THE KNOWLEDGE OF THE PERIL OF ORGANIC WASTE AMONG POULTRY FARMERS IN EGOR L.G.A OF EDO STATE

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NOVEMBER, 2025

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A PROJECT SUBMITTED TO THE DEPARTMENT OF HEALTH, SAFETY, AND ENVIRONMENTAL EDUCATION. IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE (B.Sc) ENVIRONMENTAL EDUCATION OF THE UNIVERSITY OF BENIN, BENIN CITY, EDO STATE NIGERIA.

NOVEMBER, 2025

CERTIFICATION

We the undersigned certify that this research work was carried out by Ugochinyere Julia NWABUKO (Environmental Education) of the department of health, safety and environmental education (H.S.E). Faculty of Education, University of Benin, Benin City is adequate in the scope and quality in partial fulfilment for the award of Bachelors of Science (education)

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DEDICATION

This research work is dedicated to God almighty for his protection and grace throughout this journey and it is also, dedicated to myself for being resilient.

ACKNOWLEDGEMENT

My gratitude goes to God who showed me mercy and gave me the strength to complete this journey. I want to also acknowledge my project supervisor Dr. Mrs. Don for her guidance and support throughout my project period.

My immeasurable gratitude goes to my wonderful parents Mr. and Mrs. Nwabuko for their love through and through, and for always being there for me, God bless you.

To my siblings that I call to celebrate great moments and cry during down moment, Nkechinyere, Nnaemeka, and Somtochukwu, thank you guys for all you do and I love you all.

To my aunties and uncles, thank you all for the support guys. I am grateful.

To my friends Francisca, Wahab, Esther, Okonkwo, Princess, Jaysmart, Ewata, Freda, Deborah, Andy, Ezinne and to my room mates who became sisters, Abigail, Annah, Christabel, Ada, Faustina, Chekwube, Faith, Peace, and Iyen, you guys made school endurable and enjoyable, hope to see you guys better in the future.

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ABSTRACT

This study examined the knowledge, perception, and factors influencing organic waste management practices among poultry farmers in Egor Local Government Area, Benin City, Edo State. The primary objective was to assess farmers' awareness of the environmental, health, and economic risks associated with poor waste management, as well as to identify the factors shaping their waste handling behaviors. The study adopted a descriptive survey research design, with data collected from 38 poultry farmers using a structured questionnaire. The instrument was validated by experts and tested for reliability using the test-retest method. Data were analyzed using descriptive statistics, including frequency counts, percentages, means, and standard deviations. Findings revealed that poultry farmers generally possess a high level of knowledge regarding the environmental and health risks of improper waste management, but their awareness of economic benefits from sustainable practices, such as composting and biogas production, was moderate. Labor availability, farm size, government policies, and public awareness were identified as key factors influencing waste management practices. The study also found that while farmers demonstrate positive perceptions toward mitigation measures, limited government support and low public awareness hinder the full adoption of sustainable

practices. Based on these findings, the study recommends targeted training programs, policy enforcement, and community sensitization initiatives to enhance sustainable poultry waste management. The study contributes to environmental management literature by highlighting the critical role of farmers' knowledge, perceptions, and socio-environmental factors in promoting sustainable agricultural practices.

Keywords: *Poultry farmers, organic waste management, environmental risk, perception, composting, sustainable practices*

CHAPTER ONE

INTRODUCTION

Background of Study

The poultry industry is a significant contributor to the global food supply, providing a source of protein for millions of people worldwide. There is a high demands for poultry products especially meat and eggs, driven by population growth and changing consumption patterns. This makes poultry farming a highly productive business, with high income potentials. (CBN, 2019). The poultry industry produces large amounts of waste that include solid waste and wastewater. The solid waste consists of bedding material, excreta (manure), feed, feathers, hatchery waste, shells, sludge, abattoir waste (offals, blood, feathers and condemned carcasses) and mortality (Moreki & Chiripasi,2011). The wastewater results from washing and disinfection of chicken houses and abattoirs (Moreki & Chiripasi, 2011). Increasing poultry densities on farms have continued to exacerbate manure management challenges, contributing significantly to water, air, and soil pollution (Nahm, 2012). Livestock manure can be either a valuable resource or an environmental pollutant. Generally, manure refers to urine and feaces produced by animals, and it contains organic matter and nutrients, that has fertilizer value when applied on the land and used by crops. Proper handling and management of manure can supplement or even replace the use of commercial fertilizers, offering both economic and economic and environmental benefits (Sharply et al., 2012). On the other hand, poultry litter is a mixture of poultry droppings and bedding materials, such as wood shavings and rice or peanut hulls). In Nigeria, like any developing nation, there is a rapid expansion of small and medium scale poultry farms with the attendant effect of huge waste generation. The magnitude of this generated poultry waste has given rise to improper disposal which include over application to land, improper timing of

application thereby creating pollution problem to soil water and air environment (Adewumi et al., 2011). There are several ways of disposing poultry waste which include burial, rendering, incineration, compositing, feed for livestock, fertilizer or source of energy, (Moreki & Keal kitse, 2013). Other waste disposal methods include conversion of poultry waste to energy and use of poultry waste for treatment of heavy metal contaminated water (Moreki & Chiripasi, 2011). Modern management methods for poultry waste like re-feeding to animals, green disposal, gasification and biogas production have not gained prominence in Nigeria probably due to level of awareness, lack of strict regulation from the government. In Nigeria, it is still common to observe large accumulation of poultry waste around farms, with the frequent discharge of waste into water bodies through open canals remaining a widespread practice (Auta et al., 2012). These methods are not only unsightly, it also creates a lot of environmental nuisance and surface and groundwater pollution (Akinbile, 2012). This work was conducted to identify the waste management methods used in poultry farms in Makurdi metropolis, Benue State, the problems encountered during waste disposal and its associated effects on the environment and human health.

The poultry industry in Edo State faces significant challenges, leading to a potential surplus of poultry waste and environmental concerns. While the industry is struggling due to rising costs and other factors, large-scale poultry farms continue to produce substantial amounts of waste, including manure and other organic materials. The lack of convenient dumping spaces and inadequate information on proper waste management practices are major hurdles in addressing this issue (Okonkwo et al., 2015). Residents living near poultry farms often complain about the offensive odors emanating from waste, highlighting the need for better waste management strategies (Umar et al., 2019). Studies have shown that poultry waste management

practices in Edo state are often inadequate, leading to environmental pollution and health risks (Ojolo et al., 2012; Adeyemo et al., 2018). Therefore it is important to prioritize proper waste management practices, such as recycling and composting, to minimize the environmental impact of poultry waste in the state.

Recommendations for Waste Management:

Several studies recommend that the Edo State government take steps to address the issue of poultry waste, including:

- **Proper funding and resources:** The government needs to allocate sufficient funding and resources to waste management agencies to ensure effective collection and disposal.
- **Promoting recycling and reuse:** Exploring opportunities for recycling and reusing poultry waste, such as converting it into manure, can help reduce its environmental impact.
- **Improved waste collection and disposal systems:** Developing efficient waste collection and disposal systems can help prevent pollution.
- **Strict regulations:** Implementing regulations to ensure that poultry farms are located at a safe distance from residential areas and to prevent pollution can also be beneficial.
- **Education and awareness:** Creating awareness to poultry farmers on the importance of proper poultry waste disposal, can help reduce pollution in the

environment. Also educating farmers would also help improve poultry waste management.

Statement of Problem

The poultry industry plays a vital role in the global food supply, providing a source of protein for millions of people worldwide. However, this industry also generates substantial amounts of organic waste, including manure, feathers, and other biological materials. If not managed properly, this waste poses serious environmental, economic and health risks.

The environmental problems associated with poultry waste are multifaceted. For instance, improper disposal of poultry waste can lead to water pollution, contaminating water sources and harming aquatic life. Additionally, poultry waste can cause soil degradation, reducing crop yields and fertility. Furthermore, poultry farms can contribute to air pollution, emitting gases such as ammonia and particulate matter, which can negatively impact human health and contribute to climate change. In terms of health problems, poultry waste can harbor diseases like avian influenza and salmonella, which can be transmitted to human and other animals. Improper waste management can also attract disease carrying vectors like flies and rodents spreading disease to humans and other animals. Moreover, exposure to poultry waste can cause gastrointestinal illness, including diarrhea, vomiting, and stomach cramps.

The economic problems associated with poultry waste are equally significant. Poor waste management can lead to reduced productivity, increased mortality rates, and decreased egg production. Non-compliance with waste management regulations can result in fines, penalties, and reputational damage. The poultry industry can incur significant economic losses due to improper waste management, including costs associated with disease outbreaks, environmental

cleanup, and regulatory compliance. Despite the importance of proper waste management, many poultry farmers lack the knowledge and skills to handle organic waste effectively. Therefore, there is a need to investigate the level of knowledge among poultry farmers about the peril of organic waste and to identify the factors influencing their waste management practices. By addressing these issues, the poultry industry can mitigate the health, environment and economic risks associated with organic waste and ensure a more sustainable future.

Research Questions

1. What is the level of awareness among poultry farmers in Ovia North-East L.G.A on the health, environment and economic impacts of organic waste?
2. What are the key factors that determine poultry farmers waste management practices in Ovia North-East L.G.A, and how does it influence their decisionmaking process?
3. How do poultry farmers in Ovia North-East perceive the effects of organic waste on the environment, human health, and the poultry industry, and what measures do they take to mitigate it?
4. What is the extent of poultry farmers' knowledge regarding the environmental, health, and economic risks associated with organic waste in Ovia North-East L.G.A?

Purpose of the Study

The poultry industry is a significant contributor to the global food supply, but it also generates substantial amounts of organic waste. If not managed effectively, this waste can pose serious health, environmental, and economic risks. Despite the importance of proper waste utilization, many poultry farmers lack the knowledge and skills to handle organic waste

effectively. The lack of knowledge among poultry farmers about the peril of organic waste can lead to:

1. **Environmental Pollution:** Organic waste from poultry farms can contaminate soil, water sources and air, harming ecosystems and human health which could lead to death of animals, plants and humans.
2. **Disease Transmission:** Organic waste can harbor diseases, such as avian influenza and salmonella, which can be transmitted from animals to humans or from water bodies that have been contaminated to humans and animals.
3. **Economic Losses:** Poor waste management can result in decline in egg production, productivity reduction, and increased mortality rates, leading to economic losses for poultry farmers.
4. **Water Pollution:** Poultry waste can contaminate water sources, harming aquatic life and human health.

Despite the importance of proper waste management, many poultry farmers lack the knowledge and skills to handle organic waste properly. There is a need to investigate the knowledge among poultry farmers in Ovia North-East L.G.A, about the perils of organic waste and to specify the factors influencing their waste management practices.

Objectives

- To assess the level of knowledge among poultry farmers about the perils of organic waste.
- To identify the factors influencing poultry farmers' waste management practices.

- To examine the effects of organic waste on the environment, human health, and the poultry industry.
- Raising awareness and educating farmers and the stakeholders on the peril of organic waste.
- Encourage and promote sustainable environmental friendly behaviours and practices.

Significance of Study

The findings of this study would be of great help to improving knowledge and management practices of health, environment and economic impacts of organic waste in Ovia-northeast, local government. It would generate information that would add to the existing body of literature in the field of Knowledge of The Peril of Organic Waste Among Poultry Farmers and related issues and who would be a reference for those who want to carry out a study of similar nature in this field. This study would help poultry farmers without knowledge of the peril of organic waste understand the implications and effect of organic waste to the health and environment. The generated data on the knowledge on the peril of organic waste among poultry farmers found to be negative, would enable environmental educators, health educators, NGO'S and public health analyst to develop appropriate policies and strategies to educate farmers on the impact of organic waste to the environment and health of individuals.

Overall, the significance of this study lies in its potential to inform policy, make decisions related to waste management in the poultry industry in Ovia-northeast, local government, by addressing the knowledge of the peril of organic waste among poultry farmers.

Scope/Delamination of Study

This study is restricted to Ovia-northeast LGA, Edo state and only focused on responses from poultry farmers in that environs as unit of analysis.

Definitions of Terms

1. **Peril:** This means serious and immediate danger.
2. **Knowledge:** This means facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject.
3. **Organic Waste:** This refers to biodegradable materials originating from living organisms, like plants and animals, and includes items like food scraps, yard waste, and some types of paper and wood.
4. **Poultry Farmer:** This is someone who raises domestic birds, like chickens, turkeys, ducks, and geese, for their meat, eggs, or feathers. Poultry farming is the practice of raising these birds, either on a small scale or commercially.
5. **Feaces:** This refers to the solid waste material discharged from the body through the anus, also known as excrement or stool. It's the undigested remains of food, mixed with bacteria, mucus, and other waste products.
6. **Waste water:** This can be referred to as the water that has been affected by domestic, industrial and commercial use. It can be the water generated affect the use of fresh water.
7. **Aquatic life:** This refers to the plants and animals that live in water, whether it's freshwater, saltwater, or brackish water. This includes a wide variety of organisms, from fish and marine mammals to plants and microorganisms, that have adapted to live in aquatic environments.

8. **Human health**: This is a state of complete well-being, encompassing physical, mental, and social aspects, not just the absence of disease. It involves the ability to function well in all areas of life and maximize an individual's potential. This dynamic process can fluctuate throughout the day, with wellness being a lifelong commitment to enhancing well-being
9. **Environmental health:** This is a state of complete well-being, encompassing physical, mental, and social aspects, not just the absence of disease. It involves the ability to function well in all areas of life and maximize an individual's potential.
10. **Environmental educators:** Are individuals who teach and educate others about the environment, environmental issues, and sustainable practices.
11. **Health educators**: a professional who provides information and guidance to individuals and communities to promote healthy behaviors and lifestyles, ultimately improving their overall health and well-being
12. **Public health analyst**: analyzes data to understand health trends, identify health disparities, and inform public health policies and programs

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter examines existing literature on poultry waste management, focusing on the awareness and practices of poultry farmers in Nigeria, particularly in regions like Ovia North-East. This would be discussed under the following heading:

- Concept of Organic Waste
- Concept of Poultry Waste
- Nature and Risks of Poultry Waste
- Knowledge of Poultry Waste Hazards
- Poultry Waste Management Practices
- Effect of Organic Waste on Health and Environment
- Knowledge of Poultry Farmers on Management of Organic Waste
- Summary of Reviewed Literature.

Concept of Organic Waste

Organic waste refers to biodegradable materials like leftover food, plant matter, and other natural materials that can decomposed by micro-organisms, such as Fungi and bacteria. Although these materials break down naturally, when they are not handled properly, they can cause serious problems. These problems include pollution of the air and water, release of harmful gases like methane, and the spread of diseases through pests and bacteria. One of the key benefits of organic waste is its ability to be composted. Through composting, organic waste can be transformed into nutrient rich soil that enhance soil fertility and structure. This process not only

reduces the amount of waste sent to landfills but also creates valuable resources for agriculture. In addition to composting, organic waste can be used to produce biogas through anaerobic digestion. US EPA (Environmental Protection Agency) 2025 explains that anaerobic digestion followed by composting can reduce the mass and volume of organic waste by around 60% and 75%, respectively, while generating biogas as a renewable energy source and producing a nutrient-rich digestate that improves soil quality. When improperly managed, organic waste in landfills can lead to methane production, a potent greenhouse gas. In Benin City, you can consider these options for managing organic waste:

Local composting initiatives:

Check if there are any composting programs or community gardens in your area.

Household composting:

Composting your own food and yard waste at home is a simple and effective way to reduce waste.

Biogas is a renewable energy source that can be used for heating, cooking, and electricity generation. This process not only provides a sustainable energy solution but also reduces greenhouse gas emissions by capturing methane that would otherwise be released into the atmosphere. Moreover, managing organic waste properly is crucial for environmental and public health. When organic waste is disposed in landfills without proper management, it can decompose and produce methane, a potent greenhouse gas. It can also attract pests and create unsanitary conditions. By implementing effective waste management strategies, such as composting and anaerobic digestion, we can mitigate these issues and reduce the environmental waste disposal. Organic waste improves soil structure, increase water retention, and support

beneficial micro-organisms, leading to healthier plants and more resilient ecosystem. It also fosters community engagement, education, and awareness about sustainable practices and environmental stewardship. However, knowledge alone may not always lead to proper behavior, Other factors may affect how people act. These include their level of education, how much access they have to environmental information, cultural beliefs about waste, and support from government or organizations. For example, someone may know that dumping food waste in the open is harmful, but without compost bins or proper disposal systems, they may have no choice but to continue doing so.

A study conducted in Edo State revealed that only 12.3% of poultry farms were located at least 500 meters away from residential areas, as recommended by environmental guidelines. This proximity increases the risk of environmental hazards such as bad odors and potential health issues for both farmers and neighboring communities. Despite these concerns, the study found that a significant number of farmers and workers (55.7% and 51.6%, respectively) adopted the use of nose coverings to protect themselves from bad odors. However, the overall awareness of the full spectrum of hazards associated with poultry waste remains limited. Furthermore, a study in Okha Local Government Area of Edo State assessed the information needs of poultry farmers. The findings indicated that while farmers were generally aware of some aspects of poultry farming, there was a significant gap in knowledge regarding waste management practices. This lack of knowledge underscores the necessity for targeted educational programs to enhance farmers' understanding of the environmental and health risks associated with improper poultry waste disposal. Sources of organic waste in edo state includes; markets (such as Oba market, e.t.c), restaurants, homes, rural communities (animal droppings).

The National waste policy action plan (2019) seeks to achieve an average resource recovery rate of 80% from all waste streams by 2030. Organic waste makes up roughly three-quarters of the waste stream worldwide. Organic waste contains carbon. Therefore, as it decomposes, the carbon turns into carbon dioxide (CO2) and methane, both of which are climate-warming (green-house gases). Methane is of special concern because it is a powerful greenhouse gas: in the U.S., methane from food waste does as much to warm the planet as fifteen coal-fired power plants.2 To manage organic waste effectively, we need to first adopt strategies to create less waste, and then dispose of what we do create in ways that do not contribute to climate change. But this will only succeed if policymakers set up easy-to-use waste disposal systems. Knowledge of the risks posed by organic waste remains limited among smallholder poultry farmers, particularly in developing countries. Similarly, Mwangi et al. (2021) noted that despite the fact that commercial poultry farmers in Kenya were generally more informed, largely due to access to training and extension services knowledge gaps still persisted, especially in understanding the long-term effects of waste mismanagement. Also, traditions or common habits in certain communities may ignore proper waste practices even when people are aware of the risks. The economic benefits of organic waste management should not be overlooked. By converting waste into valuable roducts like comost and biogas, we can create new revenue streams and job oortunities. Additionally, reducing waste disposal costs and minimizing the environmental imacts of waste management can lead to significant economic savings. The knowledge of the dangers of organic waste is the independent variable—the main point being studied. The dependent variable is the attitude and behavior of people toward waste disposal. Factors like education level, access to information, cultural beliefs, and available support act as moderating variables, meaning they influence how strongly knowledge affects behavior. This

highlights the importance of increasing awareness about the harmful effects of organic waste. By educating the public and creating awareness campaigns, individuals may be more willing and able to adopt better waste practices. It also shows that for knowledge to lead to action, the right support systems and conditions must be in place. In the long run, improving people's understanding of organic waste can help protect the environment and improve public health.

Concept of Poultry Waste

Poultry farming is a vital component of the global agricultural sector, providing an essential source of protein through the production of meat and eggs. With the increasing demand for poultry products, the industry has witnessed tremendous growth over the past few decades. However, this expansion has also led to significant challenges, particularly in the management and disposal of poultry waste. Poultry waste refers to the by-products generated during the rearing, processing, and marketing of poultry, including manure, feathers, litter, carcasses, and processing plant effluents. If not properly managed, poultry waste can cause severe environmental pollution, pose public health risks, and undermine the sustainability of poultry farming. This essay delves into the concept of poultry waste, examining its types, composition, environmental impacts, management techniques, economic value, and sustainable practices.

Definition of Poultry Waste

Poultry waste encompasses all the waste materials produced during the life cycle of poultry production. This includes waste generated in the breeding, feeding, housing, processing, and transportation stages. Broadly, poultry waste can be categorized into two types:

Solid waste: Includes manure, feathers, bedding materials, feed residues, and dead birds.

Liquid waste: Comprises wastewater from cleaning operations, blood, and runoff from poultry farms.

Understanding the nature and volume of poultry waste is essential for implementing effective waste management strategies and minimizing its negative impacts.

Sources of Poultry Waste

Poultry waste originates from several sources across the production chain. These include:

Poultry Housing and Feeding

Manure and litter are the primary wastes generated in poultry houses. Poultry manure consists of excreta, spilled feed, feathers, and bedding materials such as sawdust, rice husks, or straw. The type and quantity of waste depend on the housing system (deep litter, cage, or free-range), the bird species (broilers, layers, turkeys, etc.), and the duration of rearing.

Poultry Processing Plants

Slaughterhouses and processing facilities generate large quantities of organic waste, including blood, feathers, offal (internal organs), heads, feet, and wastewater. These wastes are highly biodegradable but can cause severe environmental problems if not treated properly.

Dead Birds and Hatchery Waste

Mortalities occur during all stages of poultry production due to disease outbreaks, management issues, or transportation stress. Hatcheries also produce waste such as infertile eggs, eggshells, and unhatched chicks.

Wastewater and Effluents

Cleaning of poultry houses, equipment, and processing plants results in the generation of wastewater containing organic matter, nutrients, pathogens, and chemicals. Improper disposal of this liquid waste can lead to water pollution.

Composition of Poultry Waste

Poultry waste is rich in organic matter and nutrients, making it a valuable resource for agricultural use. However, it also contains harmful pathogens and pollutants that require careful handling.

Nutrient Content

Poultry manure contains significant amounts of nitrogen (N), phosphorus (P), potassium (K), calcium, and other micronutrients. On average, poultry manure contains:

Nitrogen: 2.5% to 4%

Phosphorus: 1.5% to 3%

Potassium: 1.5% to 2.5%

These nutrients make poultry manure a highly effective organic fertilizer when applied to agricultural land.

Organic Matter

Poultry waste has a high organic content, which contributes to soil health and structure when used as compost. However, excessive application without proper treatment can lead to nutrient leaching and soil contamination.

Pathogens and Parasites

Poultry waste may harbor disease-causing microorganisms such as Salmonella, E. coli, Campylobacter, and various parasites. These pose a threat to human and animal health if waste is not properly treated before disposal or use.

Heavy Metals and Antibiotics

Commercial poultry production often involves the use of feed additives, including heavy metals like copper and zinc, and antibiotics to promote growth and prevent diseases. Residues of these

substances can accumulate in the waste and enter the environment, leading to antimicrobial resistance and ecological damage.

Environmental Impact of Poultry Waste

Improper disposal and management of poultry waste can result in serious environmental consequences:

Water Pollution

Runoff from poultry farms can carry nutrients, pathogens, and organic matter into nearby water bodies. This leads to eutrophication, where excessive nutrients stimulate algal blooms, depleting oxygen levels and harming aquatic life.

Air Pollution

Decomposition of poultry waste releases ammonia, hydrogen sulfide, methane, and other greenhouse gases. Ammonia contributes to air quality degradation and respiratory issues in both humans and animals.

Soil Degradation

While poultry manure can improve soil fertility, over-application or untreated waste can cause nutrient imbalances, salt accumulation, and contamination with heavy metals.

Odor Nuisance

Poultry waste emits unpleasant odors, especially when not managed correctly. This affects the quality of life for nearby communities and contributes to conflicts between farmers and residents.

Poultry Waste Management Techniques

Effective poultry waste management involves reducing waste generation, recycling nutrients, and minimizing environmental impacts. Key strategies include:

Composting

Composting is a biological process that converts organic waste into a stable, humus-like product. Poultry manure, feathers, and litter can be composted with carbon-rich materials like straw or leaves. Proper aeration, moisture control, and temperature management are essential for successful composting.

Anaerobic Digestion

Anaerobic digestion involves the breakdown of organic matter in the absence of oxygen, producing biogas (a mixture of methane and carbon dioxide) and digestate. Poultry waste is an excellent feedstock for biogas production, providing renewable energy and reducing greenhouse gas emissions.

Incineration and Rendering

Incineration of dead birds and offal reduces the volume of waste and destroys pathogens. Rendering is another method that converts carcasses and by-products into useful materials like meat and bone meal, which can be used in animal feed or fertilizer.

Land Application

Properly treated poultry manure can be applied to farmland as an organic fertilizer. This recycles nutrients and reduces the need for chemical fertilizers. However, care must be taken to avoid over-application and contamination of water sources.

Vermicomposting

This method uses earthworms to decompose organic waste, producing nutrient-rich vermicompost. Poultry manure is particularly suitable for vermicomposting when pre-composted to reduce its ammonia content.

Biochar Production

Poultry litter can be converted into biochar through pyrolysis, a process that thermally decomposes organic matter in the absence of oxygen. Biochar is a stable form of carbon that improves soil fertility and sequesters carbon.

Economic Potential of Poultry Waste

Beyond its environmental implications, poultry waste represents an untapped economic resource. Several opportunities exist to monetize poultry waste:

Organic Fertilizer Production

Processed poultry manure can be sold as organic fertilizer, catering to the growing demand for sustainable agriculture. Pelletized poultry manure is easy to store, transport, and apply.

Biogas and Energy Generation

Anaerobic digestion of poultry waste can produce biogas, which is used for cooking, heating, or electricity generation. This offers energy security to farmers and reduces dependency on fossil fuels.

Feed Ingredients

Rendered products such as feather meal and meat and bone meal are high in protein and used in animal feed formulations. Feathers can also be processed into keratin-rich materials.

Employment Opportunities

Waste management activities—composting, biogas production, vermiculture, and fertilizer sales—create rural employment and contribute to local economies.

Challenges in Poultry Waste Management

Despite the potential benefits, several challenges hinder effective poultry waste management:

Lack of Awareness

Many poultry farmers lack knowledge about proper waste handling techniques, leading to indiscriminate disposal practices.

Inadequate Infrastructure

Small and medium poultry farms often lack access to waste treatment facilities like compost units or biogas plants.

Sustainable Practices and Future Directions

To ensure sustainable poultry production, integrated waste management practices must be promoted. Key recommendations include:

- **Integrated Farming Systems**

Combining poultry farming with crop production allows for nutrient recycling, where manure is used as fertilizer, and crop residues are used as bedding material.

- **Government Support**

Policies that encourage waste-to-resource initiatives, provide financial incentives, and establish waste treatment infrastructure can boost sustainable waste management.

- **Education and Training**

Capacity-building programs for farmers and extension workers on composting, biogas production, and safe manure application are essential.

Nature and Risks of Poultry Waste

Poultry organic waste poses significant environmental and health risks globally, including in Nigeria. The improper disposal of poultry waste can lead to water and soil pollution, air pollution, and the spread of diseases. Globally, the poultry industry generates massive amounts of organic waste, including manure and litter, which contain high levels of nitrogen,

phosphorus, and potassium. This waste can contaminate water sources, leading to eutrophication, and harm aquatic life. Excessive application of poultry waste to agricultural fields can cause soil degradation, reducing fertility and increasing the risk of soil erosion. Poultry waste also emits gases like ammonia, hydrogen sulfide, and methane, contributing to air pollution and greenhouse gas emissions.

In Nigeria, poultry production is a significant contributor to the economy, but it also generates substantial amounts of organic waste. The improper disposal of poultry waste in Nigeria can lead to environmental pollution, disease transmission, and antibiotic resistance. Poultry waste can harbor pathogens like Salmonella and E. coli, which can be transmitted to humans through contaminated food and water. The use of antibiotics in poultry production can lead to antibiotic resistance, making treatment of infections more challenging.

To mitigate these risks, it is essential to implement proper waste management techniques, such as composting and anaerobic digestion. These methods can help reduce environmental pollution and the spread of diseases. Policymakers and stakeholders should work together to develop and enforce regulations on poultry waste management, providing incentives for farmers to adopt sustainable practices. By adopting these strategies, the environmental and health risks associated with poultry organic waste can be minimized, promoting a healthier environment and sustainable agriculture. Poultry waste poses significant risks in Nigeria and Edo State, affecting both the environment and human health. Here are ten key risks associated with poultry waste:

- **Water Pollution:** Poultry waste can contaminate water sources, leading to eutrophication and harming aquatic life.
- **Soil Degradation:** Excessive application of poultry waste to agricultural fields can cause soil degradation, reducing fertility and increasing the risk of soil erosion.

- **Air Pollution:** Poultry waste emits gases like ammonia, hydrogen sulfide, and methane, contributing to air pollution and greenhouse gas emissions.
- **Disease Transmission:** Poultry waste can harbor pathogens like Salmonella and E. coli, which can be transmitted to humans through contaminated food and water.
- **Antibiotic Resistance:** The use of antibiotics in poultry production can lead to antibiotic resistance, making treatment of infections more challenging.
- **Bad Odor:** Poultry farms can generate unpleasant odors, affecting nearby residents.
- **Environmental Degradation:** Improper disposal of poultry waste can lead to environmental degradation and loss of biodiversity.
- **High Risk of Disease Outbreaks:** Poultry waste can attract disease-carrying pests and create an environment conducive to disease outbreaks.
- **Loss of the Productivity:** Poor waste management can lead to reduced productivity and efficiency in poultry farming.
- **Negative Impact on Livelihoods:** Poultry waste can negatively impact the livelihoods of people living near poultry farms, affecting their health and well-being.

In Edo State, the improper disposal of poultry waste can have severe environmental and health consequences, emphasizing the need for proper waste management practices and regulations. By adopting sustainable waste management techniques, the risks associated with poultry waste can be minimized, promoting a healthier environment and sustainable agriculture.

Knowledge of Poultry Waste Hazards

Poultry production has grown globally to meet rising demands for meat and eggs. With that has come concomitant increases in the generation of poultry waste—comprising manure, litter (bedding material + droppings), carcasses, processing effluents, feathers, dead birds, hatchery wastes, etc. Unless well managed, these wastes represent hazards to human health, animal health, and the environment. The hazards arise from nutrients, pathogens, chemical residues (e.g. antibiotics, heavy metals), gases, and improper disposal practices. Understanding those hazards is critical for designing effective management and regulatory systems.

Types of Poultry Waste & Hazardous Constituents

To understand hazards, it helps to know what kinds of wastes poultry operations produce, and what harmful constituents they may contain:

Manure and litter

Excreta (urine and feces)

Bedding material (sawdust, straw, wood shavings, rice husk etc.)

Spilled feed, feathers

Dead birds, offal, hatchery waste

Mortality from disease, culling, hatching failures etc.

Organs, blood, unhatched eggs, embryonic tissues

Processing effluents / wastewater

Washdown water from processing plants

Blood, waste water with organic load

Ammonia, hydrogen sulfide, methane, etc., produced by decomposition of organic waste

Each of these can induce hazards by various pathways.

Pathways of Hazard Transmission

- **Water pathways:** Runoff, surface water and groundwater contamination from manure, dead bird leachate, or effluent disposal sites. Rain washes nutrients, pathogens, chemical residues into streams, rivers, wells.
- **Air pathways:** Volatilization of ammonia, odors, dusts carrying bacteria, fungal spores; also aerosols (e.g. from spray or ventilation).
- **Soil:** Direct contact, uptake of chemical residues, accumulation of heavy metals; also soil-borne pathogens.
- **Food chain:** Use of contaminated water or manure as fertilizer for crops; consumption of poultry meat, eggs that may carry pathogens or antibiotic residues; possible bioaccumulation.
- **Occupational exposure:** Workers in poultry farms, processing plants are exposed via inhalation, skin contact, accidental ingestion.
- **Community exposure:** Individuals living near poultry farms may be affected by air emissions, odor, water pollution.

Types of Hazards

- **Biological Hazards**

a. **Pathogenic microorganisms:** Salmonella, Campylobacter, E. coli, avian influenza virus, and others. FAO notes that "handling and slaughtering live, infected poultry poses the greatest hazard," but also through droppings, feathers, organs, and blood.

b. **Zoonotic disease risk:** Transmission to humans of diseases originally in poultry.

c. **Antimicrobial-resistant (AMR) bacteria:** Use of antibiotics in poultry leads to development of resistant strains, which may be present in waste, soil, water. For example,

a study in Ekiti State, Nigeria found multiple antibiotic‑resistant bacteria in droppings, wastewater, and soils from poultry waste disposal sites.

- **Chemical Hazards**

a. **Heavy metals:** Feeds sometimes include copper, zinc, arsenicals. The arsenic article shows that arsenicals once used in feed convert into inorganic arsenic in wastes and soils, which is toxic and can leach into water.

b. **Antibiotic residues:** Leading to AMR issues, but also direct toxicity or allergenicity in humans.

- **Physical Hazards**

a. **Particulate matter:** Can irritate eyes, skin, respiratory tract; reduce air quality.

b. **Gaseous emissions:** Ammonia, hydrogen sulfide, methane etc. These gases in high concentrations can be harmful. For example, a local Nigerian report ("When poultry waste turns lethal poison") said ammonia, hydrogen sulphide and methane released from poultry waste can cause respiratory distress, burning of eyes, even possible lung damage.

Nutrient Pollution and Eutrophication

Excess nitrogen (N) and phosphorus (P) entering water bodies causes algal blooms, depletion of dissolved oxygen, fish kills etc. From the "Management and utilization of poultry wastes" review: when land application exceeds crop use, or is done improperly, nutrients can be transported via runoff or leaching.

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Environmental Degradation

a. **Soil degradation:** Over-application of manure can lead to nutrient imbalances, salt accumulation, soil acidification/alkalization, accumulation of heavy metals.

b. **Water quality degradation:** Groundwater nitrate contamination (a human health hazard, especially for infants causing methemoglobinemia), surface water eutrophication.

Public Health Hazards

Respiratory problems among nearby residents and workers (due to dust, ammonia, hydrogen sulfide, odors). For example in Makurdi, Nigeria, 60% of neighbours reported respiratory symptoms, skin irritation, rashes. Exposure to pathogens, chemicals. Risk of zoonoses (Salmonella etc.), possibly avian influenza. FAO document cites infection risks via handling live infected birds or their droppings.

Occupational Health Risks

Workers handling carcasses, waste, cleaning can get infected (via cuts, inhalation, ingestion).

Chronic exposure to ammonia, dust may cause lung problems, eye irritation.

Exposure to antibiotic-resistant pathogens poses risk to treatment options. Eg. study in Ekiti state showing antibiotic resistance in bacteria from poultry waste disposal sites.

Case Studies and Examples

Several studies provide empirical evidence of the hazards of poultry waste, especially in Nigeria; these serve to illustrate how serious the problem can be.

Makurdi, Benue State, Nigeria

In a study on waste management practices, with interviews of poultry farmers and neighbors: 60% neighbours reported respiratory problems; 40% had digestive problems.

Many farms applied litter directly to farmland, sold waste, or disposed improperly. Neighbours complained of bad odor.

Ekiti State, Nigeria

In Ido-Osi area: study found multiple antibiotic-resistant bacteria in droppings, waste water and soil from poultry waste disposal sites. Diarrhea history among respondents tied to exposure to water bodies near poultry farms.

Minna, Nigeria (semi-arid region)

A large scale of poultry operations: millions of birds, many tons of poultry waste generated annually. The disposal practices generally poor: indiscriminate dumping, burning, burying of dead birds without considering shallow water tables.

Potential for contamination of soil and water is high in such settings.

Ogun State, Nigeria

Many poultry farms are very close (within ~1 km) to residential areas. Farms produce wastes: hatchery wastes, litters, mortalities etc.

Arsenic in U.S. poultry waste

Use of arsenicals in feed, conversion to inorganic arsenic in wastes, which persists in soils, incinerator ash, fertilizers. Those raise exposure risks via groundwater or via crops.

Poultry waste hazards are a significant concern in Edo State, Nigeria, posing environmental and health risks due to improper waste disposal. The environmental hazards associated with poultry waste include water pollution, soil degradation, and air pollution. Poultry waste can contaminate water sources, leading to eutrophication and harming aquatic life. Excessive application of poultry waste to agricultural fields can cause soil degradation, reducing fertility and increasing the risk of soil erosion. Additionally, poultry waste emits gases like ammonia, hydrogen sulfide, and methane, contributing to air pollution and greenhouse gas

emissions. The health hazards associated with poultry waste are also a major concern. Poultry waste can harbor pathogens like Salmonella and E. coli, which can be transmitted to humans through contaminated food and water. Furthermore, the use of antibiotics in poultry production can lead to antibiotic resistance, making treatment of infections more challenging. In Edo State, specific issues related to poultry waste include bad odor, improper waste disposal, and the risk of disease outbreaks. Poultry farms in the state can generate unpleasant odors, affecting nearby residents. Many farms lack proper waste management systems, leading to environmental pollution and health risks. The proximity of poultry farms to residential areas increases the risk of disease transmission and outbreaks.

To mitigate these hazards, proper waste management techniques, such as composting and anaerobic digestion, can be implemented to reduce environmental pollution and health risks. Establishing and enforcing regulations on poultry waste management can also help prevent environmental pollution and promote sustainable practices. Educating poultry farmers and the public about the risks associated with poultry waste and promoting best practices can help mitigate these hazards.

Poultry Waste Management Practices

Poultry farming produces significant quantities of organic waste, including manure, feathers, offal, bedding material, and unused feed. Ogbonna et al. (2023) Highlighted the health risks faced by farm workers due to improper poultry waste disposal in southern Nigeria. According to Kaza et al. (2018), improperly disposed organic waste contributes significantly to greenhouse gas emissions, particularly methane, a potent contributor to climate change. The decomposition of organic materials in anaerobic conditions—such as in landfills—leads to the release of methane, leachate, and unpleasant odors. Moreover, Awasthi et al. (2019) argue that

unmanaged organic waste can attract pests, foster microbial contamination, and contribute to the spread of diseases, particularly in densely populated urban areas. Exposure to airborne particles and gases (ammonia, dust) can cause: Asthma, Chronic bronchitis, Hypersensitivity pneumonitis.

A 2022 study in Nigeria reported increased respiratory symptoms in poultry workers due to poor ventilation and waste accumulation. Contaminated water from poultry farms may contain: Salmonella, E. coli, Campylobacter Leading to diarrhea, typhoid, and other gastrointestinal issues. Pathogens in poultry waste can transmit from animals to humans causing zoonotic infections. According to Ravindran & Blair (2021), poultry manure alone accounts for over 70% of the total waste generated in a typical poultry operation. This waste contains a complex mix of organic matter, pathogenic microorganisms, heavy metals (from feed additives), and antibiotic residues. Improper disposal of poultry organic waste can result in severe environmental degradation. Environmental Protection Agency (EPA, 2020) reports that runoff from poultry waste can lead to the contamination of surface and groundwater sources with nitrates and phosphates, contributing to eutrophication. This phenomenon leads to excessive growth of algae in water bodies, which depletes oxygen and kills aquatic life. Additionally, Jokhio et al. (2018) note that decomposing poultry waste releases greenhouse gases such as methane (CH_4), ammonia (NH_3), and nitrous oxide (N_2O), which contribute to climate change and air pollution. Ammonia volatilization is particularly problematic, as it not only affects air quality but also causes acidification of nearby soils and vegetation. Poultry organic waste poses a risk to public health directly or indirectly. World Health Organization (WHO, 2019) recognizes untreated poultry manure as a significant vector for zoonotic pathogens including Salmonella spp., Escherichia coli, Campylobacter, and Listeria monocytogenes. These can be transferred to

humans through direct contact, water contamination, or through improperly handled manure used in crop production.

Furthermore, Alam et al. (2022) stated that the overuse of antibiotics in poultry leads to the presence of antimicrobial residues in the waste. This can contaminates the environment and also facilitates the development of antimicrobial resistance (AMR), which is one of the most serious global health threats today. Some of the threats includes:

Agricultural Risks

While poultry waste is often used as a fertilizer due to its nutrient content, its improper application can harm crops and soils. According to Singh & Kaur (2020), excessive application of raw manure can lead to nutrient imbalances, soil acidification, and salt buildup, which negatively affect soil fertility and microbial life. Moreover, pathogenic microorganisms in untreated manure can contaminate food crops, posing a food safety risk.

Livestock and Farm-Level Risks

Within the farm environment, accumulated waste contributes to poor air quality and unsanitary conditions, which increase the risk of disease outbreaks. Ishola et al. (2017) found that farms with poor waste management practices had significantly higher incidences of respiratory and enteric diseases in birds. Dust particles mixed with dried manure can also carry pathogens, contributing to airborne disease transmission. Poor handling of carcasses, feathers, and other processing waste can attract scavengers and rodents, further increasing biosecurity threats. In regions with inadequate biosecurity infrastructure, this can also lead to outbreaks of highly pathogenic avian influenza.

Finally, Ogundele et al. (2019) highlighted that the accumulation of waste around poultry farms has high risk of diseases like avian influenza, salmonellosis, and respiratory infections among both birds and humans. Antibiotic in manure also contributes to antimicrobial resistance in local microbial populations which has an effect on the environment. Here are current waste management ractices in Benin City;

Land Disposal: Dumping poultry waste on land is prevalent, leading to potential soil contamination and nutrient imbalances.

Burning: Some farmers resort to burning waste, which can release harmful pollutants into the air.

Composting: A few farmers practice composting, which, when done correctly, can recycle nutrients effectively.

Biogas Production: Emerging as a sustainable option, biogas production from poultry waste offers renewable energy and reduces environmental impact.

Effect of Organic Waste on Health and Environment

Organic waste, when improperly managed, poses several risks to both human health and the environment. These effects are particularly significant in regions where waste facilities are insufficient. The accumulation of organic waste creates a breeding ground for disease-carrying pests such as flies, rats, and mosquitoes. These pests transmits disease like malaria, typhoid, and cholera, to human body. Decomposing waste emits harmful gases such as ammonia and methane, which contribute to air pollution and can trigger respiratory problems like asthma, bronchitis, and other lung problems. Organic waste sees into water bodies and contaminates drinking water sources. This leads to the spread of water-borne diseases like dysentery, hepatitis A, diarrhea. Liquids found in decomposing waste can enter into underground water, degrading the water and

also making it unsafe for consumption, recreation and agriculture. The uncontrolled burning of organic waste, common in many areas, releases carbon monoxide, dioxide, and articulate matter into the air. These pollutants not only worsen air quality but also contribute to climate change and global warming.

Excessive organic waste dumped in open spaces or roadsides degrades the aesthetic value of communities and lowers the quality of life. There is loss of soil quality due to acidity leachate which harms plant life and reduces agricultural productivity. The clogging of drainage systems by mixed organic waste leads to urban flooding, especially during rainy seasons. The stagnant water becomes a breeding ground for mosquitoes which causes more effects on the health of individuals. Methane gas from anaerobic decomposition of organic waste is a potent green house gas, significantly contributing to climate change. Land fill overcrowding is accelerated by organic waste, reducing the lifespan of waste disposal sites and increasing management costs. Lack of waste segregation increases the difficulty of recycling and composting, leading to more waste ending u in landfills. There is a large quantity of organic waste generated from public laces, markets that attracts different animals and causes health and environmental pollution and cause safety hazards and further spread diseases.

One of the most serious consequences is the spread of infectious diseases, such as avian influenza and Newcastle disease, which can quickly wipe out entire flocks. The waste often contains harmful bacteria like Salmonella and E. coli, which can infect not only poultry but also other animals that come into contact with contaminated water or feed. Parasites, including worms and protozoa, also thrive in dirty litter and can easily spread among birds, weakening their immune systems and reducing productivity.

Another major concern is the build-up of ammonia from poultry droppings, especially in poorly ventilated areas. This can lead to respiratory problems, eye irritation, and skin infections in both poultry and nearby animals. Continuous exposure to such an environment can cause chronic stress, resulting in poor weight gain, decreased egg production, and even death. Additionally, wet or soiled litter can lead to footpad dermatitis, a painful condition that affects the feet of birds and makes movement difficult.

Toxins such as mycotoxins can develop in moldy poultry waste or spilled feed, leading to internal organ damage, poor digestion, and reduced fertility in animals. Waste left untreated also attracts flies, rodents, and other pests, which serve as carriers of additional diseases. When poultry waste contaminates feed or water sources, it creates further health risks, including digestive infections and poor nutrient absorption. Over time, prolonged exposure to unsanitary waste conditions can lead to bone weakness, toxic shock, and increased mortality in poultry. Animals living under such conditions may also experience stress-related illnesses and weakened immunity, making them more vulnerable to other infections.

The energy potential in organic waste, such as biogas production, is lost when waste is simply burned or dumped, which could increase health and environmental issues and missing an opportunity for sustainable energy generation. Without effective waste strategies, organic waste continues to threaten public health, pollute the environment, and contribute to climate and social issues. Addressing these issues requires community education, creating awareness and policy enforcement. The collection and disposal of organic waste require significant public funds, especially when waste is not separated at the source. Food waste represents a waste of resources used in production land, water, labor, and energy resulting in major economic loss, If not reused or composted, organic waste fails to contribute to income-generating ventures like bioenergy,

organic fertilizer, or animal feed. Poorer communities often suffer the worst effects of unmanaged waste due to proximity to dumpsites and limited infrastructure. Piles of rotting waste affect community hygiene, create eyesores, and reduce the quality of life of individuals in the community. Wasting edible food reduces the availability of food for people in need, worsening hunger and malnutrition. Poor management of poultry waste poses numerous health risks to animals, ranging from disease transmission and physical infections to reduced growth, productivity, and survival. Proper hygiene, regular cleaning, and safe disposal methods are essential to maintain healthy livestock and protect surrounding animal populations.

Knowledge of Poultry Farmers on Management of Organic Waste

The level of knowledge possessed by poultry farmers about organic waste management lays a crucial role in how effectively such waste is handled. In Edo State, initiatives have been undertaken to empower poultry farmers with better tools and knowledge. For example, the Edo State Government, in collaboration with the Nigeria-Covid Action Recovery Economic Stimulus (NG-CARES), distributed 100 defeathering machines and 2.5KVA power generators to poultry farmers across the state. While this initiative focuses on improving productivity, it also highlights the government's recognition of the importance of supporting poultry farmers. Furthermore, a study assessing the training needs of poultry farmers in Ovia and Oredo LGAs revealed that farmers expressed the need for more training, particularly in areas such as disease management, drug usage, vaccination, and poultry house construction techniques. Although waste management was not specifically mentioned, the inclusion of related topics suggests an opportunity to integrate waste management education into future training programs. Access to reliable training opportunities and information plays a crucial role in altering poultry farmers' knowledge and attitudes toward organic waste management. Studies consistently show that

farmers' ability to understand the risks of organic waste and implement proper disposal practices is directly linked to the quantity and quality of education and support services available to them.

Agricultural Extension Services are among the most significant sources of information for poultry farmers, especially in developing regions. According to Agbaje et al. (2020), farmers who are frequently visited by extension agents are more likely to use proper waste disposal methods, such as biogas generation, compositing, or regulated application of treated manure. These agents often serve as the bridge between government policies, research institutions, and the farming community. However, the reach and effectiveness of these services vary significantly. Adebayo & Adesina (2018) observed that in many rural communities, extension officers are either understaffed or under-resourced, limiting their ability to conduct regular training sessions or disseminate up-to-date information on safe waste management.

Farmer Cooperatives and Peer Learning serve as informal but powerful channels of knowledge sharing. Okonkwo et al. (2019) found that members of poultry farmers' cooperatives in southern Nigeria had higher awareness levels about the environmental and health implications of improper organic waste disposal. These groups host workshops, invite experts, and create forums for experience-sharing among members. Peer-to-peer learning is particularly influential in rural settings, where word-of-mouth and demonstration of practices by successful farmers can strongly influence the behavior of others. According to Gyamfi & Baah (2021), demonstration farms and field days are effective in increasing awareness, particularly when they are organized locally and tailored to farmers' cultural and economic contexts.

The rapid penetration of mobile phones and the internet (digital platforms and ICT tools) in rural areas has opened new frontiers for agricultural information dissemination. Mobile-based advisory services, social media platforms (e.g. Whatsapp, Facebook farming groups), and e-

learning platforms are increasingly being used to provide training on organic waste management practices. Mass media and traditional communication channels such as Radio and television programs remain popular sources of agricultural information, especially in areas with limited digital access. Umeh & Oloyede (2020) observed that farmers who regularly listened to agricultural programs on local radio stations were more informed about the dangers of poor waste disposal, especially concerning public health and environmental degradation. In some regions, traditional communication methods—such as town criers, community meetings, and religious gatherings—are still used to disseminate public service information. When integrated with modern messages about biosecurity and waste management, these methods can be highly effective in reaching grassroots populations. Akinyemi et al. (2022) demonstrated that poultry farmers who subscribed to mobile agricultural advisory services in southwestern Nigeria showed higher levels of knowledge about the risks of organic waste and were more likely to practice composting or proper waste segregation. These platforms also allow real-time interactions, enabling farmers to consult experts or fellow farmers when faced with specific challenges. However, digital literacy remains a barrier, especially among older or less-educated farmers. Additionally, internet connectivity and the cost of data can limit access in some rural communities.

NGOs (Non-Governmental Organization), research Institutions, and donor-funded projects and research institutions often play a crucial role in bridging the knowledge gap through targeted training, capacity-building programs, and pilot projects. For instance, FAO (Food and Agriculture Organization) and local institutions have implemented community-based waste management initiatives in several African and Asian countries, offering hands-on training to smallholder poultry farmers. Mensah et al. (2021) highlighted the success of a donor-funded

project in Ghana that introduced low-cost composting technologies and provided on-site training to poultry farmers. Farmers involved in such programs not only improved their waste handling practices but also turned poultry waste into a source of income through organic fertilizer production. Waste is disposed of by open dumping or burning, leading to environmental degradation and respiratory problems.

Though some NGO's like Health of Mother Earth Foundation (HOMEF) creates awareness through grassroots programs, coverage is still limited, and traditional practices persists. To effectively manage organic waste in Nigeria, training programs should focus on building the capacity of urban and rural communities to adopt sustainable waste management practices. This can be achieved through community engagement, infrastructure development, and public-private partnerships. Therefore, some successful rural initiatives have emerged. For example, in Oyo State, a partnership between the Institute of Agricultural Research and Training (IAR&T) and local government councils provided hands-on training to rural poultry farmers on composting and the conversion of poultry waste into organic fertilizer. Similarly, the Nigerian Stored Products Research Institute (NSPRI) has engaged in rural training programs using translated audio-visual materials to bridge the literacy gap.

Summary of Reviewed Literature

In Nigeria, organic waste poses a growing environmental and public health concern. The country generates large quantities of biodegradable waste from households, markets, and agricultural activities. However, inadequate waste management systems mean that much of this waste is left to rot in open spaces, drainage channels, and landfills, creating foul odors, breeding grounds for disease-carrying pests, and contributing to greenhouse gas emissions such as

methane. These conditions not only pollute the environment but also endanger human health and contribute to climate change.

Benin City, like many urban centers in Nigeria, faces its own unique challenges with organic waste. The rapid population growth and urbanization have led to increased food and agricultural waste, but the city lacks the infrastructure to properly collect, separate, and process it. As a result, decomposing waste often clogs drainage systems, leading to flooding during the rainy season and further degrading sanitation and living conditions. Despite the high volume of biodegradable materials, there is little effort toward composting or recycling. This situation underscores the urgent need for awareness, investment in sustainable waste management, and policies that promote responsible disposal and the reuse of organic materials. Efforts to bridge the gap require strategies and they are:

i. Decentralizing training programs to reach rural areas through mobile extension teams.

ii. Using local languages and community influencers to improve training reception.

iii. Leveraging community radio, religious centers, and schools as training hubs.

iv. Investing in ICT infrastructure and digital literacy to improve access to mobile-based advisory services.

v. Developing gender-inclusive approaches, since many rural poultry farmers are women who are often excluded from formal training.

vi. Enhance the enforcement of existing regulations and develop new policies that promote sustainable waste management practices.

vii. Foster collaborations between government agencies, private sector players, and farmers to facilitate the adoption of sustainable practices.

Across both global and Nigerian contexts, the urban-rural divide in poultry waste management training remains a serious challenge. While urban farmers benefit from better infrastructure and institutional support, rural poultry farmers often operate in isolation, with limited access to formal knowledge and resources. Bridging this gap is essential for nationwide improvements in organic waste management and for protecting public and environmental health. Digital platforms and mobile advisory services are emerging as valuable tools. A study by Balogun & Adebanjo (2020) indicated that farmers who used mobile apps for poultry management had higher awareness of safe waste disposal methods.

CHAPTER THREE

METHODOLOGY

This chapter presents the procedures the researcher used in gathering and analyzing data for the study. It is discussed under the following subheadings:

- Design of the Study
- Population of the Study
- Sample and Sampling Technique
- Research Instruments
- Validity of the Instruments
- Reliability of the Instrument
- Method of Data Collection
- Method of Data Analysis.

Design of the Study

The study used a descriptive survey research design. The design is suitable for studies that seek to gather information, describe existing conditions, and interpret relationships among variables. It was chosen because it allows the researcher to obtain factual data regarding poultry farmers knowledge on the peril of organic waste and their behavioral attitudes towards it, without manipulating any variables.

Population of the Study

The population of the study consist of approximately fifty-four poultry farmers in Egor Local Government, Benin City, Edo State.

Sample and Sampling Technique

A sample of 38 poultry farmers was selected from the 54 poultry farmers in Egor Local Government representing seventy percentage of the population. This is considered appropriate because the researcher employed a simple random sampling technique to ensure that every farmer had an equal chance of being selected. Questionnaires was distributed using a probability sampling technique, to give every member of the population an equal chance of being selected. This method was chosen to avoid bias and to enhance the reliability and generalizability of the study's findings.

Research Instrument

The instrument employed for this study was a structured questionnaire. The questionnaire was divided into two sections: Section A and Section B. Section A was designed to collect relevant demographic information from the respondents, while Section B comprised items aimed at assessing farmer's knowledge on the peril of organic waste. The use of close-ended questions was adopted to ensure uniformity in responses, facilitate data collection, and enhance the ease and accuracy of statistical analysis.

Validity of the Instrument

The instrument used was validated by the project supervisor and two other lecturers. The lecturers reviewed the instrument for clarity, content, and alignment with the study objectives. Following this review, the instrument was deemed valid and appropriate for data collection in the context of the research.

Reliability of the Instrument

The reliability of the research instrument was determined through a test-retest method. In doing this, the instrument was administered to a sample of 20 respondents. A pretest of the questionnaire was administered to a sample drawn from the target population. The same instrument was administered to the same group of respondents on two separate occasions, with an interval of two weeks between the administrations. This approach was adopted to assess the consistency and stability of the responses over time, thereby establishing the reliability of the instrument.

Method of Data Collection

The researcher with the help of two trained research assistants administered the questionnaire to ensure a high return rate. Prior to administration, the purpose of the study was explained to the respondents, and their informed consent was obtained. Completed questionnaires were collected immediately to avoid delays or loss of data.

Method of Data Analysis

The data collected were analyzed using descriptive statistics, specifically frequency counts and percentages. This method was chosen to clearly present the distribution and patterns of responses from the questionnaire.

CHAPTER FOUR

PRESENTATION OF RESULT AND DISCUSSION OF FINDINGS

This chapter deals with the presentation of the research results and analysis of the findings. A total number of 20 questionnaire were administered, completed and returned, achieving a 100response rate. The data was analysed using frequency count and simple percentage as the primary statistical tools.

Presentation of Data

SECTION A: The distribution of the demographic characteristics of the poultry farmers in Egor Local Government Area, Benin City, which is essential for understanding their knowledge and behavioral attitudes toward organic waste management.

Table 4: Distribution of Demographic Characteristics

Demographic Variable	Category	Frequency	Percentage (%)
Age	20 – 29 years	6	15.8
	30 – 39 years	12	31.6
	40 – 49 years	14	36.8
	50 years and above	6	15.8
Total		38	100
Gender	Male	24	63.2
	Female	14	36.8
Total		38	100

Occupation	Poultry farmer	28	73.7
	Farmer (non-poultry)	4	10.5
	Trader	3	7.9
	Technician	2	5.3
	Banker	1	2.6
Total		38	100

Source: Field Survey, 2025

Demographic Analysis of Respondents

Age Distribution

The age distribution indicates that the majority of respondents (36.8%) are between 40 and 49 years old, showing that middle-aged adults dominate poultry farming in the area. Respondents aged 30–39 years account for 31.6%, reflecting the presence of younger, active farmers, while 15.8% each are within the 20–29 years and 50 years and above categories, representing emerging and senior farmers, respectively.

Gender Distribution

Male respondents constitute 63.2% of the sample, while females make up 36.8%. This demonstrates that poultry farming in Egor Local Government Area is male-dominated, though females play a significant supporting role.

Occupational Distribution

Most respondents (73.7%) are poultry farmers, which aligns with the focus of the study. Other occupations represented include general farming (10.5%), trading (7.9%), technical work (5.3%), and banking (2.6%). The participation of respondents from diverse professional

backgrounds enriches the study, as it provides broader perspectives on the management of organic waste.

Knowledge Level on Organic Waste Impact

Regarding poultry farmers' knowledge of the impact of organic waste, the data indicate varying degrees of awareness across different environmental and resource-related aspects. Respondents showed good understanding of general environmental hazards associated with organic waste but slightly lower knowledge regarding its conversion into useful resources.

SECTION B

Level of knowledge on organic waste impact

Table 4: Descriptive statistics Examining Poultry Farmers' Knowledge on the Impact of Organic Waste

ITEM	Frequency	Percentage	Mean	Level of Knowledge	Remark
1. Organic waste can contribute to greenhouse gas emissions.	10	26.3	3.32	High	High
2. Improper disposal of organic waste can pollute water sources.	8	21.1	3.29	High	High
3. Composting organic waste has environmental and economic benefits.	8	21.1	3.26	High	High
4. Organic waste disposal in landfills can cause environmental harm.	7	18.4	3.25	High	High

5.	Organic waste can be converted into valuable resources like biogas or fertilizer.	5	13.1	3.05	Moderate	Moderate
	Total	**38**	**100**			

Source: Field Survey, 2025 (Cluster Mean = 3.34) Scale: low (0-2) moderate (3-6) high (7-10)

Level of knowledge	**Frequency**	**Percentage%**
High	10	26.3
High	8	21.1
High	8	21.1
High	7	18.4
Moderate	5	13.1

From the above data Table 4 shows poultry farmers' knowledge regarding the impact of organic waste reveals that respondents generally have a good understanding of the environmental hazards associated with improper waste management. Specifically, the items on greenhouse gas emissions, water pollution, and environmental harm from landfill disposal received the highest mean scores, indicating that the majority of respondents are aware of the negative effects of organic waste on the environment.

However, the item on the potential conversion of organic waste into valuable resources such as biogas or fertilizer received a slightly lower mean score of 3.05, which falls into the moderate category. This indicates that while farmers are generally aware of environmental hazards, their knowledge of advanced waste management practices and resource recovery techniques is

somewhat limited. Overall, the findings suggest that poultry farmers in Egor Local Government Area possess foundational knowledge of the peril of organic waste, particularly its environmental consequences.

Table 4: Descriptive statistics on the Factors Influencing Poultry Waste Management Practices

ITEM		Frequency	Percentage%	Mean	Std. Deviation	Remark
6.	Labor influences your decisions on how to manage poultry waste on farm.	12	31.5	3.42	0.76	High
7.	The size of your poultry farm influences your management practices.	10	26.3	3.37	0.81	High
8.	Government policies play a crucial role in shaping waste management practices in my community.	8	15.9	3.05	0.88	Moderate
9.	Lack of public awareness is a major barrier to effective waste management in my area.	10	26.3	3.53	0.69	High
			100			

Source: Field Survey, 2025 (Cluster Mean = 3.34) (Criterion mean= 2.50)

From the above data Table 4 shows that several factors influence poultry farmers' waste management practices. The mean scores indicate that labor availability 31.5% and farm size 26.3% are highly influential, suggesting that the number of workers and the scale of operations strongly determine how waste is handled on farms. Government policies have a moderate influence 15.9%, indicating that while policies exist, their implementation or awareness may not be fully effective in shaping farmers' practices. Finally, lack of public awareness was identified as the most critical barrier 26.3%, confirming that community education and outreach play a key role in promoting proper waste management practices.

Overall, the findings suggest that both farm-level factors (labour and size) and broader socio-environmental factors (policy and awareness) collectively shape the waste management behaviour of poultry farmers in Egor Local Government Area. Addressing these factors through targeted training, policy enforcement, and public education can improve sustainable waste handling practices in the study area.

Table 4: Descriptive statistics on Poultry Farmers' Perception of Organic Waste Effect and Mitigation Measures

ITEM		Frequency	Percentage	Mean	Std. Deviation	Remark
10.	The government is doing enough to address organic waste management issues in my community.	6	15.8	2.84	0.92	Moderate
11.	Organic waste management is a significant environmental concern.	13	34.2	3.50	0.68	High
12.	Composting helps reduce the impact of poultry waste on the environment	10	26.3	3.37	0.79	High
13.	Organic waste should be separated from other types of waste and managed differently.	9	23.7	3.42	0.74	High
	Cluster Mean	3.28				

Source: Field Survey, 2025 (Criterion Mean= 2.50)

From the above data, Table 4 shows that poultry farmers are generally aware of the environmental implications of organic waste and the importance of mitigation measures. The majority of respondents 34.2% strongly agree that organic waste management is a significant environmental concern, indicating high awareness of its impact on the environment.

Similarly, respondents recognize the need for proper segregation of organic waste 23.7% and the benefits of composting 26.3% as practical mitigation measures, reflecting a positive perception toward sustainable waste management practices.

However, the item on government intervention received a moderate mean score of 15.8%, suggesting that farmers perceive government efforts to address organic waste issues as insufficient. This highlights the need for stronger policy enforcement, support, and awareness programs to complement farmers' efforts in managing organic waste effectively.

Table 4: Descriptive Statistics on Poultry Farmers' Knowledge of Environmental, Health, and Economic Risks

ITEM	Frequency	Percentage %	Mean	Std. Deviation	Remark
14. I am aware of the environmental health risks associated with poor waste management	**6**	**15.8**	**2.84**	**0.68**	**Moderate**
15. I stay informed about economic impacts of poultry waste.	**12**	**31.6**	**3.50**	**0.81**	**High**
16. Health conservation is crucial for economic growth.	**10**	**26.3**	**3.37**	**0.72**	**High**

17. Poultry waste degrades the environment in your community.	**10**	**26.3**	**3.42**	**0.74**	**High**
Cluster Mean	**3.41**				

Source: Field Survey, 2025 (Criterion Mean= 2.50)

From the above data, Table 4 indicates that poultry farmers have a strong knowledge of the environmental and health risks associated with poor poultry waste management. The majority of respondents 15.8% are aware of the environmental and health hazards, showing a high level of understanding of the dangers posed by improper waste disposal.

Similarly, respondents acknowledge the importance of health conservation for economic growth 31.6% and recognize that poultry waste contributes to environmental degradation in their community26.3%, highlighting their awareness of local environmental issues.

However, knowledge about the economic impacts of poultry waste received a slightly lower mean score of 26.3% which is still moderate. This suggests that while farmers are generally aware of environmental and health risks, some may not fully understand the broader economic implications of waste mismanagement. Overall, the findings reveal that poultry farmers possess a good understanding of the environmental and health risks of poor waste management, with some room for improvement in economic awareness.

Discussion of Findings

Finding in Research question one shows that there is a high level of knowledge on the impact of organic waste among poultry farmers in Egor L.G.A. With 78% of the respondents agreeing that they have knowledge on the impact of organic waste. This suggests that poultry farmers recognize the broader ecological implications of poor waste management practices.

Nevertheless, there is a need for targeted educational programs and training initiatives to enhance farmers' understanding of sustainable waste management practices, including composting and the conversion of organic waste into useful resources. Most scholars recommend targeted training, improved extension services, and awareness programs to enhance farmers technical knowledge and ensure sustainable handling of poultry waste (Bello et al., 2021). Strengthening this knowledge can lead to improved environmental practices and promote the efficient utilization of organic waste in poultry farming.

The findings in research question two shows that factors like labour, size of poultry farm, government policies and lack of awareness influences waste management practices, with over 70% of the respondents indicating that these factors are the major factors that affects waste management practices. The findings suggest that farm size and labour characterized as significant determinant of waste management strategy. Where awareness of public health and environmental risks is low, improper disposal remains common. Raising awareness is often recommended as a key to sustainable waste management.

The findings in research question three shows that poultry farmers have a high perception of organic waste effect and mitigation measures, with over 72% strongly agree and agree and it was also discovered that organic waste management is a significant environmental concerns. Regardless, many farmers continue to use traditional waste disposal methods, such as open dumping, landfills, burning and indiscriminate dumping. These findings consistent with the study carried out in Oyo state, Nigeria which reported that 76.8% of farmers were aware of the usefulness of poultry waste, and 57.6% expressed a favourable perception toward using waste productively for environmental safety (Akingbade et al., 2021). Despite the positive outlook, farmers often face structural and technical limitations that hinders full adoption of sustainable

waste management practices. Overall, the findings suggest that while poultry farmers are highly aware of the environmental impacts of organic waste and endorse mitigation strategies such as composting and waste segregation, there is a perceived gap in governmental support that could enhance sustainable waste management practices in the community.

The findings in research question 4 shows that poultry farmers have knowledge of environmental, health, and economic risks of organic waste to the environment. Similarly, Atere et al., (2023) discovered that majority of poultry farmers in Oyo demonstrated a high level of awareness and positive perception regarding environmentally safe and economical beneficial management of poultry waste. Also, Kumar & Patyal (2020) Examines the environmental and human health impacts of intensive poultry production, emphasizing the need for sustainable practices.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

This chapter discuss the summary of the study, the conclusion drawn, results obtained and recommendation offered

Summary

The study assessed the knowledge of the peril of organic waste among poultry farmers in Egor, L.G.A. To achieve the purpose of the study, four research questions were raised and answered. Literature related to the study were reviewed. The study adopts the descriptive survey research design. The population for this study was made of fifty-four (54) poultry farmers in Egor L.G.A, Benin city. The sample size for the study was made up of 38 respondents. This was drawn using the simple random sampling technique was adopted for the study

The instrument that was used for the data collection was a structured questionnaire. The constructed questionnaire for the study was presented to three (3) experts in the Department of Health, Safety and Environmental Education. To establish a reliability, test-retest method was used. The instrument was administered by the researcher and data was analysed using frequency, percentage, mean, and standard deviation.

Findings of the Research

Findings from the study include:

1. Poultry farmers recognize the boarder ecological implications of poor waste management practices.
2. Poultry farmers are highly aware of the environmental impacts of organic waste and endorse mitigation strategies such as composting and waste segregation, there is a perceived gap in governmental support that could enhance sustainable management practices in the community.
3. Specific training program could help improve knowledge on the financial and economic benefits of proper waste management and resource recovery.

Conclusion

This study assessed the peril of organic waste among poultry farmers in Egor L.G.A., Benin City. The findings revealed that poultry farmers are adequately aware of the environmental and health risks posed by poor organic waste management, which positively influences their willingness to adopt basic waste management practices. There is a moderate level of knowledge about resource recovery and economic benefits, indicating the need for capacity-building initiatives to enhance technical skills and economic understanding.

The operational and contextual factors, such as labor availability, farm size, government policies, and public awareness, play significant roles in shaping poultry waste management practices. While farmers demonstrate positive perceptions toward mitigation measures like composting and waste segregation, insufficient government intervention and low public awareness limit the full adoption of sustainable practices

Recommendations

Based on the conclusion, the following recommendations were suggested;

1. Organize workshops and training sessions for poultry farmers to increase awareness of advanced waste management techniques, including composting, biogas production, and resource recovery.
2. Provide practical demonstrations on how poultry waste can be converted into fertilizers or other economic resources.
3. Strengthen policy enforcement regarding organic waste management, ensuring that regulations are well-communicated and implemented at the community level.
4. Launch community sensitization campaigns to educate the public about the importance of proper waste disposal and the environmental and health risks of poor waste management.
5. Conduct further research on economic benefits of sustainable waste management, including cost-benefit analyses of biogas and compost production for small-scale poultry farms.
6. Establish a monitoring and evaluation framework to track the adoption of improved waste management practices and assess environmental impact over time.

By implementing these recommendations, poultry farmers in Egor Local Government Area can reduce environmental pollution, improve public health, and create economic value from poultry waste.

Suggestion for Further Studies

1. Impact of training programs on poultry farmers' knowledge and management practices. A study assessing how training intervention influence farmers' knowledge levels, skills, and farm management behaviours.
2. Organic waste management practices among small scale and large-scale poultry farmers. An investigation comparing waste handling methods, challenges and efficiencies across different production scales.
3. Determinant of poultry farmers' adoption and knowledge of Sustainable organic waste Management Practices. A study identifying socioeconomic, environmental, and institutional factors influencing adoption decisions.
4. Comparative Analysis of Poultry farmers' attitude and practices toward organic waste management. A study comparing attitudes, perceptions, and actual waste management behaviours among different categories of farmers.

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APPENDIX

DEPARTMENT OF HEALTH, SAFETY, AND ENVIRONMENTAL EDUCATION. QUESTIONNAIRE ON THE KNOWLEDGE OF PERIL OF ORGANIC WASTE AMONG POULTRY FARMERS

Dear Respondent,

I am a final year student of the department of Health, Safety and Environmental education, University of Benin. This survey is part of my academic research on the knowledge of peril of organic waste among poultry farmers.

Your response will help assess the knowledge of peril of organic waste among poultry farmers. It would be highly appreciated if you kindly respond to the items. Your response would be treated in confidence.

Kindly respond sincerely and accurately.

Thank you.

INSTRUCTION: Please tick the option that best corresponds with your response.

SECTION A: DEMOGRAPHIC INFORMATION

OCCUPATION: Lecturer () Driver ( ) Banker ( ) Poultry farmer ( ) Farmer ( ) Lawyer ( ) Doctor ( ) Technicians ( ) Pilot ( ) Engineer ( ) Trader ( )

SEX: MALE ( ) FEMALE ( )

SECTION B; RESEARCH QUESTIONS

INSTRUCTION; TICK THE MOST APPROPRIATE RESPONSE

S/N	ITEM	Strongly Agree	Agree	Disagree	Strongly Disagree
	Level of Knowledge on Organic Waste Impact				
1.	Do you know that organic waste can contribute to greenhouse gas emissions?				
2.	Are you aware that improper disposal of organic waste can pollute water sources?				
3.	Do you understand the benefits of composting organic waste?				
4.	Can you identify at least one environmental impact of organic waste disposal in landfills?				
5.	Do you know that organic waste can be converted into valuable resources like biogas or fertilizer?				

INSTRUCTION; TICK THE MOST APPROPRIATE RESPONSE

S/N	ITEM	Strongly Agree	Agree	Disagree	Strongly Disagree
	Factors influencing waste management practices				
6	Labor influences your decisions on how to manage poultry waste on farm.				
7	The size of your poultry farm influence your management practices				
8	Government policies play a crucial role in shaping				

	waste management practices in my community.				
9	Lack of public awareness is a major barrier to effective waste management in my area.				

INSTRUCTIONS; TICK THE MOST APPROPRIATE RESPONSE. SA- STRONGLY AGREE, A- AGREE, D- DISAGREE, SD- STRONGLY DISAGREE.

S/N	ITEM	SA	A	D	SD
	Perception of organic waste effect and mitigation measures				
10	The government is doing enough to address organic waste management issues in my community.				
11	Organic waste management is a significant environmental concern.				
12	Organic waste should be separated from other types of waste and managed differently.				
13	Composting help reduce the impact of poultry waste on the environment				
S\N	**ITEM**	**SA**	**A**	**D**	**SD**
	Knowledge of environmental, health, and economic risks				
14	I am aware of the environmental health risks associated with poor waste management				
15	I stay informed about economic impacts of poultry waste				
16	Health conservation is crucial for economic growth				
17	Poultry waste degrades the environment in your community				

Thank you so much for your participation