Analysis of the Environmental Effect of Pig Production in Okigwe Local Government Area of Imo State, Nigeria

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Abstract— *The research was aimed at accessing environmental effect of pig production in Okigwe local Government Area of Imo state, Nigeria. The specific objectives of the study were to describe the socio economic characteristics of the respondents; identify the environmental effect of pig farming on the environs; identify the method of pig management and waste disposal methods among the respondents, determine the factors affecting the choice of waste disposal methods by respondents; and identify the constraints to wastes managements pig production in the study area. A total of 60 farmers were selected using purposive and multi stage random sampling techniques. The data were collected using questionnaire and secondary source. The data were analyzed using descriptive statistical such as percentage and frequency distribution table for objectives i, ii and iv. The objective iii was captured using multi nominal logit model. The results showed that most of the respondents were aged, males, educated and had large household size. More so, on the method of pig management, intensive method was the most popular. Additionally, open lagoon, dumping in the farm and store in the bag were the major methods for waste disposal in pig production. In addition, the result of the multinomial regression model on the choice of methods of wastes disposal showed that age of the respondents, farming experience and membership of cooperative organization were positive and significant. The major constraints to wastes management in pig production in the study area were poor access to credit, poor road network, water problem and high costs of labour. There is need to ensure farmers' access to credit, good road net work and water availability.*

Keywords— Analysis, Environmental effect, Pig production, Okigwe Local Government Area, Imo State, Nigeria.

I. INTRODUCTION

The economic and social benefits of livestock cannot be over emphasized (Bradshan *et al* 2004; FAO 2009). Livestock provide essential commodities and services to man in form of animal by-product (like meat, milk, hides and skins,) source of draught power, manure to enhance soil fertility and serves as a capital reserve available during hard times (Sudahmed, 2008; Tewe *et al;* 2009). Among the livestock that is used to alleviate man's animal protein defficiency particularly in rural areas of most developing countries of sub - Sahara Africa is pig (Tewe *et al; 2009)* The wide acceptability of pig production especially by small holder farmers could be attributed to its' high survival rate and ability to utilize a host of agro-industrial by-products and crop residues with little or no processing and at minimal cost (Sudahmed, 2008). Furthermore, pig is known to be prolific producer as it is capable of realizing 20 to 30 piglets from 2 or 3 liters per year and is capable of attaining slaughter weight of about 80 to 90kg in about 7 to 9 months under good management (Ajala *et al* 2007; John 2011).

The availability of Palm kernel cake, courtesy of NIPROC Company (A palm kernel processing company) has resulted in spontaneous rise in pig production in the study area. Here, pigs are raised in unconventional pens such as part of residential houses and uncompleted residential building without the course of maintaining the Environmental Protection Agency (EPA) regulation of 500 meters to residential houses. In effect, pig production is growing out of balance with the environment, resulting in environmental degradation which is primarily in form of air pollution (Sudahmed, 2008). Studies showed that air pollution in pig production arises from their excretion of excess dietary phosphorus and other minerals, inappropriate housing conditions which give rise to obnoxious odours and inappropriate manure and animal waste handling systems and their operations (Ajala *et al* 2007; John 2011; Hatfield 2008). To complicate the above scenario, the pig farmers in most of the developing countries catch on corruption and poor policy implementation of environmental protection by regulatory bodies in the region to recklessly dispose their animal's wastes in large open lagoon and other unacceptable methods without minding the associated repercussions to the environment and the environs (Okolo, 2011). For instance, the open air lagoon practice of waste disposal is capable of releasing green house gases (ammonia, nitrogen and methane) which is capable of raising the environmental temperature through destroying the lithosphere, hence releasing heat to the earth (John, 2007). Furthermore, the foul odour, flies and mosquitoes breed in manure pit are grassed continually to the neighbouring communities (Hatfield, 2008). Even, the noise from the animal is capable of causing noise – induced hearing loss,

cardiovascular effects in humans and an increased frequency of coronary artery disease (Young; 2009). In animals, noise can escalate the risk of death by altering predator or prey detection and avoidance, inhibit reproduction and navigation (Ajala *et al;* 2007). Studies showed that the effects of green house gases are respiratory problem, global warming, acidic rain, acidification, autrophication of the surrounding ecosystem, source of explosive and hearing losses (Rademacher 2009; John 2011). Furthermore, the flies and mosquitoes are capable of transmitting diseases such as cholera, dysentery, typhoid, and malaria and bilabial to man ([Powers *et al;* 2011)

However, environmental pollution by pig production can be minimized through adopting the following strategies, include seeking permit for construction of standard pig building from environmental Protection agency, adherence to 500 metres from pig pen to residential houses, appropriate waste disposal or handling system and proper precision feed management (Ewuziem, 2008). The waste disposal system could be in form of open lagoon; dumping in the farm, store in bag, heap waste and burn and sales of waste (John 2011; Powers *et al* 2011). The choice of the appropriate waste disposal method is affected by among other factors, the socioeconomic characteristics of the farmers (Ume, *et al;* 2018*)*

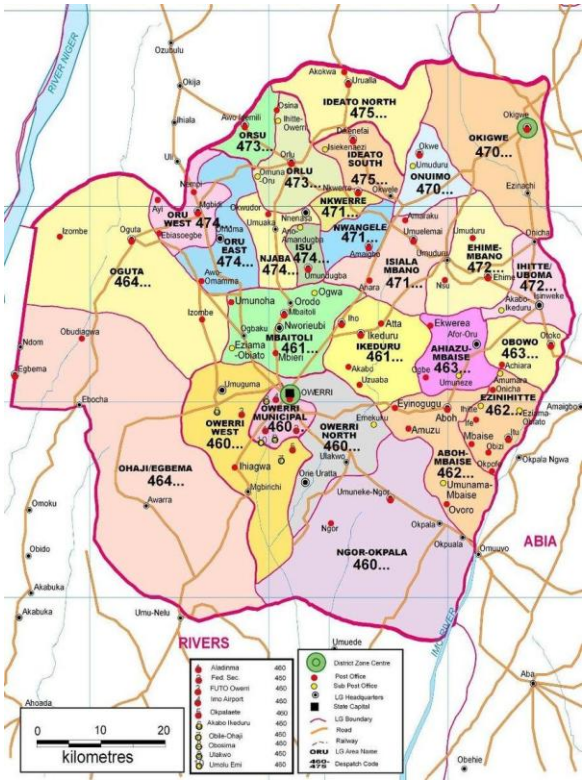
Nevertheless, in order to empirically determine the choice of waste disposal method by the respondents, a study of this nature becomes necessary as there is dearth of information in the study area. The need to access farmers 'choice of adoption of waste disposal in pig production is paramount in order to proffer appropriate policy recommendations aimed at maintaining environs that is devoid of pollutants. Furthermore, the study will equip pig farmers with better technology of waste disposal as against an open lagoon as popularly practiced by farmers which has the potentials of causing air pollution. The study could as well serves as source of research information for scholars who are interested in the subject area. It also provides useful information for agricultural extension agents and environmental protection agency for effective dissemination to the pig farmers. Moreover, the study could serve as a baseline for evaluating efficient pig management practice, at least environmental hazards especially now the climate change effect is a threat to mankind's existence. Equally, it will serve as a reference for further research work in the related area. The specific objectives of the study are to:

i. describe the socio economic characteristics of the respondents;

ii. identify the methods of pig management and waste disposal methods among the pig farmers;

iii. determine the factors affecting the choice of waste disposal methods by pig farmers and

iv. Identify the constraints to wastes in pig production in the study area



MAP OF IMO STATE OF NIGERIA SHOWING OKIGWE LOCAL GOVERNMENT AREA

II. MATERIALS AND METHODS

The study was carried out in Okigwe Local Government Area (LG A) of Imo State, Nigeria. Okigwe LGA comprises of twelve (12) communities (Ezinnachi, Ogii, Umualumoke, Aku, Umuka, Ubaha, Ugwaku, Amuro, Agbobu, Umulolo, Ihube and Umuowa) and many villages. It is located between Longitude$7^{o}44^{1\ of}$ and $7^{o}26^{1}$E Greenwich Meridian and Latitude $5^{o}30^{1}$ and $5^{o}57^{1}$N of Equator. Okigwe Local Government Area covers an area of about 360km^2 with a population of about 132,237 people (NPC 2006). It is bounded in the North by Umuahia South Local Government Area in Abia State, in the East by Onu-imo Local Government Area in Imo State, in the South by Umunneochi Local Government Area of Abia State and in the West by Isuikwuato Local Government Area in Abia State. The area has tropical climate with annual rainfall of about 1800mm-2000mm, mean temperature of about 28^0 -42^0C and relative humidity of 65%. The main seasons experienced in the area are dry season (November-April), and rainy season (May-October). The main crops cultivated in the area are cocoyam, yam and cassava. They also engaged in livestock production, namely: sheep, goat, pig and poultry. The people also engaged in other economic activities such as hunting, tailoring, barbing, petty trading, mechanics, salon and civil services.

Purposive and multi- stage random sampling techniques were used to select communities, farms and respondents. In the first stage, three towns, namely; Agbobu, Umu owa and Umulolo were purposively selected. This is because of the nearest of these towns to NEPROC (palm kernel oil processing company) which serves as source of palm kernel cake for feeding pig. In the second stage, twenty farms were selected from each of the three towns. This brought to a total of sixty pig farms. In the stage three, a pig farmer was selected from each of the farms and a total of sixty farmers selected for detailed study.

Structured questionnaire was used to generate data from pig farmers' personal characteristics, waste management methods and constraints to wastes management in pig production. Furthermore, secondary data was collected through text book, journal paper, conference paper and other periodicals. The objectives i, ii, and iv were captured using percentage responses and frequency distribution table. The objective iii was addressed using Multinomial Logit Model.

III. MODEL SPECIFICATION

3.1 Multinomial Logit Model (MNLM)

This was used to analyze the factors influencing households' choice of adoption of improved pig management practices. According to (Magombo, *et al*; 2011), MNL model for choice of adoption practices specifies the relationship between the probability of choosing an adoption option and the set of explanatory variables. The adoption practices are (adequate pig pen, adherence to 500 meters from pig pen to residential houses, adequate waste storage facilities and proper feed precision management)

The MNL Model is stated as follows:

$$P\left(y = \frac{j}{x}\right) = \frac{\exp(x\beta j)}{[1+\sum jh=1 \exp.(x\beta h), j=1,...,j]} \quad (1)$$

Let x be a 1 x k vector with first element unity.

Where βj is k x1, j=1,...,j

Implicit

$$Y_i = \text{In}(P_i, P_1) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + ei$$

Where;

Y_i= adoption practices (adequate pig pen, adherence to 500 meters from pig pen to residential houses, adequate waste storage facilities and proper feed precision management).

$X_{i,}$ where I = 1,2,….10 are explanatory variables,
X_1 = Sex of the farmers (male =1 and 0 otherwise)
X_2 = Age of the farmers (years)
X_3 = Educational attainment (years)
X_4 = Household size (in number)
X_5 = Rearing experience (years)
X_6 = Flock size (no)
X_7 = Member of farmers organization (yes=1 and 0 otherwise)

X_8 = Extension contact (yes=1 and 0 otherwise)
X_9 = Residential distance to the pig house (km)
X_{10} = Access to credit (yes =1 and 0 otherwise).

IV. RESULTS AND DISCUSSION

The results of the socioeconomic characteristics of the farmers were presented in Table 1

TABLE 1
DISTRIBUTION OF RESPONDENTS ACCORDING TO SOCIOECONOMIC CHARACTERISTICS

Variable	Frequency	Percentage
Gender		
Male	50	83.3
Female	10	16.7
Age		
>20		
21 – 41	20	33.3
42 – 62	35	58.3
63 and above	5	8.4
Educational Level		
No Formal Education	20	33.3
Primary	22	36.7
Secondary	10	16.7
Tertiary	8	13.3
Rearing Experience		
< 5	4	6.7
6 – 10	10	16.7
11 – 15	30	50
Above 16	16	26.6
Extension Services		
Yes	20	33.3
No	40	66.7
Access to Credit		
Yes	50	83.3
No	10	16.7
Membership of Organization		
Yes	35	58.3
No	25	46.7
Household Size		
1 – 3	2	3.3
4 – 6	25	46.7
7 – 10	15	25
10 and above	8	13.3
Flock Size		
>20	12	20
20 – 30	30	50
31 – 40	12	20
41 and above	6	10
Distance from pig house		
1 -200metre	6	10
201 – 400 metres	18	30
< 400 metres	36	60

Source; Field Survey, 2017.

Table 1showed that 83.3% of the pig farmers were males and 16.7% were females. This implies that men are more involved in pig production than women. This finding concurred with (Okollo, 2011) who reported that production is both labour and capital intensive, hence could be best accomplished by men who are endowed to those aforementioned attributes. Also, 58.3% of the pig farmers were within the age brackets of 42-62 and the least fell between 63 years and above. According to (Adesehinwa, 2003) aged people are less able to source and synthesis information on effect of pig production on the environment and not very receptive to adoption of improved pig production technologies. Table 1 reveals that 66.7% of the total respondents were educated, with primary and secondary attainments being the highest, 36.7% respectively. However, only 33.3% of the respondent had no formal education. Education enhances farmers' ability to evaluate, understand, and accept new innovation aimed at checkmating the effect of poor pig management on the environment (Tewe *et al;* 2009)

Beside, 50% of pig farmers had rearing experience of 11 – 15 years, 26,6%; above 16years, 16.7%; 6 – 10 years, while, 6.7%; less than 5 years. The number of years a farmer had spent in the farming business according to (Steinfeld, 2014) could be an indication of the practical knowledge he/she had acquired on how he/she can overcome certain inherent pig management problems that is capable of affecting its environs negatively. This result collaborated with the finding of (Magombo *et al;* 2011) that farming experience enhances efficient use of scarce resources by small holder pig farmers. Moreover, 66.7% of the respondent had no access to extension services and 33.3% had access to extension services. This implies that most farmers had poor access to extension service, hence could likely not to enjoy the services of extension programmes on effect of poor pig production on the environment (John 2011).

Additionally, majority (83.3%) of the respondents had access to credit, while 16.7% had no access to credit. Credit helps farmers to pay for labour and procure inputs to ensure application of appropriate pig production technologies to curtail environmental pollution as result of poor pig management (Powers *et al.,* 2011). Table shows that 58.3% of the respondents were members of farmer' organization, while 46.7% were not. Membership of organization through interaction among members could impact into themselves information as regards to ways of averting the effect of pig production to the environment (Adeschinwa, 2003). As well, 46.7% of the farmers had 4 - 6 household members, 25% had 7 - 10, 13.3% had 10 and above and 3.3% had 1-3. The implication is that farmers that have relatively larger house hold size have more proxy to labour in applying improved technologies on pig production with minimally consequences on the environment (Tewe *et al;* 2009).

More so, majority (50%) of the pig farmers studied had flock size ranging from 20 - 30 pigs, while the least (10%) had flock size ranging from 41 and above. This result confirms to a prior knowledge that farmers in most developing countries are largely small scaled in their farm operation (Tewe *et al;* 2009). Also (Steinfeld 2014) was of the view that farmers' total flock size serves as a good proxy for wealth status and income level. Table 1 shows that majority (60%) of the respondents located their farms between 400m and above to residential houses, 30% located their farms between 201 – 400 m and 10% located their farms between 1 – 200 m. It implies that only 60% of the farmers in the study area met the rules guiding pig farm location as stipulated by the Environmental Protection Agency (EPA) (Okolo, 2011). This implies that neighbours living in that environment could hardly perceive the odour emanating from pig production and management.

The results of pig management and waste disposal methods were presented and discussed in Table 2a.

TABLE 2A
DISTRIBUTION OF RESPONDENTS ACCORDING TO METHODS OF PIG MANAGEMENT

Methods of pig management	Frequency	Percentage
Intensive	50	83.4
Semi Intensive	2	13.3
Extens	2	2.3

Source: Field Survey, 2017

Table 2a shows that 83.4of the respondent used intensive system, 13.3% used semi-intensive system and 2.3% used extensive system. This means that intensive system is more commonly used in pig production and management in the study area. The intensive systems of pig production according to (Powers *et al* 2011) help to checkmate animals' urines and dung which are capable of causing environmental pollutions.

TABLE 2B
DISTRIBUTION OF RESPONDENTS ACCORDING TO WASTE DISPOSAL METHODS

Waste disposal methods	Frequency	Percentage
Open lagoons	50	83.3
Dumping in the farm	38	63.3
Store in Bag	35	58.3
Heap waste and burn	23	38.3
Sales of waste	45	75

Multiple Responses.
Source; Field Survey, 2017

Table 2b shows that 75% of the respondent sale their wastes to farmers who use them as manure. This storage method system helps to reduce the environmental effect of pig production and waste miss management on the environs (Young, 2009;Lee *et al* 2011). The finding of EPA, (2012) was in agreement with the above assertion. They were of the view that pig manure is rich in cupper (Cu), phosphorous (P) and nitrogen (N) (depending on the ingredients the animal was fed) which is very vital for crop production and income source for the farmers when sold. Furthermore, 83.3% of the respondent disposed wastes in open lagoons. This storage method system is often used to hold waste until they can be incorporated into the soil or another means of disposal (Ewuziem *et al;* 2009). The bio- oxygen decomposition (BOD) and nutrient concentration of the wastes collected in lagoons according to (Bradshain *et al* 2004) are reduced by biological activity and chemical reaction. In addition, 63.3% of the respondents dump their waste/ manure in the farm. Animal wastes generally when dumped in the farm as manure could constitute great odour especially if not incorporated into the soil. According to (Getara *et al;* 2009), drag hose and injection could be used to spread manure and as result odour-causing compounds are integrated into the soil in order to curtail maximally the amount of nitrous oxide and ammonia that will be released environment (Okolo, 2011). Also, 58.3% of the total respondents bag their wastes before disposal. (Lee, 2009) were of the view that bagging with the mouth tied will minimize the surface of manure in contact with air, hence reducing environmental air pollution

The factors influencing the choice of waste disposal method by pig farmers using Multinomial Logistic Model were discussed presented in Table 3.

TABLE 3
MULTINOMIAL LOGISTIC REGRESSION ESTIMATES FOR THE CHOICE OF ADOPTATION PRACTICES BY PIG FARMERS IN THE STUDY AREA

Variable	Open lagoon	Dumping in the farm	Store in the bag	Heap waste and burn	Sales of waste
Constant	-56.23198[-0.00]	-11.41238[-2.04]	5.680671[1.44]	6.454008(0.56)	1.003757[1.14]
Gender (Dummy)	125. 6912[0.01]	2.326612 [1.47]	0.5971423[0.59]	10.28021(0.32)	-.150328[1.006]
Age(year)	8.926072[2.00]**	-0.0686951[-0.12]	-8.080355[-1.75]*	- 2.89090[0.54]	-4.150320[1.06]*
Education(Years)	-14.68885[0.16]	0.147936 (0.25)	0.4851057(0.92)	0.342456[1.62]	4.118757[1.04]
H. hold size(No.)	-71.590454[-0.01]	1.03511[1.25]	-0.6294666[-0.94]	-2.80003[2.002]	1.154058[1.36]*
Experience(Years)	42.27053[0.00]	3.59616[0.84]	1.472007[1.38]*	2.338909(3.00)***	13.336368[1.72]**
Number of pigs[No.]	-30.3213[-0.01]	1.113757[1.34]*	-1.352448[-2.04]**	-6.009076[0.13]	3.560328[1.66]
Farmers organization [Dummy]	-65.33479[-1.001]*	2.150328[0.86]	1.868094[2.79]**	8.0087664[0.76]	0.7654000[.1.00*]
Extension services	-33.0861601[-0.01]	0.229368[0.22]	0.1677062[0.19]	3.7650000[0.06]	1.439390[0.22]
Distance residence	-11.4785[-0.00]	-1.375358[-1.47]	-2.410415[-0.3.01]***	15.006753[0.00]	-3.675900[0.09]
Log likelihood = -48.266540 Pseudo R2 = 0.4821 LR chi2(60) = 78.08					
Base outcome = adequate waste storage facilities. ***, ** and* shows significant at 1%, 5% and 10% levels of probability respectively. Figures in bracket represent z-values.					

Source; Field Survey; 2017

The result of multinomial logistic model showed the factors influencing the choice of adoption practices by pig farmers in the study area. Table 3 showed that the factors influencing the choice of use of practices options inserted into multinomial logistic model were open lagoon, dumping in the farm, store in the bag, heap waste and burn and sales of waste. The likelihood ratio statistics are indicated by statistics R^2 (-48.26) and was highly significant, suggesting the model has a strong explanatory power.

The coefficient of age of the household was positive and had significant impact on the choice of waste disposal methods/ technologies by pig farmers in order to curtail minimally environmental pollution. This implies that as the farmers get aging, the probability of adopting waste disposal method in pig production using sales of wastes, store in bags and store in open lagoon. This could be because old age is often associated with long years of farming experience and could positively influence adoption decision process (Lee, 2009). In contrary, (Ajala, *et al* 2007) found negative relationship between farmers age and adoption of technology. He reported that as farmers become older, they are less energetic and risk averse to technology adoption. Coefficient of the farming experience of the sampled household head had a positive and significant effect on the use of store in the bag, heap wastes and burn and sales of wastes in overcoming effect of pig wastes to the environs. Experienced farmers are always capable of using techniques as result of long years in the enterprise in overcoming possibly mismanagement practices in pig production which could result in air pollution (Adesehinwa, 2003). Although, experience in farming is very important and depends on years of farming experience, yet averagely young farmers are needed in business since pig production and management of waste is energy snapping. This statement agreed with Wright and Bossard (2011) and John (2011). They opined opined that apart from pig production being labour intensive, the improved technologies of pig production and management of animal waste that aimed at safe guiding environmental pollution are relatively scarce. The coefficient of number of pigs (Flock size) had a negative and significant effect on choice of using dumping wastes in the farm and heap and burn as a waste disposal method or technology in wastes management in pig production. The larger the flock size, the higher the amount of waste the farmer is left to manage or dispose. Nevertheless, (Ewuziem 2008) reported that flock size played an important role in farm success because it reflects the availability of capital, access to credit and even good management ability. In most developing countries, pig production is largely small scaled in operation and this could be linked to poverty as pig rearing is highly capital intensive (Tewe *et al* 2009) coefficient of farmers' membership of organization was positive and had significant effect in adapting of waste disposal technologies through sales of wastes, store in a bag and well managed open lagoon in order to minimize air pollution often associated with poor pig management. Farmers' organization helps to educate and train members on safe method of pig management and the consequences of the abuse. The coefficient of the distance of the pig pen to residential houses had a negative and significant effect on choice of waste disposal method on practices. This implied that neighbours living in that environment could hardly perceive the odour emanating from pig production and waste management, no matter they are living to pig house. This assertion did not concur with (Gekara et al 2009) who opined that the minimum distance to live near pig farms without perceiving the odour is 500metres.

The constraints to waste management in pig production are presented in Table 4.

TABLE 4
CONSTRAINTS TO WASTE MANAGEMENT IN PIG PRODUCTION IN THE STUDY AREA.

Constraint	Frequency	Percentage
Poor access to credit	56	93.3
Poor road network	38	63.3
Veterinary posts	45	75
Water problem	38	63.3
Housing	35	58.3
Poor access to exten. Services	52	86.7
High cost of Labour	35	58.3
Feed and Feeding	26	43.3
Water	24	40

Multiple Responses
Source: Field Survey, 2017

Table 4 showed that poor access to credit constituted the greatest hindrance to waste management in pig production in the study area and accounted for 93.3% of the total respondents. Iheke (2010) reported that credit facilities adoption of innovations in efficient waste management and payment of labour in implementing the technologies. As well, 86.7% of the respondents reported the problem of poor extension services as barrier to wastes management in pig production. Extension services are needed to disseminate information as well as technical assist to farmers on how best to curb environmental challenges associated with wastes mismanagements (Asiabaka, 2003;Adeschinwa 2003; Sudahmed 2008).

Also, 75% of the sampled farmers encountered the problem of veterinary posts being cited in urban areas. Most veterinary posts are urban based in the study area and access to their services on information regarding precision feed management to reduce animal wastes and drugs to reduce nitrogen (N) and hydrogen sulphide(H_2S) contents of animal wastes which constitute significantly the odour observed in animals' wastes is often limited (Bradshain *et al* 2004) . Moreover, 63.3% of the sampled pig farmers were faced with the problem of poor road network. The deplorable conditions of our roads especially in our rural and farm road are of great concern and very pathetic. The roads in many of the areas are impassable especially during rainy season, thus constitutes a clog in wheel of disposing pig wastes to farmers' farms in the neighbouring vicinity for usage. Consequently, such indisposed waste(s) could constitutes source of odour as many pig farms' have accommodation problem and poor technologies to adequately conserve such wastes to avoid polluting the environments (Rogers 2003; Ume *et al;* 2013). The other problems of wastes management in pig poultry were water problem (63.3%), problem of housing (58.3%) and high cost of labour(58.3%)

V. CONCLUSION AND RECOMMENDATION

Based on the results, the following conclusions were made;

Most of the respondents were aged, educated, had large household size and member of organizations. In addition, on the method of pig management, intensive method was the most popular. Furthermore, open lagoon, dumping in the farm and store in the bag were the major methods for waste disposal in pig production in te study area. Also, the multinomial logistic model results showed that age of the respondents, membership of organization and farming experience were positive to the choice of adaptation practices by pig farmers in the study area.

Finally, the major constraints to wastes managements to pig production were poor access to credit, poor road network and location of veterinary post, high labour costs, and poor housing problems and poor road net work.

Based on the findings, the following recommendations were made;

1) Extension services in the country should be boosted through employing more extension agents in order to reduce extension – farmers' ratio for effective communication to be ensued. In addition, the change agents should be adequately motivated through prompt payments of salaries and other incentives.

2) Price of building materials (such as cement, timber, zinc, and others) should be subsidized by government to enhance farmers' easy access. This will help to ensure that pig farmers use intensive pig management practice for easer control of air pollution often associated with mismanagement of pig production as against extensive management type.

3) There is need to encourage pig farmers to sink bore holes or locate their farms close to streams to have access to water for both animal consumption and cleaning of pig pens and its accessories.

4) The veterinary personnel should be encouraged to established veterinary posts in rural areas in order that pig farmers will avail to the opportunity to tackle their waste management problem as the needs arise.

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

6) The environmental laws which stipulated that pig houses should be suited 500 meters away to residential buildings should be seriously implemented by the appropriate government agencies in order to minimize the effects of pig mismanagement to the neighboring residents.

7) Pig wastes should be managed and disposed off in accordance to rules and regulations to avoid hazardous situation and achieve environmental balance and safety.

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