TRNC

NEAR EAST UNIVERSITY

INSTITUTE OF EDUCATIONAL SCIENCES

ENVIRONMENTAL EDUCATION AND MANAGEMENT

POULTRY WASTE MANAGEMENT TECHNIQUES IN URBAN AGRICULTURE AND ITS IMPLICATIONS A CASE STUDY OF TRIPOLI, LIBYA

MASTER THESIS

Kareemah S. H. ABDULLAH

Nicosia
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Thesis supervisor:

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To the management of the Institute of Educational Sciences,

This study has been accepted as Master's Thesis by our jury on Environmental Education and Administration Department.

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DECLARATION

I hereby declare that all the information in this document has been obtained and presented in accordance with the academic rules and ethical guidelines of the Graduate School of Educational Sciences. I have fully cited and referenced all materials and results that are not original to this study.

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Environmental Education and Management

January, 2019

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Kareemah S. H. ABDULLAH
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ABSTRACT

POULTRY WASTE MANAGEMENT TECHNIQUES IN URBAN AGRICULTURE AND ITS IMPLICATIONS: A CASE STUDY OF TRIPOLI, LIBYA

Kareemah S. H. ABDULLAH

Master's Thesis, Major Field of Environmental Studies and Management Thesis

Advisor: Assoc. Prof. Dr. Fidan ASLANOVA

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Poultry farming has been a source of revenue both for individual farmers and the government of Libya. However, these products posses certain human and environmental risks as they introduce certain compounds, elements as well as pathogenic microorganisms into the environment and the food chain.

The study adapted a quantitative analysis through questionnaires distributed to 350 poultry farmers within Tripoli district. In the SPSS results some of the key observations include a great percentage (99.4%) of farmers who did not have any training on poultry production and poultry waste management. It was also observed that 57.1% of the farmers remove their farm generated waste monthly which is not quite good for the environment as there will be generation of awful smell as a result of ammonia accumulation. Lastly, from the results there is a serious environmental concern in Libya due to inappropriate disposal of poultry waste as the majority of farmers (57.1%) dump their waste at dumping sites. Lastly, the study discovered that burning of dead birds is largely the mode of disposal of dead bird practiced by the majority of farmers (57.1%).

Keywords: Libya, Poultry waste, environment, environmental sustainability, waste management

ÖZET

KENTSEL TARIMDA ÇEVRE ATIK YÖNETİMİ TEKNİKLERİ VE UYGULAMALARI: TRİPOLİ, LİBYA KÖKENLİ ATIK YÖNETİMİNİN ÖRNEK OLAY İNCELENMESİ

Kareemah S. H. ABDULLAH

Yüksek Lisans Tezi, Çevre Araştırmaları ve Yönetimi Alanının Ana Alanı

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Kanatlı hayvan çiftçiliği hem bireysel çiftçiler hem de Libya hükümeti için bir gelir kaynağı olmuştur. Ancak bu ürünler, belirli bileşikler, elementler ve patojenik mikroorganizmaları çevreye ve gıda zincirine soktukları için belirli insan ve çevresel riskler oluşturmaktadır.

Çalışma, Tripoli ilçesindeki 350 kanatlı çiftçiye dağıtılan anketlerin kullanılması yoluyla nicel bir analiz gerçekleştirdi. SPSS yazılımını kullanan veri analiz sonucundan bazı önemli gözlemler şunları içermektedir: çiftçilerin devasa yüzdesi (% 99.4) kümes hayvanları üretimi ve kümes hayvanı atıkları yönetimi konusunda herhangi bir eğitim almamıştır. Ayrıca, çiftçilerin% 57,1'inin çiftlik atıklarını aylık olarak ortadan kaldırdığı, bunun da çevre için oldukça iyi olmadığı, amonyak birikiminin bir sonucu olarak korkunç kokuya neden olacağı gözlemlenmiştir. Son olarak, sonuçlara göre, çiftçilerin çoğunluğu (% 57.1) atıklarını çöplük alanlarına boşalttığı için, kümes hayvanı atıklarının uygun olmayan şekilde bertaraf edilmesi nedeniyle Libya'da ciddi bir çevresel kaygı vardır. Son olarak, çalışma ayrıca ölü kuşların yakılmasının büyük ölçüde çiftçilerin (% 57.1) çoğunluğu tarafından benimsenen ölü kuşun bertaraf edilme biçimini oluşturduğunu keşfetmiştir.

Anahtar Kelimeler: Libya, Kanatlı atıkları, çevre, çevresel sürdürülebilirlik, atık yönetimi.

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ABBREVIATIONS

SPSS : Statistical Package for Social Sciences

UNCHS **:** United Nations Human Settlement

EC : European Commission

UNCED : United Nations Conference on Environment and Development

EU **:** European Union

FAO : Food and Agricultural Organizations

R **:** Regression

UNDP **:** united Nations development program

DF **:** degree of freedom

Sig **:** significance

F **:** frequency

B : Beta

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CHAPTER I
INTRODUCTION

This section of the study is composed of problem statement, problem phrase, aim of the research, importance of the study, study limitations and definitions.

1.1 Problem Statement

Closeness to urban residence is one of the characteristics that urban agriculture is known for. Also, increasing competition for limited lands, use of waste water, solid waste and other urban resources, low farmers society or organizations and increased level of specialization are part of the characteristics and emboldens urban agriculture. Urban agriculture increases the efficiency of nation food distribution system by complimenting the rural agriculture (Veenhuizen, 2006). However, in other developing countries around the world such as Africa, animals poses a vital physical and financial capital for every family in the cities.

Agriculture is among the largest contributor in the economy of most countries. However, it involves also large generation of waste materials. Urban poultry farming producing meat or eggs, can be highly specialized operations. To maximize profits and plan future enterprise activities, a feasibility analysis prior to investment and proper management during the operation are required. Proper management ensures efficient production and good quality products. (Meat or eggs) This is accompanied by controlling diseases, maintaining feed efficiency, proper handling of waste and proper sanitizing of poultry houses. Due to short turnover rates of poultry flocks and strong market demand, the poultry business could potentially be a profitable enterprise.

In the majority of African countries, chicken meat, egg and animal milk come either from farms or from the suburbs. (Mousier and Dansoo, 2006). These animals pose as form of savings. Other form of capitals can be realized from them in the form of manure. Notwithstanding, the majority of problems among these developing countries is the negligence of urban agriculture as a potential contributor to urban development (Jacobi et al., 2000).

Huge amount of waste water and solid waste are generated from the poultry industry. The solid waste comprises mostly of excreta, bedding materials, feathers,

feed, hatchery waste, abattoir waste, sludge and bedding materials. (Adedayo, 2012). The high phosphorus content of poultry waste can increase crop production hen adopted as a sol nutrition augment (Mokwunye, 2000). Hatchery waste and dead birds contains great amount of protein with substantial amounts of phosphorus and calcium as a result of the great amount of mineral in their diet. There are diverse methods of getting rid of poultry waste ranging from burial, incinerations, source of energy, rendering, livestock feed, and composting. Other techniques that can be used in disposing poultry waste include its use in the treatment of heavy metal contaminated water and as a source of energy (Moreki and Chiripasi, 2011).

Libya is among the list populous country in Africa, but still a huge market for poultry as chicken is among the most consumed meet in Libya. The market demand for poultry produce is increasing especially in Benghazi, Tripoli and other notable cities in Libya (Davis, 2014). For the past 10 years, there has been a shift towards production to industrial scale size among the small and medium scale farmers who has gained the urban market. A springing middle-class sector with massive income and greater buying power has elevated the demand for more poultry products hence, leading to increase in demand among the urban and pre-urban cities.

Previous studies on poultry production mostly focused on rural poultry faming and its contribution to the rural areas leaving the urban counterpart underestimated with little to no attention by researchers. Notwithstanding it equally contributes to the socio-economic development of the country. Hence, it is vital to carry out a study on urban poultry faming and its waste management techniques and consequences. This research on the existing small scale intensive urban poultry farming will aid in providing solutions and challenges facing urban poultry faming and its waste management techniques. Also information from this research will add to abating some of the challenges facing farmers and the government at large in the area of solid waste management.

This study will examine the existing poultry waste management and utilization techniques in urban poultry farms, analyse the implications pattern on yield and revenue and further determine the socio-economic differentials of farmers on management pattern.

1.2 Problem Phrase

The initial aim of any waste management technique to be adopted is to maximize profit from the generated waste and to likewise maintain environmental safety standards, hence there is need in an issue of both profitability, affordability and sustainability. This afore mentioned properties are very vital as in appropriate handling of waste can result in the contamination of both surface and ground water as well as air pollution.

Part of the problems the study intends to address includes;

- Propose techniques that will reduce the level of agricultural waste generation
- How to reuse some of the agricultural waste generated from firms either in the same farm or as raw materials for production of other finished goods for production of energy.
- Propose effective techniques for recycling of agricultural waste.
- The study will address the various challenges in the proper management of poultry waste and how this affects the economic and social warfare of farmers.
- There are problems in the area of support in terms of trainings and government agricultural extension programs and how these affect proper cultivation. .

1.3 Objectives

The objectives of the study include:

- Examining poultry waste management and utilization techniques and their determinants in Tripoli, Libya.
- Analyzing the impact of poultry waste utilization on yield and revenue.
- Determination of the socio-economic differentials of poultry waste users on the management pattern of poultry waste in the study area.
- Assessment of waste management practices of small scale intensive urban poultry farming and identification of the major constraints, opportunities

and socio-economic factors affecting flock size in small scale intensive urban poultry farming.

1.4 Importance of the Study

Research on the management of solid waste mostly focused on the rural areas in Libya, while neglecting other rural areas. Hence, this study will account for solid waste management in Tripoli districts of Libya. This will contribute to our knowledge on the various consequences of the waste management practices already adopted by farmers on the environment and on the populace at large. Results from the study will provide information for lawmakers including community organizations, government and various agricultural stockholders, so as to make adequate decisions in relation to agricultural solid waste management in urban municipalities.

1.5 Hypothesis

Hypothesis I

- HI: Lack of government extension services affects proper waste management.
- HO: Lack of government extension services doesn't affect proper waste management.

Hypothesis II

- HI: Poultry farmers with access to government agricultural extension services have better waste management pattern.
- HO: Poultry farmers with access to government agricultural extension services doesn't have better waste management pattern.

Hypothesis III

- HI: Lack of finance affects proper poultry waste management.
- HO: Lack of finance doesn't affect proper poultry waste management.

1.6 Limitations

Limitations experienced during the course of this study include:

- Respondents inability to effectively attempt all questions provided in the questionnaire
- Logistics problem in terms of transportation to all local farms within Tripoli

1.7 Definitions

Urban agriculture: Urban agriculture also known as urban farming is an agricultural practice that involves cultivation, processing, as well as the distribution of food around urban areas.

Pollution: Pollution entails the release of contaminants which has adverse effect to the natural environment. Pollution is of diverse form which could be in form of energy, chemical substance, noise, light or heat. Pollution is classified into two major categories which include:; non-point source and point source pollution.

Solid waste: Solid waste is defined as any refuse or sludge from water treatment plants and other discarded materials in liquid, solid or semi-solid forms from industries, communities and from agricultural operations.

Waste management: Waste management is often regarded as waste disposal that entails all the actions and processes that are implemented to manage waste from its inception to its final discarding or treatment.

Environment: The term incorporates both living and non-living things around us and in the earth. Nature contains the connection of the species of every single living thing. It is an entire biological unit that functions as a system (Maria et al., 2013).

Environmental education: It involves a predictable learning process in different orders which brings out capacity, information on the most proficient method to tackle issues related to our surroundings (Zhaohua et al., 2016).

Environmental sustainability: A state in which the natural resources can be managed without decreasing its ability to permit the presence of life both in the present and in the future.

CHAPTER II

LITERATURE REVIEW

2.1 Urban Agriculture

Urban agriculture in its simplest term can be defined as food production (For example, fruit, eggs, fish, meat, non-food items such as ornamental plants, fuel, flowers and trees seedlings) within cities and its periphery; which could either be for commercial purposes or for home consumption (Hovorka et al., 2009). It is the act of producing food within urban municipalities for both commercial purposes and for household consumption (Dina et al., 2002). Agricultural practices in urban municipalities are conducted on either leased, rented or private lands in urban and pre-urban areas. It is also done in backyards, on vacant public lands such as school-grounds, industrial packs, prisons, road sides and other institutions (Salau and Attah, 2012).

The height in urban agricultural practices is often underestimated. Investigations carried out in 1993, showed that between the range of %15 and 20% of the world production of food is from urban areas.

However, it is further estimated that over 50% Latin American and 40% population of cities in Africa practice urban farming (Adebayo Bello and bin Ismail, 2016).

Urban agriculture contributes enormously to the areas of food security of many major cities around the world both in the area of vital part of the urban food security of divers major urban areas and as means of curtailing food insecurity problems. Previous studies conducted in a city showed a considerable level of market efficiency in poultry production, fresh vegetables as well as byproducts of other animals (Mbaye and Moustier, 2000).

Recently, the importance of urban agriculture is gaining monumental recognition by different international organization such as United Nations Human Settlements (UNCHS), United Nations Conference on Environment and Development (UNCED) and the Food and Agriculture Organization (FAO). As proposed by Waters-

Bayers, (2000), urban agriculture practices occupy a vital position as a source of income, food, and creation of employment mostly for middle class citizens.

As reported by Mougeot (2000), livestock, crops and horticulture farming are vital for countries that are still developing in the areas of food supply, supply of food rich in protein, education and source of cash for urban people.

Mougeot (2000) further proposed that urban agriculture can confer important strategies in the fight against poverty and social integration of disadvantaged groups (female-headed households with children, elderly people, HIV/AIDS-affected house as well as jobless youths), with the intent of integrating them into the urban network, avail them a proper livelihood and albeit some social problem such as drug use and crime (Novo and Murphy, 2000).

Livestock farming in urban centers can be classified in various ways, for example according to the location, main aim of production, husbandry methods (Tethering, roaming, stall feed or heading), land tenure and animal size (Schiere, 2001).

2.2 Socio-Economic Characteristics Of Urban Farmers

Approximately half of the world population inhabit in urban centers. As Bakker et al (2000) proposed, developing countries will account for close to 70% of urban settlers by the year 2020. Though urbanization creates quite a lot of socio economic benefits, the increased rate of urban migration results in a more greater problem and challenges in areas of providing appropriate services such as infrastructures, housing, employment and other facilities. The progressive expansion of urban centers towards the hinted lands mostly results in conversion of farm lands for other non-agricultural purposes.

Thomas (2013), further expressed that this issue is occurring at a time when many populated cities are facing the challenge of increasing poverty and unemployment. Various cities around the world have incorporated urban agriculture as a powerful tool in the fight against increasing urban unemployment, hunger and poverty. This notion can be traced to the ability of urban agriculture to support nutrition, provide food security, employment and serve as a means of generating

finance for low class individuals as well as other less privileged individuals such as the disabled, women, unemployed youths and the elderly (Von Veehuizen, 2006).

The increased growth of urban population and urban arrears is generally witnessed around the world as half of the world population is urban settlers (Prain, 2006). It is expected that over 55 percent of population in African nations will be urban settlers by the year 2030 (Parrot et al., 2010).

Report by UNDP stated that over 900 million urban settlers have agricultural practices as their major occupation in the mid1990s. However, in the African setting, Bamiro (2013), wrote that there was an increase from 10% to 25% in the population enlargement in urban agricultural practices of 1970 to 80% in 1990s.

For a while now, the need for urban farming practices were neglected and associated to mare traditional habits brought forward by migrants from rural settings and it was anticipated to fade away by time even though it's been integrated into the city economy.

There has been stiff opposition to the idea of urban agriculture both from urban planning circles and from public health which view urban agriculture as threat to the health and wellbeing of the populace or as a low-rent land without the capacity to compete favorably with other urban land uses. Such views were backed up in restrictive regulations and bye-laws at both city and national level, though these have been ineffective as proposed by (Hovorka et al., 2009).

In the year 1996, United Nations Development Program (UNDP) proposed that over 800 million people around the world are practicing urban farming with over 200 million being market producer that provide jobs to over 150 million people (UNDP, 1996).

In many countries, increasing urbanization is resulting in increased urban insecurity, poverty and malnutrition. Increase in urban agriculture is related to increase in urbanization. Other factor fuelling urban agriculture is the increase in the increasing demand for perishable agro-products such as meat, vegetables, eggs and milk alongside the advantage of production close to the market and the gain of agricultural useful byproducts such as waste water, organic waste and vacant arable public lands (Hovorka et al., 2009).

Urban farming is well practiced in sub-Sahara Africa. Obudho and Foeken, (1999), proposed that over 50% of urban settlers in Africa practice urban agriculture. This notion is evident in the study by Lynch et al., 2002) in Kano state Nigeria. The study showed that urban agriculture is providing farmers in that region with food and employment. Urban agriculture has the ability to decrease pollution in urban settlements by integrating solid waste and waste water as inputs for soil augmentation. Hence, preventing flooding and erosion through replanting bare lands and hence improve the micro-climate of these urban settlements.

Salau and Attah, (2012), in their study suggested that urban agriculture can be adopted in the conservation of energy and food as a result of the low loss of food produced during the cause of handling any transportation with economic savings due to No/smaller need for processing, packaging and storage.

2.3 Small Scale Commercial Poultry Production

In recent times, the recognition on the important role played by small scale commercial poultry production in eradicating and reducing poverty is gaining momentary recognition. There has also been increasing evidence to showcase the role played by small scale poultry farms in elevating nutrition and food security of low-class citizens and promotion of equality of gender (Dolberg, 2004).

Likewise, the market and poultry production has been inconsistent for the past three decades as expressed by Conroy et al., (2005). Increased urbanization and fast economic growth among the developing nations have led to the expansion of the industry into large-scale poultry production units mostly in Asian countries. Conroy et al., (2005) further expressed that opportunities have also been made available for small scale poultry enterprises as a result of easy access to improved market infrastructure.

2.4 Poultry Feeds and Feeding

Poultry feed poses as the core cost of poultry production, as it comprises up to 80 percent of the total cost of feed, over 98 percent is utilized so as to meet protein and energy requirements while major 1 to 20 percent is utilized for other feed additives. Poultry feed comprises of a mixture of ingredients which are assembled taking into consideration their unit prices as well as the nutrient content.

2.5 Urban Poultry Products marketing and Utilization

As proposed by Aden and Oguntade (2006), the commercial sector of poultry farming involves large scale slaughter, operations and in-house facilities for processing of birds. Frozen chicken source from poultry farms comprises of over 90 percent broilers while the remaining 10% is sold as live birds. Frozen and fresh meat alongside eggs are directly sold to consumers both in the open markets and at the farm gates to commercial distributors, hotels, supermarkets, fast food companies and other industrial operators (Obi et al., 2008).

Poultry products in developing nations, mostly in Africa are still of high cost due to the poor market system which is generally poorly developed. Unlike meat and eggs from commercial hybrid birds, indigenous stocks are mostly preferred by local consumers. While consumers that have high purchasing power live within the cities, there is need to intensify poultry farming in semi-urban centers or areas with good roads (Bakker., 2000).

Within the last one decade, there has been a significant development in agricultural production as a result of skyrocketing demand for food which is also connected to the increasing world population as well as increased urbanization and average income.

According to the estimation by United Nations, there will be over 8 billion people in the world by the year 2030 with an average income of 32% higher. Also, there will be 26% increase in meat consumption per-person within the same period with chicken meat in particular (FAO, 2010). Poultry products are mostly wanted by buyers as they are foods with high quality protein and low fat (FAO, 2010).

2.6 Urban Poultry Waste Management Practices

Huge amount of waste is mostly generated from the poultry industry including waste water and solid waste. The solid waste comprises of excreta (Manure), bedding materials, feed, hatchery waste (Late hatchlings, infertile eggs, empty shells and dead embryos), feathers, abattoir waste (condemned carcasses, blood, feathers and offal), mortality and sludge (John and Teto, 2013). The upscale movement from the area of waste collection to storage or final use point is vital in management of poultry waste (Mijinya and Dlmini, 2007). Hatchery waste and dead birds contain high amount phosphorus and calcium as a result of high level minerals added in their diets.

The use of poultry waste for other agricultural uses has been practiced in Africa mostly as nutrient supplements for plants and hence, creating more avenues for farmers (Onibokun, 1999). There are diver's methods of getting rid of poultry generated waste including rendering, burial, incinerations, feed for livestock, composting, source of energy generation and fertilizer (John and Teto, 2013).

The use of agricultural waste from urban centers is gaining monumental interest in developmental research because of the huge role it plays in curtailing unemployment and food problems in urban centers as a result of growing urban population. Previous literary work has proven the correlation that exists amidst economic, environmental and social contributions of agricultural waste utilization to urban food production. However, the main challenges is how these generated waste (municipal waste, poultry waste, cattle waste, waste water etc.) can be well utilized for healthy food production with near to zero negative outcome (Adebayo Bello & bin Ismail, 2016;). The use of animal manure for example, pig manure, poultry manure, cow dung as well as human excreta directly on arable agricultural farms requires a well-planned composting or integration of diseased animal manure with other forms of solid waste for effective farm products in urban centers (Cofie et al., 2005).

Poultry farming results in manure (Bird excrement), hatchery, non-farm mortalities and litter (Bedding materials for example rice halls, saw dust, peanuts and wood shavings). The poultry product procession results in generation of additional waste such as offal (Organs of slaughtered birds, entrails and feathers), bio-solids and processing waste water. The majority of these by-products are capable of providing organic and inorganic nutrients that can be of great importance when properly recycled. However, this generated waste can cause potential human health and environmental concern as some of the constituent elements involving veterinary pharmaceuticals, pathogens vermin and insect vectors. Ground knowledge on the amount of generated poultry manure or litters gotten from the poultry farm is vital so as to design an appropriate waste management technique (FAO, 2012).

Moreki and Keaikitse (2013) in their study proposed that use of manure in enriching soil nutrient is a proper way of disposing litter or manure as these manures can augment for nutrients lacking in the soil. Most poultry litters are used on farm lands close to the poultry farm.

This method of farming has been adopted widely in developed nations. Such waste management practice reduces potential water and land contamination by these poultry by-products. These techniques also depends on several factors such as the receiving crops agronomic potential to utilize the waste nutrients, the soil types were these were these manure is to be applied, geographical conditions, distance to surface and ground waters and lastly, climate.

Reuse of poultry waste poses serious threat to human wellbeing as the sight and smell of poultry waste is offensive and it also becomes breeding ground for lots of rodent pests and in cases of runoffs into water results in algae bloom (Zeeuw, 2000). Ammanullah et al., (2010), in their study stated that application of poultry manure to farm lands low in phosphorous content is an ideal way of managing poultry waste.

2.7 Major Constrains To Urban Poultry Farming

The poultry sector in Africa is faced with the challenge of high cost of production as well as lack of sanitary control and contents in technical knowhow and marketing. The high cost of production in Africa is attributed to lack of automated industrial poultry sector. Also there is lack of access to inputs by farmers in areas of chicks and feeds as well as high cost of tertiary services. The consistent outbreaks of animal diseases have resulted in export production potentials.

2.8 Nutritional Value Of Poultry Waste

Several names are signed to poultry waste such as: broiler litter, chicken litter, poultry compost, poultry litter, poultry excreta, layer litter and dry broiler excreta. Be that as it may, there are basically two sorts of waste delivered by poultry firms: confined layer and poultry litter. The first is from confined animals and the second is made of sheet material and excreta. For the most part the bedding material of poultry is wood shavings, nut structures or rice husk (Ahmed, Zohra, Khan and Hashem, 2017).

Poultry waste is viewed as a decent wellspring of supplements for ruminant animals, especially for its unrefined protein and mineral constituents (Ahsan, Alamgir, Shams, Rowshon and Daud, 2014). A Study from Babalola, Ishaku, Busu, & Majid, (2010); detailed that rough protein values from poultry waste can run from under 15%

to additional than half. Cavalaglio et al., (2017); studied l0 tests of poultry litter and got a normal estimation of 26.75% unrefined protein (dry premise).

This esteem is viewed as low in light of the abnormal state of rough fiber (23%) that came about because of wood shavings being joined with the litter. Carrión et al., (2012), estimated around 28.75% rough protein in poultry waste and Chalova, Kim, Patterson, Ricke and Kim, (2016) examined the litter from 60 broiler houses with wood shavings and found that the rough protein content differed from 25.7% to 32.2%.

These rough protein esteems are considered high in connection to other customary minimal effort nitrogen sources. Confined layer waste ought to have a high rough protein content since bedding materials are inadequate. Be that as it may Collins, Murphy, & Bainbridge, (2000); working with confined layer waste, estimated just 27.7% rough protein. Others have detailed higher rough protein content. (Ferreira et al., 2018); 34.24%; Fisheries, (2003); 32.6%; and, of lately, González & Sánchez, (2005); discovered 40%. This variability is most likely due to reduction in nitrogen concentrations as a result of accumulation, handling and drying strategies (Monoukas et a1., 1964).

A part of the nitrogen exhibit in this material is in the type of uric corrosive, urea and alkali, which make up roughly 6.34% to 11.4% of the dry issue (Gebremedhin and Tegegne, (2017); This represents over 22.9% of the aggregate nitrogen in broiler litter (Hamra, 2010), or 46.2% of the total nitrogen portions (Kannan, Balasubramaniyan, Mahimairaj and Prabukumar, 2015). This esteem can fluctuate with the volatile loss of ammonia nitrogen that can happen during processing and storage. Previous literary work has indicated that over 20% of nitrogen is lost amid drying out (Kantarli, Kabadayi, Ucar and Yanik, 2016).

Li, Cheng, Yu and Yang, (2016) considered the vitality esteem for ruminants of broiler litter containing nut hulls and wood shavings. They utilized weight control plans in which either 43% or 70% of the nitrogen was from poultry litter, or a blend of horse feed and corn as a control. At the point when 43% of the dietary nitrogen was given by broiler litter the edible vitality content was 2,498 Kcal/Kg with shelled nut hulls and 2,438 kcal kg with wood shavings. At the point when 70% of the dietary nitrogen was given by broiler litter, the absorbable vitality estimates were 2,428 and

2,387 Kcal/Kg separately. These qualities were lower than those for the control (P<.01).

Mainali, Emran and Silveira, (2017) found out that confined broiler waste had higher edible vitality content than broiler litter. Their comes about showed 3, 003, 2, 564, 2, 328, and 2,100 kcal of edible vitality/kg of dry issue for diets containing 25, 50, 75 and 100% confined layer waste, separately. (Msoffe and Ngulube, 2016) announced the gross vitality substance of broiler litter to be 3,600 Kcal/Kg, while Bhattacharya and Fontenot (1966) detailed levels of 3,862 and 3,748 Kcal/Kg when shelled nut structures and wood shavings were utilized as bedding, separately. Martinet al. (1963) revealed a gross vitality substance of 3,652 Kcal/Kg an absorbable vitality content at 2,440 Kcal/Kg. The gross and absorbable vitality substance of broiler litter and confined layer waste are like that of horse feed roughage (Msoffe and Ngulube, 2016).

Previous literary work has stated that poultry waste is a great wellspring of minerals and proper dyes for animals. Owen, Alawa, Wekhe, Amakiri, & Ngodigha, (2010); estimated 15.5 and 21.5% ash in broiler litters and confined layer wastes, individually, from 59 distinctive poultry houses. The real mineral segments were calcium and phosphorus. Different examinations have demonstrated ash remains to be 23.88% calcium and 5.31% phosphorous (Ponder, Jones and Mueller, 2005).

The incorporation of poultry waste as a source of minerals, particularly calcium, phosphorous and magnesium brought about adequate growth of sheep (Ponder, Jones, & Mueller, 2005). The investigation stated that the small digestive tract was the real site for the retention of calcium and phosphorous. The rumen was the site for the retention of magnesium. Despite the fact that calcium, phosphorous and magnesium levels surpassed the required levels, the animals did not show clinical side effects, toxicity or lethality (Field Ponder, Jones and Mueller, 2005).

2.9 Elements Which Influence The Quality Of Waste From Poultry

The nutritious estimation of rubbish from poultry fluctuates with mode of maintenance (Putman, Thoma, Burek and Matlock, 2017). Poultry dung production is a function of some determinants, condition of the climatic, composition of diet, diet additives and build-up and managing organization.

Moradi and Rasouli-Sadaghiani (2014) argue that a climatic locale's inside inconstancy of a nation can influence the substance of H_2O (water), N_2 (nitrogen) and, powder of domestic fowl rubbish. Eating routine as well as extent of nourishment is the most essential wellspring of diversity in poultry waste. Rasouli-Sadaghiani & Moradi, (2014) demonstrated that eating methodologies used on hens have considerable effect as a determinant of constitution of the generated rubbish. Concentration of N_2 and dust ash appeared greater (P<.OS), whereas lower concentrations (P>. 05) were observed with net vitality, acidic and neutral washing detergent fibrils in the new hen fertilizer nourished an abnormal state of nourishment when contrasted with those encouraged decreased sustenance quantity.

Capacity moment generates concoction diversity creation of poultry broiler waste as well as confined coating rubbish. Dampness constituent diminish along with time in poultry broiler waste and confined layer waste. Confined layer waste dampness content is higher than poultry litter in view of afore- mentioned bedding impact. Protein aceous material, fiery debris as well as corrosive uric acid of waste of broiler expanded (P>.05) within the 14^{th} and 42^{nd} day of capacity whereas ether extricate, unrefined fibrils as well as impartial cleanser fibril diminished. Not any of the confined bedding litter supplements fluctuated essentially, albeit rough protein, other concentrate, unrefined fibril and uric acid geared towards reduction while fiery remains geared at build-up (Santos Dalólio et al., 2017).

Accumulation and preparing methodology have a generous impact on the organization of poultry waste. Moradi & Rasouli-Sadaghiani, in 2014 estimated huge misfortunes of vitality and nitrogen with desiccated poultry litter. In 1969 it was discovered by Shannon and Brown that the amount of vitality lost with solidified desiccation was 1.3%.

Up to 4.6% and 4.8% setback additions from N_2 were observed with solidify desiccation. What's more, broiler drying at 60 C was utilized, individually. In 2016 Li, Cheng, Yu, & Yang, prepared domestic fowl litter at a temperature of 150° covered for 4 hours. Smelly nitrogen salts. 61.76% was observed to be the greatest vital misfortune Ngulube & Msoffe (2016); diminished the dissipation of rough protein aceous material due to desiccated conditions to half as a result of a pH fall of the waste from 7. 6 to 6. 0 with expansion of one N sulfuric acid.

N_2 usage try-outs on sheep, according to Ponder, Jones, & Mueller, (2005) noticed exposure of poultry waste to sterilization with autoclave, dehydrated warmth as well as corrosive dehydrated warmth had no influence on the admission, discharge or maintenance of the N_2 gas.

2.10 Quality Of Water And Production Of Poultry

Poultry production output rate can be adversely affected by water microbial and mineral content while, on the other hand, poorly managed poultry cultivation can affect the quality of water hence, necessity for monitoring nonpoint water source contamination. Waste maintenance especially poultry litter can be adopted as precious ancillary product associated to broiler cultivation which finds uses as food, fertilizer and source of vitality.

Broiler production and the quality of water is a broad topic and mostly associated with researchers, poultry farmers, environmentalist as well as booth federal and state agencies. Most researchers are digging into how water quality can affect poultry production output while others are interested in management of waste generated from poultry farms as to prevent environmental pollution.

Study by Ponder, Jones and Mueller, (2005), showed the possible effect of content of mineral in water on turkey and broilers. Outcome from this study showed that magnesium and nitrate have a high negative impact on the growth rate of broilers. Hence, Ponder, Jones and Mueller, (2005), went further to suggest that H_2O supply to poultry farms should be assayed for its microbial and mineral constitution in order to decide consumption acceptability.

2.11 The State and Federal Monitoring of Poultry Waste Maintenance

The Environmental Protection Agency (EPA) as well as other government arms have been charged with the responsibility of regulating and monitoring the impact of broiler waste generation, treatment and disposal on the environment and human health. Study by Ponder, Jones, & Mueller, (2005) suggested that ameliorations of coastal zone reauthorization and successive actions corresponding to nonpoint source (NPS) H_2Opollution maintenance of 1) sewage and flows from poultry farms,

2) minerals, and 3) water flooding from organizations are of vital notice to egg as well as poultry farmers.

2.12 Uses of Poultry Litters

Valuable secondary products are generated during the process of poultry farming in the form of litter-a combination of bedding materials and manure. These generated secondary materials if properly manage, could be sold and as soil fertilizer, unprocessed material for vitality generation or as feed for other animals (Adebayo Bello and bin Ismail, 2016).

Proper management skills, know-how of waste composition, as well as the method of use of waste are vital in the adoption of poultry litter as manure. (Ahmed, Zohra, Khan, & Hashem, 2017). The amount of phosphorus, potassium, and nitrogen of poultry litter ought to be known so as to ensure that substantial amount of these constituents can serve as nutrient to indigenous earth. The amount of N_2 is vital in putting into contemplation varied method of uses. As an example, in top surface application, close to a half of the N_2 as well as other necessary composition previously indicated are within plants reach. Immediate soil adoption of waste guarantees that a greater portion of all of the N_2 is obtainable as a mineral for plant

Numerous conditions have advanced maintenance strategies in poultry waste utilization as soil augment, or pasturage (Asfaw, 2016).

Poultry waste has prospective ability as vitality sources and pasturage. The contemporary analysis by Baniasadi et al., (2016), disclosed the advantages and disadvantages of biogas generation from dissolution of broiler droppings in the absence of oxygen and potentials of heap burn co-generation infrastructure. Previous studies have proposed the utilization of broiler dung as well as waste for pasture (Carrión et al., 2012).

Albeit poultry waste poses as an energy source, manure and pasture, it is mostly regarded as a vital origin of pollutants in top surface and ground H_2O. In 2017, Cavalaglio et al., stated that nitrates, phosphorus (P), and microbial infectious agents harmfully influence the grade of water. Natural as well as manmade elements affect exposure of pollutants into both ground and surface water. Soil type, location, and table water depth comprises of the natural factors that must be put into during the

storage and adoption of manure as fertilizer. Pollution resulted by natural and manmade factors like defective building of well, inappropriate preservation of poultry waste, uninhibited broiler homes, and improper waste management skills could be avoided by adopting principles for several publications (Cavalaglio et al., 2017).

2.13 Poultry Waste Management at Poultry Production Units

Disturbance to occupants of an area (such as odor, insects and rats) as well as terrain degeneration are characteristic disadvantageous impacts in areas close to broiler farmlands. Earth and H_2O contamination with microorganisms, minerals and weighty metals is most times due to improper broiler waste maintenance and mostly encountered in areas in which waste is preserved. H2O and earth contamination associated with broiler waste isn't related to the area of cultivation, since broiler waste is mostly directly introduced into surroundings under extraordinary states. However, increased mineral composition and reduced moisture constituent of broiler waste render it an important introduction into agriculture. Waste is either introduced on farmland of the animal farms or sold as out in the market. In the conventional arrangement, an intermediate obtains manure broiler waste from farmlands. The waste could be resold in its raw nature or managed into pallets or waste compost. Commodities from manure are adopted in the form of plant food, or as feed for animals mostly for cattle as well as fish.

In the southern part of Vietnam, it was seen that those who use poultry manure may be leaving up to 400 kilometers away from poultry site where fertilizer is generated. A middleman would sell fertilizer to the users who are willing to exchange for an agreed price which is subject to change with time, in relation to crop calendar and economic conditions.

Poultry farms can cause local nuisances due to the emission of pungent smell. According to a study by Kolominskas *et al*., 2002; Ferket *et al*., 2002, odor resulting from poultry farms unfavorably affect individuals within the surrounding. Smell related to broiler processes is as a result of fresh as well as decaying unwanted produce like dung, shells, feather and feces.

Odor on the farm is mostly produced from broiler homes, as well as dung and preserved constructions. Odor as a result of processes concerned with feeding animals results not from one singular constituent, rather due to extensive quantities of donating

constituents ranging from ammonia gas (NH_3), to hydrogen sulfide (H_2S) and volatile organic compounds (VOCs) (IEEP, 2005). From the multiple manure-based compounds which generate odor, mostly known compound is NH_3. NH_3 gas emits an intense and pungent odor which could cause irritation in high concentrations.

Odor is a local issue, and is unquantifiable. The impact highly stems from broad perception of people neighboring the farm. Hence, it is challenging to assay the greatest displacement a smelly gas covers; notwithstanding odor issues are broadly associated within 600 meters from the farmland. Albeit broadly doesn't cause health concern, smells pose as an intense challenge in the locality often experienced by people within neighboring poultry farmlands to be the most troubling surrounding effect. Release of odors frequently stems on farm sanitation rate, kind of manure, manure temperature and water content, air movement and kind of preservation facility. Hence, mostly higher in water-fowl farmlands compared to farmlands of chicken.

Flying insects form part of the factors that poses as a concern for people inhabiting near poultry farms. Study carried out by the Ohio Department of Health showed that people living in close proximity to poultry facilities are having issues with fly infestation. As a result of the disturbance they pose, mosquitoes as well as flies are disease vectors of malaria, dysentery, typhoid, cholera, and dengue fever. Notwithstanding that it is not frequently addressed as mosquitoes and flies, rodents also pose an immediate disturbance associated to broiler cultivation. Same as with mosquitoes and flies, these are vectors for the spread of infections. Existence of these is commonly tied to maintenance of animal-feed and specially preservation as well as dissipation from feeding structures.

The use of chemicals to monitor these pasts and raiders has been stated to cause pollution when they find their way into soil and surface water. According to a study by World Bank (2007), active molecules as a result of their degradation enter surrounding as solution, intermixtures or attached to ground molecules, while with other cases, prejudice utilization of top and soil water.

Inappropriate discarding of fowl cadavers could lead to water grade difficulties mostly within regions exposed to torrents or areas with superficial water platforms. Approaches for proper discarding of fowl cadavers comprise entombment, burning, processing into compost. With situations of current Highly Pathogenic Avian

Influenza (HPAI) eruptions, discarding great amount of diseased poultry has resulted in novel and complicated challenges related to surrounding pollution. Great quantities of cadavers could release large volumes of infusions as well as more contaminants, extending the possibility of surrounding contamination.

Entombed fowls go through putrefying operation. In the course of this procedure, constituents, microorganisms as well as diverse cadaver proportions are discharged to surrounding. In the course of these substances finding their way into the nearby ground, they could be disintegrated, converted, or rather confined such as to confer no surrounding menace. Nevertheless, according to a 2003 study by Freedman and Fleming, chances of such components subsequently pollute the ground, underground as well as top water. An additional associated issue seems to be the fertilizer retrieval from abodes housing diseased fowls.

In 1988 Ritter *et al.* assayed the effect of birds' cadaver discarding on groundwater grade. They observed groundwater grade around six discarding wells in Delaware. Producers in Delaware used open-bottomed wells for their daily death discarding. Such wells were not sternly the same as entombing wells, although some likeness existed. The greater numbers of such wells were found in sandy ground with increased periodical water platforms. The possibility of groundwater contamination is increased with such method of discarding. Following site choice, two to three observation pits were placed by each well to a depth of 4.5 meters. NH3 gas proportions were increased in two of the pits. Three of such discarding wells resulted in a rise in NH3 gas proportions in groundwater. Overall dissolute proportions were increased in all observation wells for most dates. Pathogenic infection of groundwater by discarding wells was reduced.

2.14 Environmental Pollution from Poultry Slaughterhouse

The greatest outstanding surrounding concern ensued from slaughter house procedures is the release of sewage to surrounding. As typical with most food manipulating acts, the need for sanitation as well as grade checks in meat manipulations develops in increased water use hence increased quantities of sewage release (IEEP, 2005). Broiler handling acts call for great quantities of high-grade water for process sanitation and cooling. Characteristic water use in fowl slaughter houses runs between 6 and 30 cubic meters per ton of product. Extensive volumes of water

are used in poultry slaughter houses for evisceration, sanitation and cleaning procedures (EU, 2003).

Process sewage released during such acts characteristically bears increased biochemical and chemical oxygen demand (BOD and COD3) as a result of organic contents such as blood, fat, flesh, and feces. Moreso process sewage may bear increased quantities of nitrogen, phosphorus, and residues of substances such as chlorine used for cleaning as well as sterilization, and varied microorganisms including *Salmonella* and *Campylobacter* (World Bank, 2007). According to Arvanitoyannis and Ladas in 2007, fowl by-products and rubbish may bear up to 100 varied types of microbes, such as pathogens, in infected feathers, feet and intestinal matter. Characteristic numbers for sewage generated from fowl processing are 6.8 kg BOD /ton live weight killed (LWK) and 3.5 kg suspended solids /ton of LWK (de Haan *et al*., 1997).

Broiler slaughter-houses generate extensive quantities of rubbish to the environment, contaminating ground and top water and pose a severe danger to human health. Release of perishable biotic products could lead to an intense decrease in the quantity of dissolute O_2 in top water bodies, which in turn could generate into decreased quantities of liveliness or even cessation of marine life. Nutrients present in large quantities (nitrogen, phosphorus) could lead to eutrophication of the infected aquatic bodies. Large amounts of algal bloom and consequent death and the accumulation of minerals on them could generate into cessation of water biota due to reduced oxygen levels (Verheijen, et *al*., 1996).

Abattoirs are most times found in urban or semi-urban sites, where transportation expenses to markets are reduced and which team with excessive labor availability. Such condition escalates the danger of surrounding effects: firstly, abattoirs are often deficient in the land necessary for setting up sewage maintenance equipment; secondly, the contaminants that The Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) are properties that show an evidence of the proportion of biotic components in sewage. Their computation is dependent on regulated chemical processes for deciding the rate at which organisms consume O_2 in water. The proportion of suspended solids marks the level of non-dissolvable biotic and inorganic molecules in the sewage (Verheijen *et al.*, 1996). Those generated by

other human enterprises; and thirdly, as a result of nearby localities are directly influenced by top water and soil water pollution.

2.15 Watershed-Level Pollution Associated with Waste Management

According to Naylor *et al*., in 2005 augmentation of cultivation and the physical cluster of cultivation points most times results into surrounding worries. The elimination of plant and animal husbandry via the movement of animal cultivation from plant activities into zones with little or no pasture land generates into increased quantities of surrounding effect – commonly as a result of poor manure maintenance as well as excessive mineral overloads.

2.16. Manure from Poultry

Manure from poultry bears significant quantities of minerals like nitrogen, phosphorus, and other released components like hormones, antibiotics, pathogens and weighty metals that get accessed via food. Seepage and torrential flow of such compounds have the possibility of generating into pollution of top water and soil water facilities.

2.16.1 Nutrients in Poultry Manure

Animal intensive growth in cultivation systems demands large quantities of protein aceous material and other nitrogen-constituting components in their feed. The transformation of nitrogen in diets to products of animal is quite less efficient, about 50 to 80 % of it is lost (de Haan 1997). Loss of nitrogen is in both biotic and inorganic constituents. Nitrogen released from fertilizer comprises four main types: ammonia (NH_3), nitrogen (N_2), nitrous oxide (N_2O) and nitrate (NO_3^-).

The component, phosphorus is a vital compound for animal cultivation. As opposed to N_2, P is quite stable once adhered to soil molecules and does not seep via the soil into soil water. It poses no danger to the surrounding safe as a nutrient; it restrains biological processes in aquatic facilities and accumulates in ground when released in abundance. P release from fertilizer exists in one main form: phosphate (P_2O_5).

2.16.2 Heavy Metals in Poultry Waste

According to Bolan et al., in 2004, fertilizer contains significant amounts of possible harmful metals like arsenic (As), copper (Cu) and zinc (Zn). In abundance,

these compounds could be harmful to crops, can negatively affect living things which depend on such crops, and could enter aquatic bodies through surface torrents and seepage (Gupta and Charles, 1999). Minute compounds get access into broiler feed either unintentionally via polluted feed constituents or intentionally, as diet supplements used to furnish animal needs or – in much higher quantities – as vet medication or as proliferative boosters.

2.16.3 Residues of Drug in Poultry Manure

According to Campagnolo et al., (2001) anti-pathogenic factors are given to broilers for healing purposes or as prophylaxis. At very low therapeutic doses anti-pathogenic factors are administered as diet supplements to boost proliferation rate as well as improve diet efficacy. Notwithstanding the dose of administration, about 75 % anti-pathogenic factors given to incarcerated broilers could be released back into the surrounding (Campagnolo et al., 2001). Contemporary proof by Chee-Stanford et al., 2001 proposes that relationship between microorganisms and antimicrobial agents in the surrounding could accord for the evolution of resistance of microbes to antimicrobial therapy. According to Campagnolo et al.,(2002) assayed the availability of antimicrobial components in top water and soil water facilities next to thorough poultry processes in Ohio, discovered high remnants of antimicrobials– available in twelve samples of water (67 %t) obtained next to broiler farmlands.

According to Mellon et al., (2001, in the US, total usage of anti-pathogenic agents for non-healing reasons in livestock increased by about 50 % between 1985 and 2001. This was initially governed by excessive utilization in the broiler manufacturing, in which non-healing antibiotic drug use scaled from 2 million to 10.5 million pounds (907 185 kg to 4 762 720 kg) between the 1980s and 2001 – which compounded to a considerable 307 % growth on a per-broiler point.

2.16.4 Manure Microbes in poultry

Manure also bears microbes that could possibly influence soil and water facilities especially in situations of poor management. According to Bowman et al., 2000, pathogens like as Cryptosporidium and Giardia spp. could effortlessly proliferate from manure to water bodies and could stay alive in the surrounding over prolonged periods.

CHAPTER III

METHODOLOGY

Improper disposal of waste is posing detrimental problems to the environment and to human health at large. Hence, there is a vital need to investigate the techniques adopted by Libyan urban farmers in handling the water generated from their poultry waste and how this technique affects the environment directly or indirectly. This section of the study elaborates more on the methodology for sourcing data.

3.1 Method of the research

This is a descriptive study in a screening model that aims to determine the management techniques accepted by Tripoli poultry farmers and their possible consequences. In order to reveal the current situation, the study was conducted on 350 poultry husbandry farmers (Adebayo et al., 2016).

3.2 sample selection

This study adopted a random sampling method for collection data. Over 350 questionnaires were distributed to poultry farmers within Tripoli district. A face-to-face method of questionnaire distribution was adopted for this study. This method was chosen in order to clarify any questions that might be asked by the respondents during the process of questionnaire filling (Ahmed et al., 2017).

3.3 Data collection technique

Data were sourced from poultry farmers within Tripoli between the 8th- 21st January, 2018. The questionnaire that was used for this study is divided into five sections (section, A, B, C, D, E). The first section (A) aimed at deducting the demographic background of respondents which included the gender status, age bracket, marital status, and residence location of respondents.

Section “B” of the questionnaire targets the socio-economic background of respondents. Section “C” targets the type of waste management practice adopted by the poultry farmers. Section “D” aims at extraditing the institutional support and extension service to poultry farmers while section “E” provides us with data on the constraints and opportunities facing poultry famers within Tripoli district.

For the purpose of easy response to the questions a likert type scale rating was adopted.

3.4 Framework for Data analysis

The study frame work relies on the very impact of improper solid waste on natural environment. Studies have proven that appropriate waste poultry management can prompt its use as raw materials for production of animal feeds, generation of energy or its use as manure. However, this has not been the norm in Libya mostly due to lack of awareness on the best technique for poultry waste management. Therefore, the study will investigate the current waste management practices by Libyan poultry farmers. This will give us a glimpse of the possible impact of these waste management system. The study at the end will suggest best waste management practices for poultry waste.

3.5 Statistical Analysis

Frequency and percentage analysis will be performed on the data obtained within the scope of the research and a table will be created for each question (Adebayo et al., 2016).

3.7 Validity and reliability

Validation of the data is very critical in quantitative investigation. Results of data validation show the quality of the data and its acceptance. Cronbach alpha internal consistency statistical analysis was adopted for the validation of sourced data. A Cronbach alpha of ≥ 0.70 is generally acceptable (Cavalaglio et al., 2017).

3.8. Validity

Internal validity: In preparing the survey questions, literature and expert opinion were taken. The survey was finalized before the finalization of the questionnaire and the final form was finalized. It was ensured that the findings and findings of the findings were analyzed by different researchers. Research findings were evaluated separately by experts and researchers and their compliance levels were examined.

External validity: The characteristics of the participants were defined in detail. The selected group was approved by experts for generalization. The results of the research are appropriate with research questions and studies and theories in this field.

3.9. Reliability

External Reliability: The methods and stages of the research are described in detail. Data collection, processing, analysis, interpretation and reaching the results are clearly explained.

Internal reliability: More than one researcher was added to the study and the information obtained was described directly. Similar results have been obtained by different researchers.

CHAPTER IV
FINDINGS AND DISCUSSIONS

This section deals with information examination and introduction of results as well as illustrative measurements for the statistical factors, connection investigation, and relapse investigation to test the expressed Hypothesis

4.1 Demographic Features

In this section, the demographic back ground of the respondents are tabulated

Table 4.1

Gender Frequency distribution of respondents

	Frequency	**Percent**
Male	166	47.4
Female	184	52.6
Total	**350**	**100.0**

The respondents who participated in the study comprises of 47.4% male and 52.6% female (Table 4.1). This shows that the female are more into poultry faming than the male counterparts with a difference of 5.2 %.

Figure 4.1. Gender Distribution of Respondents.

Table 4.2

Age Frequency distribution of respondents

Age	Frequency	Percent
18-24	146	41.7
25-34	130	37.2
35 and above	74	21.1
Total	**350**	**100.0**

The majority of the respondents are within the age bracket of 18-24yeas old (41.7%frequency) as in Table 4.2 followed by 25-34 year (37.2 % Frequency) and 35 years and above (21.1% frequency) respectively (Table 4.2). This shows that most farmers are within youthful age and hence are mentally sound to respond to questions. Part of the reason why youths are more into poultry business is largely due to the down toll shift in the economy as a result of low oil price which led to youths engaging in more agro businesses.

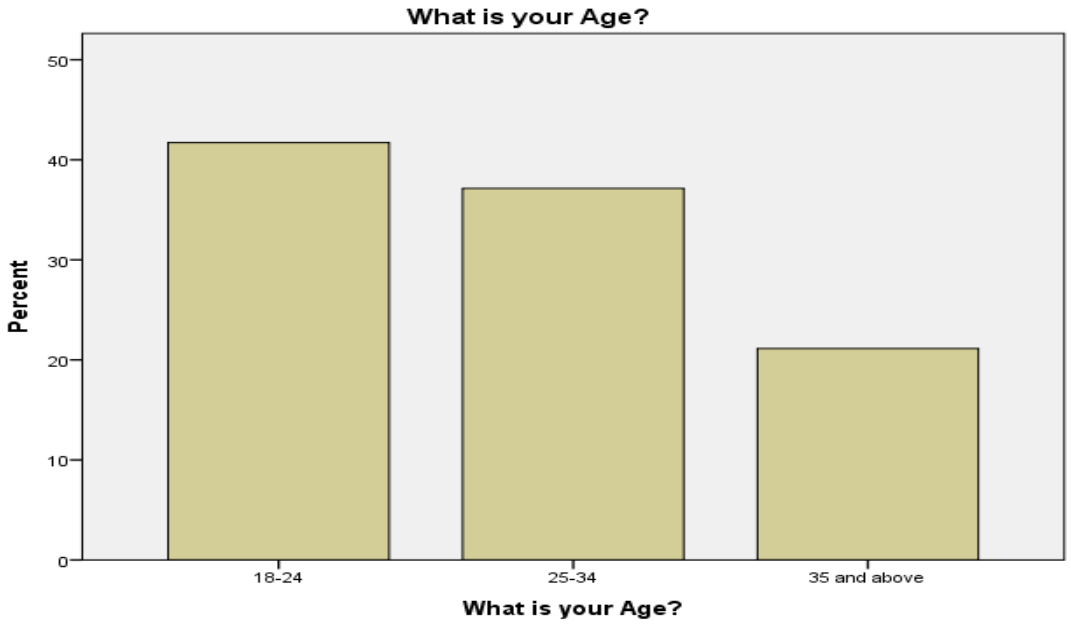

Figure 4.2 Age distribution of respondents

Table 4.3

Marital frequency distribution of respondents

Marital Status	Frequency	Percent
Unmarried	130	37.2
Married	118	33.7
Divorced	102	29.1
Total	**350**	**100.0**

The participants are more of unmarried individuals as over 33.7% indicated such while 29.1% and 33.7% are divorced and married respectively (Table 4.3).

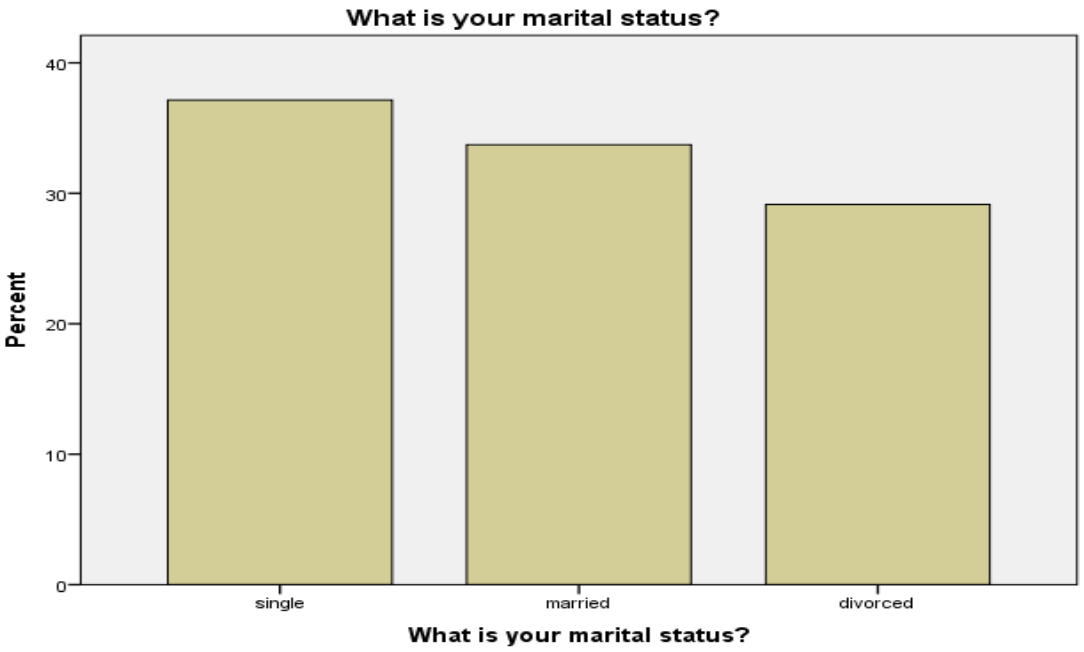

Figure 4.3 Marital Distribution of respondents

Table 4.4

Abode frequency distribution of respondents

Area	Frequency	Percent
Tripoli Environ	121	34.6
Outside Tripoli	229	65.4
Total	**350**	**100.0**

The majority of the respondents (65.4%) have farms situated outside Tripoli. their home. However 34.6% of the respondents indicated that their farms are also within Tripoli environs (Table 4.4).

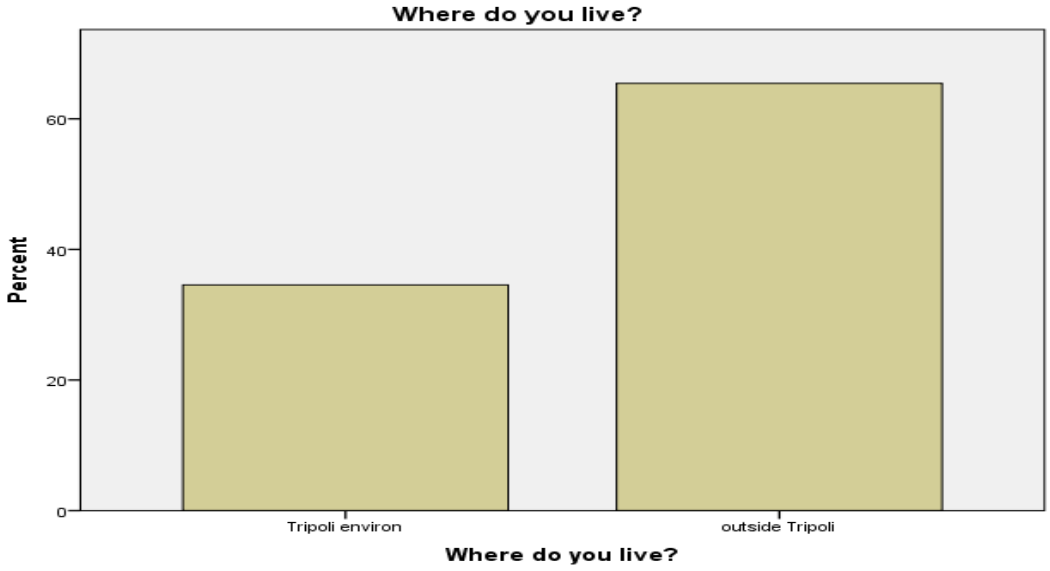

Figure 4.4 Residence Abode of respondents

4.2 Frequency distribution

In this section we analyzed the frequency distribution of responses from farmers in Tripoli who participated in the study.

Table 4.5

Extra occupation frequency distribution of respondents

Work	Frequency	Percent
Business	29	8.4
Civil Work	202	57.7
Retired	4	1.1
Poultry Worker	62	17.7
House Wife	53	15.1
Total	**350**	**100.0**

From Table 4.5 above, it can be deducted that the majority of the respondents are blue-collar workers comprising of unskilled workers, followed by Engineers, and top management officials respectively.

Figure 4.5 Bar chart for distribution of respondent's occupation.

Table 4.6

Source of income frequency distribution of respondents

	Frequency	Percent
Poultry Sales	64	18.2
Salary	44	12.6
Business	206	58.9
Pension	36	10.3
Total	**350**	**100.0**

From Table 4.6 above, it can be deducted that majority of the respondents are blue-collar workers comprising of unskilled workers, followed by Engineers, and top management officials respectively.

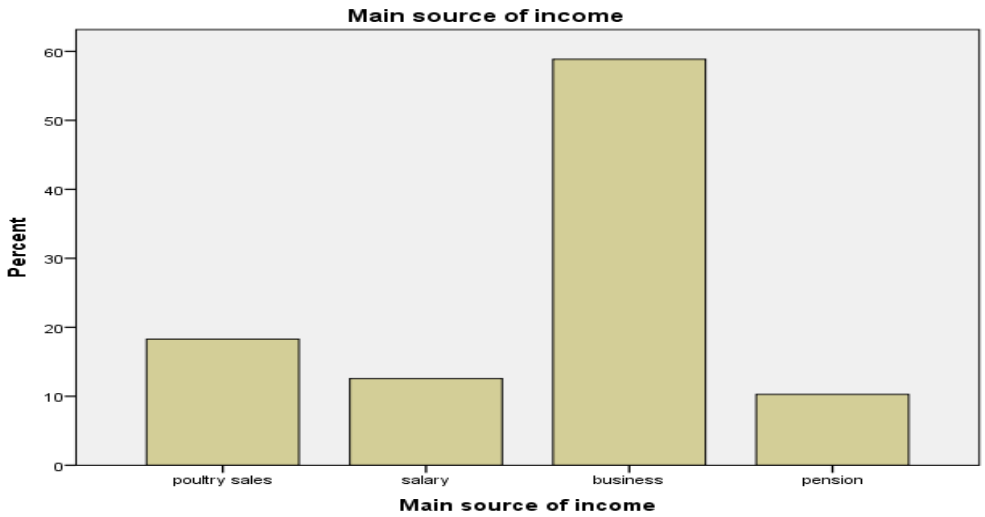

Figure 4.6 Source of income of respondents

Table 4.7

Years of experience frequency distribution of respondents

Years	Frequency	Percent
1-3years	111	31.7
3-5years	118	33.7
5years and above	121	34.6
Total	**350**	**100.0**

From Table 4.7 it is understood that the respondents are highly experienced in general in the field of poultry farming as over 34.6% indicated to have been in the poultry business for more than 5 years followed by 3-5 years' experience and lastly a one-year experience respectively.

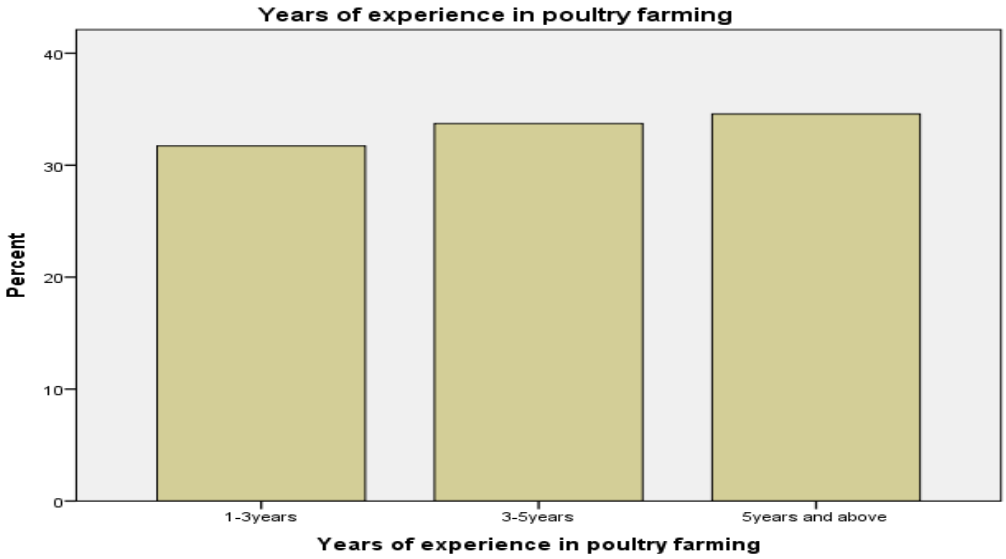

Figure 4.7. Frequency distribution histogram of respondents for number of years of experience

Table 4.8

Frequency distribution of purpose of raising poultry farm

	Frequency	**Percent**
Income Generation Only	243	69.4
Home Consumption Only	46	13.2
Home And Income Consumption	61	17.4
Total	**350**	**100.0**

The majority of the farmers engage into poultry farming majorly as means of generating income only (69.4%) followed by 13.2 % opting that engage into it in other to feed their family while 17.4% of poultry farmers both consume their produce and sale it for income generation (Table 4.8).

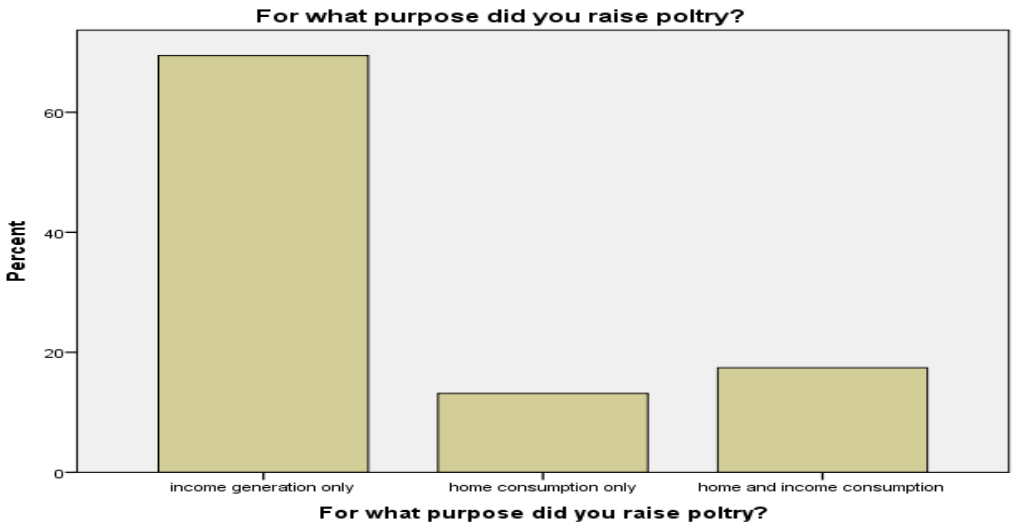

Figure 4.8 Distribution for purpose of raising poultry farm.

Table 4.9

Frequency Distribution for Area of farming with huge expenditure

	Frequency	**Percent**
Purchase of Birds	85	24.2
Purchase of Veterinary Products	51	14.6
Purchase of Feeds	204	58.3
Removal of Waste	10	2.9
Total	**350**	**100.0**

From Table 4.9 above, it can clearly be observed that the highest financial challenge confronting poultry farmers is the expenditure of poultry feed (58.3%) seconded by the “purchase of birds (24.2%) and removal of waste having the lowest percentage of expenditure (2.9%).

Table 4.10

Frequency Distribution of access to extension services

		Frequency	Percent
	Yes	202	57.7
	No	148	42.3
	Total	**350**	**100.0**

From Table 4.10, though quite a huge number of the participant farmers 57.7 have access to government extension service, a lot of farmers (42.3%) still don't have access to these services (15.4%). This shows that inefficiency in poultry production as extension services educate farmers on the best ways to manage their farm products. This will invariably affect farmer's method of disposal of poultry waste as most of them are not up-to-date with resent method of waste management.

Table 4.11

Frequency Distribution of regular visit to extension agent

	Frequency	Percent
Once in a week	128	36.5
Once in two weeks	65	18.6
once in a month	1	.3
Not Seen	156	44.6
Total	**350**	**100.0**

There is an alarming response obtained from the responses of the farmers on their regular visit to government extension agent with issues related to their farms. A whopping 44.6% (Table 4.11) which is the highest percentage has not been to the government extension office within their locality. This response shows that farmers really don't see the importance of extension service agents. Now the big question is "Will this also reflect their proper management of the waste generated from their farms?" Any mismanagement of this generated waste will lead to environmental pollution**.**

Table 4.12
Frequency distribution of availability of institutional support to poultry farming

	Frequency	Percent
Yes	146	41.7
No	204	58.3
Total	**350**	**100.0**

The majority of respondents (58.3%) opted for non-availability of institutional support for their poultry farms (Table 4.12). This can affect their way of managing the waste generated from these farms.

Table 4.13
Frequency Distribution of benefits from Agricultural extension services

	Frequency	Percent
Inputs	26	7.4
Training	4	1.2
Veterinary Service	315	90.0
Input Supply	5	1.4
Total	**350**	**100.0**

From the responds obtained on benefits from agricultural extension services, Veterinary service was the highest (90%) with training having the least (1.1%) (Table 4.13). This is alarming as it inferably means that the farmers are not consistently trained on both how to manage their farm products well as to effectively manage the waste generated from these farms.

Table 4.14

Frequency Distribution of training poultry production

	Frequency	Percent
No	348	99.4
Yes	2	.6
Total	**350**	**100.0**

From Table 4.14 the majority of the respondents (99.4%) have not received adequate training on poultry production and training in poultry waste management.

Table 4.15

Feed litter as common waste in the farm frequency distribution

	Frequency	Percent
Yes	113	32.3
No	237	67.7
Total	**350**	**100.0**

From the frequency distribution in Table 4.15, 67.7% of the participants responded “No” to feed litters being the common waste in their poultry far

Table 4.16

Frequency Distribution of manure as the common waste in the farm

	Frequency	Percent
Yes	231	66
No	119	34
Total	**350**	**100**

The majority of the respondents (66 %) agreed that manure is the common waste generated in the farm as contrary to the response to feed litters as major source of waste (Table 4.16). The question is “How is the quantum of manure waste generated and is the value well utilized or is it causing environmental menace.

Table 4.17

Frequency Distribution of the type of floor used in poultry house

	Frequency	Percent
Cemented	310	88.6
Non-cemented	40	11.4
Total	**350**	**100.0**

Most of the floors of the poultry farms are cement (88.6%) while 11.4% are not cemented (Table 4.17).

Table 4.18

Frequency Distribution of type of floor used in poultry

	Frequency	Percent
Teff straw	254	72.6
Wood shavings	96	27.4
Total	**350**	**100.0**

Type of materials used for the non-floor cemented poultry materials comprises of 72.6% teff straw and 27.4% wood shavings (Table 4.18). This helps absorb the poultry excretes hence controlling odor pollution both in the farm and in the farm surroundings.

Table 4.19

Frequency distribution of interval waste removal from poultry farm

	Frequency	Percent
Every day	42	12
Every week	69	19.71
Every month	199	56.86
Every year	40	11.43
Total	**350**	**100**

From Table 4.19 above, it can be deducted that the majority of the respondents (56.86%) remove their waste monthly. This can be regarded as not good for the environment as the poultry waste will result in generating ammonia alongside other

awful smell from the environment, thereby resulting in air pollution which can be detrimental to people living in and around the farm premises.

Table 4.20

Frequency Distribution of methods of poultry farm waste removal

	Frequency	**Percent**
Using hand	6	1.7
Wheel barrow	260	74.3
others	84	24.0
Total	**350**	**100.0**

Use of wheel barrow for the disposal of waste had the highest percentage frequency (74.3%) and relatively "orders" (24.0 %) (Table 4.20) which could be the use of advance machineries for waste removal.

Table 4.21

Frequency distribution of methods of removal of manure generated from the farm

	Frequency	**Percent**
Giving it to other farmers	44	12.57
Used in fertilize your own garden farm	74	21.14
Disposed it in the dumping site	193	55.14
Marketing for use as a fertilizer	39	11.15
Total	**350**	**100.**

Table 4.21 formed the basis of this study. From the Table there is a serious environmental concern in Libya emerging from inappropriate disposal of poultry waste as the farmers opted that this waste is dumped in the dumping site. Leaching of these products can result in algae bloom, thereby resulting in the death of aquatic lives. Also they can get into the food chain resulting in food poisoning of both man and animals. There are better alternatives to this as this generated waste can be adopted as manure for enrichment of soil nutrient leading to proper crop yield. Hence, these farmers need to be educated in mix farming and also how to process this generated manure from

poultry farm and then resell them to crop farmers to reduce the possibility of polluting the environment.

Table 4.22

Frequency Distribution of methods of removal of dead birds from the farm

	Frequency	**Percent**
Burial	47	13.4
Composting	73	20.9
Burning	200	57.1
disposal	30	8.6
Total	**350**	**100.0**

Burning of dead birds is a way of disposal adopted by the majority of the farmers (57.1%) (Table 4.22). This is directly related to air pollution leading to an increase of the amount of carbon dioxide in the environment.

Table 4.23

Frequency Distribution of challenges faced in urban poultry farming

	Frequency	**Percent**
Yes	228	65.1
No	122	34.9
Total	**350**	**100.0**

The majority of the respondents (65.1%) face challenges in urban poultry waste farming.

Table 4.24

Frequency Distribution of inadequate supply of pullets as a threat to urban farming.

	Frequency	Percent
Yes	261	74.57
No	89	25.43
Total	**350**	**100**

As in Table 4.24 above, the majority of the respondents (74.57 %) opted that inadequate supply of pullets is a threat to urban farming.

Table 4.25

Frequency Distribution of lack of capital as one of the challenges of urban farming

	Frequency	Percent
Yes	232	66.7
No	118	33.3
Total	**350**	**100**

As Table 4.25 above reveals, the majority of the respondents (66.7 %) agreed that lack of capital is a threat to urban poultry farming.

Table 4.26

Frequency distribution of high price of feed as a problem to urban farming

	Frequency	Percent
Yes	216	61.71
No	134	38.29
Total	**350**	**100**

From Table 4.26 above we note that the majority of the respondents (61.71 %) agreed that high price of feed is a threat to urban poultry farming.

Table 4.27

Frequency Distribution of shortages of land as a threat to urban poultry farming.

	Frequency	Percent
Yes	237	67.71
No	113	32.29
Total	**350**	**100**

The majority of the respondents (67.71 %) as in Table 4,27 agreed that shortage of land is a threat to urban poultry farming.

Table 4.28

Frequency Distribution of housing construction regulations as a threat to urban poultry farming

	Frequency	Percent
yes	256	73.14
no	94	26.86
Total	**350**	**100**

The majority of the respondents (73.14 %) agreed that housing construction regulations is a threat to urban poultry farming.

Table 4.29

Frequency Distribution of intent to expand poultry production

	Frequency	Percent
Yes	248	70.86
No	102	29.14
Total	**350**	**100**

As noted in Table 4.29 above, the majority of the respondents (70.86 %) agreed they intended to expand poultry production in Libya.

Table 4.30.

Frequency distribution of regulations in rising of poultry in the residential area

	Frequency	Percent
Yes	224	64
No	126	36
Total	**350**	**100**

64 % of the respondents (as in Table 4.30), agreed that there should be regulations to rise of poultry in residential areas

Table 4.31

Distribution of support for improvements in agricultural extension program

	Frequency	Percent
Yes	222	63.4
No	128	36.6
Total	**350**	**100.0**

From Table 4.31 above we note that the majority of the respondents (63.4%) agreed that there should be improvements by the government on agricultural extension programs.

Table 4.32.

Frequency distribution of the reasons for improvements in agricultural extension program.

	Frequency	Percent
Have not heard of them	18	5.2
Cannot easily reach them	188	53.7
There is no need	144	41.1
Total	**350**	**100.0**

From Table 4.32 above, it can be deducted that the majority of the respondents (53.7) suggested improvements in government extension services because they are hard to reach.

Table 4.33.

Frequency distribution of the barriers of future expansion of poultry production

	Frequency	**Percent**
Lack of capital	28	8.0
High price of feed	40	11.4
Shortage of land	71	20.3
housing construction regulation	159	45.4
Inadequate supply of pullets	52	14.9
Total	**350**	**100.0**

As shown in Table 4033, 45, 4 % of the respondents agreed that housing construction regulations are one of the major barriers to future expansion of poultry farming.

Table 4.34.

Frequency distribution of government intervention loans in the improvement of poultry farming

	Frequency	**Percent**
Yes	219	62.6
No	131	37.4
Total	**350**	**100.0**

62.6% of the participants agreed that government intervention loads will improve poultry farming and management of poultry waste.

Table 4.35

Do you think the current urban agricultural extension programs need more improvement?

	Frequency	**Percent**
Yes	225	64.3
No	125	35.7
Total	**350**	**100.0**

From the results shown in Table 4.35 it is clear that lots of improvements are needed in the current government extension programs in educating the poultry farmers in the best way to manage their waste generated in their farms. This is backed up by the respondents huge opining (64.3%) who agreed that the system needs lots of reforms.

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

5.1. CONCLUSION

Agricultural poultry farming poses as one of the important subsectors in Libya and considerably regarded as a large part of animal farming constituting of over 4.3 million birds mostly turkey, chicken and ducks. Poultry farming has been a source of revenue generations both for individual farmers and the government of Libya. These products however pose certain human and environmental risks as they introduce certain compounds, elements and pathogenic microorganisms into the environment and the food chain.

Poultry products lead to waste generation, hatchery, manure (Excrete from birds) dead birds as well as bedding materials ranging from wood shavings, peanut or rice husk and saw dust. Other waste generated in poultry farms is made-up of bio-solids, offal and poultry waste water. Some of this generated waste can be sourced from rich inorganic and organic nutrient when properly managed.

Considerably, the waste management techniques adopted by urban poultry farmers in Libya formed the bases of this study. Tripoli farmers were adopted as a case study in order to analyze the management techniques.

The study adopted a quantitative analysis through the use of questionnaires which were distributed to 350 poultry farmers within Tripoli district. From the data analysis result using SPSS software, it is revealed that some of the key observations include the highest financial challenges confronted by poultry farmers in Libya is purchasing feed (58.3%). From the study, it was discovered that poultry farming is more with women than the male counterpart and with teenagers in Tripoli, Libya. The study further revealed that the majority of them have extra occupation with 57.7 as civil workers. 58.9% of the farmers largely depend on farming businesses as their major source of income. It was also discovered in the study that increased cost of feeds and the poor sales of poultry products is part of the challenges of urban poultry farming with regards to the type of waste generated from the farms. It was discovered that

manure waste is the major poultry waste generated in the farms. However, further findings revealed that farmers have no in-depth knowledge of resulting this manure waste or how to practice integrated farming where this generated manures waste can be reused for crop farming.. Further analysis revealed that these farmers dump their generated waste in dump sites. This is environmentally hazardous as the waste can get into water bodies and hence, become toxic to aquatic life by increasing the nitrogen content in water bodies, resulting to algae bloom. Nuisance odor emanating from thesefarms as well as lack of appropriate waste disposal techniques are part of the identified challenges confronting urban agricultural farming and environmental health and sustainability in Tripoli, Libya.

There is no dispute of the fact that waste management has a direct implication on human health in as much as there is huge revenue generation from poultry farming. The tons of waste being generated mostly inform of manure constitute to environmental pollution which is detrimental to human health. Some of the bad sides of poultry farming in Tripoli, Libya include pollution of underground water, emission of foul odor, hence resulting to air pollution which causes discomfort to humans.

It was also discovered that the majority of the farmers (58.3) have no government institutional support in management of generated poultry waste. A huge percentage (99.4%) of farmers have not received any training on poultry production and poultry waste management. It was also observed that 57.1% of the farmers remove their farm generated waste monthly which is not quite good for the environment as there will be generation of awful smell as a result of ammonia accumulation. Lastly, from the results there is a serious environmental concern in Libya due to inappropriate disposal of poultry waste as the majority of farmers (57.1%) dump their waste at dumping sites. This puts the health of Libyans and the environment at risk as leaching of these products into water bodies can result in algae bloom which will invariably lead to poisoning of both man and animals. Lastly, the study also discovered that burning of dead birds is largely the mode of disposal of dead bird adopted by the majority of farmers (57.1%) which is very bad as this is directly related to air pollution leading to high level of carbon dioxide in the environment. Hopes are beckoned on the fact that precautionary measures will be taken by the Libyan government to curtail the menace of poultry waste on the environment.

5.2. RECOMMENDATIONS

With regards to the conclusion above, the following recommendations are proposed.

- It is vital for farmers to get some level of high education as this will contribute a lot to their management techniques for poultry waste disposal.

- The government has a very vital role to play with regards to educating farmers on environmental health and sustainability as well as proper means of waste disposal. This can be achieved through government agricultural extension services.

- The creation of poultry waste collection dump sites at strategic points is vital as it will aid in the proper collection of poultry manure which can be channeled to biogas generation, as well as reuse as an organic fertilizer. By so doing, the environment is safe from pollution.

- Creation of agricultural loan facilities is necessary so as to enable the farmers have access to loans so as to obtain materials for proper storage of waste. This study also recommends that the load be giving with low credit interest.

- This study also makes recommendations on poultry farming improvement alongside detention services so as to encourage small scale farmers in the urban settlement. Hence incentives, educational scholarships, job training as well as good salary should be considered for agricultural extension agencies so as to motivate them with regards to rendering effective extension and training services in Libya.
- There should be creation of enforcement agency that sees the fact that poultry farmers abide to the standard of waste disposal.

- Poultry farms should not be built close to residential areas.

- There should be adequate supply of water and sanitary wares to poultry farms.

- There are lots of researches to be conducted on proper management of poultry waste and the various factors that determine the impact of generated poultry waste on the ecosystem. Also studies on the ways to improve government intervention with sole aim of educating poultry farmers ought to be conducted.

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