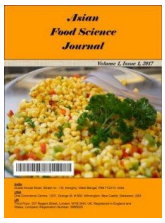

Asian Food Science Journal

11(3): 1-7, 2019; Article no.AFSJ.50660
ISSN: 2581-7752

An Assessment of Chicken Excreta Management in Poultry Farms in Oyo State, Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Author AAA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author IOO managed the analyses of the study. Author IOO managed the literature searches. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AFSJ/2019/v11i330064
Editor(s):
(1) Dr. Uttara Singh, Assistant Professor, Department of Foods and Nutrition, Govt. Home Science College, Panjab University, India.
Reviewers:
(1) Wafaa Abd El-Ghany, Cairo University, Egypt.
(2) Acaye Genesis, Uganda.
Complete Peer review History: http://www.sdiarticle3.com/review-history/50660

Original Research Article

Received 08 June 2019
Accepted 14 August 2019
Published 20 August 2019

ABSTRACT

The rapid growth in the poultry industry in Nigeria especially in Oyo State, has led to increased generation of chicken excreta. Unfortunately, there has not been a commensurate increase in the quality of chicken excreta management. There is therefore the need to assess existing methods of chicken excreta management in Oyo State with a view to achieving environmentally-friendly and economically-viable waste management methods. A three-stage sampling procedure was used. Oyo State was purposively selected due to its high concentration of chicken farms. For the same reason, two local government areas were also purposively selected: Afijio and I do. Lastly, based on the number of farms in each local government areas (LGAs) 50 and 70 chicken farms were randomly selected from Afijio and Ido LGAs making a total of 120 farms. Out of the 120 copies of the structured questionnaire administered, 101(84.2%) were retrieved. Data were collected on socio-economic characteristics, types of poultry waste generated and poultry waste disposal methods. Data were analysed using descriptive statistics, and inferential statistics. Most poultry farmers were male (85.1%) and married (86.4%) with a mean age of 41.0+ 10.8 years while household size was 5.0±1.58. Years of formal education and farming experience were 8±2 years

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and 8.09±5.87 years respectively .Based on the responses the following chicken waste disposal methods were evaluated: dumping on vacant lands (47%), using as manure (50.7%) and selling (29%). The management methods evaluated in the study area had adverse environmental effects.

Keywords: Waste; disposal methods; manure; re-use environmental effects.

1. INTRODUCTION

Waste is broadly divided into four key categories-solid, liquid, agrochemical and others. Poor waste disposal has been associated with diseases and adverse environmental effects. Continuing population growth and urbanisation in developing countries increases waste generation, thus making waste management very difficult. The greatest challenge many cities in the developing world face in relation to environmental health is the proper management of solid waste. .The poultry sector is a major source of income in Nigeria. It offers the quickest returns on investment outlays in the livestock enterprise by virtue of the short gestation period in chickens, their high feed conversion ratio as well as their being one of the cheapest, the commonest and best sources of animal protein in the country [1]. In Nigeria, the production of eggs and poultry birds occupies a prime position in improving animal protein consumption by both rural and urban households. However; the activities involved in their production also give rise to human health concerns. Chicken waste can be defined as that is of no use in its current status. The poultry industry produces large amounts of solid and liquid waste. The solid waste consists of bedding materials, manure, feed, feathers, intestines, culled birds, hatchery waste (empty shells, infertile eggs, dead embryos and late hatchlings), shells, sludge and abattoir waste (offal, blood, and carcasses). Dead birds and hatchery waste are high in protein. They contain substantial amounts of calcium and phosphorus due to the high level of material supplements in the diet. The approximate proportion of each of the elements excreted by poultry is given as nitrogen (65%), phosphorus (68.5%) and potassium (83.5%). These elements enhance soil fertility and increase crop production [2]. Poultry feathers can serve as raw materials in the bed industry; broken eggs can be used in bakeries while intestines can be used as fish feed. [3]. Chicken excreta is, therefore, potentially useful.

There are several ways of disposing of chicken excreta. These include burying, rendering, incinerating, composting and using it as livestock feed, fertilizer or source of energy. The predominant waste disposal method in Nigeria is burying in landfills. Waste disposal methods also include conversion of chicken excreta to energy for treatment of heavy-metal contaminated water [4] state that energy recovery is a promising form of waste disposal which works by having some forms of waste recycled into a source of fuel for heating, cooking and powering turbines. Another poor management method of disposing of poultry waste that has gained prominence in Nigeria is open burning after waste has been subjected to sun drying [5] to reduce the moisture content and, thereby, raising the calorific value. The open drying itself releases excessive ammonia and other greenhouse gases capable of worsening climate change [6].

There is a huge quantity of various forms of poultry waste generated from poultry operations. Unfortunately, in some countries, these are dumped on vacant lands and into rivers and cause severe environmental damage [7] Neglected waste creates environmental problems which, in turn, spread various diseases, contaminate rivers or canal water and spread odour to homes [8]. It is, therefore, important to approach poultry waste management in an innovative manner since the selection of the best device and practice in each stage depends on a variety of specific circumstances peculiar to the city under consideration. In Nigeria, there is a rapid expansion of small and medium scale poultry farms. These farms generate large quantities of chicken excreta which are not properly disposed off, resulting in soil, water and air pollution. Modern management methods of chicken excreta management such as green disposal, gasification and use in the production of organic fertilizer have not gained prominence in Nigeria probably due to the level of awareness, lack of strict regulations from government in respect of chicken excreta disposal and the care-free attitude of farm owners. Inadequacy of waste management in Oyo State needs to assess existing waste management methods.

Waste management constitutes all the activities and actions required to manage waste from its production to its final disposal [9] These includes among other things, the collection and disposal of waste, together with monitoring and regulation. It also encompasses the legal and regulatory framework in respect of waste management, including recycling. The term normally relates to all kinds of waste, whether generated during the extraction of raw materials, the processing of raw materials into intermediate and finals products, or in the course other human activities. Effective waste management should reduce the adverse effects of waste on health, the environment and aesthetics, and should encompass the 3Rs-reduce, re-use and recycle.

Waste management methods include, anaerobic digestion, gasification, biodegradation and recycling. Composting, dumping on vacant lands and in landfills and application to agricultural land are some of the commonly used methods of chicken- waste management in south western Nigeria. Recycling of chicken excreta is rare.

Composting is a form of waste disposal where organic substances decompose naturally under oxygen-rich conditions. It is the rotting down of plant and animal remains in heaps before the residue, the compost, is applied to the soil [10]; biodegradation is involved in compositing. Despite its several advantages, an unpleasant odour results from the disintegration of the organic materials by bacteria during compositing. The odour persists for quite some time, given the fact that compost is not expected to be used immediately after it is made. It should be left in a heap for, at least, one month, or better still, a year. Besides, since plant and animal remains are involved in composting, it cannot be applied to chicken management because plants and not animal remains constitute the bulk of what is used in composting. Composting involves the breaking down of organic waste by micro-organisms in the presence of air. It can also be done in the open air. In developed countries, in-vessel composting systems are used. Since these are automated, it is much easier to control any emissions. Composting is beneficial to flora/fauna and soils.

Dumping waste on vacant lands, no matter where, constitutes a health hazard. Although such waste will eventually enrich the land for agricultural use when it decomposes, it still has adverse effects on the environment; it can also contaminate surface water.

Landfills are special areas of land where waste is deposited. Dumping waste in landfills appears to be one of the most commonly used methods of waste management in developing countries. It is much better than dumping on vacant lands. Waste dumped in landfills does not constitute as much of a nuisance as that dumped on vacant land. It fills up land and increases the fertility of the soil around it. However, it still impacts negatively on the environment as well as on underground water. Landfills are special areas of land where waste is deposited. The volume of waste reduces when its biodegradable part decomposes. Dumping waste in landfills appears to be one of the most commonly-used methods of waste management, especially in developing countries. In developed countries, such as the United Kingdom, a landfill is a specially engineered land area where waste is deposited. Each section of the landfill is sealed with a permanent cap when it is full [11]. About three quarters of the U.K's municipal solid waste is disposed of directly to landfill. Socially, the cost incurred by illegal dumping of waste is much higher than what is incurred by efficiently operating a landfill [12]. It is the most economically viable waste management option in Australia.

Applying waste, especially animal waste, on agricultural land is a common waste management practice. This is because animal manure is a key ingredient in maintaining soil fertility owing to its nitrogen, phosphorus and potassium contents. However, despite its advantages, applying animal waste such as chicken waste on agricultural land produces pollution and nuisance problems. Incineration of pre-sorted waste is another waste-management technique. It involves the burning of waste after sorting. Incineration can also be done without sorting. This is generally done to reduce the volume of solids in the waste. More flora and fauna are destroyed and the soil is more adversely affected when incineration is done without pre-sorting. The environmental and health effects of waste justify the need for its management, especially considering the rapidly increasing human population.

2. METHODOLOGY

2.1 Study Area

The study was carried out in south western Nigeria, which comprises Oyo, Ogun, Osun, Ekiti, Ondo and Lagos states. It is one of the six

geo-political zones in Nigeria and falls on latitude 6° North and latitude 4° South and is marked by longitude 4° (to the) West and 6° (to the) East. It is bounded in the north by Kogi and Kwara states, in the east by Edo and Delta states, in the south by the Atlantic Ocean and in the west by the Republic of Benin. The zone is characterised by a tropical climate with a distinct dry season between November and March and a wet season between April and October. The mean annual rainfall is 1480mm while the mean monthly temperature ranges between 18°C and 24°C during the rainy season and 30°C and 35°C during the dry season. The zone covers an area of about 114,271 km^2 and has a population of 27,581,992, which is predominantly agrarian. Major food crops grown in the area include cassava, cowpea and yam [13]. The people are predominantly farmers as well as lovers of education and they are also given to hospitality.

According to [14], most commercial poultry farms with moderate to high bio-security systems are located in south western Nigeria, especially in the states nearer to Lagos, the industrial capital of Nigeria. It is estimated that over 65% of Nigeria's commercial poultry farms are located in Lagos, Ogun, Oyo, Osun and Ondo states while another 25% are located in the south-south and south-east geo-political zones. The balance of 10% or less of Nigeria's commercial poultry farms are in the North-central, North-west and North-east zones.

2.2 Sampling Technique, Sample Size and Sources of Data

A structured questionnaire was used for data collection. The questionnaire administered on the farmers sought for data on their socio-economic and demographic characteristics and chicken waste disposal methods. Descriptive statistics,

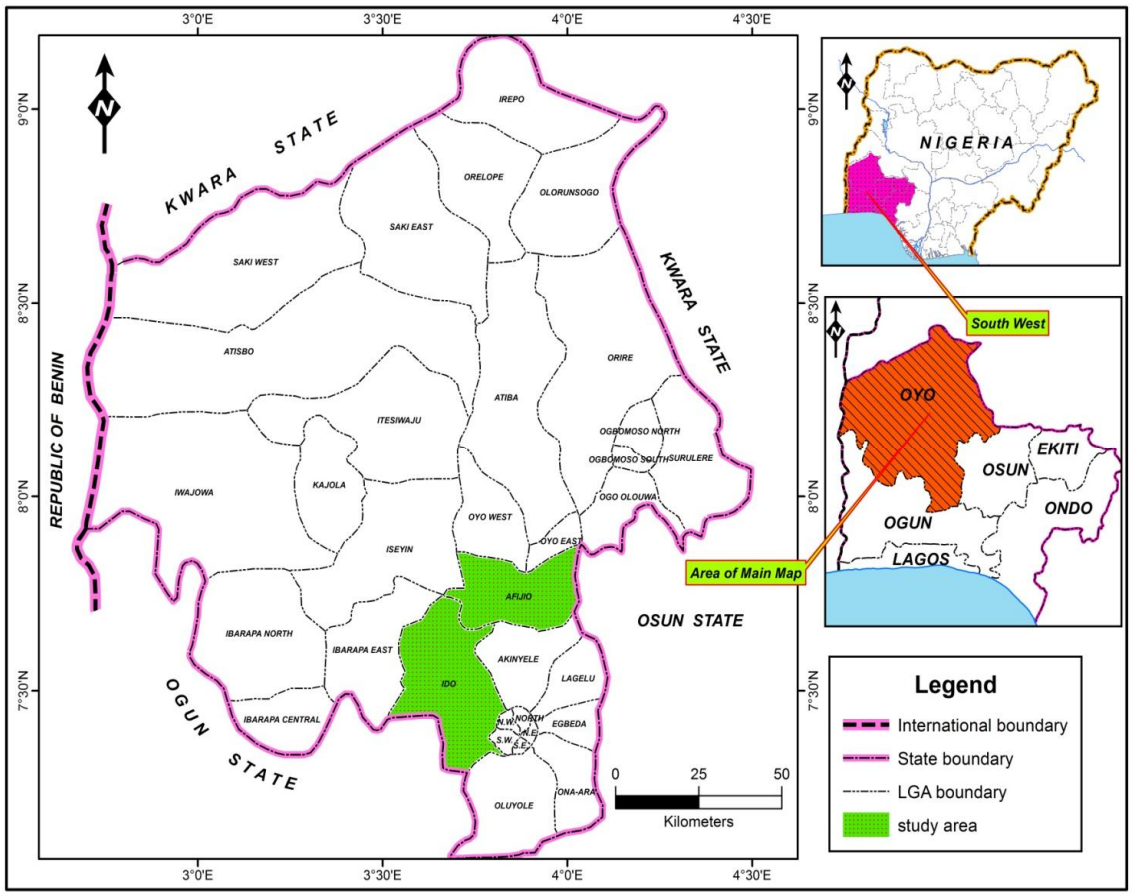

Fig. 1. Map of Oyo state indicating sampled local government areas (LGAs); inset: Map of Nigeria indicating the southwest and map of the southwest indicating Oyo state

Source: Dept. of Geography University of Ibadan (2016)

involving frequency distribution tables the mean and standard deviation were used to analyse the responses on the socio-economic characteristics of the respondents, types of waste generated by poultry farmers and methods of poultry waste disposal. Primary and secondary data were used for this study. Available records [15] show that Oyo State has the highest numbers of chicken farms per household in Nigeria [14]. Oyo State was purposively selected because the poultry business is very popular among farmers of the state and there is a ready market for poultry products.

The sample was obtained using a multistage sampling technique. In the first stage, Oyo State was purposively selected. In the second stage, two local government areas Afijio and Ido were purposively selected. This was due to the high concentration of poultry farms in these local government areas. The third stage involved the random selection of poultry farmers in the selected LGAs, proportionate to the number of poultry farms in each local government area. Altogether 120 chicken farms comprising 50 and 70 farms were selected from Afijio and Ido respectively.

3. RESULTS AND DISCUSSIONS

3.1 Socio-economic Characteristics of Poultry Farmers

Table 1 show that 84.16% of poultry farmers were males. This is consistent with the findings of [15] where 92.3% of the poultry farmers in Saki West were males. The average age of the farmers was 41 ± 11; 84.16% of the chicken farmers were married while only 15% were single. This likely implies that chicken farming is a lucrative venture with a lot of returns, which enabled them take care of their families.

Table 1. Socioeconomic characteristics of chicken farmers in Oyo state

Variable	Frequency	Percentage
Age		
24-30	26	20.83
31-40	42	35
41-50	29	24.17
Mean Standard dev.	40.858	
Gender of chicken farmer		
Male	103	85.83
Female	17	14.47
Marital status		
Single	18	15
Married	102	85
Household size		
<5	48	40.00
5-7	64	53.33
.>7	08	6.67
Educational level		
No Formal Education	03	2.50
Primary	09	7.50
Secondary	11	9.17
Tertiary	97	80.83
Years of chicken farming/ experience		
<5	38	31.67
5-10	56	46.67
10-15	18	15
>15	08	6.66
Type of chicken system		
Intensive	68	56.67
Extensive	12	10.00
Semi- Intensive	40	33.33

Source Field Survey, 2017

Table 2. Types of chicken waste generated in Oyo state

Types of waste	Yes		No	
	Freq.	%	Freq.	%
Poultry droppings	97	80.83	23	19.17
Feathers	24	20.06	96	79.94
Hatcherywaste	13	10.83	107	89.17
Carcasses	41	34.16	79	65.84
Offal	6	5.00	114	95.00
Poultry litter	68	56.66	52	43.34

Source: Field survey, 2017

Table 3. Methods of poultry waste disposal in Oyo state

Methods	Yes		No	
	Freq.	%	Freq.	%
Burying	27	22.50	93	77.50
Dumping on empty land	62	51.67	58	48.33
Landfill	7	5.83	113	94.17
Use as manure on farm	65	54.17	55	45.83
Composting	9	7.50	111	92.50
Collected by other users	48	40.00	72	60.00
Fish feed	34	28.33	86	71.67
Sale to others	34	28.33	86	71.67

Source: Field Survey, 2017

The average household size of the farmers was 5 ± 1. While 81.19% had higher education, 6.9% had no formal education. This suggests that chicken farming in the study area was dominated by educated farmers .This may be due to the technicality of the operation involved. The average years of exposure to formal education of the farmers was 8 ± 2 years while average years of farming experience was 8 ± 1 year. The majority (55.66%) of farmers practised the intensive system of chicken farming. [16] Had also observed that the dominant poultry management system in Nigeria is the intensive system.

Table 2 revealed that Poultry droppings accounted for 80.83% of the waste generated, followed by poultry litter (56.66%) and condemned carcasses (34.16%). The least quantities of poultry waste generated were feathers, hatchery waste and offal at 20.06%, 10.83% and 5.00% respectively.

Table 3 reveals that the most common methods of poultry waste disposal by poultry farmers in Oyo State ware using it as manure (54.17%) dumping it on empty land (51.67%) Farmers who dumping waste on open land do so in an anticipation of reselling it during the dry season to vegetable farmers from the northern part of the country. Other users (40%) also collected chicken excreta generated by farmers as part of the methods used to dispose chicken excreta. The least used disposal methods by farmers is dumping in landfills (5.83%) and composting (7.50%) methods respectively. Others do sell their chicken excreta (28.33%) to intending farmers while some farmers do use it to feed their fish or compound it as feed meal.

4. CONCLUSIONS AND RECOMMENDA-TIONS

An evaluation of most of the methods of the chicken excreta management in the study area showed that they were not environment-friendly, since they had adverse environmental effects. Dumping chicken excreta on vacant lands was the most detrimental to environmental health. It is, therefore recommended that Poultry Association of Nigeria [17] should make a policies to ensure that chicken excreta farmers comply with environment-friendly chicken excreta methods. Poultry farmers should be encouraged or be involved in recycling chicken excreta for organic fertilizer production.

Result from the empirical analysis showed that there are no effective methods of chicken excreta methods in the study area. In terms of usefulness and methods of disposal leading to environmental pollution at an increasing rate,

Poultry farmers should be trained through conferences and workshops by extension agents/ officers about the usefulness of chicken excreta for agricultural production.

There is need for effective monitoring services of farmers on the need for environmental-friendly chicken excreta that would reduce environmental pollution and incidence of outbreak of diseases.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ojo SO. Analysis of the three risk factors in commercial poultry production in Osun State, Nigeria, Proceedings of 27th Annual Conference of Nigeria Society for animal production(NSAP) Federal University of Technology Akure, Nigeria; 2002.
2. Olumayowa O, Abiodun OO. Profit efficiency and waste management in poultry farming. The case of Egba Division, Ogun State, Nigeria. International Journal Poultry Science. 2011;10(2):137-142.
3. Shamsuddoha M. Reverse supplies chain process as environmental sustainability in the poultry industry of Bangladesh. In Doctoral colloquim, edited by Jenny Goodison, Pert: Curtin business School, Curtin University; 2011b.
4. Moreki JC, Charipasi SC. Poultry waste management in Botswana: A review. Online Journal Animal Feed Resource. 2011;1(6):285-292.
5. Adeoye GO, Sridhor KKC, Mohammed OE. Poultry waste management for crop production. The Nigerian Experience. Waste Management and Research. 2014; 12:2165-2175.
6. Akinbile CO. Environment impact of landfill on groundwater quality and agricultural soil in Nigeria. Soil and Water Res. 2012; 7(1):18-26.
7. Shamsuddoha QM. Applying reverse supply chain in the poultry industry. In Emerging Research Initiatives and Development in Business. CGSB Research Forum. Edited by Therese Jefferson, Shamsuddoha, M and Young, E(EDS), Perth, Australia: Curtin University; 2011a.
8. Gupta G, Charles S. Trace element in soils fertilized with poultry litter. Poultry Science. 1999;78:1695-1698.
9. Glossary of Environment Statistics Series F, No 67 Department for Economics and Social Information and Policy Analysis, United Nations. New York. UN; 1997
10. Akinsanmi O. Certificate agricultural science. Singapore: Longman; 1988.
11. Review of Environmental and Health Effects of Waste Management: Municipal Solid Waste and Similar Waste. DEFRA; 2004
12. Choe Chongwoo, Fraser Ianln. An economic Analysis of Households Waste Management. Journal of Environmental Economics and Management. 1999; 38:234-246.
13. NPC National population Commission. Bulletins on Population Census figures ; 2006
14. Adere DF, Oguntade AE. The structure and importance of the commercial and village based poultry industry in Nigeria. FAO consultancy report; 2015. Available:https:www.scirp.org 2006
15. Amao Extent of Commercial Poultry Production in South West Local Government Area of Oyo State, Nigeria Transnational Journal of Science and Technology. 2013;3.
16. Sonaiya EB. The context and prospects for development of smallholder rural poultry production in Africa, In CTA Seminar Proceeding Smallholder Rural Poultry Production Seminar Thessaloniki Greccce. 2005;1:35-52.
17. Poultry Association of Nigeria (PAN); 2003. Available:www.poultry.associatin

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle3.com/review-history/50660