

Original Research Article

Environmental Effects of Poultry Production

in Edo State, Nigeria

Abstract

This study was designed to investigate the environmental hazards associated with poultry production among poultry farmers in Edo State. To carry out the investigation, a total of 366 respondents made up of 122 poultry owners, 122 poultry farm workers and 122 poultry farm neighbours were statistically selected. Multiple regression and chi-square tests were the statistical tools used for the analyses. The results of the study revealed that only 12.3% of the farms were located at least 500 metres away from living houses as recommended by Environmental Protection Agency. The major complaint about poultry farms by neighbours (74.6%) were bad odour with majority of the farmers (55.7%) and workers (51.6%) adopting the use of nose cover for protection from bad odour. The regression analysis indicated that age of the complainant had negative and significant relationship with frequency of environmental hazard complaint ($b = 0.387$, $P < 0.05$). The relationship between distance of poultry farms and living houses on hazard complaint was also negative and significant ($b = - 0.418$, $P < 0.05$). The significance and negative relationship between the poultry farms and number of complaint was also confirmed by the chi-square test ($\chi_{cal}^2 = 121.3 \geq \chi_{tab}^2 = 15.1$). The study concludes that the environmental hazard posed by the establishment of poultry farming is high in Edo due to the fact poultry houses are located too close to residential houses. The study then recommends the need for Edo State Ministries of Health and Environment to ensure that the poultry farms are located at least about half a kilometer far from the living houses. The huge waste generated by the poultry farms in Edo State can also be converted to inorganic manure using modern recycling facilities.

INTRODUCTION

Poultry production in Nigeria consists of local and exotic breeds which are reared under the free range conditions and the intensive systems. Obioha (1996) observed that of all the poultry species, the fowls are the most common and important in the tropics as they are elsewhere. Okoli, et al (2007) noted that poultry production in Nigeria is essentially categorized into extensive, semi-intensive and intensive production systems. The intensive system usually involves commercial production of high performance exotic breeds of

35 livestock. The relative success of commercial poultry production in the tropics has made the
36 business very attractive in most developing countries.

37 Oluyemi and Roberts (2000) observed that the commercialization of poultry
38 production involving the emergence of large units in urban centres has transformed poultry
39 manure or droppings from an asset to a problem of a complete nuisance in an age where there
40 is much concern with pollution of the environment. It was noted that a layer is estimated to
41 produce about 63 – 70kg manure per bird in a year and that every week, 1, 000 layers in
42 cages produce 1 ton of manure while on deep litter, they are estimated to produce 30 tons of
43 faecal matter mixed with litter of variable fibre and moisture contents. Ray (1994) noted that
44 unlike most other livestock animals, poultry reared intensively produces large amount of
45 waste capable of polluting the environment if not properly handled.

46 Waste generated in poultry production according to IFC (2007) includes waste food,
47 animal waste or faeces, carcasses, sediments and sludge from on-site waste water treatment
48 facilities, various kinds of packaging for feed and pesticides, used ventilation filters,
49 unused/spoilt medications and used cleaning materials. It was noted that air emission from
50 poultry production include ammonia, odour and dust which are generated primarily due to
51 denitrification of manure and can be released directly into the atmosphere. Potential
52 Environmental Risks (2008) reported that rice hulls or litter spread over the ground in poultry
53 houses become contaminated with droppings of the chickens. Disposing this contaminated
54 rice hull or litter poses some environmental threat as improper disposal lead to breeding of
55 flies and unpleasant odour and water pollution. It was observed that water drops over the
56 litter on the flows while chicken drink water from the troughs and when the litter becomes
57 wet, it give rise to an unpleasant odour which can be a source of annoyance for the workers
58 and nearby communities. Environmental Protection Agency (2008) noted that to manage the
59 nuisance of odour created by poultry industry, the farms are to be located at least 500 metres
60 away from human settlements. Wyatt and Annapolis (2008) reported that pollution associated
61 with poultry production has been of great concern and many authorities have argued for more
62 pollution control which would require large poultry farms to get pollution permits from the
63 state and would allow fines or even jail time for non-complaint farmers.

64 Sharply (1998) reported that the concentration of poultry production and increase in
65 operational size in several parts of the United States of America would lead to some
66 consequences on the environment. To avoid this, IFC (2007) advised that poultry wastes
67 should be managed and disposed off in accordance with rules and regulation to avoid
68 hazardous situation and achieve environmental balance and safety. This study is therefore

designed to determine the environmental hazards associated with poultry production and identify the methods of waste management among the poultry farmers in the study area.

Methodology

The data for this study were collected from three hundred and sixty six (366) respondents in Edo State made up of 122 poultry farm owners, 122 poultry workers and 122 poultry farm neighbours. Edo State was created from the Former Bendel State in Nigeria on 27th August, 1991. It has a total of eighteen (18) Local Government Areas and is divided into three Agricultural zones, namely: Edo South, Edo Central and Edo North. The State lies between longitudes 05⁰ 04¹ E and 06⁰ 43¹E and latitudes 05⁰ 44¹N and 07⁰ 34¹N of the equator. The land area is about 19, 794 square kilometres. Edo State is bounded on the north and northeast by Kogi State, on the west by Ondo State, on the south and southeast by Delta State. The population of Edo State based on 2006 census exercise is 3, 218, 332 people and consists of 1, 640, 461 males and 1, 577,871 females (NPC, 2006). The population of the study consists of two hundred and twenty (220) commercial poultry farms keeping domestic fowls in the area. This was made up of one hundred and seventy four (174) poultry farms as identified by the Poultry Association of Nigeria, Edo State Branch and the Ministry of Agriculture and Natural resources, Benin City, Edo State, and forty six (46) unregistered poultry farms identified by the researcher. Proportional sampling technique was used to select a sample size of one hundred and twenty two (122) poultry farms across the three agricultural zones from the population of 220 commercial poultry farms in Edo State. To collect primary data for the study, the instrument used was the questionnaire and three sets were constructed and used. The set one was used to generate data from poultry farmers which included personal characteristics, experience in poultry keeping, waste management methods and hazards associated with poultry production. The set two questionnaire was designed and administered on poultry farm workers. The information gathered included personal characteristics, hazards of poultry employment and measures to minimise the hazards. The set three of the questionnaire was constructed and administered on people living in the vicinity of the poultry farms. It was designed to gather information on personal characteristics and environmental effects of poultry production in the area. The three sets of questionnaire were administered by the researcher and trained enumerators. The different information provided in the three sets of questionnaire were coded and analysed using tables and percentage distribution.

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104 **Results and Discussions**

105 Table 1 shows that majority of the respondents were married. Married men and
 106 women are most likely to be more dedicated to their jobs than workers who are single. The
 107 neighbours of poultry farms and the farm workers who were respondents of the study were
 108 youths while the farm owners were young adults. The presence of young men and women in
 109 their productive and active years of life in farming has also been observed by Agbamu and
 110 Fabusoro (2001). Young men tend to be progressive and innovative in what they engage in.
 111 The table also reveals that the respondents possessed good educational background as the
 112 mean educational level was 12 years for neighbours and 11.5years for farm workers and 15
 113 years for farm owners. In terms of experience in poultry keeping, the poultry farm workers
 114 had mean experience of 5.5 years while the poultry farm owners had mean experience of 14
 115 years.

116 **Table 1: Socio-economic background of the respondents**

Characteristics	Neighbours	Farm workers	Farm owners
Sex:			
Male	67.2%	54.9%	90.2%
Female	32.8%	45.1%	9.8%
Age:			
Mean	38 years	30 years	49 years
Marital status:			
Single	41.8%	36.9%	6.6%
Married	55.7%	55.7%	91.0%
Divorced	2.5%	4.1%	2.4%
Separated	-	3.3%	-
Educational Level:			
Mean (years)	12 years	11.5 years	15 years
Experience:			
Mean		5.5 years	14 years

117 Source: Computed from field data

118 The distance between living houses and poultry farms in the study area is shown in
 119 Table 2. Table 2 shows that majority (60.7%) of the poultry farms were located between 1

metre to 100 metres away from living houses while only 12.3% were located above 500 metres from living houses. It implies that only 12.3% of the farms in the study area met the rules guiding poultry farm location as stipulated by Environmental Protection Agency (2008). The mean distance between the living houses and poultry farms in Edo State is 153 metres. Environmental Protection Agency (2008) indicated that in order to manage nuisance of odour created by poultry industry, the farms are to be located at least 500 metres away from human settlements. It means that the 87.7% of the sampled poultry farms located between one metre and 500 metres away from living houses are therefore likely to have conflict with neighbours as a result of the nuisance of odour and others associated with intensive poultry production.

Table 2: Distance between living houses and poultry farms

Distance (metres)	Frequency	Percentage
1 – 100	74	60.7
101 – 200	16	13.1
201 – 300	11	9.0
301 – 400	1	0.8
401 – 500	5	4.1
≥ 500	15	21.1
Total	122	100.0

Source: Computed from field data.

The poultry farmers in the study area adopted different management systems to rear poultry birds. Table 3 reveals that 36.1% of the poultry farmers adopted deep litter system only, 16.4% the battery cage system only while 47.5% adopted both deep litter and battery cage systems in the rearing of their birds. This findings show that the commercial poultry farmers used only the intensive system of poultry management which according to Banerjee (2007) is the system where birds are confined to the house entirely with no access to land outside and it is usually adopted where land is limited and expensive. The type of intensive management system of poultry adopted has implication for the immediate environment. This is because, Oluyemi and Roberts (2000) observed that the same number of birds kept on deep litter is estimated to produce more faecal matter mixed with litter and moisture contents than when kept in battery cages.

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146 **Table 3: Poultry management systems**

Management System	Frequency	Percentage
Deep litter only	44	36.1
Battery cage only	20	16.4
Deep litter and battery cage	58	47.5
Total	122	100.0

147 Source: Computed from field data.

148 The complaints against poultry farms were of different types are shown in Table 4.
 149 Table 4 shows that 78.7% of the poultry farmers, 69.7% of the poultry workers and 74.6% of
 150 the neighbours of poultry farms indicated that bad odour from poultry farms was the major
 151 complaint against poultry farms. Only 1.6% of the workers and 3.3% of the neighbours
 152 indicated that rats/vermins constituted the type of complaint while 4.1% of the workers and
 153 5.7% of the neighbours complained against noise from poultry houses. The findings imply
 154 that bad odour from poultry farms constituted the major types of complaint against poultry
 155 farms. This agrees with Bough (1992) and Environmental Protection Agency (2008)
 156 observations that wet contaminated litter in poultry houses give rise to unpleasant odour
 157 which can be a source of annoyance for the workers and nearby communities.

158 **Table 4: Influence of distance on complaint of odour and other hazards**

Types of complaint	Farm owners		Workers		Neighbours	
	Freq	%	Freq	%	Freq	%
Bad odour	96	78.7	85	69.7	91	74.6
Rats/vermins	0	0	2	1.6	4	3.3
Noise	0	0	5	4.1	7	5.7
None	26	21.3	36	24.6	20	16.4
Total	122	100.0	122	100.0	122	100.0

159 Source: Computed from field data.

160 Table 5 shows that of the 102 respondent neighbours who complained of odour and
 161 other hazards, 72.6% lived within zero to 100 metres away from poultry farms. Of the
 162 neighbours who did not complain of hazard exposure, 75.0% of them lived above 500 metres
 163 distance away from poultry farms. For the poultry farm owners that received complaint about
 164 hazards, 78.1% had their farms within zero to 100 metres away from living houses. Out of the
 165 26 poultry farm owners that did not received complaint, 76.9% had their farms above 500

metres distance from living houses. The Chi-square test for the null hypothesis that the complaint of environmental hazard by neighbours was independent of the distance of poultry farms from living houses was ($\chi_{\text{cal}}^2 = 121.3 \geq \chi_{\text{tab}}^2 = 15.1$) significant. That the complaint of environmental hazards received by poultry farms owners was independent of the distance of poultry farms from living houses was ($\chi_{\text{cal}}^2 = 141.22 \geq \chi_{\text{tab}}^2 = 15.1$) significant at 1% level. This implies that complaint of environmental hazard from poultry farms is as a result of distance between poultry farms and living houses.

Table 5: The level of complaints levied by neighbours and complaint received by poultry farm owners.

Distances (metres)	Complaint by neighbours		No complaint by neighbours		Complaint received by farm owners		No complaint received by farm owners	
	Freq	%	Freq	%	Freq	%	Freq	%
100 – below	74	72.6	-	-	75	78.1	-	-
101 – 200	16	15.6	-	-	18	18.7	-	-
201 – 300	11	10.8	-	-	3	3.2	-	-
301 – 400	1	1.0	-	-	-	-	1	3.9
401 – 500	-	-	5	25.0	-	-	5	19.2
≥ 500	-	-	15	75.0	-	-	20	76.9
Total	102	100.0	20	100.0	96	100.0	26	100.0

Source: Computed from field data

The frequency of complaint of hazards from poultry farms is a measure of the awareness of such problems by neighbours with a view to finding solution to the problem as shown in Table 6. Table 6 shows that 36.9% of the neighbours of poultry farms complained 1 – 2 times about environmental hazards, 22.7% complained 3 – 4 times while 19.7% made more than 10 complaints of hazards exposure from poultry farms in their neighbourhood to concerned authorities. However, 16.4% of the neighbours indicated no complaint. The fact that as much as 83.6% of the neighbours made complaint is in confirmation of findings of Alabi, et al (2008) that majority of the people living close to poultry farms are aware of the environmental hazards associated with living in poultry farm vicinities.

Table 6: Frequency of complaint of environmental hazard from poultry farms by neighbours.

Number of complaint per year	Frequency	%
1 – 2	45	36.9
3 – 4	27	22.7
5 – 6	4	3.3
7 – 8	1	0.8
9 – 10	1	0.8
≥ 10	24	19.7
None	20	16.4
Total	122	100.0

Source: Computed from field data

Table 7 shows the test results of the null hypothesis that demographic characteristics of respondents, including distance from poultry farms have no significant influence on the level of environmental hazard complaint. The results showed that age of the respondents and distance from poultry farms are significant at 5% level. Age of the neighbours was negative ($b = -0.387$, $t = 2.067$) which implies that older respondents complained less about hazards caused by the closeness of the poultry farms than younger respondents. The distance between poultry farms and living houses was negative ($b = -0.418$, $t = 7.910$) and with significant influence on hazard complaint. This implies that the less the distance between living houses and poultry farms, the more the complaint from neighbours. The fact that constant is significant and positive ($t = 3.377$) implies that there are other explanatory variables that influence number of complaint which are not captured in the model. Such variables may include subjective variables as the personal relationship of neighbours with the poultry farm owners and gift from the farmers to the neighbours.

Table 7: Regression results of complaint by neighbours

Variable	Co-efficient	T-Ratio	Probability level
Constant	3.191	3.377	.001
Sex	-0.574	1.439	.153
Age	-0.387	2.067	.041
Education	0.081	0.385	.701
Distance	-0.418	7.910	.000

Source: Computed from field data.

The different poultry farms adopted different methods to minimize the occurrence of odour in their poultry farms because of the potential hazards. Table 8 showed that majority (66.4%) of the farm owners adopted regular removal of wet faeces to minimized odour while 23.8% adopted the use of deep litter system of management. The adoption of different methods to minimized odour by the poultry farmers is an indication of awareness of the need to prevent the hazards of odour to neighbours and workers alike.

Table 8: Methods to minimize occurrence of odour by farm owners

S/N	Methods	Frequency	%
1	Regular removal of net faeces	81	66.4
2	Use of deep litter system	29	23.8
3	Spray chemicals to reduce odour	10	8.2
4	Avoid spill of water and feed on floor	5	4.1

Source: Computed from field data. ≥ 122 (multiple responses)

Table 9 shows that to protect the workers from the effect of odour, 55.7% of the farm owners and 51.6% of the poultry workers used nose cover while 20.5% and 24.6% of both respectively used disinfectants. At the same time, 23.8% and 20.5% of both farmers and workers did not use any measure. The finding that majority of poultry farms used nose cover to protect workers from the odour is an indication of the awareness of the effect of odour on the health of the workers.

Table 9: Methods to protect workers from the effects of odour

Method	Farmers		Workers	
	Frequency (%)		Frequency (%)	
Provision of nose cover	68	55.7	63	51.6
Use of disinfectant	25	20.5	30	24.6
Use of handkerchief to cover nose	.0	0	4	3.3
No measure	29	23.8	25	20.5
Total	122	100.0	122	100.0

Source: Computed from field data.

The poultry farmers in the study area adopted different methods to manage waste and carcasses generated from their farms. Table 10 shows that majority (72.1%) of the farms disposed off their poultry waste through heap and burning during the dry season while 22.1% adopted the disposal to farmland to increase soil fertility. The finding that majority of the poultry farms burnt their waste is confirmed by the report of Alabi and Abu (2008) who found out that majority of the poultry in Akure metropolis, Ondo state used burning to dispose off poultry waste. However, Asch and Seneca (1978) noted that burning poultry waste has been associated with air pollution and that the decreased air quality will affect the wellbeing of the people living around the burning points. Table 10 also reveals that majority (86.1%) of the farms buried carcasses or dead birds from their farms while 8.2% of them sold them to customers. However, Archie (1996) suggested that the dead bird should be properly buried to prevent the risk of contaminating the environment.

258 **Table 10: Poultry waste and carcass management methods**

Method	Frequency	Percentage
A: poultry waste		
Heap waste and burn	88	72.1
Disposal to farmland	27	22.1
Dig and bury waste	4	3.3
Sale of waste	3	2.5
Total	122	100.0
B: Carcass		
Sold cheap to customers	10	8.2
Workers consumed them	4	3.3
They were buried	105	86.1
Sold some and worker consume some	3	2.4
Total	122	100.0

259 Source: Computed from field data.

260 **Conclusion and recommendations**

261 The establishment of poultry farms close to human settlement has created
 262 environmental problems based on the level of complaint by neighbours in Edo State. Odour
 263 from poultry houses constituted the major complaint because of the low average distance
 264 between poultry farms and living houses. The study then recommends the need for Edo State
 265 Ministries of Health and Environment to ensure that the poultry farms are located at least
 266 about half a kilometer far from the living houses. The huge waste generated by the poultry
 267 farms in Edo State can also be converted to inorganic manure using modern recycling
 268 facilities.

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