



Environmental Effects of Poultry Production In Edo State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author RAA designed the study performed the statistical analysis and wrote the first draft of the manuscript. Authors CIA and DIO managed the analyses of the study. Author OGE managed the literature searches. All authors read and approved the final manuscript.

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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 randomly 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 covering of nose 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 chi-square test ($\chi^2_{cal} = 121.3 \geq \chi^2_{tab} = 15.1$). The study concludes that the environmental hazard posed by the establishment of poultry farming is high in Edo due to the fact

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commercial 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.

Keywords: Environmental effect; poultry production; Nigeria.

1. INTRODUCTION

Poultry production in Nigeria consists of local (backyard) and exotic breeds which are reared under the free range conditions and the intensive systems. The backyard poultry constitutes about 84% of total poultry production, while the exotic contributes about 14% to the total poultry production in Nigeria [1]. According to [1], Edo state contributes about 1% to the total poultry production in Nigeria. In Edo state, backyard and exotic poultry contributes about 1129350 and 112290 respectively. Obioha [2] 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. [3] 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 livestock. The relative success of commercial poultry production in the tropics has made the business very attractive in most developing countries.

Oluyemi and Roberts [4] observed that the commercialization of poultry production involving the emergence of large units in urban centres has transformed poultry manure or droppings from an asset to a problem of a complete nuisance in an age where there is much concern with pollution of the environment. It was noted that a layer is estimated to produce about 63–70 kg manure per bird in a year and that every week, 1,000 layers in cages produce 1 ton of manure while on deep litter, they are estimated to produce 30 tons of faecal matter mixed with litter of variable fibre and moisture contents Oluyemi and Roberts [4]. Ray [5] noted that unlike most other livestock, poultry reared intensively produces large amount of waste capable of polluting the environment if not properly handled.

Waste generated in poultry production according to [6] includes waste food, animal waste or faeces, carcasses, sediments and sludge from on-site waste water treatment facilities, various kinds of packaging for feed and pesticides, used ventilation filters, unused/spoilt medications and used cleaning materials. It was noted that air emission from poultry production include ammonia, odour and dust which are generated primarily due to denitrification of manure and can be released directly into the atmosphere. Potential Environmental Risks [7] reported that rice hulls or litter spread over the ground in poultry houses become contaminated with droppings of the chickens. Disposing this contaminated rice hull or litter poses some environmental threat as improper disposal lead to breeding of flies and unpleasant odour and water pollution. It was observed that water drops over the litter on the flows while chicken drink water from the troughs and when the litter becomes wet, it give rise to an unpleasant odour which can be a source of annoyance for the workers and nearby communities [7]. Environmental Protection Agency [8] noted that to manage the nuisance of odour created by poultry industry, the farms are to be located at least 500 metres away from human settlements. Wyatt and Annapolis [9] reported that pollution associated with poultry production has been of great concern and many authorities have

argued for more pollution control which would require large poultry farms to get pollution permits from the state and would allow fines or even jail time for non-complaint farmers.

Sharply [10] reported that the concentration of poultry production and increase in operational size in several parts of the United States of America would lead to some consequences on the environment. To avoid this, International Finance Corporation [6] advised that poultry wastes should be managed and disposed off in accordance with rules and regulation to avoid 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.

2. MATERIALS AND METHODS

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 05° 04' E and 06° 43' E and latitudes 05° 44' N and 07° 34' N of the equator. The land area is about 19794 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 3218332 people and consists of 1640461 males and 1577871 females [11]. 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. One hundred and twenty two (122) poultry farms were randomly selected from 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 to 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 to 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. The distance between the poultry houses were physically measured by the trained enumerators. The enumerators used tape rule to measure the distances in metres.

3. RESULTS AND DISCUSSIONS

Table 1 shows that majority of the respondents were married. Married men and women are most likely to be more dedicated to their jobs than workers who are single. The neighbours of poultry farms and the farm workers who were respondents of the study were youths while

the farm owners were adults. The presence of young men and women in their productive and active years of life in farming has also been observed by [12]. Young men tend to be progressive and innovative in what they engage in. The table also reveals that the respondents possessed good educational background as the mean educational level was 12 years for neighbours and 11.5 years for farm workers and 15 years for farm owners. In terms of experience in poultry keeping, the poultry farm workers had mean experience of 5.5 years while the poultry farm owners had mean experience of 14 years.

Table 1. Demographic information of the respondents

Characteristics	Neighbours	Farm workers	Farm owners
Sex:			
Male	67.2%	54.9%	90.2%
Female	32.8%	45.1%	9.8%
Mean Age	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):	12.0	11.5	15.0
Mean Years of Experience	-	5.5	14.0

Source: Computed from field data, 2012

The distance between living houses and poultry farms in the study area is shown in Table 2. Table 2 shows that majority (60.7Percent) of the poultry farms were located between one metre to 100 metres away from living houses while only 12.3 Percent were located above 500 metres from living houses. It implies that only 12.3 Percent of the farms in the study area met the rules guiding poultry farm location as stipulated by [13]. The mean distance between the living houses and poultry farms in Edo State is 153 metres. Environmental Protection Agency [8] 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 Percent 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 in the study area

Distance range in metres)	Frequency	Percent
1 to100	74.0	60.7
101 to200	16.0	13.1
201 to300	11.0	9.0
301 to400	1.0	0.8
401 to 500	5.0	4.1
Greater than500	15.0	21.1
Total	122.0	100.0

Source: Computed from field data, 2012

The poultry farmers in the study area adopted different management systems to rear poultry birds. Table 3 reveals that 36.1Percent of the poultry farmers adopted deep litter system only, 16.4Percent the battery cage system only while 47.5Percent 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 [5] 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 [4] 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.

Table 3. Poultry management systems used by the respondents

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

Source: Computed from Field Data, 2012

The complaints against poultry farms were of different types are shown in Table 4. Table 4 shows that 78.7Percent of the poultry farmers, 69.7Percent of the poultry workers and 74.6Percent of the neighbours of poultry farms indicated that bad odour from poultry farms was the major complaint against poultry farms. Only 1.6 Percent of the workers and 3.3 Percent of the neighbours indicated that rats/vermins constituted the type of complaint while 4.1 Percent of the workers and 5.7 Percent of the neighbours complained against noise from poultry houses. The findings imply that bad odour from poultry farms constituted the major types of complaint against poultry farms. This agrees with [13,14] observations that wet contaminated litter in poultry houses give rise to unpleasant odour which can be a source of annoyance for the workers and nearby communities.

Table 5 shows that of the 102 respondent neighbours who complained of odour and other hazards, 72.6Percent lived within zero to 100 metres away from poultry farms. Of the neighbours who did not complain of hazard exposure, 75.0Percent of them lived above 500 metres distance away from poultry farms. For the poultry farm owners that received complaint about hazards, 78.1Percent had their farms within zero to 100 metres away from living houses. Out of the 26 poultry farm owners that did not received complaint; 76.9Percent had their farms above 500 metres distance from living houses. The Chi-square test value of the null hypothesis that the complaint of environmental hazard by neighbours was independent of the distance of poultry farms from living houses was 121.3, which is greater than the Chi-square test tabulated value of 15.1 when tested at 1Percent level of significance. This implies distance between the poultry and living house can influence the environmental hazard significantly. The test of null hypothesis that the number of complaint of environmental hazards received by poultry farms owners was independent of the distance of poultry farms from living houses yielded Chi-square test value of 141.2, which is greater than the tabulated value of 15.1 at 1Percent level of significance. This implies that complaint of environmental hazard from poultry farms can be attributed to small distance between poultry farms and living houses in Edo state.

Table 4. Types of complaint of against the poultry farms as indicated by farm owners, workers and neighbour

Type of complaint	Farm owners		Farm workers		Neighbours	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Bad Odour	96.0	78.7	85	69.7	91.0	74.6
Rats/Vermins	0.0	0.0	2.0	1.6	4.0	3.3
Noise	0.0	0.0	5.0	4.1	7.0	5.7
None	26.0	21.3	36.0	24.6	20.0	16.4
Total	122.0	100	122	100	122.0	100.0

Source: Computed from field data, 2012

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

Distances range(metres)	Complaint by neighbours		No complaint by neighbours		Compliant received by farm owners		No complaint received by farm owners	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	%
100	74.0	72.6	-	-	75.0	78.1	-	-
101 – 200	16.0	15.6	-	-	18.0	18.7	-	-
201 – 300	11.0	10.8	-	-	3.0	3.2	-	-
301 – 400	1.0	1.0	-	-	-	-	1.0	3.9
401-500	-	-	5.0	25.0	-	-	5.0	19.2
≥ 500	-	-	15.0	75.0	-	-	20.0	76.9
Total	102.0	100.0	20.0	100.0	96.0	100.0	26.0	100.0

Source: Computed from field data, 2012

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 36.9Percent of the neighbours of poultry farms complained 1 – 2 times about environmental hazards, 22.7 Percent complained 3–4 times while 19.7Percentmade more than 10 complaints of hazards exposure from poultry farms in their neighbourhood to concerned authorities. However, 16.4Percent of the neighbours indicated no complaint. The fact that as much as 83.6Percent of the neighbours made complaint is in confirmation of findings of [14] 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. Distribution of complaint of environmental hazard from poultry farms by neighbours

Number of compliant Per Year	Frequency	Percent
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, 2012

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 5Percent level. Age of the neighbours was negative and significant at 5Percent level, 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 and significant at 5Percent. This suggests 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 too subjective to be captured in this econometric model and such variables include personal relationship of neighbours with the poultry farm owners as indicated in [15].

Table 7. Linear regression results of determinants of complaint by neighbours living close to poultry houses in the study area

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, 2012; *Significant at 5%

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

(64.8Percent) of the farm owners adopted regular removal of wet faeces to minimized odour while 23.2Percent 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	Percent
1	Regular removal of net faeces	81.0	64.8
2	Use of deep litter system	29.0	23.2
3	Spray chemicals to reduce odour	10.0	8.0
4	Avoid spill of water and feed on floor	5.0	4.0
	Total	125.0*	100

Source: Computed from field data, 2012* (Multiple responses)

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

Table 9. Methods used to protect workers from the effects of odour

Method	Farmers		Workers	
	Frequency	(Percent)	Frequency (Percent)	
Provision of special nose cover	68	55.7	63.0	51.6
Use of disinfectant	25	20.5	30.0	24.6
Use of handkerchief to cover nose	0.0	0.0	4.0	3.3
No measure	29.0	23.8	25.0	20.5
Total	122.0	100.0	122.0	100.0

Source: Computed from field data, 2012

The poultry farmers in the study area adopted different methods to manage waste and carcasses generated from their farms. Table 10 shows that majority (72.1Percent) of the farms disposed off their poultry waste through heap and burning during the dry season while 22.1Percent 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 [3] who found out that majority of the poultry in Akure metropolis, Ondo state used burning to dispose off poultry waste. Table 10 also reveals that majority (86.1Percent) of the farms buried carcasses or dead birds from their farms while 8.2Percent of them sold them to customers. However, Archie [15] suggested that the dead bird should be properly buried to prevent the risk of contaminating the environment.

Table 10. Poultry waste and carcass disposal methods used in the study area

Method	Frequency	Percentage
A: Poultry waste		
Heap waste and burn	88.0	72.1
Disposal to farmland	27.0	22.1
Dig and bury waste	4.0	3.3
Sale of waste	3.0	2.5
Total	122.0	100.0
B: Carcass		
Sold cheap to customers	10.0	8.2
Workers consumed them	4.0	3.3
They were buried	105	86.1
Sold some and worker consume some	3.0	2.4
Total	122.0	100.0

Source: Computed from Field Data, 2012

4. CONCLUSION AND RECOMMENDATIONS

The establishment of poultry farms close to human settlement has created environmental problems based on the level of complaint by neighbours in Edo State. Odour from poultry houses constituted the major complaint because of the low average distance between poultry farms and living 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.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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