooms and equipment, increase farm hygiene and enhance poultry production husbandry practices.

Moreover, Matebie et al., (2023) also studied Productivity, economic performances and survivability of exotic chicken breeds under small-scale chicken production system in South Gondar Zone, Ethiopia. Yared et al. (2019) have identified the primary obstacles faced by poultry growers and indicated primary obstacles to chicken production: an unexpected illness outbreak, the high expense of commercial ration, the inability to obtain day-old chicks in a timely manner, unstable market conditions and low sales, and inadequate availability and quality of vaccines. Nebiyu (2016) reported on the high cost of feed, land scarcity, delayed delivery of pullets, high pullet cost, feed quality, water scarcity, lack of feed availability in surrounding areas, challenges with poultry product marketing, health issues, credit availability issues, and inadequate training in Addis Ababa, Ethiopia.

So this study will consider the topics which is not discussed by the above mentiond scholars. The researcher, in addition to the challenges and merits associated with poultry waste management practices, lack of organized west management practices, gap in level of awareness, lack of strict regulation from the government in respect of poultry waste disposal, to his knowledge believes that in Bishoftu town the study of waste management both in the small scale and large scale is

not been covered and the researcher will consider it as the main reason of conducting this study. The majority of the research that has been conducted so far has concentrated on the economic improvement of the setor , production performance, and epidemiology (or characterization) of chicken disease in the study area. Furthermore the majority of studies done on poultry production in the past have concentrated on village poultry production and how it helps the rural poor. Despite its substantial contribution to the nation's socioeconomic development, urban poultry farming is undervalued and receives very little attention from researchers. Not only that, but the practices used to manage poultry waste were not adequately evaluated for quality. However, there is a major gap in understanding the challenges and disadvantages associated with poultry waste management practices, lack of organized west

management practices, gap in level of awareness, lack of strict regulation from the government in respect of poultry waste disposal, and the carelessness attitude of the farm owners is the problem in general.

1.3 Objective of the Study

1.3.1 General objective

The general objective of the study was to assess waste management practices and constraints of micro and lalge-scale poultry farms in and around Bishoftu, Oromia region, Ethiopia.

1.3.2 Specific objective

Specifically

- ✓ To assess the association between Flock size and waste management practices
- ✓ To analyze Benefits of micro and large-scale poultry farms wastes management practices
- ✓ To analyze Challenges of micro and large-scale poultry farms wastes management practices
- ✓ To analyze Determinant factors of waste management practices

1.4 Research Question

Based on the above objectives, the following questions are set as guideline of the study

- Is there significant relation between flock size and waste management practices?
- What are the benefits of micro and large-scale poultry farms wastes management practices?
- What are the challenges of micro and large-scale poultry farms wastes management practices?
- What are the Determinant factors of waste management practices

1.5 Significance of the study

The result of this research would have the potential to contribute to a better understanding of the current state of waste management practices in micro-and large-scale poultry farms. The study can provide empirical evidence on the environmental impact of waste management and provide insights into sustainable agriculture practices by assessing these methods. The study investigates the advantages and disadvantages of waste management. Understanding these factors can help with community engagement, resource utilization, agricultural sustainability, and potential economic prospects from waste management strategies. As the studies focus both on micro- and large-scale poultry farms, the research can provide specific requirements and challenges for the sector in a local and national context, potentially benefiting local stakeholders in addressing localized concerns. Additionally, the data from this study will be useful to institutions, researchers, and politicians as a baseline for future sector development..

1.6 Scope of the study

The study well focuse on investigating the benefits and challenges of large-scale and micro poultry farm waste in the Bishoftu area, and on the analysis of waste collection, treatment, and disposal methods in both large-scale and micro poultry farms. By limiting the study to waste generated specifically from poultry farming activities rather than broader socio-economic, industrial, environmental, and agricultural waste management practice.

1.7 Limitations of the Study

The researcher will encountered a number of problems during data collection period. One of the main problems will be inaccessibility to contact enumerators. This makes the data collection period longer than planned for. In addition, there will be lack of willingness of some of the sampled households to provide real information about their asset possessions, and production level brings some limitation to the finding.

1.8 Organization of the paper

There are five chapters in the paper. The background of the study, statement of the Problem, research questions, objective, significance, scope and limitations of the study are covered in the first chapter, which is the introduction. Chapter two, which reviewed the relevant theoretical and empirical literature, is then presented. In chapter three, the research

methodology including the study design, the research approach, the target population, the sample, and the sampling technique were examined. It also looked at sources of data, data collection techniques, and data analysis techniques. The fourth chapter focused on and discusses the results of the study and narrates the detail findings of the study. Chapter five of the paper concludes the study with summary, conclusions, and suggestions based on the research findings.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 Theoretical and conceptual reviews

The majority of people worldwide may obtain acceptable amounts of animal protein (meat and eggs) from poultry, which is raised in most parts of the globe. They offer a revenue stream in addition to a supply of premium protein. Millions of people rely on the chicken industry for their livelihood and food security. Due to urbanization, rising incomes, and population growth, there is currently a greater demand for the meat and eggs of chickens (FAO, 2011). The Ethiopian poultry population is projected to be around 56.06 million, from the total poultry the local hybrid, and exotic breeds accounting for 88.2%, 6.45%, and 5.4% respectively (CSA, 2018). Chicken are the most common livestock in Ethiopian being owned by almost every rural family. They provide a crucial source of protein and revenue for the family. Poultry production is vital for developing countries' socioeconomic development (FAO, 2004).

2.1.1 Conceptual reviews

2.1.1.1 General Description of Poultry Manure

Poultry production is one of the most valuable agricultural products. As poultry farms produce more desirable items for society, a growing volume of chicken excrement is produced. The environmental impact of poultry farming is a growing concern for poultry farms, the government, and the general population. A significant amount of money is spent each year on poultry dung storage, transportation, and disposal (Chiamin, 1998). Poultry manure can also be defined as the mixture of expelled chicken dung and other items that need to be cleaned up from the floor of parent hen and broiler operations (dry manure) and layers cage operations (wet manure). Poultry manure, bedding material, and leftover feed made up the majority of the material (Lusk, 1998).

According to John and Teto's (2013) analysis, the chicken industry generates a lot of waste, including waste water and solid waste. Bedding materials, excrement (manure), feed, feathers,

hatchery waste (empty shells, infertile eggs, dead embryos, and late hatchlings), sludge, waste from the abattoir (offal, blood, feathers, and condemned carcasses), and mortality comprise the solid waste. During the normal operation of hatcheries, broiler production, and egg laying production, manure is created. The broiler and layer operations produce the majority of manure. For broiler production, a floor system is used.

2.1.1.2 Waste Management Practices

Asses (2019) study shows that there are advantages and disadvantages to managing poultry farm waste, both on a large and small scale. It has been demonstrated that thorough composting of poultry slaughterhouse processing waste effectively lowers pathogen levels and yields high-quality biofertilizer. Zazykina (2019) argued that, however, improper management of the buildup of poultry litter, a significant waste product, can result in environmental contamination Bolan (2010) found that, despite these obstacles, recycling poultry waste has the potential to have positive economic effects, such as raising poultry farms' revenue. According to Baba (2018), the process of fermenting poultry farm waste, especially carcasses, can serve as a biosecure means of disposal and utilization. The resultant product can be fed to other animals as fermented feed.

Glatz et al., (2011) highlight the potential of on-site treatment methods such as heating waste to produce steam or using an in-line composter. Various methods and techniques are used to handle and dispose of poultry farm waste, including composting, anaerobic digestion, and other waste utilization practices. Poultry waste, a significant environmental pollutant, can be mitigated through various measures. Thyagarajan (2014) suggests physical, chemical, and biological approaches to reduce pollutants, such as ammonia and odors. Moore (1995) reported the necessity of optimum management methods, such as effective nutrient management and buffer zones, in preventing groundwater contamination from excessive poultry litter land application. Sims (1994) also underscores the need for effective waste management programs, considering the composition and reactions of poultry waste.

2.1.1.3 Environmental and Agricultural Outcomes

Bolan (2010) highlights the value of poultry litter as a nutrient source and soil amendment, but also the need for best management practices to mitigate environmental consequences.

Found that long-term application of poultry litter and livestock manure significantly increased soil organic carbon, nutrient content, and microbial activity. Gezahegn (2017) similarly reported that integrated application of poultry manure and inorganic fertilizer improved soil chemical properties and nutrient uptake in maize and soybean crops. Mažeika (2020) demonstrated that organic chicken manure-based fertilizers maintained stable nutrient content in soil and increased crop yields, particularly litter, which is a valuable source of nutrients for plants, providing nitrogen, phosphorus, and trace elements. However, its application can lead to environmental pollution if not managed properly. Anaerobically digested poultry slaughterhouse waste, rich in nitrogen, has been found to be suitable for use as a fertilizer, although it may require post-treatment to reduce it (Salminen 2001). Innovative technologies, such as acid solubilization and neutralization, can further enhance the value of poultry waste as a fertilizer, with the potential to increase crop yield and improve soil health.

A range of studies have highlighted the potential benefits of integrating poultry waste into sustainable farming practices. Baruwa (2018) and Rahman (2022) emphasize the importance of effective waste management, with the latter suggesting that poultry waste can be turned into a useful agricultural resource.

2.1.1.4 Socio-Economic Context

Poultry waste has been identified as a viable substitute for chemical fertilizers, offering both economic and environmental benefits. Studies in Pakistan (2016) and India (2021) have shown that the use of poultry waste as a fertilizer can increase crop yield and profits while also reducing the dependence on chemical fertilizers. This waste can be further processed into valuable products such as animal feed, biogas, and biodiesel, contributing to the circular economy (Prabakaran, 2021). In addition, the use of poultry biogas slurry has been found to be a cost-effective and environmentally friendly alternative to mineral fertilizers in hydroponic lettuce production (Wang, 2018). Furthermore, the valorization of poultry slaughterhouse waste for fertilizer purposes has been proposed as a safe and effective method with the potential to improve crop yield and quality (Izydorczyk, 2021).

2.1.1.5 Regulatory Framework

According to Ferronato (2019) improper waste management, particularly in developing nations, has serious environmental consequences, including contamination of the air, soil, and water, as well as adverse impact on local ecosystems. Concerns have also been raised about the direct and indirect effects of waste treatment and disposal facilities on the environment and human welfare. Controlling the location of waste disposal facilities through regulation is critical for minimizing potential dangers and environmental deterioration (Wright, 1992).Sustainable waste management is essential for reducing the effects of global climate change, particularly in developing countries where primitive waste management methods are prevalent (Nwofe, 2014).

Inadequate waste management practices in livestock farming pose significant health and safety concerns for farm workers, local communities, and livestock. These practices can lead to the spread of infectious diseases and the release of harmful gases, dust, and odors (Cole, 1999). Studies in the Philippines and Nigeria have found that many farms engage in inappropriate waste management, including the discharge of untreated effluent into waterways, open dumping, and burning of waste (Paraso et al., 2010). These practices can result in environmental pollution, surface water contamination, and air pollution, leading to health issues such as respiratory and digestive problems.

Alam (2009) the legal and regulatory environment for waste management in poultry farms varies across different regions, leading to a range of practices. In Bangladesh, small and medium farms often sell their litter, while large farms typically do the same. In Nigeria, a mix of practices is observed, including sun-drying and burning, conversion into slurry, use as manure, and dumping in open areas (Olarinmoye, 2011).

2.1.1.6 Poultry production in Ethiopia

According to FAO (2017), based on various selected factors like breed, flock size, housing, feeding, health, technology, and biosecurity, Ethiopia’s poultry sector can be divided into three primary production systems. Large-scale commercial poultry production systems, small-scale commercial poultry production systems, and village or backyard poultry production systems are the three types of commercial poultry production systems. Poultry remains an

important part of farming systems and household economies in rural communities, while large and small-scale commercial poultry industries in cities and towns play a critical role in providing safe, high-quality products for urban consumers.

2.1.1.6.1 Small- Scale Commercial Poultry Production

Ethiopia's business sector is split among the three major FAO classified sectors. The country is home to an increasing number of small-scale commercial poultry keepers, the precise number of which is unknown, with between 50 and 1000 animals. This production method is expanding quickly in prey-urban and urban areas. These are a significant source of revenue for many families, using hybrid stock and comparatively contemporary management techniques.

Although farms are typically operated by families, they rely heavily on erratic market supply for their inputs, such as grain, medications, and day-old chicks. Although the precise number of small-scale commercial farms and their contribution to the country's production is unknown, the increasing towns of Ethiopia mostly rely on them for their eggs and poultry meat (FAO 2008).

According to Jayaraman et al. (2013), by-products of chicken production have value if they are handled and recycled properly; however, if they are not, they are a cause for concern. When compared to other meat consumption, people all around the world are generally accepting of the preference and consumption of chicken meat.

According to FAO (2009), there is a positive association between the level of income and the use of animal products. Foods derived from animals have quality and safety considerations, which open up business prospects for producers, market players, and industry participants in emerging nations. The increasing affluence and population expansion in society are driving up demand for protein-rich foods, which in turn is influencing trends in chicken production. By 2040, Ethiopia's current population of 149.3 million will have grown to approximately 2.4% of the total human population (FAO, 2005). With the country's growing population comes an increased demand for food supplies. As a result, the demand for animal products is likely to skyrocket. To address the ever-increasing need for meat and eggs, one viable approach has

been proposed: the introduction of superior or exotic breeds. Under the current managerial scenario, meeting these demands in a timely manner may be problematic. As a result, intensification and upgrading of bird potential will be unavoidable in order to produce surplus products (Haftu, 2016).

The development community has become more conscious in recent years of the contribution small-scale commercial chicken production may make to reducing poverty and reaching the most impoverished. Growing research indicates that small-scale chicken production contributes significantly to gender equality and the enhancement of the food and nutrition security of the poorest households (Dolberg, 2004). At the same time, the market and production context of chicken production have been evolving fast during the previous two decades. Large-scale, vertically integrated industrial chicken production facilities have quickly expanded, particularly in Africa, as a result of the rapid economic growth and urbanization that have occurred in developing nations. Opportunities have also expanded for small-scale poultry firms due to better market access infrastructure (Conroy et al., 2005).

2.1.1.6.2 Large scale poultry farm

The large-scale commercial production system is a very intensive production system including an average of greater than or equal to 100,000 birds kept indoors under medium to high bio-security standards. Fertile eggs, table eggs, day-old chicks, broiler meat, and adult breeding stocks are provided by large-scale commercial poultry to small-scale modern poultry farms. It is distinguished by a higher degree of productivity, as chicken production is fully market-driven to meet the strong demand for chicken in major cities, and it employs a diverse workforce ranging from chicken attendants to truck drivers to professional managers (Afras, 2018).

Many of them are purposefully positioned in a 100-kilometer corridor south of Addis Ababa to have greater access to feed, veterinary services, other inputs, and market outlets in Addis Ababa (FAS, 2017).While the highlands are home to many local village chickens, the majority of commercial producers are centered in the regions that include Addis Ababa, Debre Zeit, Mojo, and Adama. Other expanding cities like Mekelle, Dire Dawa, Gondar,

Awassa, and Bahir Dar are also seeing the emergence of commercial poultry farms (CIA, 2012).It is evident that Ethiopia does not have a "average" commercial farm. The sizes of the farms vary, ranging from fifty to ten thousand birds each. Small-scale commercial poultry keepers make up the great majority of the industry.

2.1.2 Theoretical review

2.1.2.1 Waste Management Hierarchy

The Waste Management Hierarchy is a concept that outlines a preferred order of waste management strategies, emphasizing the importance of waste prevention, minimization, and resource recovery before resorting to disposal methods. When applied to poultry farm waste, this hierarchy theory provides a framework for effectively managing waste generated within the poultry farming context. Here's how the Waste Management Hierarchy theory can be applied to poultry farm waste in practice:

Agricultural waste management system consists of six basic functions These are production, collection, storage, treatment, transfer, and utilization. Production is a function of the amount and nature of agricultural waste generated. The waste requires management if quantities produced is sufficient enough to become a resource concern. A complete analysis of production includes the kind, consistency, volume, location, and timing of the waste produced. Collection refers to the initial capture and gathering of the generated waste from the point of origin or deposition.

Waste minimization efficiency is stated to be better achieved applying 3Rs in a hierarchical order- Reduce, Reuse and Recycle.The waste hierarchy refers to the "3Rs" i.e., reduce, reuse and recycle, which classify waste management strategies according to their desirability. The 3Rs are meant to be a hierarchy, in order of importance. The waste hierarchy has taken many forms over the past decade, but the basic concept has remained the foundation of most waste minimization strategies. The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste.

The concept of minimizing waste reduces the quantity and ill-effects of waste generation by reducing quantity of wastes, reusing the waste products with simple treatments and recycling

the wastes by using it as resources to produce same or modified products. This is usually referred to as '3R'. Some waste products can be consumed as resources for production of different goods or the same product, meaning recycling the same resource. When wastes are reused time and again, it offsets harvesting of new similar or same products. This saves fresh resources exploitation and reduces waste generation. All in all, the 3Rs individually or collectively saves fresh resources exploitation, add value to the already exploited resources and very importantly minimizes the waste quantity and its ill effects (USDA, 2012).

Figures 2.1 The 3R (redue, reuse and recycle) Hierarchy

Source National 3R strategy for waste management Bangladesh, 2010.

2.1.2.2 Environmental Impact Assessment Frameworks

The Environmental Impact Assessment (EIA) process for poultry waste management practices involves analyzing various options, such as source reduction, recycling, composting, waste to energy, and land filling waste. By conducting an EIA, the potential risks associated with each waste management option can be identified and assessed. This enables decision-makers to choose the most environmentally sustainable and socially responsible poultry waste management approach. An expansion of this model and approach must include overall risk evaluation, uncertainty and decision analysis, and waste EIA (Chukwuma, 1996).

2.2 Empirical literature review

2.2.1 Comparative empirical studies

A comparative analysis of waste management approaches between micro and large-scale poultry farms in similar geographical contexts reveals significant differences. Large-scale farms, such as those in Romania, are able to implement sustainable solutions for waste management, including local energy recovery (Lăzăroiu, 2020). In contrast, micro farms in Bangladesh and Nigeria often lack awareness of the environmental and health hazards of poultry waste, leading to improper disposal methods (Modak, 2019; Balogun, 2017; Abah, 2019). These differences highlight the need for improved waste management practices in micro farms to mitigate the negative impact on the environment and human health.

Reusing poultry manure presents a major risk to public health because of how it is used, how close it is to surrounding surface and ground waterways, how many vegetated areas (riparian buffers) there are between them, and the climate. Poultry manure is repulsive to the sight and smell, and it frequently serves as a haven for rodents and other pests. It also causes contaminated discharge into waterways and the surrounding environment (Zeeuw, 2000).

2.2.2 Improper waste management practices

Poultry waste management has far-reaching ramifications for local communities, including potential health consequences, economic advantages, and stakeholder engagement. In Nigeria, poultry waste has been discovered to cause environmental and health problems, emphasizing the importance of adequate waste management procedures (Akanni, 2014). Similarly, in Bangladesh, the direct use of poultry manure as fertilizer has been linked to environmental deterioration and health issues, highlighting the need for improved waste disposal methods (Rahman, 2022).

Poultry farms can have significant negative impacts on the environment, human health, and farm viability. Studies in Nigeria (Kalu, 2016; Abah, 2019; Olarinmoye, 2011) and Bangladesh (Rahman, 2022) have highlighted the prevalence of inefficient waste disposal methods, such as direct application of poultry waste to farmlands and water bodies, and the lack of awareness among farmers about the potential risks. These activities can pollute the

environment, pose health risks, and impair farm output. To address these issues, improved waste management strategies, such as composting and biogas generation, are required to reduce the negative impact of chicken waste on the environment and human health, as well as to improve the economic sustainability and operational viability of poultry farms.

2.2.3 Ethiopian environmental and agricultural Policy and Regulation

Ethiopia's livestock development strategy is focused on enhancing productivity and promoting sustainable animal husbandry practices; this includes the use of crop residues and purchased feed, improved livestock breeds, and modern management practices (Benin, 2003). This approach acknowledges the significance of sustainable livestock production in achieving the SDGs and emphasizes the need for environmentally friendly practices, improved genetics, and nutrition in order to overcome feed shortages and increase milk and meat production in Ethiopia. Furthermore, the approach highlights the importance of supportive policies and market adjustments that encourage sustainable livestock production. Furthermore, Ethiopia's livestock development strategy seeks to prioritize farm objectives that would result in long-term sustainable farm output and livelihood (Mijena, 2022).

The requirement for conducting an environmental impact assessment (EIA) for development projects is a crucial aspect of Ethiopia's environmental policy (Dara, 2005). Poultry farms, as potential sources of environmental impact, may be subject to EIA regulations for waste management systems (Dessie, 2011). However, the effectiveness of EIA in Ethiopia has been questioned, with concerns raised about its weakness and lack of enforcement (Getu, 2018; Ruffeis, 2010).

2.2.4 Challenges and Societal Implications

Moreki (2013) discovered in his study that the benefits and challenges of poultry waste management are shaped by localized factors such as disposal methods, knowledge, and space availability. In Botswana, farmers primarily give away manure or use it as fertilizer, with challenges including lack of transport and knowledge. in Nigeria, Olarinmoye (2011) found that waste management is inefficient, with practices such as burning, converting to slurry, or using as manure. Baruwao (2018) identified composting as a common practice in Osun State,

with significant factors affecting waste disposal being age, waste quantity, household size, and association membership.

Ethiopia's integrated waste management interventions, while not explicitly focused on poultry waste, have the potential to inform poultry waste management practices. Hailemichael (2016) highlights the need for improved technologies and innovations in the livestock value chain, which could be applied to poultry waste management Kalu (2016) underscores the lack of awareness and knowledge among poultry farmers in waste disposal, suggesting a need for education and training in this area.

2.2.5 Poultry Farm Waste Management Practices

Poultry waste management practices significantly impact the environment and agriculture. Effective management programs, including site selection and utilization, are crucial for minimizing these negative effects (Sims, 1994). The potential of poultry waste for renewable energy production and value-added product recovery underscores the need for safe disposal methods (Mozhiarasi, 2022).

Adedayo (2012) study shows that poor waste collection and lack of knowledge on treatment can lead to significant differences in crop yield and revenue. Akanni (2014) identified environmental risks and health implications, with the distance between poultry farms and residential areas being a key factor. Onyia (2022) can also define the need for a poultry waste management policy, with a focus on the use of biogas energy sources. BaruwaO. (2018) underscored the importance of raising awareness and promoting sustainable farming practices among poultry farmers.

2.2.6 Sustainable Waste Management Strategies

Ethiopia's solid waste management strategy faces significant challenges, including weak policy enforcement, inadequate infrastructure, and poor waste handling practices (Hirpe 2021). These issues are particularly acute in Addis Ababa, where rapid urbanization has led to a mismatch between waste generation and collection (Diriba 2021). The country's waste management system is characterized by irregular, inadequate, and inefficient practices, with a

heavy reliance on open dumping and burning (Teshome 2020). To address these challenges, there is a need for improved policy enforcement, infrastructure development, and public awareness campaigns, as well as the implementation of a more sustainable waste management system (Hirpe 2021, Diriba 2021, Teshome 2020).

Haylamicheal (2012) study shows that this is consistent with the challenges identified in the management of healthcare waste, where there is a lack of comprehensive legislation and coordination among government institutions. Similarly Kalu (2016) the situation is further complicated by the increase in poultry waste generation and the lack of awareness among farmers about its environmental and health impacts. In the healthcare sector, the absences of proper waste segregation and treatment practices, as well as the lack of awareness and enforcement, contribute to the unsatisfactory healthcare waste management (Yazie, 2019).

A range of barriers and limitations exist in the implementation of effective waste management strategies in poultry farms. These include environmental impacts, such as the high contribution of feeding to the environmental footprint of poultry production (Andretta, 2021), and microbial contamination, which poses a threat to human, animal, and environmental health the construction and demolition waste management hierarchy, which includes reduce, reuse, and recycle strategies, can provide a framework for addressing these challenges however, the feasibility and effectiveness of these strategies in the context of smallholder poultry flocks in developing countries, where backyard production methods are common, remains a key area for further research (Kabirifar, 2020).

2.2.7 Socioeconomic implications of poultry farm waste on local communities

The impact of poultry waste management practices in the Bishoftu area, Oromia region, Ethiopia is a complex issue that requires a comprehensive understanding. Tekletsadik (2015) provides a detailed analysis of husbandry practices and the adoption of poultry technology packages in the region, shedding light on the current situation.

Current waste management practices in poultry farming vary across different regions. In Umuahia, Nigeria, Kalu (2016) discovered in his study that many farmers are unaware of the environmental and health impacts of improper waste disposal challenges of waste disposal,

including lack of knowledge and resources. A range of studies have explored best practices and innovative methods for poultry waste management in agricultural settings. Baruwa (2018) and Adedayo (2012) both emphasize the importance of raising awareness and providing education to poultry farmers, as well as the need for proper waste collection and transportation.

Poultry waste, including litter and manure, has been identified as a valuable resource for sustainable agricultural practices and land enrichment (Bolan, 2010). Innovative technologies, such as composting and biogas generation, are being explored to mitigate these issues (Rahman, 2022). Additionally, agricultural wastes, such as citrus, grape, pomegranate, and apple by-products, have been successfully used in poultry diets, improving product quality and reducing environmental concerns. Various technological processes, including anaerobic digestion and pyrolysis, have been developed to convert poultry waste into value-added products with potential economic, environmental, and social benefits (Zhang, 2023).

Effective waste management, including waste prevention, waste-to-energy strategies, and proper landfill design and operation, can significantly reduce pollution and promote ecosystem health Proper landfill management is crucial to minimize the negative impacts of landfills on the environment and human health (Gentil, 2011; Tan, 2014; Ozbay, 2021).

2.2.8 Environmental and Regulatory Challenges

According to Abah (2019), improper waste management in poultry farming poses significant environmental challenges, including air and water pollution, soil degradation, and ecological imbalances. Gomes (2023) In addition, the management of livestock waste, including manure, is crucial for improving water quality A One Health approach is also needed to tackle microbial contamination in poultries, which can threaten human, animal, and environmental health The management of poultry waste presents a complex set of challenges with significant implications for public health and local economies. Harhay (2009) highlights the need for greater research and attention to the unintended consequences of waste management practices, particularly in low- and middle-income countries underscores the environmental impact of poultry production, with feeding practices identified as a major contributor to this impact and

the importance of biosecurity measures in preventing infectious diseases in backyard poultry, particularly in developing countries.

A range of studies have highlighted the challenges and opportunities in waste management in various regions. In Shashemene Town, Kuluse (2022) discovered in his study that inadequate collection, transportation, and disposal processes were key challenges, while the potential for recycling and reusing materials, energy, and employment were identified as opportunities. Similarly, in Debre Berhan Town, Genati (2021) noted that poor waste management practices were prevalent, with factors such as age, education, and attitude influencing these practices. The inclusion of community and stakeholder perspectives in poultry waste management practices is crucial for understanding the benefits and challenges of these practices. Benyam (2018)

Adedayo (2012) found that poultry waste is often poorly managed due to a lack of knowledge, skill, and resources, with significant differences in utilization, crop yield, and revenue. Castellini (2012) compared the sustainability of different poultry production systems, highlighting the need for a holistic approach that considers economic, social, environmental, and quality dimensions.

2.3 Factors that should be considered in Poultry waste management

2.3.1 Waste type and amount

According to Roeper et al. (2005), one of the main issues associated with raising chickens is the excrement, which requires adequate handling to prevent harm to humans and the environment. Manure, in general, refers to animal excrement and urine; it has nutrients and organic matter that enhance its value as fertilizer. Feces, bedding materials, leftover feed, and feathers are the waste by-products of the chicken industry that make up litter (Chen Z et al., 2014). According to Dong and Tollner (2003), the use of poultry manure can lead to environmental issues such air, water, and land pollution. The primary odorous chemicals found in poultry manure are ammonia, dimethylamine (DMA), and trimethylamine (TMA). A study conducted by Nowak et al. (2017) examined the genotoxic and cytotoxic activity of these compounds in a model chicken cell line, and the results indicated that these compounds could cause necrosis and apoptosis in cells.

Spreading manure next to streams, waterways, and lakes significantly increases the danger of nutrients, organic matter, and pathogens contaminating water bodies and public water supplies (Coote and Zwerman, 1975). Poultry manure's high nitrogen concentration causes nitrate leaching and groundwater contamination, which affects sources of drinking water and has an adverse effect on people's health, especially children.

2.3.2 Farm Size

The size of a poultry farm has a significant impact on waste management practices and agricultural outcomes. Larger farms tend to have more complex waste management infrastructure, such as compost plants and lagoons, to handle the substantial amount of waste they produce. In contrast, smaller farms may struggle with waste disposal due to limited resources and knowledge (Moreki, 2013). This can lead to inefficient waste management practices, such as the use of manure as fertilizer or its disposal in landfills, which can have negative environmental and health impacts (Olarinmoye, 2011). The adoption of backyard poultry farming, which is often practiced on smaller farms, is influenced by various factors such as age, income, and experience (Sihag, 2022). Therefore, the relationship between farm size, waste management infrastructure, and waste management practices is complex and multifaceted.

2.3.3 Regulatory frameworks

Waste management regulations have a variety of implications. Effective waste management strategy design and implementation are greatly influenced by regulatory frameworks. These frameworks include rules and specifications that control behavior and activities related to waste management. In many developing nations, the lack of formal, structured waste management systems, inefficient laws and regulations, and a lack of government funding and dedication are the main causes of the ineffective waste management techniques. laws have a major role in determining whether recycled products have sustainable end markets (Rekart, 2023). To increase waste management efforts and investment, partnerships between the public and commercial sectors are essential.

In waste management procedures, stakeholder involvement and participatory planning are essential because they promote societal norms and behaviors and improve the efficiency of organizational and regulatory structures. However, issues including poor governance and policies, financial limitations, and low public knowledge can all reduce the efficacy of regulatory frameworks. Sensitization campaigns that aim to improve waste management techniques and encourage responsive behavior should concentrate on socialization frameworks (Moreki, 2013).

A complex network of laws that cover different facets of waste development, collection, treatment, and disposal regulate waste management. These rules are intended to preserve the environment, prevent harm to people, and effectively handle garbage. Ordinances and rules pertaining to waste management are frequently set down by local governments. These can address things like trash disposal costs, recycling regulations, and collection schedules. In contrast to state restrictions, local regulations are crucial for customizing waste management strategies to the unique requirements of each town. By creating extensive rules that address a variety of topics, such as trash processing, landfill operation, recycling targets, and hazardous waste management, state governments play a critical role in waste management (Rekart 2023, Abah et al., 2019). Generally, the regulatory framework in poultry waste management significantly impacts waste management practices and associated outcomes. Innes (2000) discusses the efficiency effects of regulatory policies, including scale regulations, fertilizer taxes, and waste storage and handling standards. Rahman (2022) highlights the negative impact of poultry waste disposal on the environment and recommends future research and improved waste disposal methods. These studies collectively underscore the need for stringent regulations and innovative waste management practices to mitigate the environmental impact of poultry waste.

2.3.4 Stakeholder involvement

López-Toro (2016) reported in poultry waste management decisions significantly impacts waste management practices and outcomes. The importance of considering stakeholder interests in sustainable waste management programs, with a focus on recycling, pollution, and corporate social responsibility. Muturi (2021) identifies key stakeholders in solid waste

disposal, including local and national government municipalities, NGOs, households, and private contractors, and emphasizes the role of authorities in waste collection. Joseph (2006) underscores the need for stakeholder participation in sustainable waste management, highlighting the importance of waste generators, processors, agencies, NGOs, and financing institutions. Heidrich (2009) provides a stakeholder analysis model for industrial waste management systems, emphasizing the need to identify stakeholder roles and influences. These studies collectively highlight the critical role of stakeholder involvement in shaping poultry waste management practices and outcomes.

2.3.5 Technology type

The treatment and management of the large generation of chicken is one of the challenging issues that the poultry industry's growing output has brought about (Dalolio et al., 2017). A substantial portion of the livestock business is the poultry production sector, which has also been linked to environmental issues if improper handling of the waste from the birds is practiced (Zhang et al., 2023). A lot of wastes, such as hatchery waste, litter and manure waste, feather waste, mortality waste, and abattoir waste, can be released into the air as a result of poultry production. These gases, along with a lot of other gases like ammonia and aerosol, can contribute to climate change and environmental pollution (Zhang et al., 2023).

Furthermore, the dissemination of pathogens and illnesses could pose a threat to human health (Zhang et al., 2023). Since industrial technologies have advanced, these poultry wastes can actually be recycled and repurposed as resources to create value-added products. They can also be used as raw materials for the production of biocomposites, wood adhesives, biomaterials, biomedical applications, textiles, leather processing, environmental remediation, flame retardants, and even as an organic fertilizer and animal feed for agriculture. Finally, they can be used as an energy source for the production of biodiesel. According to Steinfeld (2006), recycling and valorizing wastes can have a significant positive impact on reducing greenhouse gas emissions and the formation of pollutants, while also conserving resources and minerals.

Almost all technological processes can be used to valorize poultry litter and manure waste; however, for agricultural applications, energy recovery, and feed production, composting and

anaerobic digestion appear to be the most practical and financially viable methods; pyrolysis and enzymatic treatment are better suited for handling feather waste. Gasification, pyrolysis, and microbial conversion can completely decompose or remove the numerous germs and pathogens present in poultry mortality waste, slaughterhouse waste, and hatchery waste in order to recover energy and protein from these wastes. Process simulations and laboratory studies are still required to confirm the effectiveness of these technologies in treating various poultry wastes (Zhang et al., 2023). A range of tecnologys have been investigated for poultry waste management, each with potential benefits and cons. Anaerobic co-digestion, anaerobic mono-digestion, pyrolysis, and gasification have been recognized as viable waste valorization methods (Kanani, 2020). These technologies can help to minimize pollution and increase sustainability in the poultry supply chain. Similarly, sophisticated technologies such as reverse osmosis, dissolved air flotation, and integrated fixed film activated sludge have been shown to be successful in treating chicken slaughterhouse effluent, with the potential to recycle water and reduce waste (Baker, 2020). The potential of poultry waste-to-wealth technologies, including anaerobic digestion, pyrolysis, gasification, hydrolysis, enzymatic treatment, and microbial conversion, is also addressed, with a focus on their economic, environmental, and social implications. (Zhang. 2023). However, the paper underlines the need for additional research on the behavior strategies of many stakeholders and legislation for the commercialization of these technologies. Finally, Mozhiarasi's (2022) review emphasizes the necessity of excellent solid waste management procedures in the poultry business, notably in recovering value-added products and producing bioenergy.

2.3.6 Housing systems

Housing systems for poultry farms play a significant role in waste management, as they influence the efficiency of waste removal, hygiene, and overall environmental impact. Slatted floor systems, for example, are widely recognized for their benefits in waste management and hygiene. These systems facilitate efficient waste removal, reducing direct contact between birds and waste materials, which minimizes disease transmission, improves air quality, and enhances animal welfare. Additionally, the appropriate utilization of poultry waste or by-products, such as land application of litter as organic fertilizer, feed for livestock, and biogas production, can increase the monetary output and protect from unwanted side-effects, the

planning, construction, and operation of poultry installations of any size should consider the issues involved in storing, managing, and utilizing waste by-products to mitigate environmental impacts Therefore, the design of poultry housing systems plays a crucial role in ensuring effective waste management and environmental sustainability on poultry farms (Bolan, 2010).

2.4 **Conceptual Framework**

Animal waste and urine are major problems when it comes to raising hens, and they need to be handled properly to keep people and the environment safe (Roeper et al., 2005). Waste management procedures and agricultural results are significantly impacted by the size of a chicken farm (Moreki, 2013). Stakeholder involvement and participatory planning are crucial to waste management procedures because they enhance the effectiveness of organizational and regulatory structures and foster social norms and habits. Furthermore, Joseph (2006) emphasizes the necessity of stakeholder participation in sustainable waste management by developing comprehensive regulations that cover a wide range of subjects and stressing the significance of trash sources, processors, agencies, NGOs, and financing institutions. Zhang et al. (2023) expounded on the significance of technology, stating that with the advancement of industrial technologies, poultry wastes can be recycled and repurposed as resources to produce goods with added value. Additionally, they can be utilized as raw materials for the manufacturing of flame retardants, textiles, leather processing, wood adhesives, biomaterials, biomedical applications, and even as organic fertilizer and animal feed for agriculture. Including the housing system these systems facilitate efficient waste removal, reducing direct contact between birds and waste materials, which minimizes disease transmission, improves air quality, and enhances animal welfare. Based on the above conceptual review of the study the researcher draws the following framework.

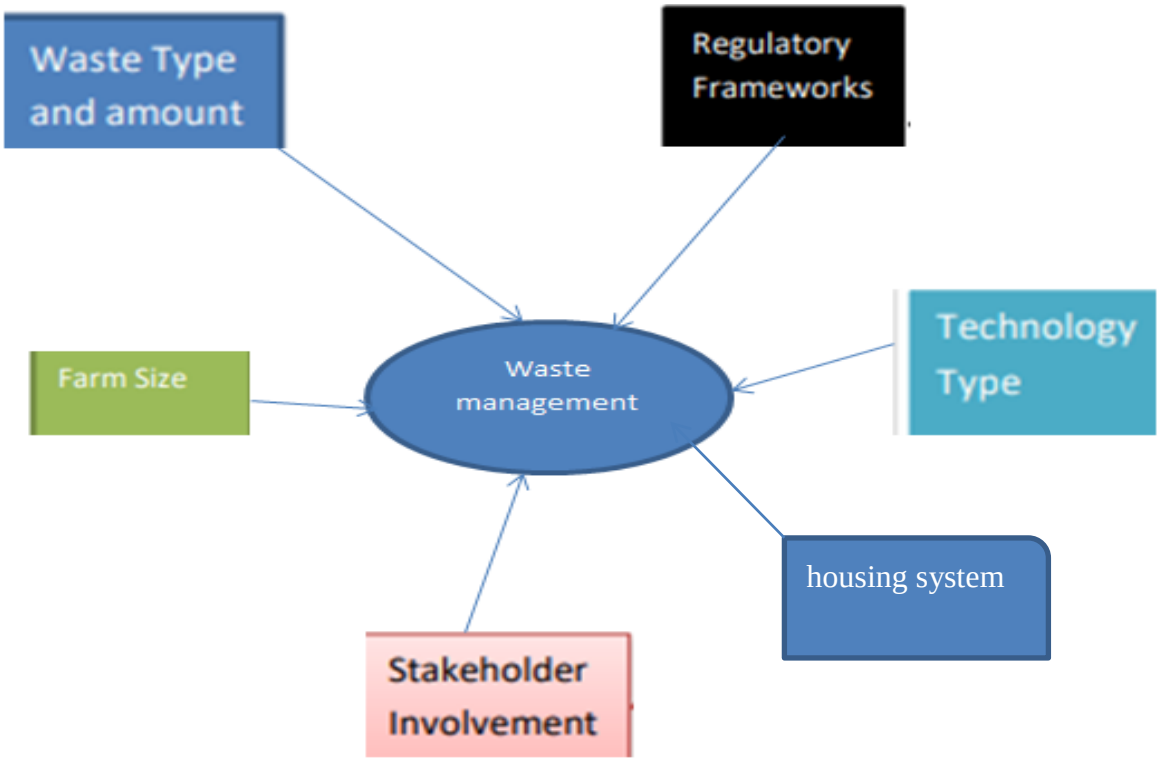


Figure 2.2: Conceptual framework of the study

Source: compiled by the researcher form Moreki, 2013, Roeper et al., 2005 and Zhang et al. (2023)

CHAPTER THREE

3 RESEARCH METHODOLOGY

3.1 Description of the study area

3.1.1 Location and geography

The study was conducted in the poultry farms of Bishoftu area, situated in East Shewa Zone of the Oromia Region in central Ethiopia. The town is located 48 kilometers southeast of Addis Ababa. The town has a total population of 197,557 as of 2021 (CSA, 2021). The area typically experiences a bimodal rainfall pattern, with a spring (Belg) rainy season spanning extend from March to May followed by main (Kiremt) rainy season occurring from June to October with an average annual rainfall of 800 mm. The area maintains an average maximum temperature of 28°C and an average minimum temperature of 12.3°C (CSA, 2015). Bishoftu and its surroundings exhibit variable and yet representative agro-ecologies of the country. These agro climatic zones are inhabited by different plant and animal species (Conway, 2007). It is strategic position on the road to Djibouti that makes the area a hub for industrial development. The agro-industries established in Bishoftu Town and its surrounding include Elfora Agroindustry Export Abattoir Farmers. The rural people of the area engage in a mixed crop and livestock farming system.

3.2 Methods

3.2.1 Study Population

A target population, as defined by Hair et al. (2010), is an object or group of individuals for which inquiries can be made or observations made in order to provide the necessary data structures and information. Mugenda (2008) further states that the study population is the entire population that the researcher designates for that particular study.In order to undertake this study, the researcher the study populations were selected from both micro and large-scale poultry farms. Therefore, the survey encompassed all large-scale poultry farms that

incorporate an average of greater than or equal to 10,000 chickens as well as those operating by micro-enterprises has a capacity of 50 to 1000 chickens, thus forming the study population.

The following subsections delineate the research methods employed in completing the research work incorporating the research design, data collection techniques, as well as the data sampling techniques plan for use in the study.

3.2.2 Research Design and approach

The data type, data collection technique, data source, and sample strategy are all included in the research design (Thornhill et al., 2012). A descriptive and explanatory research were applied as the primary data that can help to understand the impact on farmers and the broader community. Because for the study to comprise an investigation that offers a complete image of the current situation and a detailed description of the findings, the descriptive research design were chosen. The significance of the farm size, waste type and amount, technology type, stakeholders, regulatory frameworks etc on the waste management can also be investigated through explanatory research. The goal of the explanatory study is to provide an explanation for observable events, problems, or behaviors. Accordingly, correlational research were used (Creswell 2002), when a study aims to determine the degree to which two or more variables co-vary.

Researchers can choose from three different methodologies: mixed methods, quantitative, and qualitative (Khotari, 2004). Qualitative inquiry is employed when it's critical to comprehend the relationships between various problems or elements and to gather comprehensive data to satisfy study goals (Creswell and Clark, 2007). It also places a strong emphasis on interpretation, giving target population access to all relevant viewpoints, taking situations into account, immersing oneself completely in the environment, and intellectual depth. According to Creswell (2009), research that examine new angles on pre-existing issues or undeveloped, early-stage issues perform better with it. On the other hand, quantitative research employs mathematical, statistical, and logical techniques to produce concrete facts and numerical data, viewing the relationship between theory and study as deductive. For this type of research, finding indicators of waste management problems is part of the measurement

process, which can be conceptualized as a practices. Quantitative methods with a closed-ended questionnaire were employed respectively in this study.

So the researcher used descriptive and explanatory research to explain the study quantitatively.

3.2.3 Sample Size determination and sampling method

Before proceeding with any sampling, background information on micro and large-scale poultry farms in the Bishoftu area. The list of all poultry farms were obtained from the Agricultural Bureau of Bishoftu with the assistance of the staff, which includes poultry enterprises, encompassing a combination of micro-scale and large-scale farms. From this compiled list, poultry farmers were clustered according to the local administration in 3 sub-cities including surrounding woredas.

From the three subcities of bishoftu town and the surrounding the total number of population for both the micro and large scale poultry farm were 595. From this total population 377 are number of employees working under the large scale poultry farms. Then only one representative from the small scale poultry farm of the Bishoftu town and the surrounding area totally making number of populations 218. So the sample size of the population from the three subcities of Bishoftu town and surrounding for the small scale poultry constitutes 218. the sample size were determined using Taro Yemane' s (1964) N = N / (1 + Ne^2). Statistical formula due to its simplicity to apply and have 95% confidence level as follows: and 5% error.

$$n=\frac{595}{1+595*0.05^2}$$

Where: n = sample size to be determined (239), N = population of interest 595 and e = error margin (0.05). Therefore, **239** sample made the total sample size before clustering.

The research adopt a purposive (for the owners of the small scale farms) and stratified random sampling method (for the large scale farms in subcity 01 and 02) to acquire the relevant information essential for achieving the study's objectives. This categorization entails

differentiating between micro-scale enterprises and large-scale enterprises, resulting in a total of 218 micro and 7 (each with an different number of employees but totally 377) commercial large-scale registered poultry enterprises in Bishoftu and clustered random sampling can help to ensure representation from both categories by the characteristics of each enterprise, which might include factors such as waste management practices, economic conditions, geographical locations, farm size this can effectively involve partitioning the entire population into mutually exclusive and exhaustive subgroups.

From subcity 01 Hora Haadhoo, from subcity 02 Hore Arsade, from subcity 03 Odaa Nabee wooreda were selected based on clustering criteria such as waste management practices, economic conditions, geographical locations, farm size. From this, by taking the average number of small scale poultry farms found in the 11 woredas' of the city that gives us nearly 20 farms out of 218 farmes in the 11 woredas. However, in the case of large poultry there are different numbers of employees in each farms, but seven of them are found only in two subcities. That is sub city 01 which represent large scale farms having 262 employees and sub city 02 has three large scale farms with 115 employees (Table 3.1).

Table 3.1: distribution of sample size in each clusters and

Kebeles	Cluster one		Cluster two		Cluster three (only small scale)
	Small scale farms	Large scale farms (70% of the remaining sample size)	Small scale farms	Large scale farms (30%)	Small scale farms
Subcity **(01)**	20	126			
Subcity **(02)**			20	53	
Subcity **(03)**					20

Source: own survey (2024)

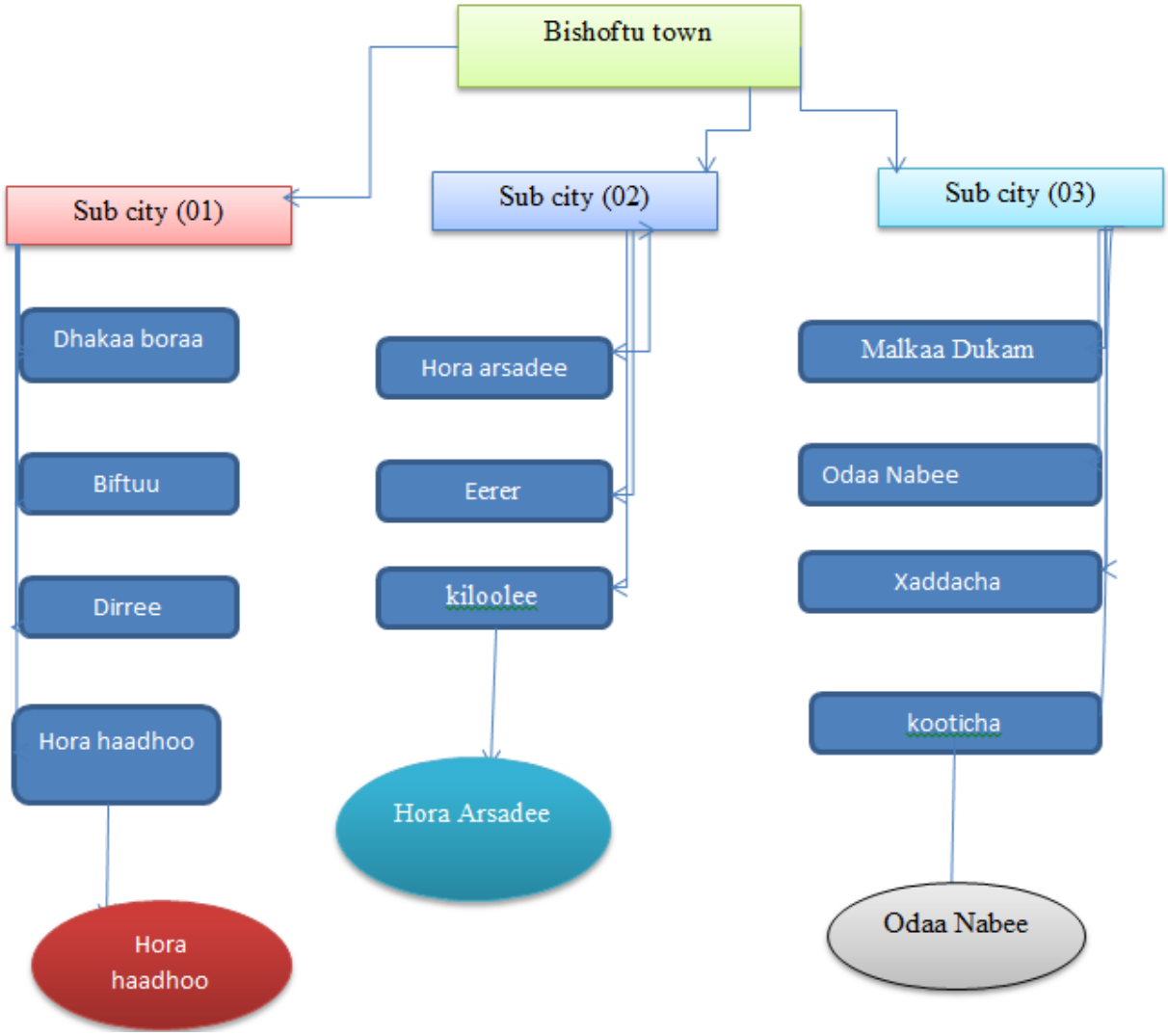


Figure 3.1: Woredas by sub-cities

Source ; The Bushoftu City Administration

3.2.4 Data type and source

3.2.4.1 Primary data source

Surveys through structured questionnaires were used to collect primary data from poultry farm owners, operators, workers, and poultry farm surrounding residents. With the goal of quantifying and understanding their perspectives and gathering data on waste management practices, infrastructures, waste generation rates, and waste treatment methods at both micro and large-scale poultry farms. Moreover, interviews to acquire qualitative information

potentially on various dimensions relevant to waste management practices and their impacts on health, environmental concerns, economic effects, and perceived benefits or challenges.

Furthermore, the potential economic benefits of waste utilization in terms of cost savings or revenue generation for poultry farmers. Use survey responses to assess the most prevalent waste management difficulties faced by both micro and large-scale poultry farms, such as odor control, waste disposal logistics, and environmental impacts. This can provide statistically reliable data on poultry waste attitudes, habits, and perceived problems and benefits.

A well-design structured questionnaire were used to collect information from poultry farmers on their manure/litter management techniques. The questionnaire were developed to collect relevant information such as the type of management system utilized, the types of disposal methods used to remove manure/litter, the restrictions or key obstacles of waste disposal in poultry farms, Contains open-ended and close-ended questions, The study considers all type of poultry farms like broiler, and layer and collected on socioeconomic characteristics of sample farmers that included level of education, duration of farming, and training on poultry farm management etc. poultry litter management system, constraints of waste management and also economic information of poultry farming system

For more information, a key informant interview, in-depth interviews were undertaken by using a pretested structured questionnaire for government offices (regulation perspective), Debre Zeit Agricultural Research Center and small and micro enterprise offices about technical and extension supports, on challenges faced by small scale poultry producers, and production opportunities also to understand the practical implementation and challenges of waste management practices.

3.2.4.2 Secondary data source

For the secondary data, the researcher used previous research and literatures documents were thoroughly reviewed in order to describe micro and large-scale poultry farms, waste management procedures, benefits, and challenges

3.2.5 Methods of Data Collection

Data collecting took place during March and April 2024. The researcher then administered a structured questionnaire to poultry farms using manual method and the researcher collected data on micro and large-scale commercial chicken farms at Bishoftu. For the survey, owners demography, farm characteristics were included in the questioners specific questions that included were the demography of commercial chicken farm owners (gender, occupation, education level etc) and characteristics of the farms was conducted at the poultry site or owners home. The researcher also translated the questions into the local language "Oromifaa" whenever necessary for the convenience of data collection during the survey. To achieve the objective of the study, data collectors could be employed based on their ability in communicating with local language (specifically Afaan Oromo), educational background and experiences in similar works.

3.2.6 Data analysis

3.2.6.1 Discriptive statistics

The Data generated from the survey were into Statistical Package for Social Sciences software Version 20 and analyzed by using descriptive statistics to summarize and describe the characteristics of waste management practices of respondents. This includes measures of central tendency (mean), variability (standard deviation, range), and frequency distributions to provide a clear overview of waste management practices.

3.2.6.2 Regresion analysis

Correlation analysis investigate relationships between waste management practices. Additionally, regression analysis determines the strength and direction of these relationships to compare the frequency and severity of challenges faced by poultry farms. This manages to involve analysis of variance (ANOVA) well computed to know the significant difference of variables. Finally, The waste management status of farms were correlated with farm attributes and farm owners using either Pearson's chi-square analysis. When $P < 0.05$, a variable is considered to have a significant impact. Examples of such variables include farm size, waste type and amount, technology type, stakeholder involvement, and regulatory frameworks.

a. Model specification

For the purpose of achieving the objectives of the study, data gathered through different techniques were analyzed and interpreted quantitatively; hence the data analysis employed quantitative methods. To this effect, linear multiple regression model was used to show the cause-effect relationship determinant factors and waste management.

SPSS software was used to analyze the data, like:

$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots\ldots\ldots + \beta n Xni + \varepsilon i$

Where: Yi is dependent variable for ith observation;

Xi is independent variable for ith observation;

B0 is the intercept;

B's are regression coefficients

Ei is the error term for ith observation

b. Definition of variables

No	Variables	Type	Expected Outcome
1	Sex	Dummy	-ve
2	Age	Continuos	+ve
3	Educational level	Continuos	+ve
4	Exprience of the respondents	Continuos	+ve
5	Benefits of waste management praties	Continuos	+ve
6	Cahllenges of waste management praties	Continuos	+ve
7	Factors affecting waste management practies (farm size, waste type,… etc)	Continuos	+ve

3.2.7 Ethical considerations

This study followed the ethical standards and maintained a high level of professionalism by national and international ethical procedures. The Addis Ababa University, College of Development Studies Center for Environment and Development reviewed and approved the study proposal. The respondents were given the Center's support letter, and the researcher explained to them that the questions were meant to be straightforward, understandable, and sensitive in order to prevent confusion and misinterpretations. Last but not least, each participant was granted the privacy they needed to consider the research and freely submit their answers. The confidentiality of the study was given top priority in every way. Firstly, consent were obtained from respondents and assures participants of the confidentiality of their information. In order to prevent confusion and misconceptions, the researcher also made sure the respondents knew that the questions were straightforward, sensitive, and unambiguous. Last but not least, each participant was granted the privacy they needed to consider the research assignment and freely submit their answers. The study attempted to uphold moral and ethical behavior throughout the research process and guarantee that participants were treated fairly and with respect by adhering to these ethical concerns.

CHAPTER FOUR

4 RESULT AND DISCUSION

4.1 Demographic characteristics of survey respondent

Out of 239 questionnaires issued to the respondents 235 were accurately completed and submitted by the participants were used for the analysis in the research which yielded 98.3% response rate. As shown in Table 4.1, of the 235 respondent who took part in this survey 151 (64.3%) and 84 (35.7%) were male and female respectively. The fact that there were more male than female participants, this show that the sector employ more male than female. Poultry farms have provided employment opportunity to many smallholder farmers but at household level women engage on the poultry production as means for income generation because more than 80% (ILO Pro Agro Ethiopia project, 2022) of the population lives in rural areas specifically in the peripheral of the study area. So it eminent that the participation of women in the poultry production at household level is improving.

Table 4. 1: Demographic characteristics of survey respondents

Socio demographic profile	**Frequency**	**Percentage**
Response by gender		
◆ Male	151	64.3
◆ Female	84	35.7
◆ Total	235	100.0
Educational background of the respondents		
◆ First cycle	3	1.3
◆ High school completed	106	45.1
◆ Second cycle	36	15.3
◆ Higher education	64	27.2
◆ Others (informal education)	26	11.1
◆ Total	235	100
Experience		
◆ less than 3 years	119	50.6
◆ 3-5 years	38	16.2
◆ 6-10 years	68	28.9

Socio demographic profile	Frequency	Percentage
• Above ten years	10	4.3
• Total	235	100
Age category of the respondents		
• Below 25 years old	18	7.7
• 25-35	105	44.7
• 35-45	62	26.4
• Above 45	50	21.3

Source: own survey (2024)

The respondents' educational attainment is a crucial metric for assessing their knowledge and capacity expected to impact the waste management practices. It is evident from the statistics that the respondents have a variety of educational backgrounds, ranging from a first cycle to a higher education level and beyond. The analysis revealed that 45.1% of the respondents attended secondary school level education making the majority. The second largest group of respondents educated at higher level (diploma and above up to master's degree level) who account 27.1% . The remaining 15.3% of respondents educated to second cycle, 11.3% attended informal education 1.3% respondents attended first cycle educational. This suggests that nearly all of the respondents are not anticipated to comprehend the study's questions, as well as to analyze and grasp the variables related to the waste management practices that are employed and discussed, and from the first inspection of the research that was why it was found to interpret the questionnaire in Amharic and English.

Table 4.1 above depicts that the majority of respondents (50.6%) have less than three years work experience, with the experience on the industry ranging from 6 to 10 years representing the second greatest percentage with 28.9%. The next 16.2% and 4.3% percentages, for experience ranging from 3 to 5 years and above 10 years, implied that there respondents who have been in the poultry farm for significant amount of years to answer the relevant response to each questions. It is well known that the work experience helps employees understand the work environment and what they can expect from their colleagues in terms of waste management practice elements. It also gives them the chance to consider different waste management practices that should be over seen by the poultry farms.

The survey shows that the majority (44.7%) of respondents fall in 25–35 years age range, followed by those in the age category 36 and 45 that account 26.4% of respondents, respondents above 45 years account 21.3% and 7.7% were in the age category below 25 years old. Thus, the research attempted to include the viewpoints of nearly every age group that are engaging in the poultry farm.

4.2 Association between farm size and waste management practices

The researcher tried to assess the association between farm flock size and waste disposal practices. From the table of the response, we can depict that most of the waste is Litter/manure (65.1%) and manure (22.1%), which is a mixture of poultry excreta, spilled feed, feathers, and material used as bedding in poultry operations, and the chi-square value of 290.157[a] and p (<0.01). The table also shows that selling it immediately/giving it away (36.6%) and spreading on the surface of the earth (35.7%) are the main methods employed to dipose waste, as it can be sold immediately or later for animal feed (see the response for animal feed supplement (46.6%) under the statement regarding the end use after selling). The researcher emphasizes that without additional treatment, disposing of raw chicken manure is harmful, unsafe, and can cause major environmental issues like unpleasant odors, heavy metal leaching, methane emissions, eutrophication of streams, nutritional imbalances, phytotoxicity, and the spread of weeds and pathogens (Nebiyu, 2016). Moreover, there is the practice of burying (16.6%), which is not as significant as selling or spreading. However, the association significance of p-value (<0.01) with the high value of chi-square (458.096[a]) indicates that there is a significant relation with farm size.

Table 4.2 Association between farm size and waste management practices

Questions	Activities/items/response	Frequency	Percent	chi_square	p-value
What are the common wastes in your farm?	Litter/manure	153	65.1	290.157[a]	.000
	Manure	52	22.1		
	Dead birds	24	10.2		
	Others, specify_____	6	2.6		
	Total	235	100.0		
What type of waste disposal	Burning,	18	7.7	458.096[a]	0.00
	burying	39	16.6		

Questions	Activities/items/response	Frequency	Percent	chi_square	p-value
you use for the poultry wastes?	Spread on the surface of the earth	84	35.7		
	Selling or give it away	86	36.6		
	Compositing for own agricultural purpose, if there is any	8	3.4		
	Total	235	100.0		
If you are selling or give it away, what do you think is the end use ?	Fertilizer for agricultural crops	69	29.4	284.640[a]	0.00
	Animal feed supplement	108	46.0		
	Compost for soil enrichment	22	9.4		
	Renewable energy production	4	1.7		
	others	32	13.6		
	Total	235	100.0		
How frequently you dispose the manure and other wastes?	Every day	57	24.3	342.987a	0.00
	Every week	21	8.9		
	Every month	45	19.1		
	Every 6 month	38	16.2		
	others	74	31.5		
	Total	235	100.0		
Number of bags collected after clearance of poultry houses in daily base	1-5	88	37.4	406.611[a]	0.00
	6-10	66	28.1		
	11-15	36	15.3		
	16-20	33	14		
	21 and above	12	5.1		
	Total	235	100.0		
What are Complaints of neighbor's about poultry farms in the area?	Odor	109	46.4	255.313[a]	0.00
	Noise from birds	64	27.2		
	Pollution of nearby waters	44	18.7		
	Other	18	7.7		
	Total	235	100.0		
How do you transport the manure and or litter of your farm?	Using hand/carried by person	117	49.8	333.496[a]	0.00
	Wheelbarrow	50	21.3		
	Vehicle	44	18.7		
	Others, specify_____	24	10.2		
	Total	235	100.0		

Questions	Activities/items/response	Frequency	Percent	chi_square	p-value
How often does environmental protection team visit your farm?	Once a month	27	11.5	289.331[a]	0.00
	Once in 6 months	82	34.9		
	Never	126	53.6		
	Total	235	100.0		

Source: own survey of the researcher and SPSS result (2024)

The response in table 4.3 also shows that there is no outstanding specific time of waste disposal frequency; rather, it can be done daily at any time, and most of the total number of bags collected after clearance of poultry houses in the daily base are about 1-5 bags (37.4%), and 28.1% of the respondents also implied that 6-10 bags can be collected. And the p-value (<0.05) and chi-square 406.611[a] showed that there is a significant relation between the amount of waste generated each day and the size of the farm. The analysis also shows that there are complaints of neighbors about poultry farms in the area because of its odor (46.4%), noise from birds (27.2%), and pollution of nearby waters (18.7). This has also relation with the size of the flock or farm size, and its p-value is (<0.05). When sold or buried, there must be a means of transportation to the end destiny, and the above response showed that most of the respondents transport the manure or litter using hand/carried by person (49.8%), and some of the farmers use wheelbarrows (21.3%) and vehicles (18.7%); the chi-square and p-value also indicated that there is a significant association. Finally, the last question believed to have a relation with waste disposal is how often the farms are visited by the protection team, and the majority of the team implied that they were never visited by the protection team (53.6%), and 34.9% of them implied that they were visited every six months, while 11.5% of them have seen the protection team once a month. The result showed that there are large number of flocks, impacting waste management practices and benefits. Layer type flocks are the most reared type of poultry and their purpose is to produces egg. In order to reduce environmental pollution, enhance biosecurity, and preserve the overall sustainability of their operations, poultry layer farms must implement sustainable waste management procedures (Nebiyu, 2016). Generally, the majority of waste is manure and litter which is a mixture of poultry excreta, spilled feed, feathers, and material used as bedding in poultry operations. Selling or spreading waste is the main method, as it can be sold immediately or later for animal feed. The researcher emphasizes the harmful and unsafe disposal of raw chicken manure without

additional treatment, which can cause environmental issues like odors, heavy metal leaching, methane emissions, eutrophication of streams, nutritional imbalances, phytotoxicity, and the spread of weeds and pathogens. The study also found a significant relation between the amounts of waste generated daily and the size of the farm.

4.2.1 Flock size, replacement stock and source of poultry feed

From table 4.2, we can see that 40% of the respondents have flock size greater than 250 up to 1000 and 36.6% have 1000-5000 flocks, implying that the response is from most of the respondents who own large numbers of flocks, which can contribute significantly to the benefits as well as challenge analysis and the effect of each of the variables considered as factors affecting the waste management practices.

Egg layer type flocks are the most reared type of poultry in the reseached area which implied by 65% respondents. The respondents implied that one of the key functions of poultry is the production of eggs. Therefore, selecting the appropriate breed of layers is essential. Retaining layers primarily serves their egg-laying purpose. Finding high-quality layers reduces financial risk and allows you to keep an eye on your flock's output. As implied by 82% of the respondents, the main source of the chickens when reared are private farms.

Table 4.3 poultry farm descriptions

Questions/statements	responses	Frequency	Percentage
Farm flock size	<250	39	16.6
	250-1000	94	40.0
	1000-5000	86	36.6
	<10,000	16	6.8
	Total	235	100
Which age group of poultry you rear?	Starter	33	14.0
	Grower (pulate)	33	14.0
	Broiler	6	2.6
	Breeder	10	4.3
	Total	235	100
Source of chicken	Private farm	193	82.1
	Government farm	18	7.7

	others	24	10.2
	Total	235	100.0
Is there chicken replacement in the farm?	Yes	235	100
	No	0	0
	Total	235	100

Source: own survey of the researcher and SPSS result (2024)

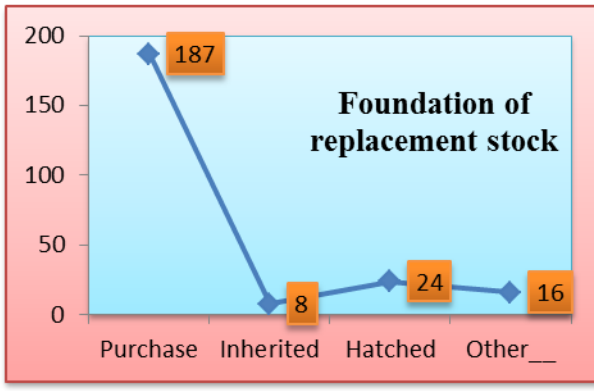


Figure 4.1 replacement stock

Source: own survey of the researcher and SPSS result (2024)

The replacement purchase frequency of 187, as shown in Figure 4.1, indicates that farmers predominantly buy from private farms. They trust that these private farms will provide them with chickens, believing that replacement options are readily available. This behavior suggests that farmers have the financial means or backup capital to purchase replacements, often relying on a stable customer base to facilitate these transactions.

The availability of day-old chicks and parent breeds is crucial for establishing a balanced and sustainable commercial poultry chain. However, in the study area, there is a chronic shortage of day-old chicks, which poses significant challenges for farmers looking to maintain their operations. As a result, many farmers abandon raising chickens, as their chicken houses often remain empty for months while they wait for fresh supplies from their breeders. This uncertainty makes poultry farming a risky venture for many.

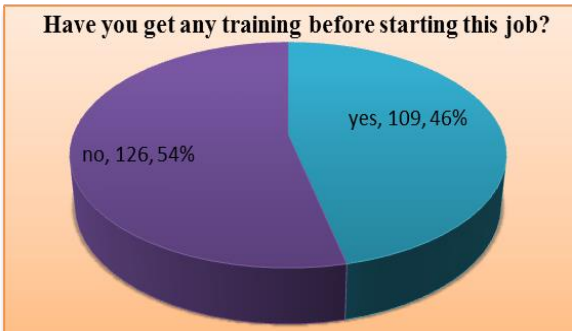


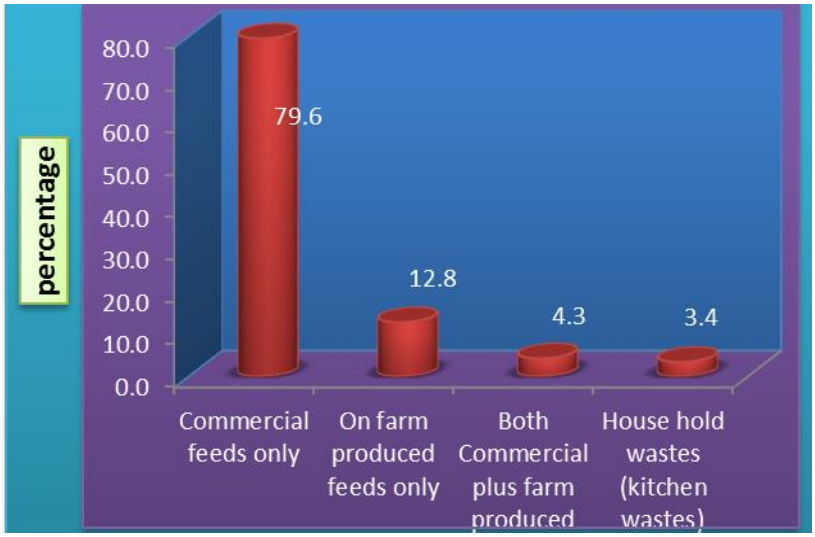
Figure 4.2 Training Availability

Source: own survey of the researcher and SPSS result (2024)

Regarding training opportunities received by the poultry farmers before they started the job, some of them have received the training, while more than half (53.6%) of the respondents them, did not receive training. During the data collection, most of the respondents expressed that receiving adequate training would be beneficial for both production and waste management. Accrediting to Kshandaka and Singh (2018), farmers lack knowledge about the various challenges associated with raising chickens, particularly as the size of the flock increases. Therefore, it's crucial to have a basic understanding of poultry farming in order to make it financially feasible in rural areas. Training enhance farmer's level of knowledge and skills, particularly in areas such as disease control, feed ingredient identification, climate stress management, and the effective management of backyard poultry.

From figure 4.3, it can be seen that most (79.6%) of the farmers provied commercial feeds, while the remaining 12.7%, 4.2% and 3.4% respondant provied on farm produced feed, chemical as well as on farm produced feed and houshold (kichin) wastes respectively. Thus most of them feed the chicken commertial feed with ingradiant of grain, broken rice, rice bran, wheat grain, wheat pollard, maize, etc. For poultry producers, the primary nutritional challenge is ensuring that the feed meets the birds requirements, especially in terms of protein content and the proper balance of amino acids (Applegate, 2008). The respondents underlined that poultry have relatively high nutrient requirements because they turn feed quickly into food items (meat and eggs). Hence, to reduce poultry excrement, it is necessary to reduce the amount of crude protein provided by adding amino acid supplements to diets (Applegate, 2008).

Excessive feed consumption may arise from a diet lacking in specific amino acids as an attempt to make up for the deficit. This could result in excessive protein (nitrogen) intake and increased emissions of nitrous oxide, a greenhouse gas, from manure, both of which would be bad for the environment (Nebiyu, 2016)). On the other hand, reduced consumption of a high-protein ration may transpire, leading to a reduced intake of amino acids.



Source: own survey of the researcher and SPSS result (2024)

Figure 4.3 source of poultry feed

4.3 Benefits of micro and large-scale poultry farms wastes management practices

Poultry farm with the goals of ensuring food security, maximizing productivity, increasing farm income, and efficiently recycling resources while reducing environmental damage needs training. The study also attested this as reported by survey respondents, they confirmed benefits like economic gains (39.1%), environmental protection (23.8%), and addressing social responsibility (23%). This is supported by the findings of Kshandakar et al., (2018) which indicated that poultry farming is influenced by the farmer's goals, social and economic intentions, waste management practice and social responsibility. As it can be seen from the table 4.4, cumulatively, environmental preservation and social responsibility hold a greater percentage of the response than economic gains. Further, the waste management practice can

generate additional income (25.5%), increase profitability (44.3%), enhance sanitation, and reduce health risk (30.25).

Table 4.4 Benefits of micro and large-scale poultry farms wastes management practices

Questions	**Benefits**	**Frequency**	**Percent**
Which benefit do you consider most significant from effective waste management practices?	Economic gains	92	39.1
	Environmental preservation	56	23.8
	Social responsibility	54	23.0
	Health and safety improvements	33	14.0
	Total	235	100.0
What is the expected primary benefit of implementing waste management practices in your poultry farm?	Additional Income	60	25.5
	Increased profitability	104	44.3
	Enhanced sanitation and reduce health risks	71	30.2
	Total	235	100.0
How do waste management practices impact the productivity aspects of your poultry farm?	Reduce operating costs	65	27.7
	Increase revenue	125	53.2
	Improve operational efficiency	45	19.1
	Total	235	100.0
For what purpose by-product of poultry production used in your farm?	Composted and fertilizer for crops	56	23.9
	Feed ingredient for animals, such as fish, pigs, and cattle	73	31.1
	selling it away	67	28.5
	It can be converted into bioenergy, such as biogas, bioethanol, and biodiesel	39	16.6
	Total	235	100.0

Source: own survey of the researcher and SPSS result (2024)

Kshandakar et al. (2018). There are benefits associated with the removal of waste, and the researcher believes that training on how to effectively dispose of waste affects the social,

economic, and social aspects of the farmer. Ethiopian Master Plan for Livestock Road Maps for Growth and Transformation, 2015, quoted in the ILO Pro Agro Ethiopia project, 2022) suggested that the Ethiopian government has set a lofty goal of raising the proportion of chicken consumption by 2030 from 5% to 27%, which depends on training. Poultry product consumption is primarily concentrated in urban areas, with seasonal surges observed in rural areas. The government has shown a strong interest in maximizing the sector's potential and providing some degree of financial support to local farmers. To encourage smallholders to get into commerce, Improved Family Poultry (IFP), a crucial smallholder transformation tool, was developed (ILO Pro Agro Ethiopia project, 2022). Basic training in chicken farming is crucial to making the practice financially feasible in rural areas.

With respect to productivity, it is implied in the above table 4.4 that it can reduce operating costs (2.7%), increase revenue (53.2%), and improve operational efficiency (19.1%), and the value of chi-square also shows that there is a significant association between the productivity of the poultry farm and training. Moreover, purposeful astes, if properly disposed of, are important for compost and fertilizer (23.9%); ingredients for animals, such as fish, pigs, and cattle (31.1%), can be sold (28.55); and they can be converted into bioenergy, such as biogas, bioethanol, and biodiesel (16.6%). Chatterjee et al. (2015) emphasized the value of farmer training and argue that the use of locally adapted birds, a conducive environment, and the availability of high-quality feed are the main factors influencing the success of poultry farming. However, Kabir et al. (2015) also looked at how chicken farming training affected Bangladeshi farmers' socioeconomic circumstances and came to the conclusion that training in poultry farming had a positive socioeconomic impact on 38% of farmers.

4.4 Challenges of micro and large-scale poultry farms wastes management practices

With respect to the challenges of the waste management/disposal practices, handling and storage (35.7%) and disease control (35.7%) are the most difficult challenges that most of the farmers are facing. Additionally, biosecurity risk (28.5%), which does not directly impact the poultry farmer and his/her property but may impact someone/things like pests, diseases, weeds, or contaminants on the economy, environment, or community. Poultry production poses a significant issue in terms of biosecurity because diseases can spread swiftly and have

disastrous effects. Strict measures, such as restricting access to the farm, maintaining adequate sanitation, and routinely checking the health of their flocks, are necessary for farmers to put in place in order to stop epidemics. Another crucial component in stopping the spread of illness in birds is the prompt identification and isolation of diseased birds (Gbigbi, 2020).

Table 4.5 Challenges of micro and large-scale poultry farms wastes management practices

Questions	Activities	Frequency	Percentage
Which aspect of poultry waste management presents the greatest difficulty in your opinion?	Handling and storage	84	35.7
	Biosecurity risks	67	28.5
	Disease control	84	35.7
	Total	235	100.0
Which factor poses the most significant challenge in implementing effective waste management strategies on poultry farms?	Lack of financial resources	117	49.8
	Limited technical know-how	56	23.8
	Resistance to change	62	26.4
	Total	235	100.0
In your experience, what is the most common obstacle faced when trying to optimize poultry waste utilization?	Limited market demand for by-products	131	55.7
	Inefficient waste conversion technologies	52	22.1
	Resource constraints	52	22.1
	Total	235	100.0
Which area of poultry waste management poses the greatest risk to farm sustainability?	Environmental impact	90	38.3
	Health and safety concerns	59	25.1
	Economic viability	86	36.6
	Total	235	100.0

Source: own survey of the researcher and SPSS result (2024)

Moreover, the most significant challenge in implementing effective waste management strategies on poultry farms is lack of financial resources (49.8%), resistance to change (26.45), and lack of technical know-how (23.8%), respectively. However, even if there are challenges like financial resources and resistance to change in trying to optimize the waste

utilization, the respondents implied that they face limited market demand for by-products (55.75), and the researcher also believes that if there is a limited market, it can significantly affect the poultry waste management. The study also showed that insufficient resources (22.1%) and inefficient waste conversion technologies (22.1%) are among the obstacles in optimizing waste disposal. Also, the study depicted that environmental impact (38.3%) is one of the greatest risks to farm sustainability and health and safety concerns (25.1%).

Generally, the high cost of feed, insufficient land/space, delayed delivery of pullets, poor quality feed, scarcity of water, insufficient feed availability in the surrounding areas, challenges in marketing chicken goods, health issues, inability to obtain loans are challenges associated with poultry farming (Nebiyu, 2016). The result of this study also showed that lack of knowledge especially as flock size increases, is a significant challenge. Regarding consumption most farmers feed commercial feeds, including grain, broken rice, rice bran, wheat grain, wheat pollard, and maize. Poultry producers face nutritional challenges in meeting protein and amino acid needs due to their high nutrient requirements.

What do you perceive as the most significant challenge in managing poultry waste on farms?

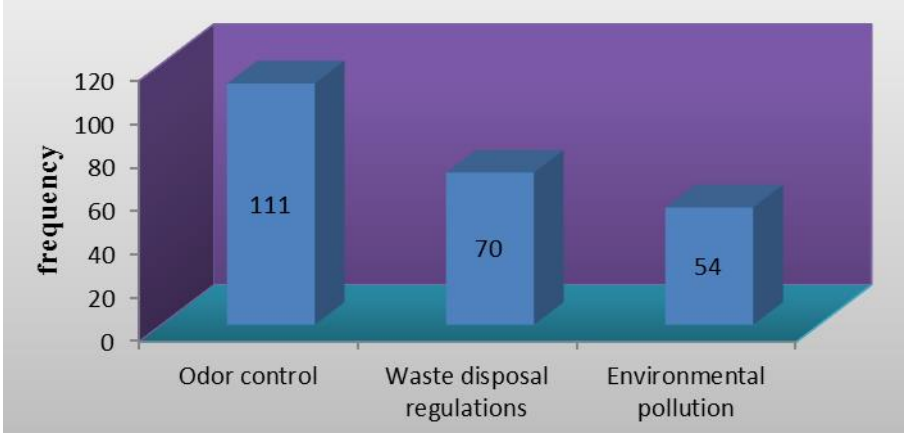


Figure 4.4 challenge in managing poultry waste

Source: own survey of the researcher and SPSS result (2024)

Gbigbi (2020) in the study titled Contributing Factors of the Choice of Poultry Waste Management Practices implied that out of the 133 respondents, 36.8% (49) said there was insufficient information about waste management practices; 24.8% (33) said that managing poultry waste is hampered by bad weather; 9.0% (12) said there was no convenient place to

dump waste; 6.8% (9) said there were no buyers; 9.8% (13) said that there was a lack of litter material; 4.5% (6) said there was a labor shortage; 4.5% (6) said that odor was an issue; and 3.8% (5) mentioned flies and mosquitoes. This suggests that the majority of respondents in the research area experience the primary obstacle of weather conditions. The researcher also has seen that a significant portion of poultry farmers have dealt with waste-related environmental and health issues, so building awareness is one of the key strategies to solve the primary obstacle to sound waste management, which is unconsciousness.

4.5 Determinant factors of waste management practices

In this study, two forms of inferential statistics were employed: regression and correlation analysis. One statistical technique for determining the relationship between one or more independent variables and a dependent variable is regression analysis. Regression analysis is specifically used in this study to evaluate the impact of each independent variable on the dependent variable waste management practice, including housing, waste type, regulatory, technology, farm size and stakeholders. Coefficients indicating the relative significance of each element in the waste management practice are calculated as part of the procedure. This analysis indicates the factors that have the most impact on the practice of waste management disposal. To learn more about it, correlation analysis is performed to ascertain the direction and degree of these correlations between variables.

4.5.1 Correlation analysis of the waste management factors

The correlation coefficient, a number that falls between -1 and +1, is used to describe correlation analysis. An increase in one variable is likely to result in an increase in the other if there is a positive correlation coefficient between the two. In this case, positive correlations imply that housing, waste type, regulatory, technology, farm size and stakeholders are all favorably connected with the waste management practices. Conversely, a negative correlation coefficient denotes a negative relationship and shows that one variable tends to rise in tandem with the other. The links between the independent variables housing, waste type, regulatory, technology, farm size and stakeholders and the dependent variable waste management practices have been well understood by correlation analysis. Based on the absolute values of

the correlation coefficient (r), the strength of these relationships was examined: poor (0.0-0.39), moderate (0.40-0.59), strong (0.6-0.79), and very strong (0.8-1).

From the following table, farm size exhibits a positive and statistically a very strong correlation with waste management practices. However farm size has moderate and positive correlation with waste type (0.416), housing (0.496) and stakeholders (0.317) but has poor correlation with regulatory (0.092). Waste type also has poor and positive correlation with regulatory (0.221), stakeholder (0.143) and housing (0.149) whereas it has moderate and positive correlation with farm size (0.416), technology (0.324) and waste management practices (0.324). regulatory on the other hand low to poor correlation with all of the variables. Stakeholders also has strong correlation with housing (0.676) and waste management practices (0.592) but it has poor correlation with technology (0.281). Technology has also moderate correlation with housing (0.434). Finally waste management practice has strong correlation with farm size (0.579), stakeholders (0.592) and technology (0.519) and strong correlation with housing (0.761). The analysis however showed moderate correlation with waste type and poor correlation with regulatory frameworks.

Table 4.6 correlation table for the waste management factors

		farm_size	waste_type	regulatory	stakeholders	technology	housing	waste_management
farm_size	Pearson Correlation	1	.416**	.092	.317**	.257**	.496**	.579**
	Sig. (2-tailed)		.000	.162	.000	.000	.000	.000
	N	235	235	235	235	235	235	235
waste_type	Pearson Correlation	.416**	1	.221**	.143*	.324**	.149*	.324**
	Sig. (2-tailed)	.000		.001	.028	.000	.022	.000
	N	235	235	235	235	235	235	235
regulatory	Pearson Correlation	.092	.221**	1	.071	.051	.246**	.296**
	Sig. (2-tailed)	.162	.001		.279	.432	.000	.000
	N	235	235	235	235	235	235	235
st a ,	Pearson	.317**	.143*	.071	1	.281**	.676**	.592**

		farm_size	waste_type	regulatory	stakeholders	technology	housing	waste_management
	Correlation							
	Sig. (2-tailed)	.000	.028	.279		.000	.000	.000
	N	235	235	235	235	235	235	235
technology	Pearson Correlation	.257**	.324**	.051	.281**	1	.434**	.519**
	Sig. (2-tailed)	.000	.000	.432	.000		.000	.000
	N	235	235	235	235	235	235	235
housing	Pearson Correlation	.496**	.149*	.246**	.676**	.434**	1	.761**
	Sig. (2-tailed)	.000	.022	.000	.000	.000		.000
	N	235	235	235	235	235	235	235
waste_management	Pearson Correlation	.579**	.324**	.296**	.592**	.519**	.761**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	235	235	235	235	235	235	235
**. Correlation is significant at the 0.01 level (2-tailed).								
*. Correlation is significant at the 0.05 level (2-tailed).								

Source: own survey of the researcher and SPSS result (2024)

4.5.2 Regression analysis of the waste management factors

This section presents the results of the regression analysis; R^2, regression coefficient findings, and interpretation.

4.5.2.1 Assumptions

It is vital to evaluate the possible problem of multicollinearity between the explanatory variables prior to moving on with the multiple regression models (Verbeek, 2008). Multicollinearity, or redundant response data, is the outcome of strong correlations between independent variables in a multiple regression model. It is critical to identify multicollinearity since it can lead to significant fluctuations, high t-values, and potentially misleading results (Hosmer and Lemeshow, 1980). Two popular techniques for assessing multicollinearity

(TOL) are tolerance and the Variance Inflation Factor (VIF). Generally speaking, multicollinearity is indicated by a VIF value larger than 10 or a TOL of less than 0.10.

- **Multicollinearity**

As indicated above in table 4.8, multicollinearity tests were performed in our study, and the findings show that the requirements for multicollinearity are met. To be more precise, TOL values are higher than 0.10 and all VIF values are below 10. These results imply that our model's explanatory variables are not highly linked, which reduces the possibility of multicollinearity.

Table 4.7 multicollinearity

Tolerance	VIF
.625	1.599
.693	1.442
.853	1.172
.531	1.883
.737	1.357
.378	2.649

Source: own survey of the researcher and SPSS result (2024)

- **linearity**

It appears that the assumptions are reasonable for these data since, as the p-plot of the residuals illustrates in the figure 4.5 below, there is no significant variation in the residuals' distribution. This graphic demonstrates the existence of a linear correlation between the independent and dependent variables. This finding implies that the relationship the researcher is attempting to anticipate is linear.

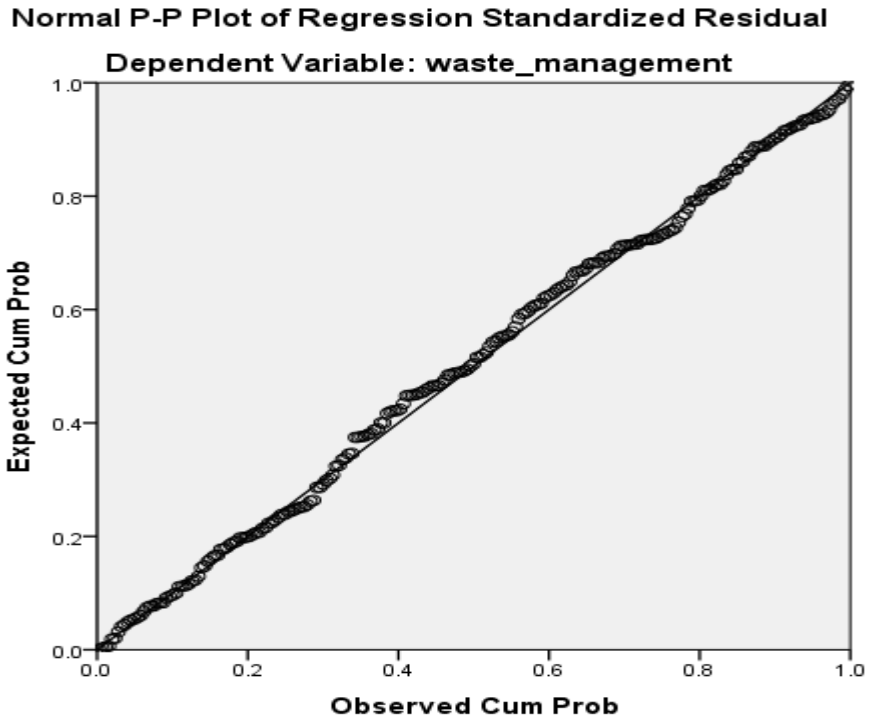


Figure 4.5 normality plot of the dependent variable

Source: own survey of the researcher and SPSS result (2024)

- **Homoscedasticity**

The variance of errors is supposed to be constant under the homoscedasticity assumption. Hetero-scedasticity is the state of non-constant variance or non-homogeneity of variance when the disturbance terms do not have the same variance. Consequently, based on the outcome displayed in the figure 4.6 below, we can be certain that the points are distributed randomly and uniformly throughout the scattered diagram and that there is no indication of a funnel-like shape of points on one side compared to the other, indicating that there was no confirmation of heteroscedasticity in the data.

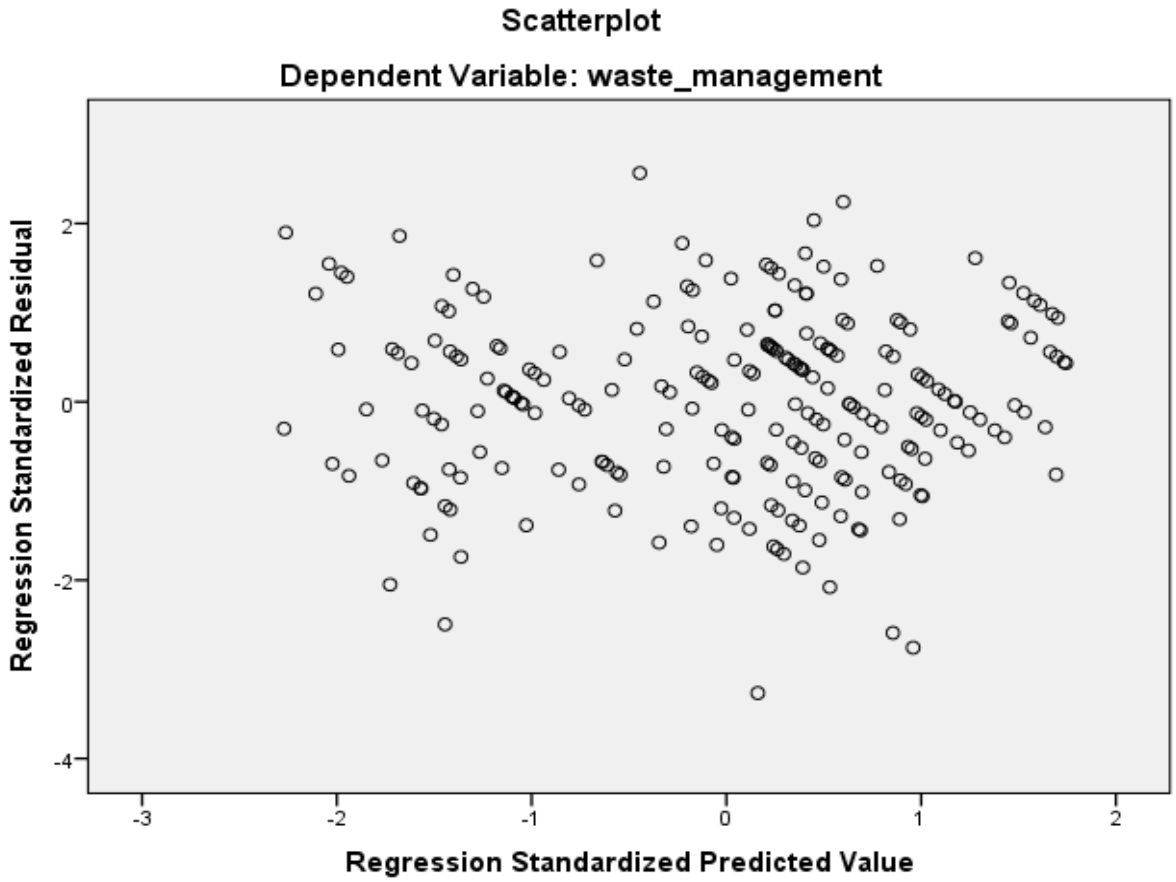


Figure 4.6 Scatter plot of the dependent variable

Source: own survey of the researcher and SPSS result (2024)

4.5.2.2 Model summary

The multiple correlation (R) analysis presented in Table 4.9 above shows how the predictors housing, waste type, regulatory, technology, farm size and stakeholders had a collective high positive associations ($R = 0.849^{a}$) with the dependent variable, waste management practice. housing, waste type, regulatory, technology, farm size and stakeholders are the factors that are taken into consideration, and the coefficient of determination (R^2) shows that these factors account for roughly 72% of the variance in the waste management practices. When sample size and predictor count are taken into account, the adjusted R^2 of 71.3% yields a somewhat more conservative estimate.

Table 4.8 model summary

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.849[a]	.720	.713	.37618
a. Predictors: (Constant), housing, waste_type, regulatory, technology, farm_size, stakeholders				
b. Dependent Variable: waste_management				

Source: own survey of the researcher and SPSS result (2024)

The standard error of the estimate, .37618, shows the average variation between the actual and predicted rates waste management practices. Together, the predictors in this model account for 71.4% of the variance in the waste management practices; the remaining 28.6% cannot be explained, presumably because the study did not account for additional factors. The precise correlations between each predictor and the waste management practice would become clearer with more research into the regression coefficients and their relevance.

4.5.2.3 Analysis of variance

The two-way ANOVA table above (table 4.10) provides significant insights into the predictive power of the regression model for the dependent variable (waste management pracices) in relation to the predictor variables (housing, waste type, regulatory, technology, farm size and stakeholders). The ANOVA table's **regression component** evaluates the regression model's overall significance. In a regression with five degrees of freedom (df = 6), the sum of squares (82.964) shows the overall variability in the waste management pracices that is explained by the predictor variables. The F-ratio (13.827) is produced by comparing the mean square for regression to the mean square for residuals. The statistical analysis reveals that this F-ratio is statistically significant (Sig. =.000[b]). This indicates that the predictor variables have a considerable impact on waste management practices.The amount of variability in waste management practices that cannot be explained after predictor variables have been taken into account is measured by the **residual component** of the ANOVA table. With 228 degrees of freedom (df = 228), the unexplained variance is reflected in the residuals sum of squares (32.264).

Table 4.9 analysis of variance

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	82.964	6	13.827	97.713	.000[b]
	Residual	32.264	228	.142		
	Total	115.228	234			
a. Dependent Variable: waste_management						
b. Predictors: (Constant), housing, waste_type, regulatory, technology, farm_size, stakeholders						

Source: SPSS output and own survey of the researcher (2024)

The average degree of unexplained variability in the waste management practice is indicated by the residuals mean square (0.142). Prior to regression modeling, the overall variability in waste management practices was captured by the total component of the ANOVA table. The overall varaition in the waste management practices is represented by the sum of squares for the total (115.228) with 234 degrees of freedom (df = 234). The regression model, which considers predictor factors, explains the heterogeneity in the waste management methods significantly, according to the p-value of 0.000 for the regression component. It is significant to remember that the ANOVA table does not provide the relative importance or input of each predictor variable, which can be seen using the following regression coefficeients analysis.

4.5.2.4 Result of analyses

Regression analysis between the independent variables and the dependent variable was performed after converting, computing, and labeling the means of the responses for each variable step-by-step. We can examine the effects of each predictor variable housing, waste type, regulations, technology, farm size, and stakeholders on the dependent variable, waste management methods, using the unstandardized coefficients in the coefficients table. The regression equation can be stated as follows using the unstandardized coefficients from table 4.11 above. The unstandardized coefficient for farmsize at significance level of 0.00 is 0.208. This indicates that, on average, a one unit increase in farmsize is associated with a 0.208 unit increase in waste management practices, holding other variables constant. The coefficient for waste-type at p-value of 0.00 is 0.135 suggesting that, on average, a one unit increase in waste

type is associated with a 0.135 unit increase in waste management practices, holding other variables constant.

Table 4.10 regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.612	.276		-2.220	.027
	farm_size	.208	.045	.208	4.683	.000
	waste_type	.135	.043	.133	3.162	.002
	regulatory	.252	.051	.189	4.970	.000
	stakeholders	.121	.033	.177	3.672	.000
	technology	.185	.039	.195	4.776	.000
	housing	.244	.036	.388	6.802	.000

Source: SPSS output and own survey of the researcher (2024)

The coefficient for regulatory framework is 0.252 suggesting that, on average keeping other variables constant; one-unit increase in regulatory framework is associated with a 0.252 unit increase in waste management practices. The coefficient for stakeholders is 0.121 and with p-value of 0.000 it is also significant at p-value of 0.01 and technology with coefficient of 0.185 and p-value of 0.000 it is significant at p-value of 0.01, and on average keeping other variables constant, one unit increase in stakeholders increases waste management practices with 0.121. With the same stated conditions technology (0.185) is also significant at p-value of 0.01, and on average; a one unit increase in technology is associated with a 0.185 unit increase in waste management practices. Finally one unit increase in housing increases the waste management practices with 0.244. In summary, based on the unstandardized coefficients, it appears perceived housing, waste type, regulations, technology, farm size, and stakeholders on the dependent variable, waste management methods have significant effect on waste management practices.t. These findings suggest that improving housing, waste type, regulations, technology, farm size, and stakeholders of the poultry farm are effective strategies for increasing waste management practices.

CHAPTER FIVE

5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Based on the research objective of assessing the main challenges, benefits and factors associated with waste management practices; the study summarizes the following main points.

5.1 Summary

The majority of respondents own large flocks, impacting waste management practices and benefits. Layer-type flocks are the most reared type of poultry, with 65% of the popultry producing eggs as a key function. 82% of respondents rely on private farms for chicken rearing, with 82% believing there are replacements. Day-old chicks are in chronic shortage, leading many farmers to abandon raising chickens. Regarding the association of the training opportunities for poultry farmers, it was found that trainings are crucial for production and waste management. Lack of knowledge about challenges associated with raising chickens, especially as flock size increases, is a significant challenge. Regarding consumption, most farmers feed commercial feeds, including grain, broken rice, rice bran, wheat grain, wheat pollard, and maize. Poultry producers face nutritional challenges in meeting protein and amino acid needs due to their high nutrient requirements. To reduce excrement, adding amino acid supplements can help reduce crude protein intake. Excessive feed consumption may result in nitrogen intake and greenhouse gas emissions. Retailers and factories are the main sources of feed for poultry, with high feed costs being a major obstacle for small-scale urban poultry growers.

The researcher assessed the relationship between farm flock size and waste disposal practices. The majority of waste is manure (65.1%) and manure and litter (22.1%), which is a mixture of poultry excreta, spilled feed, feathers, and material used as bedding in poultry operations. Selling or spreading waste is the main method, as it can be sold immediately or later for animal feed. The researcher emphasizes the harmful and unsafe disposal of raw chicken manure without additional treatment, which can cause environmental issues like odors, heavy metal leaching, methane emissions, eutrophication of streams, nutritional imbalances,

phytotoxicity, and the spread of weeds and pathogens. The study also found a significant relation between the amounts of waste generated daily and the size of the farm.

The majority of respondents used hand/carried transportation for waste disposal, and the protection team visited farms less frequently (53.6%). Poultry farming aims to ensure food security, maximize productivity, increase income, and recycle resources while reducing environmental damage. Training in poultry farming leads to economic gains, environmental preservation, and social responsibility; hence, training is highly associated with benefits obtained from waste management practices. Training in poultry farming reduces operating costs, increases revenue, and improves operational efficiency. Waste management practices generate additional income, increase profitability, enhance sanitation, and reduce health risks. Moreover Proper waste disposal is essential for compost, fertilizer, animal feed, and conversion into bioenergy. Factors influencing poultry farming success include locally adapted birds, a conducive environment, and high-quality feed.

Poultry farmers face significant challenges in waste management and disposal practices, including handling and storage, disease control, and biosecurity risk. Biosecurity risks include pests, diseases, weeds, and contaminants impacting the economy, environment, or community. Strict measures like restricting access, maintaining sanitation, and checking flock health are necessary to prevent disease spread. Financial resources, resistance to change, and technical know-how are also significant obstacles. Limited market demand for by-products also affects waste management. Insufficient resources and inefficient waste conversion technologies are also obstacles. Environmental impact is a major risk to farm sustainability and health and safety. Most respondents experience insufficient information about waste management practices, poor weather, lack of convenient waste disposal locations, labor shortages, odor issues, and flies and mosquitoes. The study found a strong correlation between waste management practices, farm size, stakeholders, technology, and housing, but moderate correlations were found with waste type and poor correlation with regulatory frameworks. Moreover, the analysis reveals that predictors housing, waste type, regulatory, technology, farm size, and stakeholders have a strong positive association with waste management practice.

The adjusted R^2 is 71.3%, with an average variation of 0.37618, indicating a conservative estimate. The study examined the effects of various predictor variables on waste management practices in poultry farms. The unstandardized coefficients show that increasing farm size, waste type, regulatory framework, stakeholders, technology, and housing significantly affect waste management practices. The results suggest that improving housing, waste type, regulations, technology, farm size, and stakeholders can be effective strategies for increasing waste management practices. The regression analysis also showed that one unit increase in farm size, waste type, regulatory framework, stakeholders, technology, and housing increases waste management practices with 0.208, 0.135, 0.252, 0.121, 0.185, and 0.244, respectively.

5.2 **Conclusions**

Mos of the farms in thi study own large flocks, becuause the size of the farm is directly related to the the waste amount. The result of analysis implied that training opportunities for poultry farmers are crucial for production and waste management practices. Lack of knowledge about challenges associated with raising chickens, especially as flock size increases, is a significant challenge. The relationship between farm flock size and waste disposal practices is significant and, because increase in farm size increases the amount of waste. The study also found a significant relation between the amount of waste generated daily and the size of the farm. The majority of respondents also implied that as the size of the farm increases the transportation for waste disposal increases but selling or spreading waste is the main method of disposing, as it can be sold immediately or later for animal feed. The researcher emphasizes the harmful and unsafe disposal of raw chicken manure without additional treatment, which can cause environmental issues like odors, heavy metal leaching, methane emissions, eutrophication of streams, nutritional imbalances, phytotoxicity, and the spread of weeds and pathogens. The study also found a significant relation between the amounts of waste generated daily and the size of the farm.

Poultry farming has relation with traing of the poultry farmers and the study showed that training in poultry farming leads to economic gains, environmental preservation, and social responsibility, hence training is highly associated with benefits obtained from waste mansagement practices. Training in poultry farming reduces operating costs, increases revenue, and improves operational efficiency. Waste management techniques improve

sanitation, lower health hazards, boost profitability, and create additional revenue. Additionally Compost, fertilizer, animal feed, and bioenergy conversion all depend on proper waste disposal. Successful chicken farming depends on a few key elements: high-quality feed, a suitable habitat, and birds that get acclimated to their new home.

With respect to challenges, poultry farmers face significant challenges in waste management and disposal practices, including handling and storage, disease control, and biosecurity risk. To reduce the spread of disease, measures like limiting access, keeping the environment clean, and monitoring flock health are required. Barriers of technical know-how, financial resources, and opposition to change and insufficient market demand for byproducts has an impact on waste management as well, so increasing awareness is essential to overcoming unconsciousness and enhancing waste disposal procedures.

Waste management techniques, farm size, stakeholders, technology, and housing were shown to be strongly correlated in the study. Waste type and regulatory frameworks were found to be moderately and poorly correlated, respectively. Waste management techniques are greatly impacted by increasing farm size, waste kind, regulatory framework, stakeholders, technology, and housing, as seen by the unstandardized coefficients.

5.3 **Recommendations**

The study based on the main fndings and conclusion of the study recommends the following set of points:

- ✓ Training in areas like disease control, feed ingredient identification, climatic stress management, and backyard poultry bird management can help make poultry farming financially feasible in the peripheral areas.
- ✓ Regulating the size of farms of the poultry farmers and the amount and ways to use the disposal method
- ✓ Giving sufficient training to the poultry farmers about how to dispose waste and effectively utilize wastes
- ✓ Improving biosecurity safety by giving the necessary training regarding the impact of the wastes on the nearby by life

- ✓ Improving regulatory frameworks will improve the waste management practices by limiting access, keeping the environment clean, and monitoring flock health are required.
- ✓ Building awareness is crucial to overcome unconsciousness and improve waste management practices.
- ✓ Improving proper dieting is crucial for productivity, bird welfare, and sustainability.
- ✓ Improving the financial resources, creating awerness to reduce resistance to change, and increasing technical know-how of the farmers are also significantly important in reducing the obstacles of weaste management practices.

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COLLEGE OF DEVELOPMENT STUDIES

CENTER FOR ENVIRONMENT AND DEVELOPMENT

Consent:

Dear respondent, Greetings!

My name is Zelalem Genene a post graduate candidate at Addis Ababa university Center for Environment and Development, I am conducting a research on Benefits and challenges of micro and large-scale poultry farm waste management: evidence from poultry farms in Bishoftu area".

The main purpose of this questionnaire is to collect necessary data for the study on the above mentioned title and will be only for academic purpose and your response will be kept confidential. As a result the outcome of this study will depend upon your response. Therefore, I would like to request you to fill the questionnaire as per the instruction.

Note that:

- Do not write your Name.
- You are kindly request to offer the real and accurate information.
- You can also add, Amharic Language.
- Please, Use thick mark "√" in the box, or circle the letter and write your comment on the space provided.

Thank you in Advance

Part I: Demographic profile of the respondent

1. Sex: ☐ Male ☐ Female

2. Age: below 25 ☐ ☐ 25-35 ☐ 36-45 ☐ above 45

3. Educational back ground (completed):

Not educated ☐ 1st cycle ☐ Higher education ☐

2nd cycle ☐ High school complete ☐ others ☐ Write an read ☐

4. Years of experience in poultry:

☐ Less than 3 years ☐ 6-10 years

☐ 3-5 years ☐ above 10 years

Part II: Questions related with your activities

A. Firm capacity:

1) Farm flock size A. <250 B. 250–1000 C. >1000 D. <10,000

2) Which age group of poultry you rear

1. Starter (0-8 weeks) 2. Grower (9-20 weeks) 3. Layer 4. Broiler 5. Breeder

3) Source of chicken

1. Privet farm 2. Government farm

4) Is there chicken replacement in the farm?

1. Yes 2. No

5) Foundation of replacement stock

1. Purchase 2. Inherited 3. Hatched 4. Other__

6) have you get any traning before starting this job 1, Yes 2, No

B. Consumption

1) Do you feed commercial feed (concentrates)? 1.Yes 2.No

2)If yes what type?

1. Commercial feeds only 2.On farm produced feeds only 3. Both Commercial plus farm produced 4.House hold wastes (kitchen wastes) 5. Others (specify)_____

3) Where is your feed source ?

1. Factories 2. Retailers 3. Commercial farms

4. Government farms 5. Feed mills 6. Others specify

C. Waste disposal (Multiple responses are possible)

1) What are the common wastes in your farm?

1. Litter/manure 2.Manure 3. Dead birds 4. Others, specify_____

2) What type of waste disposal you use ?

1. Burning, 2. Burying 3. Spread on the surface of the earth 4.Selling or give it away

5. Compositing for own agricultural purpose, if there is any 6. Other uses

3) If you are selling or give it away, what do you think is the end use _____

4) How frequently you dispose the manure and other wastes?

1. Every day 2. 2-3 times a week 3. Every week 4. Every month 5. Others, specify_____

5) Number of bags after clearance of poultry houses

1. 1-5 2. 6-10 3. 11-15 4. 16-20 5. 21 and above

6) What are Complaints of neighbor's about poultry farms in the area ?

1. dour 2. Noise from birds 3. Pollution of nearby waters 4.Other

7) How do you transport the manure and or litter of your farm?

1. Using hand 2.Wheelbarrow 3. Vehicle 4. Others, specify_____

8). How often does invironmental protection team vist your farm ?

1. once a week 2. Once a month 3. Once in 6 months 4. Never

D. Benefits of waste management (multiple responses are possible)

1) Which benefit do you consider most significant from effective waste management practices?

1. Economic gains 2. Environmental preservation 3. Social responsibility

4. Health and safety improvements

2) What is the expected primary benefit of implementing waste management practices in your poultry farm?

1. Additional Income 2. Increased profitability

3. Enhanced sanitation and reduce health risks 4. Other , specify _____

3) How do waste management practices impact the productivity aspects of your poultry farm?

1. Reduce operating costs 2. Increase revenue 3.Improve operational efficiency

4) For what purpose by-product of poultry production used in your farm ?

1. Composted and fertilizer for crops 2.It can be recovered for value added products

3. Feed ingredient for animals, such as fish, pigs, and cattle,

4.It can be converted into bioenergy, such as biogas, bioethanol, and biodiesel

E. Questions related to Challenges

1) Which aspect of poultry waste management presents the greatest difficulty in your opinion?

1. Handling and storage 2. Biosecurity risks 3. Disease control

4. Other, please specify _____

2) Which factor poses the most significant challenge in implementing effective waste management strategies on poultry farms?

1. Lack of financial resources 2. Limited technical know-how

3. Resistance to change 4. Other (please specify)

3) In your experience, what is the most common obstacle faced when trying to optimize poultry waste utilization?

1. Limited market demand for by-products 2. Inefficient waste conversion technologies

3. Resource constraints 4.Other,specify _____

4) Which area of poultry waste management poses the greatest risk to farm sustainability ?

1. Environmental impact 2. Health and safety concerns 3. Economic viability

4. Other, specify _____

5) What do you perceive as the most significant challenge in managing poultry waste on farms?

1. Odor control 2. Waste disposal regulations

3. Environmental pollution 4. Other, specify_____

Part III: Closed Ended Questionnaire

INSTRUCTIONS I: The following table contains questionnaires about benefits and challenges of micro and large-scale poultry farm waste management. Give your own opinion

and feeling about each item. Please mark (√) your response to each statement according to the following five-point scale in terms of your own agreement and disagreement of the statement.

5= Strongly Agree 4= Agree 3= Neutral 2= Disagree 1= Strongly Disagree

1. **Effects of farm size on poultry**

Items	**1**	**2**	**3**	**4**	**5**
We have more complex waste management infrastructure which is compatible to the large farm size					
There are compost plants and lagoons to dispose waste					
There is a use of manure as fertilizer or its disposal in landfills					
We struggle with waste disposal due to limited farm size					
Our poultry farm has a lower feed consumption he size of the storage area will not depend on the amount of litter produced					

2. **Effects of waste type and amount**

Items	**1**	**2**	**3**	**4**	**5**
Excrement is adequately handled to prevent harm to humans and the environment					
Feces, bedding materials, leftover feed, and feathers are well handled					
There is direct use of poultry manure					
There is spreading of manure next to streams, waterways, and lakes					
There is illegal waste dumped along farm sides, in the woods, in wetlands and streams					

Recycling waste materials from poultry farming operations benefits the local ecosystem and reduces the carbon footprint					

3. Effects of regulatory frameworks

Items	**1**	**2**	**3**	**4**	**5**
There is strategy design and implementation for proper waste management					
There are rules and specifications in handling wastes in poultry farm					
There is lack of funding and dedication from regulatory bodies					
There are trash disposal costs, recycling regulations, and collection schedules					
As the size of farm increases the government policy support for urban poultry farmer increases					
Implementing effective waste management strategies has increased revenue generation or profit margins on my farm.					
There are waste storage and handling standards					

4. Effects of stake holders

Items	**1**	**2**	**3**	**4**	**5**
There is stakeholder involvement and participatory planning to handle waste					
There is corporate social responsibility in handling wastes of poultry					
Municipalities, NGOs, households, and private contractors are integrated in collecting and managing wastes					
There is a defined roles and influences of stake holders in					

shaping poultry waste management practices and outcomes					
There is commercial, health, social, and environmental stakes of stakeholders					
The stakeholders are not aware of the impact of their power and how waste cold be governed					

5. <u>Effects of technology</u>

Items	**1**	**2**	**3**	**4**	**5**
Wastes are recycled and repurposed to create value-added products					
There are bio-composites and wood adhesives technologies to convert manures					
There is a technology to utilize the wastes for organic fertilizer					
There is a practice to use the waste as energy source for the production of biodiesel					
There is technological advancement in reducing formation of pollutants					
There an anaerobic digestion method of economical waste management					
There is a trend of waste-to-wealth technologies thinking					

6. <u>Questions related to housing system</u>

housing system contribute to improving air quality and ventilation for the birds.					
housing system help in minimizing odor and ammonia levels, creating a more comfortable living environment					
Investing in waste management infrastructure within the poultry housing system leads to improved efficiency in waste handling and disposal processes.					
The proper management of wastes within the housing					

system contributes to a more sustainable and environmentally friendly farming operation.					
The implementation of waste management practices in the poultry housing positively impacts overall productivity and performance of the birds					

7. Waste management practices

Items	**1**	**2**	**3**	**4**	**5**
We avoid direct use of poultry manure to reduce poor air and soil quality					
Our farm is highly aware of environmental deterioration					
There is no knowledge gap of waste management					
Responsible waste management practices reduce pollution of air, soil and water					
There is no land for composting to manage wastes					
Waste management practices contribute to cost savings and operational efficiency on my poultry farm					