

*Original Research***Determinants of Waste Management Techniques among the Poultry Farmers in Ikenne Local Government Area of Ogun State, Nigeria****Olubunmi Lawrence Balogun, Taofeek Ayodeji Ayo-Bellol, Osagie John Afodu, Oladele Timothy Akinwole, Lois Chidinma Ndubuisi—Ogbonna**

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**Abstract**

One of the largest growing agro-based industries in the world is poultry. The industry is faced with the problem of ineffective disposal of solid waste produce without jeopardize health of people. This study examined waste management techniques among poultry farmers in Ikenne Local Government Area of Ogun State. Primary data were collected with the aid of structured questionnaire and stratified random sampling procedure was employed to collect the data. Data were collected from one hundred and nineteen (119) poultry farmers. Data were analysed using descriptive statistics and multinomial logit model. Results showed that majority of the farmers employed burying of poultry waste as management technique. Result also showed that 8.25 tons of wastes were generated per production cycle. Experience in poultry business significantly affected the likelihood of rendering as a waste management technique employed by farmers. However, the frequency of waste disposal positively influenced the choice of burning as a management technique. The study recommends entrenchment of policies and guidelines that make adherence to standard sanitation/health practices a normal routine to all poultry farmers.

**Key words:** Agro-Based Industries, Poultry Waste, Management Techniques, Production Cycle, Poultry Farmers**How to cite:** Balogun, O., AyoBellol, T., Afodu, O., Akinwole, O., & NdubuisiOgbonna, L. (2017). Determinants of Waste Management Techniques among the Poultry Farmers in Ikenne Local Government Area of Ogun State, Nigeria. International Journal of Livestock Research, 7(12), 1. <http://dx.doi.org/10.5455/ijlr.20170213054006>**Introduction**

Solid-waste management is a major challenge in most urban centers throughout the world. Without an effective and efficient solid-waste management program, the waste generated from various human activities, both industrial and domestic, can result in health hazards and have a negative impact on the

environment. The recent upward shift in the demand for low-cholesterol meat products has led to tremendous expansion in the poultry industry (Manu *et al.*, 2013). This rapid and concentrated growth of the industry in several states has caused increasing concern about the disposal of poultry wastes with respect to other sources of pollution.

Poultry wastes constitute a serious environmental pollution threat in Nigeria arising mainly from their offensive odour. The wastes consequently provides a place of breeding for flies and rodents. Farmers normally dispose of their poultry wastes through heaping and burning or dumping on the farm in the fresh state (Adeoye *et al.* 1994). Waste of a poultry farm includes litters from broiler and layers, hatchery debris, dead birds and much other debris. Broiler litter is a mixture of manure, bedding material, wasted feed, feathers and in some cases soil (Jacob *et al.*, 1997, Sarker *et al.*, 2009). Accordingly Tao and Manci (2008) estimated the daily manure production by a broiler and laying hen to be 0.09 kg and 0.18 kg respectively and that the type of chicken, age and breed, stocking density, feed conversion, kind and amount of feed type and amount of litter, moisture content of litter, type of floor, and even climatic conditions during accumulation are the factors responsible. In Nigeria, the efforts of poultry farmers to get rid of organic waste always result in an additional management cost and if left unmanaged, these wastes probably can create an environmental hazard to the farmers (Rashid, *et.al.* 2010). Therefore, this study seeks to examine the economic importance of poultry waste management techniques in Ikenne Local Government Area of Ogun State. The specific objectives are:

1. To identify the different poultry waste management techniques used by poultry farmer and their characteristics; and
2. To know the determinants of waste management techniques adopted by the poultry farmers in the study area.

### **Theoretical/Conceptual Framework and Literature Review**

Management of waste in poultry has become an important phenomenon in developmental research due to its role in curbing urban food and unemployment problems for the growing urban population. Recent studies have provided evidences of environmental, social and economic contributions of waste utilization for urban food production. However, a major problem to contend with remains how waste (wastewater, municipal waste, cattle waste, poultry waste etc.) can best be managed for healthy living and minimal negative health implications. According to Bilitewski *et al.* (1994), waste management incorporates “the collection, transport, storage, treatment, recovery and disposal of waste”. Poultry waste disposal offers substantial environmental, biological, and financial problems for the poultry industry worldwide (Moreki and Chiripasi (2011). Studies by (Adedayo, 2012; Moreki and Keaikitse, (2013) have investigated poultry waste management techniques and practices in urban and rural areas in Nigeria. According to Adedayo

(2012), poultry waste is poorly collected, packaged and transported; hence, proper knowledge on treatment is lacking due to lack of skill, space, time together with paucity of capital. In another study by Moreki and Keaikitse (2013), poultry waste management operations practices in around the City of Gaborone was investigated. The result revealed that most poultry farmers dispose solid waste by giving it out as manure/litter in the landfills or dumping sites. Olumayowa and Abiodun (2011) examined the profit efficiency and poultry waste management in Egba division of Ogun State, Nigeria. The result showed that most poultry farmers did not treat their farm waste before or after disposal thereby polluting their environment. Fafioye and John-Dewole (2012) investigated the effect of open dumping of animal wastes on the farm workers' health and the environment. The results show that the open dumping of animal wastes as a method of disposal has a significant effect on the environment and health of the workers.

### Materials and Methods

The study was carried out in Ikenne Local Government Area, Ogun State, Nigeria. It's headquarters is located at Ikenne. The population of inhabitants is approximately 74, 000 people (National Population Commission, 2006). The major occupation of the people is farming. Others include trading, artisan work and craft. Poultry production is prominent at both commercial level and small-scale level among the livestock farmers in the local government area. The local government area has the potential to supply a large portion of the nation's demand for poultry and poultry products if available resources are efficiently used for optimal production (Habib, 2015). Stratified random sampling procedure was employed to collect data from poultry farmers in the study area. Data were collected from one hundred and nineteen (119) poultry farmers randomly selected from the Local Government Area using producers sample frame obtained from the Poultry Association of Nigeria (PAN), Ogun State Chapter. Information on the poultry farmers' socioeconomic characteristic, poultry management techniques and waste characteristic of the farm for a production cycle were collected from the farmers.

Analytical tools: The analytical tools employed include descriptive statistics and multinomial logit model.

- i. Descriptive statistics: Descriptive statistics such as tables, frequencies, mean and percentages were used for socioeconomic characteristics of poultry farmers and poultry management activities.
- ii. Multinomial Logit Model: The determinants of waste management technique employed by poultry farmers in the study area were analysed using Multinomial Logit (MNL) model. The model was adopted from Mpuga (2008). The model is used to handle the case of dependent variables with more classes than two. The various waste management techniques used by poultry farmers are classified as the dependent variables. It is supposed that the dependent variable  $Q_{it}$

can take on one of j categories 1, 2... k (the different alternative choices waste management available to farmers).

In this study, four distinct categories of waste management technique employed by poultry farmers are burying, rendering, burning and composting. It is assumed that all the alternative waste management are mutually exclusive (in this case, waste management mostly used by farmers) (Mpuga, 2008).

Let Pr (Q<sub>it</sub> =M/X) be the probability of observing outcome M given X, the probability model for D<sub>it</sub> can be constructed thus:

$$\Pr (Q_{it} =M/X) = \frac{\exp \beta_o + \beta_1 X_{2i} + \dots + \beta_k X_{mi}}{\sum_{j=1}^k \exp (\beta_{o\lambda} + \beta_{ij} X_{2i} + \dots + \beta_{kj} X_{ni})} \dots \dots \dots (1)$$

for j = 1, 2, .., k. The parameters are not all identified since more than one set of parameters generate the same probabilities of the observed outcomes unless we impose constraints on the model which is achieved by setting parameters. For example, those of the first choice category j = 1 to all be zero: β<sub>01</sub> = β<sub>11</sub> = β<sub>k1</sub> = 0. In other words, parameters of the first choice category are used as the base against which the other choices are compared.

The log likelihood function for the multinomial logit can be written thus;

$$\ell = \sum_{i=1}^n \sum_{j=1}^k d_{ij} \text{Log}(P_{ij}) \dots \dots \dots (2)$$

Where d<sub>ij</sub> is a dummy variable that takes the value 1 if observation i has chosen alternative j; 0 otherwise.

The first-order conditions are;

$$\frac{\partial \ell}{\partial \beta_{kj}} = \sum_{i=1}^n (q_{ij} - P_{ij}) X_{kj} \dots \dots \dots (3)$$

In our case, the choice of waste management techniques is modelled as a function of socioeconomic characteristics and poultry management activities. This can be presented as a general form equation:

$$Q_{it} = f(X_i) \dots \dots \dots (4)$$

Where Q<sub>it</sub> takes on values 1, 2,..,k if individual i chooses alternative j (including burying and other management techniques) at time t.



The MNL model is however operationalized empirically in this study with the following equations:

$$Q_{it} = \alpha_0 + \beta_{ij}X_i + \dots + \beta_n X_n + \varepsilon_i \dots \dots \dots (5)$$

The dependent variable  $Q_i$  is when household sourced credits from source  $i$  and 0 when otherwise. Thus  $Q_1, Q_2, Q_3,$  and  $D_4$  represent probabilities of farmers using burying, rendering, burning and composting management techniques respectively.

$X_1 \dots X_n$  represents vector of the explanatory variables where  $n = 1 \dots 12$

$\beta_1 \dots \beta_2$  represents the parameter or coefficients,  $\varepsilon_i$  represents the independent distributed error term and  $\alpha_0, \alpha_1, \alpha_2, \alpha_3$  shows the intercept or constant term.

The Explanatory Variables are:

Household Characteristics:

- $X_1$  = Sex (Male=1, Female = 0)
- $X_2$  = Age of household head (Years)
- $X_3$  = Marital status (Married =1, otherwise =0)
- $X_4$  = Household size
- $X_5$  = Years spent in school (years)
- $X_6$  = Poultry farming experience (years)
- $X_7$  = Cost of labour used in farm (Naira)
- $X_8$  = Quantity of waste generated in farm (Tons)
- $X_9$  = Number of birds
- $X_{10}$  = Frequency of waste disposal/month
- $X_{11}$  = Cost of labour used in farm (Naira)
- $X_{12}$  = Cost of waste transport (₦)

**Results and Discussions**

Socioeconomic characteristics of poultry farmers is presented in Table 1. The result shows that most poultry farmers (63.0%) in the study area were males while the remaining were females. This shows the dominance of men in poultry industry in the study area, which can be as a result of risk involved in venturing into the business. This indicates that males are mostly risk-takers and also have a higher chance of getting loans from various money lending institutions than the females. Age of the poultry farmers indicates that 49.6% of them were in age range of 30-40 years while 15.1%, 20.2% and 15.1% were in age groups of less than 30 years, 41-50 years and greater than 50 years respectively. Age is an important factor in traditional agriculture; the mean age of poultry farmers in the study area is 38.1 years. And also, it can be said that the young ones are still strong enough to venture into poultry farming which is risk-taking.



Most poultry farmer households (72.3%) have household size of 1-3 members, while 24.4% of the households have 4-8 members. However, the average poultry farmer’s household size in study area was about 3 persons per household. The table shows that majority (62.8%) of the farmers had over 12 years of formal education while only 9.2% of the poultry farmers did not attend any form of school. Years spent in poultry business shows that 52.9 % of the farmers had been in the poultry business for at least five years while 24.4% and 22.7% of the farmers had been in the business for about six to twelve years and over 13 years respectively. Average experience in poultry production business was 4.72 years. The implication is that the more years a farmer spends in a business the more experience the farmer acquires to manage and solve certain problems associated with the business.

**Table 1:** Socio-economic characteristics of poultry farmers

Variable	Frequency	%
<b>Sex</b>		
Male	75	63.03
Female	44	36.97
Total	119	100.0
<b>Age</b>		
Less than 30	18	15.13
30-40	59	49.58
41-50	24	20.17
Greater than 50	18	15.13
Total	119	100.0
Mean = 38.10 ; SD =20.4		
<b>Household size</b>		
1-3	86	72.27
4-8	29	24.37
Greater than 8	4	3.36
Total	119	100.0
Mean = 3.08 ; SD= 2.37		
<b>Year spent in school (Years)</b>		
0	11	9.2
1- 6	20	16.8
7 – 12	14	11.8
Greater than 12	74	62.2
Total	119	100.0
<b>Experience in poultry business (Years)</b>		
Less than 5	63	52.9
6 – 12	29	24.4
Greater than 12	27	22.7
Total	119	100.0
Mean = 4.61 ; SD= 0.30		

Source: Field Survey, 2015

Table 2 depicts different poultry waste management techniques among the operators of poultry farms in the study area. The result reveals that 60.5% of the farmers employed burying of wastes as management technique in their farms. Poultry farmers adopt this method because of smell and sight of poultry waste which are offensive and often become breeding ground for a variety of pests, rodents and also generate polluted run-off into water ways and to the environment. This result supports Zeeuw (2000) that exposed poultry waste is breeding ground for a variety of pests, rodents and also a major source of water and environmental pollution. Dead birds constitute an appreciable proportion of waste generated in poultry farms. However, 6.9% of the farmers preferred burning of dead birds. The remaining farmers either used means of waste management while 5.9% and 6.7% used rendering and compositing methods respectively.

**Table 2:** Different poultry waste management techniques among the operators of poultry farms in the study area

Variable	Frequency	%
Burying	72	60.50
Rendering	7	5.88
Burning	32	26.89
Compositing	6	6.72
Total	119	100.0

Source: Field Survey, 2015

The profile of characteristics of waste generated in poultry farms is presented in Table 3. Waste characteristics such as farm size, quantity generated, types of poultry farming practices and frequency of waste removal had higher percentages among the farmers with over 75%. However, few (18.5%) of poultry farmers were concerned about the types of poultry breed reared in their farms. Only 46.2% of poultry farmers were concerned about waste utilization while 54.6%, 66.4% and 67.2 % respectively had disposal method adopted, frequency of waste removal and types of farming practices.

**Table 3:** Profile of characteristics of waste generated in poultry farms

Variable	Number (%)
Quantity generated	98 (83.4%)
Waste utilization	55(46.2%)
Disposal method adopted	65 (54.6%)
Frequency of waste removal	79 (66.4%)
Farm size	114 (95.8%)
Type of poultry farming practices	80 (67.2%)
Type of breed	22 (18.5%)
Total number of Farmer	119

Source: Field Survey, 2015

Average quantity of poultry wastes generated per production cycle per farm is presented in Table 4. The mean daily poultry litter per bird estimated from the result of daily measurement from the farms was

0.0013 ± 0.0002 ton/bird. The result shows that about two-third of the waste generated was less than five tons while only 1.6% of the sampled farms had more than ten tons of waste generated in their farms. The average annual generated wastes stood at 8.25 ± 1.34 tons.

**Table 4:** Average quantity of poultry wastes generated per production cycle per farm

Quantity of waste (Ton)	Frequency	Percentage
Less than 5	81	68.1
5 – 10	36	30.3
Above 10	2	1.6
Total	119	100
Mean = 8.25 ; SD= 1.34		

Source: Field Survey, 2015

Determinants of poultry waste management techniques used by farmers are presented in Table 5. As indicated in the methodology, four responses were used as dependent variables. These are waste management methods defined as burying, rendering, burning and composting. The dependent variable burying was used as the base category or reference cell. Chi-square distributions was used to test overall model adequacy at specific significant level. Likelihood ratio also determines whether the multinomial logit model is preferable to binomial logit model. The table shows that number of birds, sex of farmer, marital status, household size, poultry farmers' experience and frequency of waste disposal per month are important variables influencing poultry farmers' management technique.

For the farmers who adopted rendering waste management technique, the number of birds, marital status, household size and poultry farmers' experience are the significant variables when burying is used as base category. In case of marital status of the poultry farmers, being married decreased the probability of using rendering waste management by 10.4%. However, household size of the poultry farmers has positive sign and significantly affects the waste management technique employed by farmers. An additional member to the poultry farmer's household increased the likelihood of the farmer's adopting rendering as waste management in his/her farm by 0.17%. Poultry farming experience is positive and significantly affects whether rendering waste management will be used or not by a farmer. A year increase in farmer's experience increased the likelihood of adopting rendering method of waste management to dispose wastes in his/her farm. The number of birds has negative coefficient and significantly influences the waste management technique adopted by poultry farmers. This result implies that as the number of birds increases the probability of farmers adopting rendering waste management declines.

The result shows that being male increased the probability of farmer burning poultry wastes by 19.6%. In the case of household size, an additional member to the farmer's household increased the likelihood of disposing his/her wastes by 5.4%. Frequency of waste disposal has a positive sign and significant at 1%

level. The result implies that a unit increase in the frequency will increase the probability of using burning method as a means of disposing poultry waste by 1.08.

The result shows that being male poultry farmer increases the likelihood of using composting as waste management technique by 6.34%

**Table 5:** Determinants of poultry waste management techniques used by farmers

Explanatory Variable	Rendering		Burning		Composting	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Sex of farmer	0.4910715 (0.50)	0.0005771	1.404916 (2.32)**	0.1964563	2.062451 (1.66)*	0.0634738
Age of farmer	-0.036666 (-0.84)	-0.0001715	0.0053628 (0.20)	0.0007586	0.0194956 (0.35)	0.0007641
Marital status	-2.348356 (-2.07)**	-0.104228	-0.0035015 (-0.20)	0.0009611	0.0748065 (0.30)	0.0035809
Household size	0.4719485 (2.01)**	0.0017188	0.336502 (2.39)**	0.0538241	0.2680034 (1.15)	0.0078731
Years spent in school	-0.0396844 (-0.49)	-0.0001508	-0.0507807 (-1.21)	-0.0096619	0.1219455 (0.99)	0.0055264
Poultry farming experience (year)	0.1175939 (1.69)*	0.0004897	0.0424819 (1.01)	0.0074876	-0.0466513 (-0.50)	-0.0023482
Cost of labour (₦)	0.0007047 (1.24)	3.62e-06	-0.0004777 (-0.88)	0.0000795	-0.0001836 (-0.38)	-3.29e-06
Quantity of waste generated (kg)	0.9790206 (1.27)	0.0046381	-0.322996 (-0.74)	-0.0559839	0.0601396 (0.22)	0.0053023
Number of birds	-0.0008076 (-1.68)*	-3.54e-06	-0.0000427 (-0.20)	-6.5e-06	0.0000124 (0.38)	1.07e-06
Frequency of waste disposal/month	-0.0399869 (-0.06)	-0.001329	1.077971 (3.44)***	0.1760887	0.6239238	0.0158104
Cost of waste transport (₦)	-0.0001442 (-0.28)	-4.72e-07	-0.000022 (-1.11)	3.50e-06	-0.0007608 (-0.22)	-0.0000313
Constant	-1.556609		-3.79204		-6.786253	
No of Observation	119					
Pseudo R <sup>2</sup>	0.2377					
Log likelihood	-91.2003					

Absolute value of z statistics in parentheses, \* significant at 10%, \*\* significant at 5% and \*\*\* significant at 1%  
Omitted category in the dependent variables are the (Burying)

Source: Field Source 2015

### Conclusion and Recommendations

The study examined economic situation of poultry waste management techniques in Ikenne Local Government Area of Ogun State. The result revealed that majority of the farmers still employs burying of wastes as management technique in their farms. Poultry farmers adopt this method because of smell and sight of poultry waste which is offensive and often become breeding ground for a variety of pests, rodents

and also generate polluted runoff into water ways and to the environment. However, the frequency of waste removal from these farms by farmers was high.

Also, few (18.5%) poultry farmers were concerned about the types of poultry breed reared in their farms. An average of 8.25 tons of wastes is generated per production cycle in the study area. Poultry farming experience is positive and significantly affects whether or not rendering waste management will be used by a farmer. Also, the number of birds has a negative coefficient and significantly influences the use of rendering waste management technique by poultry farmers. It implies that as the number of birds increase the probability of farmers adopting rendering waste management declines. Frequency of waste disposal positively influences the choice of burning as a management technique. This method is safe and eliminates the threat of diseases and residue is largely harmless and does not attract rodents or insects. Based on the findings of this study, it is therefore recommended that there should be a strict enforcement by supervisory agencies of the existing sanitation/health policies aimed at environmental protection, especially as recommended by the State and Federal Environmental Protection Agencies in Nigeria.

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