

Contributing Factors of the Choice of Poultry Waste Management Practices: Evidence from Nigeria

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Abstract— The research was conducted to evaluate the choice of management practices for poultry wastes in Delta State. A multistage sampling procedure was used to obtain data from 133 respondents. A well structured questionnaire was used for the study. Data were analyzed using descriptive statistics, cost and return analysis and binary logit. Results showed that 70.9% were male with an average age of 44 years. About 73.0% were married with 99.0% acquiring formal education. The mean household size was 5 persons with mean farming experience of 6 years. Burying and burning were the primary waste management practices employed. The binary logit result indicates that age ($p < 0.05$), educational level ($p < 0.05$), household size ($p < 0.05$), type of bird ($p < 0.05$) and poultry housing method ($p < 0.05$) were positively significant while marital status ($p < 0.05$) was negatively significant among the factors affecting the choice of poultry waste management practices by the farmers in the study area. The major challenges in managing poultry waste were inadequate information, weather condition, lack of convenient dumping space and unavailability of litter material.

Keywords— choice, poultry, waste, management practices, farmers.

I. INTRODUCTION

Poultry is the raising of domesticated birds such as chickens, ducks, turkey, and geese which are of economic and nutritional benefit to man by providing him meat and eggs for food. Poultry is one of the most developed animal industries in Nigeria. To this end, Bolan et al (2010) reiterated that the poultry sector is one of the world's biggest and fastest expanding agro-industries. Alongside the increase in poultry patronage and activities, the business is faced with numerous environmental problems. The challenge is aggravated by large-scale accumulation of wastes which poses disposal and pollution problems Ekenma (2015). Orhervata and Omoyakhi (2008) gave an estimated daily waste generation of poultry farms to be between 0.09kg and 0.18kg, depending on the farm size. According to Williams (2010), poultry production result in hatchery waste, manure, litter and mortality on the farm. In furtherance, Moreki and Keaikitse (2013) noted that the poultry sector produce large quantities of waste which comprises of solid waste and waste water. The solid waste

comprises of bedding materials, excreta, feed feathers, hatchery waste, shells, sludge, abattoir waster (Offals, blood, condemned carcasses and feathers) and mortality. The waste water result from washing and disinfecting of poultry house and abattoirs.

There are several ways poultry waste can be managed and disposed which are burial, rendering, composting, fertilizer, feed for livestock. Other methods of disposal for poultry waste include the use of poultry waste for heavy metal-polluted water treatment as well as for conversion to power (Draper and Tomlinson 2012). It has been observed that re-using poultry waste can be beneficial and economical, if managed properly by farmers.

According to Idowu and Otuniaya (2002), despite the widespread importance and uses, less than 10% of poultry waste is recycled through feed in Nigeria. Previous studies shows the same pattern in most African countries for handling poultry wastes (Ayodeji et al , 2011; Adeoye et al. 2014). The predominant waste management practices in Nigeria and Botswana are dumping on adjacent wastelands

or spills into pits and nearby rivers. Although some farmers also used composting (Ayodeji et al., 2011; Moreki and Keaikitse, 2013).

Farmers' choice of disposal techniques depends on the environment, the location, the nature of the poultry housing and the number of birds (Charles 2008) and the socio-economic characteristics of the farmers (Idowu and Otuniaya 2002), and Adedayo 2012; Ojewale 2014).

According to Vide (2012), there had been no conscious effort made to clearly understand the management practices of poultry waste for urban agriculture; problems associated with its acquisition, handling, organization, seasonal variations and farmers' perception as well as their implications on yield. This concern has brought the need to focus attention on the choice and practices used for managing poultry waste in Delta State. Understanding the drivers of poultry waste management and utilization techniques especially as they affect crop yield and revenue generation among farmers, could pave way for improving poultry waste activities for urban agriculture and consequently increase income.

A report by Moore, Miles and Burn (2006) revealed that most poultry farms stored the waste for about 4-6 weeks on their farms before they heap them up and burn, flush them into drain or dispose them of with other domestic refuse. He further stated that about 50% of the poultry farmer spread the waste on nearby land, 40% of poultry farmer burns the waste after sun drying while only 5% compost the waste. The inappropriate and carelessness of this important aspect of poultry waste management in the farms, can lead to disease outbreak.

Poultry farmers' attempts to remove poultry waste often entail additional maintenance costs, and if left unmanaged, such residues will possibly pose an environmental threat to farmers (Rashid et al., 2010). Poultry wastes have failed to be properly managed in Nigeria because of a number of factors including ignorance, lack of technical knowledge, high management costs, lack of adequate technology, and lack of policies (Idowu and Otuniaya, 2002; Adedayo, 2012; Adeoye et al., 2014; McAllister, 2015).

In Nigeria, the current poultry waste disposal methods are neither economical nor environmentally friendly (Adeoye et al, 2014; Kalu et al 2016). Animal dung is also likely to induce soil and air flow if the effluences if the agronomic uptake for the crop obtained is less than the deposits of nutrients (Cofie and Drechsel, 2005; Charles, 2008). And

the choice of disposal method differs from one farmer to another in their location (Charles, 2008).

Thus, environmental, human health, potential earnings and quality of life issues for both poultry farmers and people living near and far from poultry production locations are crucial to waste management's long-term growth and sustainability in poultry production.

Poultry manure represent a valuable resource that if properly managed can replace large amount of chemical fertilizers. The first goal of any waste management system is to maximize the economic benefit from the waste resource and uphold an acceptable environmental standard. Studies on determinants of choice of poultry waste management are in short supply, especially in Delta State. The specific objectives are to: determine the socio economic profile of poultry farmers, ascertain the methods of waste management practices adopted by poultry farmers, determine the factors affecting the choice of poultry waste management practices by farmers and ascertain the challenges of poultry waste management practices.

II. MATERIALS AND METHOD

Study Area

This research was conducted in Oshimili North Local Government Area of Delta State, Nigeria. The study area has a population of 143,361 people (National Population Commission, 2006).. It has GPS coordinates of 6°19'21.83" N and 6°38'40.02" E (Live satellite map, 2019). The study area has a mean temperature of 29°C with annual rainfall ranging from 1,500mm to 2,200mm per annum (Ukwuaba and Inoni, 2012). Rainy season is between April and October. The major occupations of the people are farming, fishing and trading. The major livestock reared include poultry, piggery and goat while major crops produced are yam, melon, cassava, maize. Rural poultry is prominent in the study area.

Sampling Technique/ Data Collection

A two stage sampling procedure was used to handpick 135 poultry chicken farmers in the area of study. The first stage involved purposive selection of poultry farms from 9 communities based on prevalent of good number of poultry farmers involved and the second stage involved a random sampling method of 15 respondents from each community to give 135 poultry farmers selected from the list obtained from the ministry of agriculture and natural resources Delta

State. The sampling frame comprised the list of all registered poultry farmers obtained from the ministry of agriculture and natural resources Delta State. However, only 133 questionnaires were retrieved for the study. The survey was conducted using a pretested structured questionnaire.

Data Analysis

Data was analyzed using descriptive statistics and inferential statistics such as binary logit.

Model Specification

Binary model

Binary model was used to analyze the determinants of the choice of poultry waste management practices. Let us assume that the response variable Y^* captures the true status of the farmer either adopt waste management practices or not, the regression equation can be estimated as follows;

$$P(Y=1) = \frac{e^{\beta_0}}{1 + e^{\beta_0}} \quad (1)$$

$$P(Y=0) = \frac{1 - e^{\beta_0}}{1 + e^{\beta_0}} = \frac{1}{1 + e^{\beta_0}} \quad (2)$$

The empirical specification for examining the explanatory variables is,

$$Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + et \quad (3)$$

Y_i = Dependent variable indicating the farmers use of waste management practices. Y^*_1 is not observable and is a latent variable. Y is observed as a dummy variable that takes the value of 1 if $Y^* > 0$ and takes the value 0 otherwise. X are the various household level socioeconomic factors that determine farmers choice of waste management practices.

b_0 = Constant

X_1 = Gender

X_2 = Age

X_3 = Marital status

X_4 = Educational level

X_5 = Household size

X_6 = Occupation

X_7 = Farming experience

X_8 = Size of farm

X_9 = Type of birds

X_{10} = Type of poultry housing method

X_{11} = Method of disposal

et = Stochastic error term

III. RESULTS AND DISCUSSION

Socio-economic profile of the respondents

Sex Categorization of Respondents

Table 1 shows that out of the surveyed 133 poultry farmers, 70.7% were male while 29.3% were female. This implies that the poultry farms in the study area were dominated by males. Male dominance may possibly be because of the rigours required to take care of the birds to maintain. The evidence is supported by Olumayowa and Otunaiya (2011) claims that poultry production is possibly masculine because its activities require physical strength that men can provide alone.

Age Distribution of Respondents

Most of the farmers (45.0%) fall within the age range of 27-41 years, 45.0% of the respondents falls within the age bracket of (27-41) with a mean of 44 years. This implies that they are young and very energetic to carry out tedious work associated with poultry waste management. This is in line with the findings of Olumayowa and Otunaiya (2011) that poultry farmers are mostly middle-aged citizens.

Marital Status of Respondents

The finding shows that most of the respondents 72.9% were married. This suggests that marriage is part of most culture and as such every marriage age individuals take to marriage with a view to raising family and sustain their generation genealogically.

Educational Level of Respondents The results shows that 0.8% had non-formal education, 1.5% had primary education, 27.1% had secondary education and 70.7% had tertiary education. This implies that most of the respondent had formal education which could possibly help them to innovate a good poultry management practices.

Household Size Distribution of Respondents

The distribution of respondents according to their individual household sizes showed that 57.9% had between 4-6 persons per household, with a mean of 5 persons. This indicates labour availability to carry out waste management operations easily. The size of households affects the

possible number of labour readily available for individual poultry farmer, according to Olumayowa and Otunaiya (2011).

Occupation Distribution of Respondents

The result of the distribution of respondents showed that 68.4% of respondents had farming as their primary occupation, while the remaining 31.6% of the respondents were involved in other business as their secondary source of income. This implies that the respondents also engaged in other income generating activities. Akanni and Benson (2014) support this outcome.

Farming Experience of the Respondents

The results showed that (68.4%) of the respondents had been in poultry farming between 1 and 6 years, with a mean of 6 years. This implies that the respondents were relatively

new in poultry management. Knowledge on management is key to poultry production which is gained through years of experience by poultry farmers. This result agrees with the findings of Aromolaran et al. (2013) in his study on challenges of small poultry farms in layer production in Oyo State.

Size of the farm

In addition, the Table 1 shows that 50.4% of the respondent had small farm, 25.6% had medium farm size and 24.1% had large farm size. This implies that majority of the respondents in the study area operate scale poultry farm.

Farmers are therefore expected to be able to handle poultry wastes because of their small stock size. Olumayowa and Otunaiya (2011) support this finding that 78% of farmers raised less than five thousand birds.

Table 1: Socio-economic profile of respondents (n=133)

Variable	Frequency	Percentage %	Mean
Gender			
Male	94	70.7	
Female	39	29.3	
Age			
27-41	60	45.0	44 years
42-56	58	43.6	
57-71	15	11.3	
Marital status			
Single	22	16.5	
Married	97	72.9	
Divorced	6	4.5	
Widow	8	6.0	
Educational level			
No formal Education	1	0.8	
Primary	2	1.5	
Secondary	36	27.1	
Tertiary	94	70.7	
Total	133	100	
Household size			
1-3	37	27.8	
4-6	77	37.9	5 persons

7-9	17	12.8	
10-12	2	1.5	
Occupation			
Farmer	91	68.4	
Politician	12	9.0	
Civil servant	23	17.3	
Trader	7	5.3	
Experience			
1-6	91	68.4	6 years
7-12	37	27.8	
13-18	4	3	
19-24	1	0.8	
Size of farm			
Small	67	50.4	
Medium	34	25.6	
Large	32	24.1	

Waste management practices employed by the farmers

Table 2 portrays types poultry waste management practices employed by the poultry farmers. The outcome discloses that 63.2% of the respondents adopted burying of wastes management system. Poultry farmers take on this method due to the offensive smell fascinating diversity of pests, rodents as their habitat and also it could also result to environmental pollution. However, 27.8% of the farmers preferred burning of dead birds. The residual poultry farmers 6.0% and 3.0% adopted composting and flushing approaches respectively. This finding is congruent with the study by Zeeuw (2000) that exposed poultry wastes are a breeding ground for a number of pests, rodents and also a major source of pollution in the environment. Dead birds represent a large share of poultry waste.

Table 2: Waste management practices employed by the farmers (n=133)

Waste mgt practices	Frequency	Percentage
Burying	84	63.2
Burning	37	27.8
Composing	8	6.0
Flushing	4	3.0

Determinants of choice of poultry waste management practices

The result indicate that age, educational level, marital status, household size, poultry housing method and type of bird produced are significant at 5% probability level while gender, farming experience, occupation, size of the farm and method of disposing poultry waste are not significant in determining whether the farmers will use any form of poultry waste management practice.

The result showed that age (0.44) was positively signed and significant at 5% and this implies that increase in the age of poultry farmers led to a corresponding increase in the choice of poultry waste management practices. The coefficient for educational level (0.950) was positively signed and significant at 5%. This implies that increase in educational level will lead to an increase in the choice of waste management. When the farmers are educated, they have better knowledge and reasons why waste should be managed. The coefficient for marital status (-0.666) was negatively signed and significant at 5%. This implies that increase in marital status will lead to a decrease in the choice of poultry waste management. The coefficient for household size (0.368) was positively signed and significant at 5%. This implies that increased in household size will

result to an increase in the choice of waste management practice. The coefficient for type of birds' produce (1.447) was positively signed and significant at 5%. This implies that if the birds generate high quality of waste on daily or weekly basis, it encourage the farmer to adopt waste management practice. Birds like layers produce more manure and odour and this can be a factor affecting the choice of waste management practice. The coefficient for poultry housing method (0.730) was positively significant at 5% .This positively affect the choice of poultry waste

management because the type of housing method encourages a farmer to manage waste just like in Battery cage housing method where managing of waste is very simple and easy to carry out.

The coefficient for disposal method (0.437) was positively significant at 5% .This positively affect the choice of poultry waste management because the type of waste disposal method a farmer is conversant with will bring about willingness to adopt poultry waste management practices.

Table 3: Binary logit regression on determinants of choice of poultry waste management

Variables	B	SE	wald	Sig (p-value)
gender	0.419	0.452	0.859	0.354
age	0.440	0.137	2.631	0.005 **
marital status	-0.666	0.273	3.181	0.054 **
educational level	0.950	0.415	5.238	0.022 **
household size	0.368	0.130	0.615	0.033 **
Occupation	-0.106	0.186	0.323	0.570
farming experience	-0.045	0.069	0.420	0.517
size of farm	-0.086	0.249	0.120	0.729
type of bird	1.447	0.560	6.671	0.010 **
poultry housing method	0.730	0.358	4.158	0.041 **
method of disposal	0.437	0.136	2.335	0.002**
Constant	-9.387	2.737	11.764	0.001***

***significant at 1%, ** significant at 5%, * significant at 10%.

Challenges of Poultry Waste Management

Table 4 showed that out of the 133 respondent, 36.8% (49) respondents said inadequate information about waste management practice, 24.8% (33) said weather condition is a major challenge in managing poultry waste, 9.0% (12) said lack of convenient dumping space, 6.8% (9) said there were no buyers, 9.8% (13) said unavailability of litter material is a challenge in managing waste, 4.5% (6) said shortage of labour, 4.5% (6) said odour is a challenge and 3.8% (5) said flies and mosquito. This indicates that most of the respondent in the study area are faced with the major challenge of weather condition.

Table 4: Challenges of Poultry Waste Management

Variable	Frequency	Percentage
Inadequate information	49	36.8
Weather condition	33	24.8
Lack of convenient dumping space	12	9.0
Lack of buyers	9	6.8
Unavailability of litter material	13	9.8
Shortage of labour	6	4.5
Odour	6	4.5
Flies and mosquito	5	3.8
Total	133	100

IV. CONCLUSION AND RECOMMENDATIONS

The most important waste management practices employed by farmers were burying and burning. The relevant determinants of the choice of poultry waste management practices in the study area has been properly identified and documented. This shows that age, educational level, household size, type of bird and poultry housing method positively contributed to waste management choice while marital status contributed negatively to the choice of waste management at 5% probability level respectively. The major constraints are inadequate information, weather condition, unavailability of litter material and lack of convenient dumping space. It is therefore recommended that the government and other bodies should provide incentives to the poultry farmers for construction of litter shed.

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