Improving Poultry Waste Management for Energy Production in Nigeria: A Case Study of Poultry Management Systems in Selected Local Government Areas of Anambra State, Nigeria

Umeghalu, I.C.E.[1*]; Ubah, J.I.[2]; Nwanna, E.C.[3]; Okpala, C. D.[4]; Akwuobi, S.I.[5]; J. C. Okonkwo[6*]; Maduegbuna, J.I.[7]

[1-5,7]Department of Agricultural and Bioresources Engineering, Nnamdi Azikiwe University, Awka, Nigeria
[6]Department of Animal Science and Technology Nnamdi Azikiwe University Awka, Nigeria
*Corresponding Author

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Abstract— *The aim of this study was to conduct a survey of poultry production systems and waste management in some local government areas of Anambra State of Nigeria. The basics of poultry farming were discussed including various types of chicken kept by farmers, production systems and scales. A proposal for improved poultry waste management through anaerobic digestion for biogas production was also discussed. The work highlighted anaerobic digestion process of poultry waste in biogas production. The research methodology adopted in the work is primary data obtained by use of questionnaires distributed to respondents, also secondary data obtained from journals and newspapers. The study revealed that medium scale poultry farms are predominant in the study area where majority of the farms still operate deep litter system. Only few of the farms operate battery cage system. It was found out that mechanized poultry farming is still at its lowest ebb in the state. It was found out that the poultry wastes generated by farmers are widely used for fertilizer. It is recommended that some level of mechanization is introduced in the industry to minimize the drudgery associated with poultry farming; technical training programs should be organized on regular basis to familiarize farmers with modern technology in poultry farming. Extension services are also recommended to educate farmers on recent best practices in the industry.*

Keywords— Poultry Farm Mechanization, Poultry Waste, Waste Management, Anaerobic Digestion, Biogas Production.

I. INTRODUCTION

Agriculture is the mainstay of Nigeria's economy, employing more than two-thirds of her total active labour force and has been contributing more than 42.2% of her gross domestic product (GDP). Also in 2007, agriculture provided about 88% of the country's non-oil earning. However, despite all these achievements, animal protein especially meat is expensive, in short supply and out of reach of the majority of the population. Thus, most of the people get far too little of these nutritious and protective foods such as meat and eggs that are required for normal growth, energy and resistance to various diseases (Chukwuji *et al*, 2006). The effect of this inadequate meat intake is felt more by a large proportion of the population especially in rural areas, where inhabitants constitute over 70% of Nigerians who constitute about 85% of the extreme poor in the country (Anosike *et al*, 2015).

The term poultry generally used in agriculture refers to all the domesticated birds kept for eggs or meat production. These include chickens or domesticated fowls, turkeys, ducks and geese. However, atimes the term poultry is seen as being synonymous with chickens. The rising standard of living in the country has resulted to rising demand for eggs and meat. Meanwhile, the fact that people cannot raise their own poultry has called for more establishments of poultry farms in the country. Under this system, birds are kept in runs made of wire-netting where they can move about in the runs during the day but are kept in poultry house at night.

Poultry meat and eggs play a very useful role in bridging the protein gap in Nigeria (Nwagu, 2002). The total poultry bird population in Nigeria reached a total of 169 million heads in 2021 (Doris, 2023; Ajala *et al*, 2007), same as the count of the preceding year, however, the count observed that within the period, the highest stock of live poultry birds in the country was registered in 2018 which stood at 184 million birds. The Nigerian poultry industry has been contributing approximately 25%

to her agricultural GDP; and since 2008, there has been a deliberate national drive to promote agriculture as business. But Adedotun (2002), noted that despite the expansion of the poultry industry in recent years, poultry farming in the country only caters for about 30% of chicken eggs and meat needs of Nigerians, which amounts to about 300metric tons and 600metric tons of eggs respectively per year. The poultry industry in Nigeria is worth about N1.6tr, making it the most commercialized sub-sector of all Nigeria's agricultural sub-sector (Emefiele, 2019; FAO, 2019; Udo *et al.* 2006; PAN, 2017; Adene and Oguntade, 2006; World Bank, 2005). There is consensus that about 90% of the figures derived from the local poultry stocks are composed of chickens (91%), guinea fowl (4%), duck (3%), turkeys and others (2%).

1.1 Poultry Management:

Depending on the purpose for which the birds are reared, and available capital, there are various methods of poultry management:

1.1.1 Intensive Systems:

In this system, the birds are kept indoors all the year round. More fowls can be kept in a small area of land than under the semi-intensive or free range systems. There are different methods or intensive management systems.

1.1.2 The Fold System:

Under fold system, the birds are kept in moveable houses which allow the birds certain amount of freedom. Thus, this method is successful where land is clear and well-drained, with good pasture, however, the system is very expensive and demands much attention.

1.1.3 Deep Litter System:

In this system, birds are kept in as completely closed but well-ventilated house where they are fed. The birds are kept indoors all the time on a layer of litter made of absorbent materials, such as straw, saw dust, or wood shavings, which absorbs the liquid droppings of the poultry. It is essential that the house is airy and cool, providing about I sq. m space per bird for light breeds and about 1.3 sq.m space for birds for heavy birds.

Inside the deep litter house, feeding and drinking troughs are necessary, as well as suitable length of perch on which birds can rest at night. Both feeders and drinkers should be moveable, and should be kept not less than 46 cm high such that birds cannot perch on them or defecate into them this is to avoid feed wastage or spread of disease.

1.1.4 Battery Cage System:

Birds especially layers can be kept in battery cages made of galvanized wire. The birds may be kept single in each cage or in groups of two to four. Some battery cage systems permit automatic supply of both feed and water and egg collection while other operations can be carried out manually. This system allows poultry droppings to fall through the wire at the bottom of the cage from where the can be cleared away.

1.1.5 Free Range System:

In free range system, birds are allowed to roam freely about under natural conditions and feed themselves. However, this system exposes the birds to the dangers of wild animals and theft.

1.1.6 Semi-intensive System:

1.2 Types of Chicken:

Although there are many different breeds of chickens used in poultry farming, they all can be divided into three types:

1.2.1 Layers:

These breeds primarily are for egg production. These birds usually weigh about 1-2 kilograms. They are lighter than chicken bred used for meat production, and they need less feed to maintain their body weight while laying as many or more eggs than the big birds.

1.2.2 Meat Chickens:

These types of chicken grow very rapidly and reach marketable size after two to three months, and are commonly called broilers. However, their size and age determine whether they are called a fryer or a roster.

1.2.3 Dual-Purpose Chickens:

These birds are raised for both their eggs and meat. Females of the new, improved breeds are kept to lay eggs while the males are separated and sold for meat as soon as they reach about 15 weeks of age.

1.3 Basic Requirement for Poultry Housing:

There are some important basic requirements for poultry housing such as: space, ventilation, light, and protection.

1.3.1 Space:

Space is most important basic requirement for poultry housing as it determines the number of poultry that can be kept (Chukwuji *et al.* 2006). For instance, a deep litter size of 6m x 11m can hold 200 laying hens at stock density of 3 birds/m^2. (3.6 ft^2/bird), while the recommended requirement for chickens for floor and perch space is presented in Table 1. Less space creates stressed social behaviour which encourages disease vulnerability and cannibalization, weaker birds deprived of feed or perch space (Sonaiya, 2000; Ugwu, 1990; Adeyemo and Onikoyi, 2012).

TABLE 1
REQUIREMENT OF CHICKEN FOR FLOOR AND PERCH SPACE.

Chicken Types	Floor Space (Birds/m^2)	Floor Space (ft^2/Bird)	Perch Space (per Bird)
Layer	3	3.6	25 cm (10 in)
Dual purpose	4	2.7	20 cm (10 in)
Meat	4 – 5	2.1 – 2.7	15 – 20 cm (6 – 8in)

1.3.2 Ventilation:

A building with open sides is ideal, otherwise cross-ventilation at bird-level should be allowed for in the form of floor level inlets, open in a direction to allow the prevailing wind to blow across the width of the building. Heat stress can lead to death of the birds. Birds can withstand several degrees below freezing point, but cannot tolerate temperature above 40^{O}C (Feddes *et al.* 1992; Kocaman *et al*. 2005; Salum *et al*. 2002). Building materials such as tin or other metal should be avoided for this reason. Heat stress affects the birds in several ways:

i. Reduction in feed intake as ambient temperature rises.
ii. An increase in water consumption in an attempt to lower temperature.
iii. A progressive reduction in growth rate.
iv. Reduction in rate of laying eggs

1.3.3 Light (Duration and Intensity):

A well-lit house is essential for birds as a dark house leads to lethargic, inactive and unproductive (Kenneth and Larry, 1981). Light is important for feeding, increased egg production, thus regular and reliable electricity supply is required.

1.3.4 Protection:

There are many factors that affect the type of houses. Birds need to be properly housed to protect them from adverse effect of weather or predators. These factors include local climate, space, size and number of the flock, and management system (Onwualu et al. 2006). In extensive systems, birds must be protected from disease and predators such as snake, kites, rats, theft, and other vermin (Conroy *et. al.* 2005; Sonaiya *et. al.* 2004).

1.4 Poultry Waste:

Poultry raised for commercial purposes produce large amount of wastes which contain valuable plant nutrients and other chemicals that if properly managed, can be returned to the land or processed for other uses.

1.5 Production of Biogas from Poultry Waste:

1.5.1 Definition of biogas:

Biogas is a flammable gas produced when organic materials are fermented under anaerobic condition. It originates from biogenic material and it is a type of bio-fuel (Ghosh, 1997; Jenner, 2006). Biogas has globally remained a renewable energy source derived from plants that use solar energy during the process of photosynthesis. Being is source of renewable natural gas; it has been adopted as one of the alternatives to fossil fuels after 1970's world energy crisis. Biogas is a product of the metabolism of methane bacteria and is created when bacteria decomposes a mass of organic materials. It is smokeless, hygienic and more convenient to use than other solid fuels. To produce biogas, water is added to animal/plant waste in a certain ratio to form slurry and digestion takes place in the process of anaerobic digestion. Anaerobic digestion (AD) is a microbial process in which micro-organisms breakdown and organic waste because it provides volume and mass reduction of the input material. Anaerobic digestion is also a biological process in which organic material is decomposed in the absence of oxygen to produce biogas. The organic matter can be degraded by the sequential action of hydrolytic, acetogenic and methanogenic bacterial to produce biogas.

Biogas is a colourless, flammable gas produced through anaerobic digestion of animal, plant, human, industrial and municipal waste amongst others. It is composed of methane (50-70%), carbon dioxide (20-40%), water vapour (2-7%), and traces of other gases such as ammonia, nitrogen, hydrogen, hydrogen sulphide as shown in Table 2 below.

TABLE 2
COMPOSITION OF BIOGAS

Component	Concentration by volume (%)
Methane (CH_4)	50 – 70
Carbon Dioxide (CO_2)	20 – 40
Water (H_2O)	2 – 7
Hydrogen Sulphide (H_2S)	2
Ammonia (NH_3)	0 - 0.55
Nitrogen (N)	0 – 2
Oxygen (O_2)	0 – 2
Hydrogen (H)	0 – 1

Source: Mattocks, (1980)

Biogas technology is a biochemical conversion technology of bio-energy conversion where decomposition or degradation of organic matter occurs in the absence of oxygen by microorganisms (Legett, 2006). Biogas technology is based on the phenomenon that when organic matter containing cellulose is fermented in the absence of air (anaerobically), combustible gases (chiefly methane) are emitted. Biogas technologies commonly apply consortia of microbes. These communities form an intricate microbiological food chain.

1.5.2 Bases for Biogas Technology:

Biogas is produced by the biological breakdown of organic matter in the absence of oxygen. It originates from biogenic material and is a type of bio-fuel. One type of biogas is produced by anaerobic digestion or fermentation of biodegradable materials such as biomass, manure or sewage, municipal waste, green waste and energy crops. This type of biogas comprises primarily of methane and carbon dioxide. The other principal type of biogas is wood gas which is created by gasification of wood or other biomass. This type of biogas is comprised primarily of nitrogen, hydrogen, and carbon monoxide, with trace amounts of methane.

Biogas generators or digesters yield two products: The biogas itself and a semi-solid by-product called effluent or sludge. Biogas systems are most popular for their ability to produce fuel from products that might otherwise be wasted crop residues or manures. The fuel is a flammable gas suitable for cooking, lighting, and fuelling combustion engines.

1.5.3 Formation of Ammonium Fertilizer from Poultry Waste:

The digested waste or sludge is a high-quality fertilizer. The digestion process converts the nitrogen in the organic materials to ammonium, the form in which it becomes more stable when ploughed into the soil. Ammonium is readily fixed or bonded in the soil so that it can be absorbed by plants. Moreover, biogas systems offer a need to sanitize wastes. Thus, the systems are capable of destroying most bacteria and parasitic eggs in human and animal wastes, enabling the digested sludge to be applied safely to crops.

1.5.4 Biogas models:

The development of biogas plant that co-digests agricultural waste with other organic wastes, energy crops or industrial wastes has been aggressive over the past two decades. This is as the result of economic, social and environmental pressure. The Kyoto Protocol, which requires countries to meet 1990 levels of greenhouse gas (GHGs), is a very significant driver (Energy Commission of Nigeria, 1998 In Europe, Denmark has been the world leading country in anaerobic digestion development and implementation, especially for generating manure for fertilizer and for electricity production. One of the driving forces in Denmark is their goal of achieving 33% of their total energy requirement to be derived from renewable energy sources by the year 2030. Biogas generators or digesters operate throughout Asia, for example, more than 100,000 biogas generators or digesters have been reported to be in use India, about 30,000 in Korea, and several millions in China. Ancient Chinese experimented burning the gas given off when vegetables and manures were left to rot in a closed vessel (Nwoye *et al*. 2014; Chukwu *et al*. 2006).

Presently, China has successfully promoted the use of biogas as a source of household energy since 1980s, especially in the rural areas where wood for fuel was in short supply and rural electricity was not available. Each household builds its own plant to channel waste from the domestic toilet and nearby shelters for animals, usually pigs, into a sealed tank. The waste ferments and is naturally converted into gas and compost. In addition, the project has resulted in better sanitary conditions in the home. In Nigeria, biogas technology can serve as a means to overcome energy poverty, which poses a constant barrier to economic development in Africa, (Chukwuma *et. al.*, 2021). Biogas production from energy crops, agricultural wastes, industrial wastes, municipal water, crop residues etc., does not compete for land, water and fertilizers with food crops like is in the case with bio-ethanol and biodiesel production.

1.5.5 Biogas technology in Nigeria:

Anaerobic digestion has been deemed one of the most useful decentralized sources of energy supply by the United Nations Development Programme. In United States of America, Europe and Asia, there has been considerable interest in the process of anaerobic digestion as an approach to generating a safe clear fuel as well as source of fertilizer (Chukwuma *et al.* 2013; Umeghalu *et al*. 2015). In the past decades, the consumption of poultry in Nigeria and in many other countries has been on the increase. Growing demand for poultry product has resulted to corresponding increase in the poultry industry and consequently increased amount of organic solid by-products and wastes. It was reported that annually about 724.8 tons of poultry droppings and 184,128 tons of paunch are produced from poultry farms and from cows slaughtered in major abattoirs respectively in Anambra State of Nigeria (Umeghalu *et al.* 2012). Only a small proportion of the poultry droppings generated in major farms in the state is utilized for manure application (majorly during planting season) and fish farming. Poultry droppings can be considered as a sustainable biomass. The rapid growth of poultry industry in the country has been causing increasing concern about the disposal of poultry wastes with respect to non-point source pollution. The management of poultry waste constitutes a major problem in poultry industry (Umeghalu *et al.* 2012; Chukwuma *et al.* 2012).

II. MATERIALS AND METHODS

2.1 The Study Area

The study was carried out in seven out of the twenty one local government areas that make up Anambra State of Nigeria. Anambra State is located in the South-East Geopolitical Zone of Nigeria between Latitude 5°37’60N and Longitude 7°10’0E (NPC, 2006). Fig. 2.1 shows the map of the Anambra State which is bounded in the East by Enugu State, in the North by Kogi State, in the South by Rivers and Imo States and in the west by Delta State. The state comprises of 21 LGAs with a population of 4.06 million (NPC, 2006) people and a population density of 1,500 to 2,000 persons living within every square kilometer. Anambra State occupies a land mass of about 4,844 km^2 (1,870.3 square miles).

The poultry farms studied were randomly selected and are located in the following local government areas of State: Awka North, Awka South, Oyi, Anaocha, Ekwusigo, Nnewi North, and Idemili North Local Government Areas.

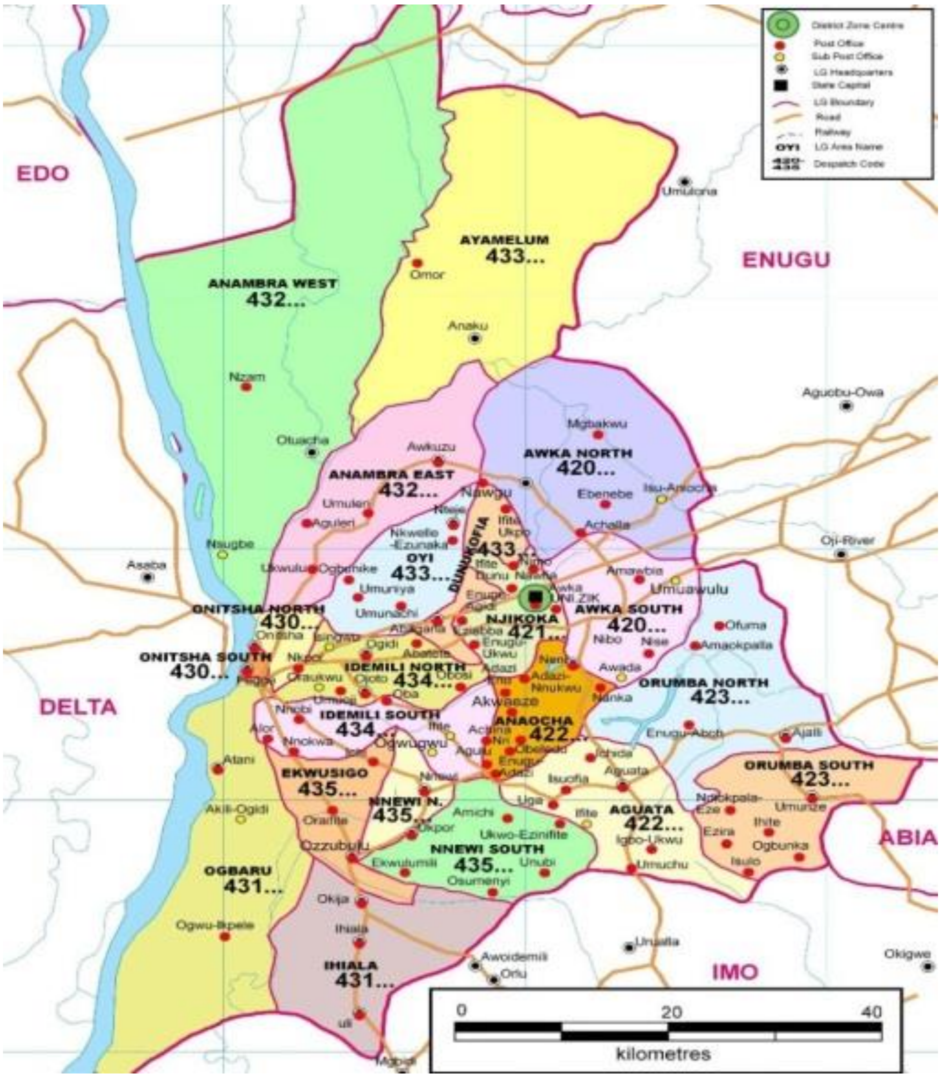

FIGURE 1: Map of Anambra State of Nigeria.

The criteria for the selected nine poultry farms were based on their categorization as being small or medium scale in addition to size of the farms, number of years of experience in poultry farming and membership of Poultry Association of Nigeria (PAN). The primary data used for this research were obtained from questionnaires designed for nine (9) respondents. All the nine (9) questionnaires were filled properly and returned.

III. RESULTS AND DISCUSSIONS

Analytical tools such as graphs and simple descriptive statistics were used to characterize and analyze the data generated from the study. Also, in the course of data analysis in this work, the percentage distribution of data were first obtained for easy and proper analysis of the data as shown in the tables below.

3.1 Percentage Distribution of the poultry types.

The data presented are shown in the tables and analyzed in percentages as shown. Table 3 below represents the percentage distribution of each poultry type (layers, broilers and day-old chicks) and number housed respectively by the farms. The estimated total production of poultry in the study area is 234,035 birds comprising 41,750 (17.84%) layers, 65,985 (28.19%) broilers and 126,300 (53.97%) day-old chicks.

The numbers of birds housed by the farms differ markedly. Out of the 41,750 layers in the study area, Ausco Farms has 47.90%, Chika Ebele Farms has 11.98%, Labour Farms has 14.37%, Ozubulu Monastery Farms has 1.8%, Aroma Farms has 9.58%, Chidera and Ifeukwu Farms both have 2.4% while Michael and F.C. Muonwem Farms both have 4.79%.

Out of the 65,985 broilers, in the study area, Ausco Farms has the largest percentage of 90.93% followed by Aroma Farms with 4.85%, Chika Ebele Farms has no broiler, Labour Farms has 2.27%, Ozubulu Monastery Farms has 0.13%, Chidera Farms 0.61% and Ifeukwu Farms have no broiler. Michael Farms has 0.76% and F.C. Muonwem Farms has 0.45%%.

Ausco Farms has 95.10% of the total number of 126, 300 day-old-chicks housed in the farms studied, Chidera Farms has 1.19%, Aroma Farms has 1.58%, Michael Farms 0.63%, F.C. Muonwem and Labour Farms both have 0.79%, while Chika Ebele, Ifeukwu and Ozubulu Monastery Farms have no day-old chicks.

TABLE 3
PERCENTAGE DISTRIBUTION OF POULTRY TYPE AND NUMBER IN THE FARMS STUDIED

S/N	Name of Farms	Distribution of Layers (%).	Distribution of Broilers (%).	Distribution of Day-old Chicks (%).
1.	Ausco Farms	47.90	90.93	95.01
2.	Chika Ebele Farms	11.98	-	-
3.	Labour Farms	14.37	2.27	0.79
4.	Ozubulu Monastery Farms	1.80	0.13	-
5.	Chidera Farms	2.40	0.61	1.19
6.	Ifeukwu Farms	2.40	-	-
7.	Aroma Farms	9.58	4.85	1.58
8.	Michael Farms	4.79	0.76	-0.63
9.	F.C. Muonwem Farms	4.79	0.45	0.79
	Total	**100**	**100**	**100**

3.2 Percentage scale of poultry production:

Table 4, below presents the percentage distribution of production scale of the poultry farms studied. Out of the nine farms studied, two farms can be categorized as small scale farms with (22.22%) each, six of the farms are medium scale farms which made up (66.66%) of the total poultry production and only one is categorized as large-scale farm with (11.11%) of the total poultry production.

This shows that there are more of the medium scale farms in the study area. The research indicates that the level of mechanization in poultry farming in Anambra State is at its low ebb. The methods of feeding, brooding of day-old chicks, egg and waste collection and disposal predominantly are carried out manually by the employees of the farms.

TABLE 4
PERCENTAGE SCALE OF POULTRY PRODUCTION

S/No	No. of Farms	Production Scale (No. of Chickens)	Percentage distribution (%)
1.	2	Small Scale (less than 2,000)	22.22
2.	6	Medium Scale (2,000-10,000)	66.67
3.	1	Large Scale (10,000 and above)	11.11
		Total	**100**

3.3 Distribution of daily egg production in crates of 30 eggs each:

The estimated total egg production is 871 crates daily of 30 eggs each with Table 5 below showing the distribution respectively by the farms studied. From the table, Ausco Farms produces about 500 crates of eggs (57.41%) followed by Aroma Farms with 135 crates (15.50%), while Ifeukwu Farms and Ozubulu Monastery Farms produce 26 crates (2.99%) and 11 crates (1.26%) respectively representing the least daily egg production among the farms studied indicating those farms with the highest number of layers produce more eggs.

TABLE 5
SHOWING DISTRIBUTION OF DAILY EGG PRODUCTION IN CRATES OF 30 EGGS EACH.

S/N	Name of Farms	Daily egg production in crates of 30 eggs each.	Percentage Distribution (%)
1.	Ausco Farms	500	57.41
2.	Chika Ebele Farms	40	4.59
3.	Labour Farms	60	6.89
4.	Ozubulu Monastery Farms	11	1.26
5.	Chidera Farms	30	3.44
6.	Ifeukwu Farms	26	2.99
7.	Aroma Farms	135	15.50
8.	Michael Farms	35	4.02
9.	F.C. Muonwem Farms	34	3.90
	Total	**871**	**100**

3.4 Brooding size of poultry farms studied:

Brooding stage is the first and most delicate stages of poultry husbandry when the strength foundation of the birds are laid with respect to future performance as regard to egg laying, body weight, growth rate, feed consumption, conversion efficiency and resistance to diseases. Table 6 shows the percentage distribution of brooding size of the respective farms. Ausco Farms broods 20,000-day-old chicks (62.02%), Chika Ebele, Labour, Aroma and Michael Farms brood 2,000 chicks (6.2%) each, while Chidera and F.C. Muonwem Farms brood 1,500 chicks (4.65%) each. Ifeukwu and Ozubulu Monastery Farms brood 900 chicks (2.79%) and 350 chicks (1.09%) respectively. Factors affecting brooding of day-old-chicks are temperature, light, relative humidity, ventilation, floor space, nutritional requirement and ammonia concentration. There are optimum temperatures for chicks of different ages. Too high or too low temperatures will slow down their growth rate. Extreme temperatures may cause death. The most important condition for brooding is to keep the chicks comfortable and to avoid extreme temperature.

TABLE 6
BROODING SIZE OF POULTRY FARMS STUDIED.

S/N	Name of Farms	No. of day-old-chicks	Percentage
1.	Ausco Farms	20000	62.02
2.	Chika Ebele Farms Name	2000	6.2
3.	Labour Farms	2000	6.2
4.	Ozubulu Monastery Farms	350	1.09
5.	Chidera Farms	1500	4.65
6.	Ifeukwu Farms	900	2.79
7.	Aroma Farms	2000	6.2
8.	Michael Farms	2000	6.2
9.	F.C. Muonwem Farms	1500	4.65
	Total	32250	100

3.5 Monthly poultry waste generation by the farms studied:

Table 7 below shows the distribution of monthly poultry waste generated by the farms. Out of the 1,244 bags (25 kg each) of poultry wastes generated, Ausco Farms generates the highest quantity of waste generated with 600 bags representing about (48.23%) of the total quantity of the poultry wastes, Aroma Farms generates about 200 bags (16.08%), F.C. Muonwem Farmsgenerates 112 bags (9%), Michael farms 150 bags (12.06%), Ifeukwu Farms generates 85 bags (6.83%), Labour Farms produces about 40 bags representing 3.22%, while Ozubulu Monastery Farms and Chidera Farms each generates 20 bags representing 1.61% each and Chika Ebele Farms generates about 17 bags (1.37%). With these data, if the wastes are effectively managed as source of bio-energy production, it will result to having cleaner environment, sustainable source of raw material for bio-energy production and fertilizer for farmers.

TABLE 7
MONTHLY POULTRY WASTE GENERATION BY THE FARMS STUDIED IN 25KG BAGS.

S/N	Name of Farms	Monthly poultry waste ((25kg bag)	Percentage
1.	Ausco Farms	600	48.23
2.	Chika Ebele Farms Name	17	1.37
3.	Labour Farms	40	3.22
4.	Ozubulu Monastery Farms	20	1.61
5.	Chidera Farms	20	1.61
6.	Ifeukwu Farms	85	6.83
7.	Aroma Farms	200	16.08
8.	Michael Farms	150	12.06
9.	F.C. Muonwem Farms	112	9
	Total	1,244	100

3.6 General overview of poultry production system of the farms studied:

TABLE 8
RESULT OF THE SURVEY NOT SHOWN IN THE TABLES.

S/N	Farms	Production purpose	Production system	Method of waste management	Price of day-old chick (N)	Constrains	Common diseases
1.	**Ausco Farms**	Day old chicks, eggs & meat production	Battery cage & Deep litter	Fertilizer, Feedstock & Bio-digester	-	Finance	Newcastle
2.	**Chika Ebele Farms**	Meat and egg production	Deep litter	Fertilizer	200 – Layers	Finance	Gomboro, Newcastle & Coccidiosis
3.	**Labour Farms**	Day old chicks, eggs & meat production	Deep litter	Fertilizer & Feed	230 - Layers; 180 – Broilers	Bad road network	Newcastle
4.	**Ozubulu Monastery Farms**	Meat and egg production	Deep litter	Fertilizer	210 - Layers; 205 – Broilers	Finance	Green & white
5.	**Chidera Farms**	Meat and egg production	Deep litter	Fertilizer	180 – Layers	Disease	Coccidiosis
6.	**Ifeukwu Farms**	Egg production	Deep litter	Fertilizer & Feed	150 – Layers	Lack of mobility, capital	Gomboro, Newcastles, Almonella & Coccidiosis
7.	**Aroma Farms**	Egg production	Deep litter	Fertilizer	230 - Layers; 180 – Broilers	Unavailability & high cost of day-old chicks	Newcastle, & Coccidiosis
8.	**Michael Farms**	Meat and egg production	Deep litter	Fertilizer	230 - Layers; 180 – Broilers	High cost of feeding	Cough
9.	**F.C. Muonwem Farms**	Meat and egg production	Battery cage & Deep litter	Fertilizer	220 - Layers; 120 – Broilers	Slow market	Newcastle,& Coccidiosis

IV. CONCLUSION

Brooding stage is the first and the most delicate stage in poultry husbandry. It is at this stage that the strength of performance of the birds are laid in respect to egg laying, body weight and good growth rate in broilers, feed consumption and conversion efficiency and resistance to diseases.

Efficient use of the poultry wastes generated by these poultry farms for biogas energy production will contribute meaningfully in solving the energy crisis in the country as are found in many countries of the world such as in Asia, Europe and America.

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