

Original Research Article

AN ASSESSMENT OF CHICKEN EXCRETA MANAGEMENT IN POULTRY FARMS IN OYO STATE, NIGERIA

Abstract

The rapid growth of the poultry industry has led to the generation of increased chicken waste. There **is**, however, a dearth of information on environmentally- friendly and economically viable methods of poultry waste management. Therefore, the existing methods of chicken excreta management methods were investigated in Oyo State. 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 Ido respectively. Lastly, based on the number of farms in each local government areas 50 and 70 chicken farms were randomly selected from Afijio and Ido respectively making a total of 120 farms. 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+ while household size was 5.0±1.58. Years of formal education and farming experience were 8±2 years 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: Chicken excreta, management, poultry farms, environmental effects

Introduction

Waste **is are** broadly divided into four key categories-solid, liquid, agrochemical and others. Poor waste disposal **is has been** associated with diseases and adverse environmental effects. Continuing population growth and urbanisation in developing countries cause increase in waste and make the provision of urban environmental services very difficult. The greatest challenge many cities in the developing world face in relation to environmental health **is** the proper management of solid waste. Solid waste is the residue of consumption and production

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38 activities and poses environmental health risks. According to Mistra and Pandey (2005), a
39 material becomes waste when it is discarded without the expectation of compensation for its
40 inherent value. In the agricultural sector, farm animals generate a lot of solid waste. The need
41 for effective management of such waste **is** has been
42 critical, considering the adverse health and environmental effects of poor waste management.

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43 Next to the arable-crop subsector, the livestock subsector is the second largest agricultural
44 subsector in the Nigerian economy, contributing about 10% of the agricultural gross domestic
45 product (GDP) (CBN, 2008). Livestock contribute about 3% to Nigeria's GDP (NBS, 2006c).
46 According to the Federal Department of Livestock (FDL, 2010), livestock estimates in
47 Nigeria in 2009 stood at 16.43 million cattle, 34.69 million sheep, 55.15 million goats, 7.18
48 million pigs and 183.16 million birds. The poultry subsector is the most commercialised of all
49 subsectors in Nigeria's agriculture and represented approximately 6.2% of the total livestock
50 contribution to the agricultural GDP in 2012 (CBN, 2012). Birds commonly reared in Nigeria
51 are chickens, ducks, guinea fowls, turkeys, pigeons and, more recently, ostriches. Those that
52 are of commercial importance, given the trade in poultry, however, are chickens, guinea
53 fowls and turkeys, among which chickens predominate (Adene and Oguntade, 2006, Akanni
54 *et al.*, 2014). The main poultry products from the Nigerian poultry sub-sector are parent
55 stock, commercial day-old chicks, frozen chicken, birds and table eggs (Akanni *et al.*, 2014).
56 Poultry is one of the world's major and fastest growing sources of meat representing over
57 22% of the meat production (Ekere *et al.*, 2010). It is a well known fact that poultry is a very
58 good converter of ingredients, into animal protein especially those of plant origin.

59 The poultry sector is a major source of income in Nigeria. It offers the quickest returns on
60 investment outlays in the livestock enterprise by virtue of the short gestation period in
61 chickens, their high feed conversion ratio as well as their being one of the cheapest, the
62 commonest and best sources of animal protein in the country (Ojo, 2002). In Nigeria, the
63 production of eggs and poultry birds occupies a prime position in improving animal protein
64 consumption by both rural and urban households. However, the activities involved in their
65 production also give rise to human health concerns. Chicken waste can be defined as that is
66 of no use in its current status. The poultry industry produces large amounts of solid and liquid
67 waste. The solid waste consists of bedding materials, manure, feed, feathers, intestines, culled
68 birds, hatchery waste (empty shells, infertile eggs, dead embryos and late hatchlings), shells,
69 sludge and abattoir waste (offal, blood, and carcasses). In Botswana, ashes which result from
70 the use of coal in chick brooding are also produced in large quantities on chicken farms,

71 especially in medium and large scale operations. Poultry waste needs to be disposed of
72 (Moreki and Chiripasi, 2011).

73 Dead birds and hatchery waste are high in protein. They contain substantial amounts of
74 calcium and phosphorus due to the high level of material supplements in the diet. The
75 approximate proportion of each of the elements excreted by poultry is given as nitrogen
76 (65%), phosphorus (68.5%) and potassium (83.5%). These elements enhance soil fertility and
77 increase crop production (Olumayowa and Abiodun, 2011). Poultry feathers can serve as raw
78 materials in the bed industry; broken eggs can be used in bakeries while intestines can be
79 used as fish feed. (Shamsuddoha, 2011b). Chicken excreta is, therefore, potentially useful.

80 There are several ways of disposing of chicken excreta. These include burying, rendering,
81 incinerating, composting and using it as livestock feed, fertilizer or source of energy. The
82 predominant waste disposal method in Nigeria is burying in landfills. Waste disposal
83 methods also include conversion of chicken excreta to energy for treatment of heavy-metal
84 contaminated water Moreki and Chiiripasi (2011) state that energy recovery is a promising
85 form of waste disposal which works by having some forms of waste recycled into a source of
86 fuel for heating, cooking and powering turbines.

87 There is a huge quantity of various forms of poultry waste generated from poultry operations.
88 Unfortunately, in some countries, these are dumped on vacant lands and into rivers and cause
89 severe environmental damage (Shamsuddoha, 2011a, 2011b). Neglected waste creates
90 environmental problems which, in turn, spread various diseases, contaminate rivers or canal
91 water and spread odour to homes (Gupta and Charkles, 1999). It is, therefore, important to
92 approach poultry waste management in an innovative manner since the selection of the best
93 device and practice in each stage depends on a variety of specific circumstances peculiar to
94 the city under consideration.

95 In Nigeria, like in any developing nation, there is a rapid expansion of small and medium
96 scale poultry farms. These farms generate large quantities of chicken excreta which are not
97 properly disposed of, resulting in soil, water and air pollution. Modern management methods
98 of chicken excreta management such as green disposal, gasification and use in the
99 production of organic fertilizer have not gained prominence in Nigeria probably due to the
100 level of awareness, lack of strict regulations from government in respect of chicken excreta
101 disposal and the care-free attitude of farm owners.

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102 **Literature review**

103 **Waste management methods in Nigeria**

104 Waste management constitutes all the activities and actions required to manage waste from
105 its production to its final disposal (Glossary of Environment Statistics, 1997) **these include**
106 amongst other things, the collection and disposal of waste, together with monitoring and
107 regulation. It also encompasses the legal and regulatory framework in respect of waste
108 management, including recycling. The term normally relates to all kinds of waste, whether
109 generated during the extraction of raw materials, the processing of raw materials into
110 intermediate and final products, or in the course of other human activities. Waste management,
111 which **is** intended to reduce the adverse effects of waste on health, the environment or
112 aesthetics, encompasses the 3Rs- reduce, re-use and recycle.

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

117 Composting is a form of waste disposal where organic substances decompose naturally under
118 oxygen-rich conditions. It is the rotting down of plant and animal remains in heaps before the
119 residue, the compost, is applied to the soil (Akinsanmi, 1988); biodegradation is involved in
120 composting. Despite its several advantages, an unpleasant odour results from the
121 disintegration of the organic materials by bacteria during composting. The odour persists for
122 quite some time, given the fact that compost is not expected to be used immediately after it is
123 made. It should be left in a heap for, at least, one month, or better still, a year. Besides, since
124 plant and animal remains are involved in composting, it cannot be applied to chicken
125 management because plants and not animal remains constitute the bulk of what is used in
126 composting. Composting involves the breaking down of organic waste by micro-organisms in
127 the presence of air. It can also be done in the open air. In developed countries, in-vessel
128 composting systems are used. Since these are automated, it is much easier to control any
129 emissions. Composting is beneficial to flora/fauna and soils

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

133 Landfills are special areas of land where waste is deposited. Dumping waste in landfills
134 appears to be one of the most commonly used methods of waste management in developing
135 countries. It is much better than dumping on vacant lands. Waste dumped in landfills does not
136 constitute as much of a nuisance as that dumped on vacant land. It fills up land and increases
137 the fertility of the soil around it. However, it still impacts negatively on the environment as
138 well as on underground water. Landfills are special areas of land where waste is deposited.
139 The volume of waste reduces when its biodegradable part decomposes. Dumping waste in
140 landfills appears to be one of the most commonly-used methods of waste management,
141 especially in developing countries. In developed countries, such as the United Kingdom, a
142 landfill is a specially engineered land area where waste is deposited. Each section of the
143 landfill is sealed with a permanent cap when it is full (Defra, 2004). About three quarters of
144 the U.K.'s municipal solid waste is disposed of directly to landfill. Socially, the cost incurred
145 by illegal dumping of waste is much higher than what is incurred by efficiently operating a
146 landfill (Choe and Fraser, 1998). It is the most economically viable waste management option
147 in Australia.

148 Applying waste, especially animal waste, on agricultural land is a common waste
149 management practice. This is because animal manure is a key ingredient in maintaining soil
150 fertility owing to its nitrogen, phosphorus and potassium contents. However, despite its
151 advantages, applying animal waste such as chicken waste on agricultural land produces
152 pollution and nuisance problems. Incineration of pre-sorted waste is another waste-
153 management technique. It involves the burning of waste after sorting. Incineration can also be
154 done without sorting. This is generally done to reduce the volume of solids in the waste.
155 More flora and fauna are destroyed and the soil is more adversely affected when incineration
156 is done without pre-sorting.

157 Recycling has many advantages such as conserving energy, and, in the case of paper,
158 reducing the felling of trees for paper making. It helps in mitigating global warming and
159 reducing pollution. It minimises waste and can help save money. Although recycling some
160 materials has some disadvantages, it can be said that recycling organic materials such as
161 chicken waste, is the least disadvantageous of the methods of chicken-waste management.

162 Waste can also be re-used. For instance, reusable products such as returnable milk bottles
163 can be taken from waste, cleaned up and re-used. Waste can also be recycled, in which case,

164 new products are produced. This will reduce the need to use natural resources directly, and
165 may reduce emissions from the extraction and processing of raw materials. (Defra, 2004)

166 The environmental and health effects of waste justify the need for its management, especially
167 considering the rapidly increasing human population. This must have informed the
168 observation of Eliot Morley, Minister of State for Environment and Agro-environment of the
169 United Kingdom, that "the growing amount of waste we produce" must be disposed of
170 (Defra, 2004, Foreword). The need for not "wasting" waste in the course of its management is
171 also stressed in the Prime Minister's Strategy Unit Report titled "Waste not, want not: a
172 strategy for tackling the waste problem in England". Another poor management method of
173 disposing of poultry waste that has gained prominence in Nigeria is open burning after waste
174 has been subjected to sun drying (Adeoye *et al.*, 2014) to reduce the moisture content and,
175 thereby, raising the calorific value. The open drying itself releases excessive ammonia and
176 other greenhouse gases capable of worsening climate change (Akinbile, 2012).

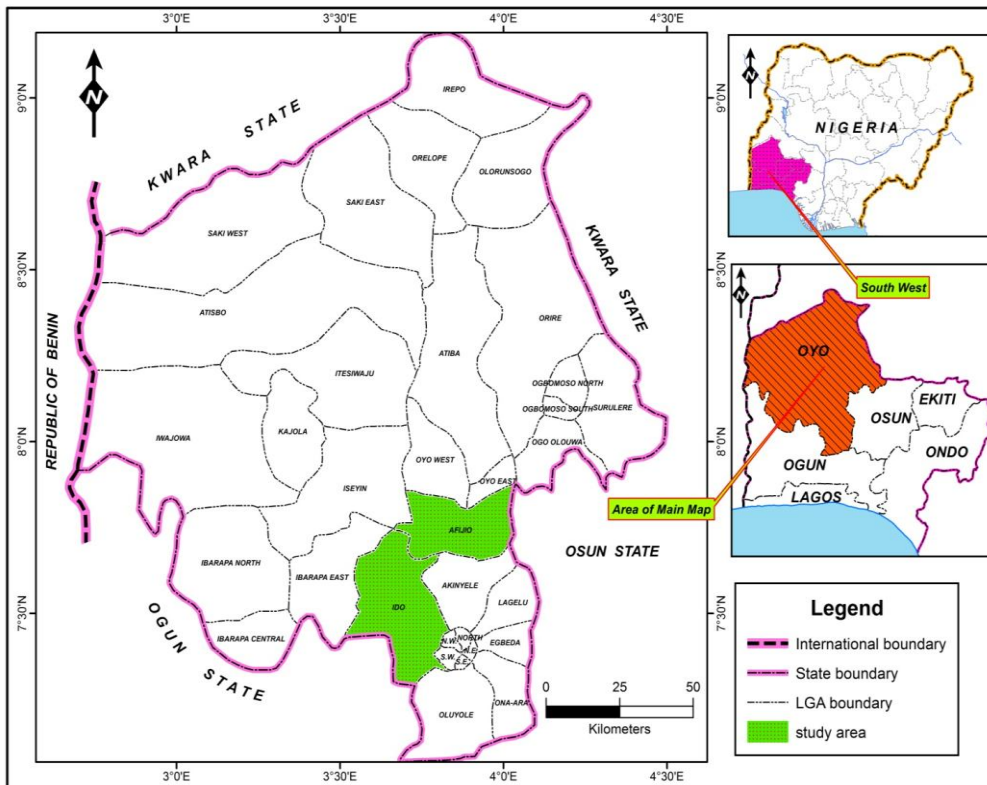
177 **Materials and method**

178 **Study area**

179 The study was carried out in south western Nigeria, which comprises Oyo, Ogun, Osun,
180 Ekiti, Ondo and Lagos states. It is one of the six geo-political zones in Nigeria and falls on
181 latitude 6^o North and latitude 4^o South and is marked by longitude 4^o (to the) West and 6^o (to
182 the) East. It is bounded in the north by Kogi and Kwara states, in the east by Edo and Delta
183 states, in the south by the Atlantic Ocean and in the west by the Republic of Benin. The zone
184 is characterised by a tropical climate with a distinct dry season between November and
185 March and a wet season between April and October. The mean annual rainfall is 1480mm
186 while the mean monthly temperature ranges between 18^oC and 24^oC during the rainy season
187 and 30^oC and 35^oC during the dry season. The zone covers an area of about 114,271 km² and
188 has a population of 27,581,992, which is predominantly agrarian. Major food crops grown in
189 the area include cassava, cowpea and yam (NPC, 2006). The people are predominantly
190 farmers as well as lovers of education and they are also given to hospitality. According to
191 Adene and Oguntade (2006), most commercial poultry farms with moderate to high bio-
192 security systems are located in south western Nigeria, especially in the states nearer to Lagos,
193 the industrial capital of Nigeria. It is estimated that over 65% of Nigeria's commercial poultry
194 farms are located in Lagos, Ogun, Oyo, Osun and Ondo states while another 25% are located

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195 in the south-south and south-east geo-political zones. The balance of 10% or less of Nigeria's
 196 commercial poultry farms are in the North-central, North-west and
 197 North-east zones.



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 199 Fig 1: Map of Oyo State indicating sampled Local Government Areas (LGAs); Inset: Map of
 200 Nigeria indicating the southwest and map of the southwest indicating Oyo State.

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

202 **Sampling Technique, Sample Size and Sources of Data**

203 A structured questionnaire was used for data collection. The questionnaire administered on
 204 the farmers sought for data on their socio-economic and demographic characteristics and
 205 chicken waste disposal methods. Descriptive statistics, involving frequency distribution
 206 tables the mean and standard deviation were used to analyse the responses on the socio-
 207 economic characteristics of the respondents, types of waste generated by poultry farmers and

208 methods of poultry waste disposal. Primary and secondary data were used for this study. Oyo
 209 State was purposively selected because the poultry business is very popular among farmers of
 210 the state and there is a ready market for poultry products. . The sample was obtained using a
 211 multistage sampling technique. In the first stage, Oyo State was purposively selected. In the
 212 second stage, two local government areas- Afijio and Ido were purposively selected. This was
 213 due to the high concentration of poultry farms in these local government areas. The third
 214 stage involved the random selection of poultry farmers in the selected LGAs, proportionate to
 215 the number of poultry farms in each local government area. Altogether 120 chicken farms
 216 comprising 50 and 70 farms were selected from Afijio and Ido respectively

217

218 **Results and discussions**

219 **Table 1. Socio-economic characteristics of poultry farmers**

220 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 | 40.858 | |
| Standard dev. | | |
| 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 |

221 Source Field Survey, 2017

222 Table 1 showed that 84.16% of poultry farmers were males. This is consistent with the
 223 findings of Amao (2013) where 92.3% of the poultry farmers in Saki West were males. The
 224 average age of the farmers was 41 ± 11 ; 84.16% of the chicken farmers were married while
 225 only 15% were single. This implied that chicken farming is was a lucrative venture with a
 226 lot of returns, which enabled them take care of their families

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227 The average household size of the farmers was 5 ± 1 . While 81.19% had higher education,
 228 6.9% had no formal education. This suggests that chicken farming in the study area was
 229 dominated by educated farmers. This may be due to the technicality of the operation
 230 involved. The average years of exposure to formal education of the farmers was 8 ± 2 years
 231 while average years of farming experience was 8 ± 1 year. The majority (55.66%) of farmers
 232 practised the intensive system of chicken farming. Sonaiya (2005) had also observed that the
 233 dominant poultry management system in Nigeria is the intensive system.

234 **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 |
| Hatchery waste | 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 |

235 Source: Field survey, 2017

236
 237
 238 Table 2 revealed that Poultry droppings accounted for 80.83% of the waste generated,
 239 followed by poultry litter (56.66%) and condemned carcasses (34.16%). The least quantities
 240 of poultry waste generated were feathers, hatchery waste and offal at 20.06%, 10.83% and
 241 5.00% respectively.

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247 **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 |

248 Source: Field Survey, 2017

249 Table 3 reveals [swd](#) that most common methods of poultry waste disposal by poultry farmers
 250 in Oyo State was using it as manure (54.17%) while that of dumping it on empty land was
 251 (51.67%). The farmers dumping it on open land do so in an anticipation to resell during the
 252 dry season to vegetables farmers from the North. Other users also collected (40%) of chicken
 253 excreta generated by farmers as part of the methods used to dispose chicken excreta. The
 254 least methods used by farmers to dispose of chicken excreta were landfills (5.83%) and
 255 composting (7.50%) methods respectively. Others do sell their chicken excreta (28.33%) to
 256 intending farmers while some farmers do use it to feed their fish or compound it as feed meal.

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