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Full Length Research Paper

Poultry wastes management strategies and environmental implications in Abia State

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Abstract

This study examined 'poultry waste Management Strategies and Environmental Implications in Abia State'. Multistage Random sampling technique was used in selecting the 10 farms. Data collected with the aid of well structured questionnaires were analyzed using descriptive statistics and probit model. Results indicated that majority (50%) of the farms adopted 'manure use' as a management strategy. All the variables except age of the farm and labour were significant at various levels. There should be a strict enforcement of the existing sanitation and health policies aimed at environmental preservation, and protection as recommended by the state and Federal Environmental Protection Agencies.

Keywords: Poultry wastes, Management strategies, Human Health, Implications, Mitigation, Abia State of Nigeria

INTRODUCTION

Poultry production forms an important of the livestock sub-sector in Nigeria and is by far or arguably the largest livestock group estimated to be about 4.2 million, consisting mainly of chicken, ducks and turkey (Food and Agriculture Organization 1999).

However, chickens, ducks, guinea fowls, turkeys, pigeons and more recently, ostriches are the types of poultry that are commonly reared in Nigeria now. Those that are of commercial or economic importance, given the trade in poultry, however, are chickens, guinea fowls and turkeys (Akanni *et al*, 2014). The main poultry products from the Nigerian poultry sub-sector are parent stocks, commercial day- old chicks, frozen chicken and table birds (Akanni *et al*, 2014).

However, the emergence and activities of these products also give rise to potential environmental and human health concerns as the sources of elements, compounds (including veterinary pharmaceuticals), vectors for insects and vermin, and pathogenic micro-organisms. With the probable exception of veterinary pharmaceuticals, these factors are also relevant to small flocks, including small family flocks that may be partially housed in containment structures.

The production of poultry products results in hatchery wastes, manure (bird excrement), litter (bedding materials such as sawdust, wood shavings, straw and peanut or rice hulls), and on-farm mortalities. The processing of poultry results in additional waste materials, including offal (feathers, entrails and organs of slaughtered birds), processing waste water and bio-solids. Most of these by-products can provide organic and inorganic nutrients that are of value if managed and recycled properly, regardless of flock size. However, they also give rise to potential environmental and human health concerns as the sources of elements, compounds (including veterinary pharmaceuticals), vectors for insects and vermin, and pathogenic micro-organisms. With the probable exception of veterinary pharmaceuticals, these factors are also relevant to small flocks, including small family flocks that may be partially housed in containment structures. Specific concerns that are well documented include degradation of nearby surface and/or groundwater, resulting from increased loading of nutrients such as nitrogen and phosphorus (and potassium in some locations). Air quality issues are less well understood and include the fate and effect of ammonia,

hydrogen sulphide, volatile organic compounds (VOCs) and dust particulates emitted from poultry production facilities. Greenhouse gas emissions and health effects associated with nuisance odorants are also emerging and/or relevant issues, owing to global climate change and increasing human populations in close proximity to poultry operations, respectively.

Waste by-products such as excreta or bedding material that are generated by the worldwide annual production of more than 40 million metric tonnes of poultry meat and 600 billion eggs are generally applied as the final step of a producer's waste management strategy (Anosike V. 2007). Anosike 2007 also posited that under proper land application conditions, the nutrients and organisms in poultry wastes pose little environmental threat.

Environmental contamination occurs when land application of poultry wastes is in excess of crop utilization potential, or is done under poor management conditions causing nutrient loss from environmental factors such as soil erosion or surface run-off during rainfall (Akanni et al, 2014).

The use of poultry wastes for both urban and rural agriculture has become a subject for research and discussion owing to the fact that its conceived importance which include: higher production output, that ensures food security and poverty reduction among the rural farmers. Despite these benefits, the use of poultry wastes has been associated with environmental pollution and threat to human health, such as the recently reported cases of human deaths relating to the transmission of poultry bird flu (Anosike, V. 2007)

However,(Anosike, V. 2007) concluded that poultry wastes are a resource for urban agriculture but if contaminated could cause dermatitis among users. They do not provide a better substitute for industrial manure.

According to Humane Society of the United States (HSUS) Report 1989, faecal decomposition generates several irritating chemicals, including hydrogen sulphide, methane, and ammonia, which in a poultry house are nauseating to the caretaker, irritate the eyes, and affect the chickens. Schiffman, 1998 posits that high levels of ammonia also increase the severity of respiratory disorders, such as pneumonia, by directly damaging the respiratory tract. Arsenicals are fed to chickens to grow larger birds more quickly using less feed. Some arsenicals are also approved for improved pigmentation and disease prevention. Arsenic is classified by the U.S. Environmental Protection Agency (EPA) as a Class 'A' human carcinogen. It has been linked to elevated risk of liver, bladder, kidney, and lung cancers when ingested.

Arsenic ingestion is also associated with mucous membrane damage, eye irritation, darkening and lesions of the skin, liver inflammation and damage, among others.

In the light of the foregoing, this study sought to determine the degree of impact of poultry wastes on human health. Specifically, the types and quantity of wastes being generated and various management strategies being used by these poultry farms in Abia State were also studied.

METHODOLOGY

Study Area

The study was carried out in Abia state. The state was carved out of the former Imo State on 27th August, 1991. It is located at 5°25′N 7°30′E, bounded by Imo, Rivers, Akwa Ibom and Ebonyi states. The major farming activities of Abia state (God's own state) are the production of arable crops such as maize, cassava, melon, and poultry farming activities. They also engage in some socio- economic activities such as, trading, carpentry, furniture works, transport service, civil service etc. business and civil service. According to NPC, 2006, Abia state has 17 local government areas and a population of 2,728,098.

Methods of Data Collections

Data for this study were sourced from both primary and secondary. Oral interview and structured questionnaire were employed for primary data collection. Information regarding poultry wastes management, mechanism and implications on the environment were collected from the respondents. Additionally, academic journals, bulletins and other related publications were useful sources of information.

Ten poultry farms were purposively selected based on scale of operation (large scale) in the study area.

Method of Data analysis

Descriptive statistical method was used in the analysis of data. Descriptive statistics (frequency distribution tables, percentages) were used to describe the types and quantities of poultry wastes generated by the poultry farms. Descriptive statistical tool was also used to describe the various management strategies being practiced by the poultry farms in the study area.

Binary probit regression model was used to examine the determinants of the degree of impact of poultry wastes on human health.

The probit regression model is appropriate when the response takes one of only two possible values representing presence or absence (Gujarati (2003)). This is expressed as follows:

$[Fz_1]$----------(1)

Where

$Z = \beta_0 + \beta_1 X_1$

Table1. Quantity of cracked/stale egg wastes Produced Monthly

Dead birds/chicks	Frequency	Percentage (%)
Less than 50	2	20
50 – 100	7	70
Above 100	1	10
Total	10	100

Source: field survey data, 2015

Table 2: Quantity of cracked/stale egg wastes Produced Monthly

Cracked/stale eggs	Frequency	Percentage (%)
Less than 10 crates	1	10
10-20 crakes	3	30
Above 20 crates	6	60
Total	10	100

Source: field survey data, 2015

$Y_i=\beta_1 +\beta_2X_2 +$--------- $+\beta_K X_{K\,I} +u$--------(2)

Y^* is unobserved but Yi =O if Yi^*=1 if $YI^* \geq$ O

P (Yi-1) =p($Yi^* \geq 0$)

$P(U_I \geq \_\beta_1\_\_\beta_2X_{2I}\_\_\_\_\_\beta_KX_{KI}$----------(3)

Where Yi = the probability that poultry wastes have negative impact on human health
(Dichotomous dependent variable 1=yes, 0=No)
β= factor of unknown co-efficient.
X= factor of characteristics of the ith individual and is independent variable which are defined as follows.
X_1= Distance of poultry farm from residential area (1: far, 0: not far)
X_2= Number of poultry birds (number)
X_3= Age of poultry farm (years)
X_4= Farm labour (Man –day)
X_5= Farm manager year of experience (years)
X_6= Management system
X_7= Feacal material quantity(kg)
X_8= No of dead birds/chicks (number)
X_9= No of cracked/stale eggs (crates)
$X_{10=}$ Waste clearance frequency
μ = error term

RESULTS AND DISCUSSION

Types of Poultry Wastes produced monthly

Quantity Of Cracked/Stale Egg Wastes Produced In The Study Area

The descriptive statistics reveals that 20% of the farms of produced less than 50 dead birds/chicks waste monthly, while 10% of them produced above 100 dead birds/chicks. More so, 70% of the farms produced between 50-100 dead birds/chicks waste. The result shows that an average of 73 dead birds/chicks waste were produced

Quantity of cracked/stale egg wastes Produced Monthly

Table 2 shows that10% of the poultry farms lost less 10 crates of stale/broken eggs per month while the majority (60%) of the farms produced above 20 crates. More so 30% of the poultry farms lost between 10-20 crates of stale/broken eggs monthly. On the whole, average of 22 crates was lost monthly by the respondents.

The Quantity of Feacal Wastes Produced Monthly

Table 3 shows that 55% of the sampled respondents indicated that they generated between 500kg – 1000kg of faecal material per month while 20% of the respondents generated less than 500kg and above 1000kg each while the average monthly generated faecal wastes stood at 750kg.

Poultry Management Strategies by the 10 Farms In Abia State

Table 4 shows that 50% of the selected farms in the study area recycled the wastes as manure for crop production in form of compost manure. No doubt. This could become an environmental issue when the manure

Table 3: Quantity of Feacal Wastes Produced Monthly

Feacal material	Frequency	Percentage (%)
Less than 500kg	2	20
500kg – 1000kg	6	60
Above 1000kg	2	20
Total	10	100

Source: field survey data, 2015

Table 4: Poultry Management Strategies

Management method	Frequency	Percentage (%)
Burying	1	10
Selling	1	10
Flushing into pits, toilets, streams	2	20
Burning	1	10
Used as manure	5	50
Combination of methods	1	10
Total	10	100

Source: Field Survey data, 2015

is applied to the land in excess of the receiving crop's threshold level and the ability to utilize the nutrients.

On the other hand, the result also revealed that it was also discovered that about 10 % of the farms buried the wastes in the ground. This may, however, lead to groundwater contamination and thus constitutes a source of risk to human life. This serves as warning signals to the owners of residential houses in their efforts at properly locating their wells and boreholes on their compounds. However, it is also noted that burning of poultry wastes could cause atmospheric pollution which might pose some danger to human and livestock animals' lives.

The result also shows that 20% of the farms adopted flushing the wastes into pits, rivers, streams and toilets as their management strategy. It is noteworthy that flushing of poultry wastes in form of slurry into nearby pits, streams and rivers can cause damaging effects to both the human and aquatic lives and even water qualities downstream. Flushing may also cause a reduction in the quantity of dissolved oxygen and high water turbidity. This often threatens the natural habitats of many organisms in the nearby water masses. Huge quantities of organic and inorganic nutrients that are released as slurry are capable of permanently distorting the aquatic ecosystem.

10% of the farms sell the wastes to crop farmers and other agro-based industries s a source of income. This adds to the net farm income of the farms, while 10% of them burn the wastes as their management strategy. This, if not properly done could also constitute air and environmental pollution which is detrimental to human life

Relationship between Poultry Wastes and Human Health

As shown in table 5, the likelihood ratio test showed a significant value of 56.85 and chi-square value of 51.36 implying that the estimated model is statistically significant. Hence, the model is considered to be a good fit and equally consistent with theory. Also the value of fit measure, McFadden R^2 (0.65) indicated a very satisfactory fit.

Binary logit model was used to capture the relationship between poultry waste and human health. On the whole, the number of poultry birds being kept, farming experience of the manager of the farm, management system, quantities of the generated faecal materials and the number of dead chicks/chickens were all significant determinants at 1% level. Similarly, the distance between the poultry farms and the residential households, frequency of waste clearance by the farm attendants and the number of cracked/stale eggs were significant determinants (at 5%) of the level of impact of poultry wastes on human health

The coefficients of the number of poultry birds being kept, farming experience of the manager of the farm, management system, quantities of the generated faecal materials, the number of dead chicks/chickens, the distance between the poultry farms and the residential households, frequency of waste clearance by the farm attendants and the number of cracked/stale eggs (0.101, 0.012, 0.634, 0.800, 022, 0.522, 0.743 and 0.221 respectively) were all positively signed and significant at their respective levels. This implied positive relationship

Table 5: Binary Probit Regression Coefficients of Determinants of the Level of Impact of Poultry Wastes on Human Health in Abia State

Parameter	Coefficient	Standard error	z-stat
Constant	2.136*	1.157	2.755
Distance of poultry farm	0.522**	1.341	2.654
Number of poultry birds	0.101*	3.089	3.269
Age of poultry farm	0.672	0.326	1.577
Farm labour	0.058	0.034	1.588
Farm manager year of experience	0.012*	0.186	16.194
Management system	0.634*	0.534	4.933
Feacal material quantity	0.178*	0.019	9.368
No of dead birds/chicks	0.800*	0.702	13.687
No of cracked/stale eggs	0.221**	0.352	2.671
Waste clearance frequency	0.743**	5.956	2.140
Log likelihood function 56.85			
McFadden R^2 : 0.65			
Chi squared: 51.36			
Degree of freedom:10			

Source: Field survey data, 2015

with the impact on human health, suggesting increase in the probability of impact on human health.

CONCLUSION AND RECOMMENDATIONS

No doubt, the poultry wastes management strategies and environmental implications on human health in Abia state, have been highlighted. Particular reference was made of the quantities and forms of poultry wastes being generated, the common management strategies being used by the farms and the determinants of the level of impact of poultry wastes on human health. It was however observed that despite the huge benefits that abound in poultry industry, the wastes that are continually being generated in form of either birds' feaces, offals, dead chicks/chickens, stale or broken eggs constitute some environmental nuisance that are harmful to both animal and human health. The effects of poultry production activities include the degradation of nearby surface and /or underground water, and pollution of the environment through the emission of foul odour; thus causing a huge discomfort to both the human and animal lives.

On the whole, it was observed that the distance of poultry farms from the residential areas, and frequency of clearance of poultry wastes were some of the significant determinants of the level of impact of poultry wastes on the environment. Based on the principal findings of this study, it is therefore recommended that:

1. There should be a strict enforcement by supervisory agencies of the existing sanitation/health policies aimed at environmental preservation and protection, especially as recommended by the State and Federal Environmental Protection Agencies in Nigeria.
2. Any Poultry farms that contravene 1 km resident-poultry unit distance from residential houses should be asked to relocate to far distant places. This would help to reduce or eliminate the chances of environmental pollution/health hazards.
3. Poultry farms should be able to provide all the necessary sanitary wares and adequate water supply. This is to ensure that all the surroundings of the farms are properly cleaned as at when do.

Poultry wastes should be cleared from the farms on daily basis or as at when do to avoid accumulation of the wastes which could pose some health risks to the environment

.It is therefore hoped that if these necessary precautionary measures are taken with the required levels of seriousness and in compliance with the appropriate existing government regulations, the negative implications of the poultry wastes on both human and animal lives will be mitigated

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