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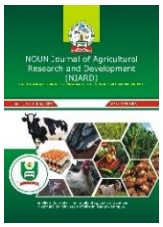

**Original Article**

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# Environmental Effects of Poultry Production in Abia State, Nigeria.

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**ABSTRACT**

*This study examined the environmental effects of poultry production in Abia State, Nigeria. A multi-stage random sampling technique was used to select 80 poultry farmers, and data were collected through structured questionnaires and oral interviews. Descriptive statistics and Tobit regression analysis were employed for data analysis. Results revealed that most farmers were middle-aged (62.5%), educated (85%), and experienced in poultry farming (83.5% with over 11 years' experience). A majority had access to extension services (75%), credit facilities (87.5%), belonged to farmers' organizations (58%), and lived in households of 4–6 members (43.7%). The major pollutants identified were microbial pathogens (20.4%), feed additives (19%), and wastewater (14.1%). Reported environmental effects included mosquitoes (12.4%), rats (11.1%), water contamination (12.1%), eutrophication (10%), noise (9.7%), pathogens (9%), flies (9.2%), drug residues (7.8%), land use constraints (9%), and dust (7.8%). Pollution control measures adopted included proper housing (34.6%), precision feed management (27.4%), and appropriate carcass disposal (23.2%). Socioeconomic factors significantly influencing the adoption of pollution management technologies were age, education, and access to extension services. Constraints to adoption included poor access to credit, inadequate extension services, illiteracy, high labor costs, expensive building materials, limited veterinary services, and weak organizational membership. The study recommends strengthening farmers' access to extension services, credit, and educational programs, while encouraging participation in farmers' organizations to enhance sustainable poultry waste management and mitigate environmental impacts.*

***Keywords:*** *Environmental Effects, Poultry, Production, Pollution, Abia State, Nigeria.*

## Introduction

Despite the challenges facing poultry production sub - sector of agriculture, yet the business remained the surest means of alleviating animal origin protein deficiency among the poor resource in sub Saharan Africa (Ogundipe and Sanni, 2002; Ogbonna,2020). This could be linked to its intrinsic features as asserted by Ojo, (2003) and Atubi and Sonnaiya, (2004) are good converters of feed into useable protein in form of meat and eggs, low production cost per unit, needs a small amount of capital to start off and. The other factors are high return on investment (ROl), short production cycle (payback period) and high consumers' preference/acceptability for poultry meat and egg and ready market for the products (Ume, *et al*; 2018). Literatures show that poultry production, just like any other livestock, has attendant effects to the environment (Sharpely, 2004 and World Bank, 2017, Steinfeld, *et al;* 2014). Environment is the totality of physical, economic, cultural, aesthetic, and social factors which surround and affect the quality of people's life (Environmental Protection Agency, (EPA), 2012). The effect of the poultry production to the environmental pollution is capable of causing several health problems to the victim depending on pollution types (Steinfeld, *et al*; 2014).For instance, air pollution emanating from emission of greenhouse gases (Methane, Zinc, Nitrogen, Phosphorous and Cupper) from manure, have the ability to perforate the ozone layer, leading to increase in environmental temperature, acidic rain, death of aquatic organisms(Fishers, 2005) and proliferating of the environs with odour, flies and rodents (Le, 2009, Le, *et al,* 2012). Studies have attributed these menaces to inappropriate poultry management practices

(Mack, 2015*;* Hodger, 2009). In most developing countries, these practices are very rampant in rural areas and yet the perpetuators have always go unpunished or not reprimanded. The reasons often cited among literatures are corruption, inadequate environmental personnel, lack of effective mechanisms to enforce environmental laws and legislation and lack of public awareness/enlightens on environmental issues ((World Bank, 2017; Ogbonna,2021).

Nevertheless, improved poultry production had been developed by research and disseminated to the farmers, included appropriate poultry housing conditions, precision of feed management, use of antibiotics and appropriate waste disposal or handling system (Rutherford, *et al*; 2002). Studies (Uzu, 2008; Ume and Odo, 2013, Le *et al;* 2012) show that the efficient use of the technologies in abating environmental pollution are well document. The effectiveness of the use of the technologies are influenced in part by the farmers' socioeconomic factors. To the best knowledge of the researcher, there is paucity of such information in the study area. This study tends to fill the research gap.

Specifically, the objectives of the study were;

(i) describe the socio economic characteristics of the respondents;

(ii) identify the poultry production pollutants prevalent in the area

(iii) identity pig management technologies used by farmers to abate the pollution

(iv) effect of farmers' socioeconomic characteristics on use of poultry management technology in controlling of environmental pollution

(v) Identify constraints to use of poultry management technologies in the study area.

## Materials and Methods

The study was carried out in Abia state. Abia State lies between latitudes $04^0$45'and $04^o$41' North and longitudes $7^0$5' and $08^0$04' East. It occupies a total land area of 6,420square kilometer with a population of approximately 284.104 million people (NPC, 2006). Abia state is situated in the south-east of Nigeria and is bounded by Imo state at the western boundary, Ebonyi/Enugu states at the north, Cross River/Akwa Ibom states at the east and Rivers state at the south. It has annual rainfall of 1800-2000mm and temperature range of $22^0$C-$38^0$C during the year. The people in the area are predominantly farmers, although engage in other economic activities.

Sampling Technique and Sample Size

In Abia State, two zones were purposely selected. The selected zones were Ohafia, and Umuahia zones. In the second stage, a multistage random sampling technique was employed in selecting four (4) blocks out of 2 from each zone. These brought to a total of eight (8) blocks. In the third stage, one (1) circle each was selected from each block, making a total of 8 circles. Finally, ten (10) respondents, poultry farmers were randomly selected from each circle and this brought to a total of 80 respondents for detailed study.

**Methods of Data Collection**

Structured questionnaire and oral interview were used to collect the data

Methods of Data Analysis

Percentages responses and Tobit model analysis were used to address the objectives of the study

Model Specification

Tobit Model Analysis

The objective (iv), effect of farmers' socioeconomic characteristics on use of poultry management technology in controlling of environmental pollution was captured using Tobit model. The Tobit model was developed by Tobin (1957) would be expressed as:

$Y^* = x\beta + e$……(1)

Where β is a vector of unknown coefficient, x is a vector of independent variables, e is an error term that yis assumed to be independently distributed with mean zero and a variance of $S^2$. Y* is a latent variable that is unobservable. If the data for the dependent variable is above limiting factor, zero is this case; Y is observable as continuous variable. If Y is the limiting factor, it is held at zero. This rushing is presented mathematically in the following two equations.

$Y = Y^*$ if $Y^* > Y_0$,

$Y = 0$ if $Y^* < Y_0$……..…….....(2)

Where: $Y_0$ is the limiting factor. There two equations represent a censored distribution of the data. The tobit model can be used to estimate the expected value of Y as a function of a set of explanatory variables (x) weighed by the probability that $Y_i \geq 0$ (Oladele, 2005).

Moddala, (2003) shows that the expected intensity of adoption

$\sum(Y)$ is $\sum Y = x\beta\ f(z) + \alpha f(z)$ and $Z = x\beta/\sigma$……..(3)

Where f(Z) is the cumulative normal distribution of Z, f(Z) is the value of the derivative of the normal curve at a given point (unit normal density). Z is the Z score for the area under the normal curve and S is the standard error of the error term. The coefficients for variables in the model, β do not represent marginal effect directly but the sign of the coefficient will give the researcher information as to the direction of the effect.

The rate of use of poultry management technology in controlling of environmental pollution in the study area can be represented as: $y = f(X_1,X_2,X_3,X_4,X_5,X_6,X_7,X_8,X_9,X_{10} \ldots Xn + e)$..……..…….....(4)

Where: y = rate of technology use (1 for yes, 0, otherwise) $X_1$ = farmers age (in years), $X_2$ = educational level (yrs), $X_3$ = no. of extension visits (no.), $X_4$ = household size (no.), $X_5$ = farming experience (in years), $X_6$ = credit access (Naira)

$X_7$ = membership of organization (dummy), e = error term

. Factor analysis

Factor analysis was utilized to identify restrictions to the use of poultry production technologies. The principal component factor analysis with varimax –rotation and factor loading of 0.4 was used. The limitations as responded by sampled farmers were categorized into three

factors using varimax rotation and factor loading of 0.40. The principal component factor analysis model is represented as thus

$v_1 = x_{11}\ f_1 + x_{12}\ h_2 +$----------$bn_{1hn}$..... (5)

$v_2 = x_{21}\ f_2 + x_{22}\ h_2 +$ ----------$x^2hz$.....(6)

$v_3 = x_{31}\ f_3 + x_{32}h_2 +$----------$x^3nh_n$.....(7)

$v_n = x_{n1}f_1 + x_{n2}h_2 +$ ----------$x_{nn}h_n$.....(8)

Where

$v_1 = v_n$= observed variable / hindrances to adoption of technologies pdts

$x_1 = x_n$ = factor loading or correlating coefficients

$z_1 = z_n$ =unobserved underlying limiting poultry production

**Results and Discussion**

Table 1: Distribution of Respondents According to Socioeconomic Characteristics

| Variable; Age | Frequency | Frequency |
|---|---|---|
| 21 - 41 | 30 | 37.5 |
| 42 - 62 | 45 | 56.25 |
| 63 and above | 5 | 6.25 |
| Educational Level | | |
| No Formal Education | 12 | 15 |
| Primary | 20 | 25 |
| Secondary | 40 | 50 |
| Tertiary | 8 | 10 |
| Rearing Experience | | |
| < 5 | 2 | 2.5 |
| 6 – 10 | 12 | 15 |
| 11 – 15 | 50 | 62.5 |
| 16 and above | 16 | 20 |
| Extension agents | | |
| Yes | 60 | 75 |
| No | 20 | 25 |
| Access to credit | | |
| Yes | 70 | 87.5 |
| No | 10 | 12.5 |
| Membership of Organization | | |
| Yes | 55 | 58.3 |
| No | 25 | 46.7 |
| Household size | | |
| 1-3 | 2 | 2.5 |
| 4-6 | 35 | 43.7 |
| 7-10 | 25 | 31.3 |
| 10 and above | 18 | 22.5 |

Source; Field Survey, 2023

Table 1 shows that 58.3% of the poultry farmers were within the age brackets of 42-62 and the least (6.25%) were 63 years. Atunbi and Sonnaiya, (2004) posited that aged farmers are usually less receptive to adoption of technology on poultry production without polluting the environs. More so, that the 85% of the total respondents were educated, whilst 15% were had no formal education. Similarly, Uzu, (2008) opined that educated farmers could effortlessly and synthesis information on possible remedies in forestalling pollution emanating from poultry production. Besides, 16.5% of the respondents had rearing experience in poultry production for less than 11 years, whereas 83.5% had above 11years. This implies that most of the sampled farmers were well experienced to subvert associated with environmental degradation as result of poultry production through practical knowledge gained over decades in the vocation (Ogundikpe, *et al*; 2002).

Also, 75% of the sampled farmers had access to extension services, while 25% had access. This implies that most farmers had quality access to extension service to inspire a positive attitude towards environmental conservation through training and access to material inputs in achieving the goal. On the other word, negative attitude of the change agents to their responsibilities and poor motivation have characterized extension services in most developing countries, in effect reaping sparsely the gains of noble vocation, as opined by Umeh and Odoh, 2013). In addition, majority (83.3%) of the respondents had access to credit, while 12.5% had no access. Credit assists poultry farmers to acquire the material inputs and hire labour for implementation of pollution free related technologies (Rutherford, *et al*; 2016).Nevertheless, the diversion of this farm resource to unproductive ventures by many farmers as seen in many countries in sub- Saharan Africa have left the poultry production environs proliferated with flies, odour, rodents and other pollutants, as most of the farmers cannot afford the prerequisite technologies for efficient poultry management(Fisher, 2002).

Additionally, 58.3% of the respondents were members of farmer' organization, while 46.7% were not. Ume, *et al;* (2017) attested to the aforesaid assertion. They posited that cooperative members could gain experience in pollution control through training organized by cooperative using professionals as subject matter specialist. As well, 43.7% of the farmers had 4 - 6 household members, 31.3% had 7 -10, 22.5% had 10 and above and 2.5% had 1-3. This result implies that the farmers have relatively larger house hold size, which could serve as labour source in applying poultry production and management technologies tending towards ward off the environmental problems associated with rearing of poultry (Decumpere, *et al* ; 2017).

Table 2; Distribution of Respondents according to poultry pollutants

| Item | Frequency | Percentage |
|---|---|---|
| Feces and manure production | 69 | 24.3 |
| Carcass | 63 | 22.2 |
| microbial pathogens | 58 | 20.4 |
| feed additives | 54 | 19 |
| Waste water | 40 | 14.1 |
| Total | 284 | 100 |

*Multiple Responses
Source: Field Survey, 2023

Table 2 shows that Feces and manure production were complained by the 24.3% of the total respondents. Poultry manure is use as fertilizer, or as animal feed especially for fish and cattle. Manure contains nutrients, pathogens and heavy metals, which if not adequately managed could lead to soil and water pollution (Christen, 2019). In addition, 22.2% of the respondents complained about carcass as among the pollutants caused through poultry production. Dead birds contain leachate, nutrients (nitrogen, phosphorus), pathogens and other pollutants, increasing the potential for environmental contamination and posing a serious human-health risk, if discharged into the soil, ground water and surface water, especially when the carcass is at decomposition process (Fisher, 2002 ). Poultry carcasses could be disposed through burial, incineration for especially for birds that died because of pathogenic avian influenza (HPAI) outbreak (Campagnolo, *et al*; 2019).

Additionally, feed additives (19%) such as trace elements (arsenic, zinc and boron), hormones, antibiotics, pathogens and heavy metals are introduced into poultry diets purposively to supply animals' requirements or in much greater proportions – as veterinary medicines or growth promoters

Table 3: Distribution of Respondent According to Effect of Poultry to the Environment

| Environmental effect | Frequency | Percentage (%) |
|---|---|---|
| Mosquitoes | 72 | 12.4 |
| Rats | 64 | 11.1 |
| Water quality | 70 | 12.1 |
| Eutrophication | 58 | 10 |
| Climate Change | 56 | 9.7 |
| Pathogens | 52 | 9 |
| Effects of Drug | 56 | 9.7 |
| Acidification, and | 54 | 9.2 |
| Land use per hectare | 52 | 9 |
| Dust | 45 | 7.8 |
| Total | 579 | 100 |

Multiple Responses.
Source: Field Survey, 2023.

Table 4 shows that also, 12.4% of the respondent complained about mosquitoes. Mosquito breeding is common especially where the poultry droppings is wet condition and is a cause of malaria as frequently complained by respondents living within the environs (Lee, 2009). Moreover, 11.1% of the respondents complained about rats breeding. This animal thrives on the stored poultry feeds and capable of attacking household belongings living in the immediate environs (Bowman, et al; 2014). The careful use of rat poison and trap are often recommended in order eradicating this menace. Also, 12.1% of the respondents complained about poor water quality. The wastewater generation has high concentrations of bio chemical demand (BOD) and chemical oxygen demand (COD) due to the presence of organic materials such as blood, fat, carcass, and excreta, with resultant effects of curtailing the levels of activity or even death of aquatic life (Burton and Turner, 2003.).

Moreover, the effects of drug residues (9.7%), which could be as result of interaction between bacterial organisms and antimicrobials in the environment may contribute to the development of antimicrobial-resistant bacterial strains, which could pose risk to humans and aquatic animals especially where it leaches into the water (Burton and Turner, 2003.). Additionally, land use intensification was reported by 9% of the sampled farmers. Intensification of feed production could result expansion of cropland at the expense of forested land (deforestation), leading to erosion, particularly wind type (Chisten, 2019). The alteration in land use influences carbon fluxes formation, thus resulting in more realize of carbon and stimulating climate change. Besides, changes in carbon fluxes, deforestation affect negatively water cycles and cause soil erosion (Bellows, 2015)

Furthermore, 9.7% of the respondents complained about noise emanating from poultry production.. Beside, causing hearing loss, noise can also result in psychological and possibly physiologic damage to respondents bodies (Aarnink, 2007). The noise in poultry production according to Gekara *et al*., (2019) could arise during feeding and clashing of farm implements in the poultry house. In addition, 9.2% of the respondents complained about flies. Flies which is common when the poultry dropping is wet can transmit diseases such as cholera, dysentery, typhoid, filarial, and dengue fever, to the respondents (Olarinde and Kuponiyi, 2014).

Besides, problems of pathogens were reported by 9% of the respondents Poorly managed poultry manure is capable of inhibiting parasites such as *Cryptosporidium* and *Giardia* spp., which if the manure is not properly cured and realized to the environment could affect the health of humans (Bolan, *et al;* 2005). Moreover, 7.8% of the respondent complained about dust. Dust is generated from feed, manure and animals themselves (Steinfeld *et al.,* 2014). The determining factors to the amount of dust in poultry house are cleanliness of the building, birds activity, temperature, litter types, relative humidity, ventilation rate, flocking density, and feeding method (Lee, 2011).

Table 4: Distribution of Respondents According to Poultry management Technologies

| Poultry production technologies | Frequency | Percentage (%) |
|---|---|---|
| Proper housing | 82 | 34.6 |
| Proper manure disposal | 35 | 14.8 |
| Precision in feed management | 65 | 27.4 |
| Proper disposal of poultry carcass | 56 | 23.2 |

*Multiple Responses
Source; Field Survey; 2023

Table 4 shows that 34.6% of the respondents used proper housing to reduce dust and odour in poultry house The

dust palaver can be checkmated through disinfecting all the poultry houses interior surfaces and adding oil to poultry feed. Bolan, *et al*, (2005). Also, 27.4% of the respondent used precision in feed management. Literatures (Burton and Turner, 2003. Bolan, *et al.*, 2005, Steinfeld *et al.,* 2014) stipulated precision involves among others formulating feed, closely metal, the nutritional requirement of poultry in different production and growth stages to reduce the amount of nutrients excreted, thus curtailing pollution. In addition, 23.2% of the respondent used proper disposal of animal carcass. Improper disposed animal carcass is capable of causing air and water pollution. The methods of disposing pen carcass include; burning, incineration, composting and rendering. Nevertheless, large volume of carcass can generate excess amount of lead and other pollutants, increasing potential for environmental contamination (World Bank, 2017).

Table 5 Result of Tobit Model Analysis

| Variables | Coefficient | Standard Error | t-rate |
|---|---|---|---|
| Age | 0.8120 | 0.2710 | 2.996** |
| Educational Level | 0.7280 | 0.2230 | 3.2620*** |
| Extension services | 0.7000 | 0.2030 | 3.3700*** |
| Credit | -0.0408 | 0.2850 | -1.7200* |
| Farming Experience | -0.1501 | 0.05249 | -2.8676** |
| Membership of Cooperative | 0.0598 | 0.0623 | 0.9602 |
| $X^2$ | 0.4881*** | | |
| Log likelihood | -179.86789 | | |
| Total sample size | 60 | | |

Source : Computed from STAT 84 Tobit Result/Field Survey, 2023
***, **, * are significant levels at 1.0%, 5.0% and 10.0% respectively.

Table 5 shows the estimated results of the Tobit model. The result indicated that nine variables were significant in explaining the adoption rate of poultry production technologies by the farmers in the study area. The chi-square ($X^2$) (0.4881) was highly significant at 1% level of probability, indicating goodness fit of the model. The positive relationship between farmer's age (0.8120) and use of the technologies as shown in Table 5 is thought to stem from accumulated knowledge and experience of the farmers in use of poultry management technologies in controlling of environmental pollution obtained from years of observation and experimenting with various technologies. In addition, since adoption pay-offs occur over a long period of time, while costs occur in the earlier phases (Onyenweaku *et al*., 2010). In contrary, Ume, *et al;* (2018) reported that innovativeness, motivation and adaptability of individual decreases with age. As well, statistical test showed that the coefficient of levels of education (0.7280) was positive and significant at 1% risk level. The positive relationship between a use of poultry management technologies in controlling of environmental pollution and education as stated by Buckle, (2018) could be because the more educated the farmer becomes, the more ability he gained to understand and apply improved poultry production and management technologies in abating environmental pollution. This finding was in consonance with Ume, Ezeano and Gbughemobi, (2018), who posited that higher educational status facilitates use of technology as it makes one to be more objective in evaluating innovations, which would positively influence his/her environmental management. In contrast, the negative sign of the coefficient of education according to Getara; *et al;* (2019 ) could have risen due to the composite nature of poultry environmental management technology adoption or use. The adopters or users with more levels of schooling seemed to have been more dire in evaluating the components of poultry production and environmental management technology package. As a result, they might have been adopting the technology in bits which influenced the sign of the coefficient.

Additionally, the coefficient of credit (-0.0408) was negative and significant at 5.0 % probability level. The negative sign for coefficient of credit agreed with the evidence from Ume and Odoh, (2013) that such negative sign could be an indication of poor access to credit facilities. As well, the diversion of credit to non-farm uses could be responsible for the sign of the coefficient. However, Cambra-López , Aarnink Zhao , Calvetm and Tores , (2010) reported that l credit has the potential to enhance efficient resource allocation, permits application of technology and reduces post poultry production wastes aimed at curtailing maximally environmental pollution. In addition, the coefficient of extension services (0.7000) had direct relation with the independent variable at 99% confidence interval. Extension helps to disseminate information on the mode of application or usage of the poultry management technologies in controlling pollution as well as the availability of the technological inputs. Therefore, frequent extension contact could likely to minimize doubts among poultry farmers and ensure timely obtaining of inputs. This would most probably boost unrelenting usage of the improved poultry management technologies in controlling environmental pollution. Nevertheless, this finding contradicted Onyenweaku; *et al;* (2010), who found negative relationship with dependent variable. They cited inefficient transfer of information to farmers as well as bottleneck that militated against enhancing the adoption of technology as the critical reasons for the behaviour of the variable.

Further, the sign identity of coefficient of farming experience (-0.1501) was negative and significance at 10% probability level. The negative value of the coefficient of farming experience could be attributed to neglect attitude most experienced farmer's accord to extension agents while discharging their duties (Ume *et al*., 2018). More so, Christen, (2019) observed that the sign identity of the coefficient is probably because farmer who had over the years gained experience in use of particular management technologies in abating environmental pollution find it difficult to switch over to a new one, no matter the perceived benefits. This result disagreed with Cambra-López, *et al*., (2010), who found a positive relationship between farming experience and adoption or use of management technologies in averting pollution. They viewed that the more experienced a farmer is, the more efficient his decision making process and the more he would be willing to take risk associated with the adoption of innovations to prevent pollution.

Table 6; Varimax-Rotated factors against factors affecting adoption or use of the management technologies

| Variable | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|
| Membership of farming Organization | 0.421 | 0.012 | 0.431 |
| Illiteracy | 0.417 | 0.178* | 0.089 |
| High cost of building material | 0.212 | 0.023 | 0.449 |
| Training | 0.217 | 0.024 | 0.427 |
| Access to credit | 0.411* | -0.142 | 0.283 |
| High labour cost | 0.091 | 0.493* | -0.229 |
| Poor access to extension services | 0.409* | -0.013 | 0.149 |
| Rearing Experience | 0.452 | -0.429 | 0.002 |
| Veterinary services | 0.117 | 0.158 | 0.431* |
| Inadequate equipment | 0.107 | 0.490 | 0.470* |
| Flock size | 0.125 | 0.409* | 0.433 |

Source: computed from SAS 2018.

Factor 1= economic/institutional factor, Factor 2 = infrastructural factor and Factor 3 = socio-financial factor (Ume, *et al*; 2016). In identification of the variable, only variables with factor loading of 0.30 and above and at 10% superimpose variance were employed. The factor loading of less than 0.30 and variables that loaded more than one factor were discarded. The variables that loaded more than one factor were flock size, inadequate equipment and rearing experience were observed. The limitations under the economic /institutional factor include Access to credit (0.411) poor access to extension services (0.409) and illiteracy (0.417). The poor access to credit to purchase the required physical facilities and, material inputs such as additives in feed formulation could be accessible to the farmers, especially poor resource ones owning to perhaps lack of collaterals, and lack of knowledge of existence of loan facility, particularly from institutional source(Umeh and Odoh, 2013). Additionally, poor access to extension services has been general problem among developing countries as result of poor motivation of the change agent, thus depriving most farmers from being enriched with improved innovations in the subject area as disseminated by extension agents(Olarinde, *et al* ; 2014). Also, the problem of illiteracy as seen among farming population in sub Saharan Africa has limited the farmers access to information in among others environmental pollution free technologies in order to attain sustainability of the environment (Uzu, 2005).

Variables that loaded under factor 2 (infrastructural factor) include; high cost of labour(0.493). The high cost of labour as reported by the farmers could be related to economic depression in the country and labourers in attempt to survive this predicament they have to charge very high for their services (Ume, *et al* ; 2013). The variables under socio-financial factors were high cost of building materials (0.444), membership of farming organization (0.431)and veterinary services (0.331). The membership of farm organization such as cooperative society, young farmers club and others has the capability to Membership to farmer groups facilitate easier access to inputs like feed supplements, drugs and vaccines, technical assistants, credit, and training aimed at adoption of technologies on adequate poultry management that will assist in reducing pollution of environment (Bellow, 2015). Furthermore, qualified veterinary and animal production personnel should inculcate into the farmers in among others proper use of feed additives such as trace elements and hormones in enhancing animal growth without inhibiting their endocrine growth and posing to other environmental risks (World Bank, 20017). As well, the problem of high cost of building has forced many farmers to use improvisers such as incomplete house and cages as against adequate housing in poultry rearing. The effects of that are proliferation of environment with odour and flies as the such houses are not well designed to ensure efficient and effective hygiene (Kolominskas; *et al*., 2016).

**Conclusion and Recommendation**

Based on the findings, the following conclusions were drawn; Most of the respondents were males, aged, educated, high rearing experienced, had access to credit, member of organization and moderate household size. Also, the poultry pollutants identified in the study area were microbial pathogens, feed additives and waste water .Also, effects of poultry to the environment were mosquitoes, rats, water quality, eutrophication, climate change, pathogens, drug effect, acidification, land use per hectare and dust. Besides, the farmers' socioeconomic characteristics on use of poultry management technology in controlling of environmental pollution were age, educational level and extension service.

More so, factors against factors affecting adoption of poultry waste disposal technologies under the economic /institutional factor include access to credit, poor access to extension services and illiteracy. The infrastructural factor was high cost of labour. The variables under socio-

financial factors were high cost of building materials, membership of farming organization and veterinary services. Based on the results, the following recommendations were given;

(1)There is need for adequate sanitation of poultry house through removal of dead birds, discarding spoiled feed and washing of poultry house with water and disinfectants in order to ensure control of odour and other pollutants from contaminating the environment.

(2). Reduce dust from feed should be advocated through addition of oil to dry poultry rations which will significantly reduce the amount of dust in a building

(3). Proper and timely maintenance of feeders, augers, and other feed handling equipment is required for proper dust control.

(4) Extension services in the country should be boosted through employing more extension agents and motivation of extension agents.

(5) Policies aimed at improving farmer's access to education through aggressive awareness campaign and mass mobilization are needed

(6). Price of building materials such as cement, timber, zinc, and others should be subsidized by government to enhance people's easy access.

(7). There is need to ensure standard veterinary drugs for the farmers, ensure availability of standard and genuine drugs to the farmers at the right time. The veterinary personnel should be encouraged to established veterinary posts in rural areas through provision of regular electricity to keep their vaccines in cold chain for optimal efficiency to be maintained.

(8). National research institute should be adequately funded to ensure adequate availability of veterinary drugs and vaccines that are localized to our environment, instead of importing of drugs and vaccines that are partially adaptive to our local condition.

(9) Farmers' should be ensured access to credit through microfinance banks, commercial banks and other credit facilities.

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