

*Full Length Research Paper*

# Distribution and characteristics of poultry farms in Enugu State, Nigeria after the 2007 outbreak of highly pathogenic avian influenza

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The objective of this study was to evaluate the distribution and characteristics of poultry farms in Enugu State, Nigeria after the 2007 outbreak of highly pathogenic avian influenza. Structured questionnaire, interview, and physical enumeration and measurements were used to collect data on number of farms, farm capacity, farm location, type of bird reared, and socio-economic attributes of farmers. Data collected were analyzed and results presented using descriptive statistics (means  $\pm$  SEM). Local Government Areas were rated according to their level of urbanization (scale: 1-5) and this was correlated with number of farms, farm capacity, and number of birds in stock. A total of 384 farms were enumerated during the study, out of which 43 (11.2%) were large scale ( $\geq$  5,000 bird capacity); 57 (14.9%) medium scale (2000-5000 birds); 229 (59.6%) small scale (250-1900 birds) and 55 (14.3%) backyard (< 250 birds). Local Government Areas differed significantly ( $P < 0.05$ ) in level of urbanization. Most large and medium scale farms were associated with 'very' urban and urban LGAs while most small and backyard farms were located in 'rural' LGAs. For most farms, birds in stock accounted for over 60% of calculated farm capacity, and differences between farm capacity and birds in stock were less for medium, small and backyard farms compared to large scale farms. Backyard, small and medium scale poultry farms accounted for over 80% of poultry farms in Enugu State, Nigeria.

**Key words:** Poultry farms, distribution, characteristics, Enugu State.

## INTRODUCTION

Animal agriculture is vital to the socio-economic development of Nigeria and to the health and well-being of her teeming population. The poultry sub-sector is one of the most dynamic aspects of animal agriculture for a number of reasons. In 2004, it contributed about 4.45% of

the agricultural gross domestic product (GDP) (CBN, 2005), and 9-10% in 2005 (AICP, 2007; CBN, 2008). Estimates from the National Bureau of Statistics (NBS) showed that the poultry sub-sector grew at the rate of 5.9% per year from the year 2000, and by 2005, reached

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a population of 150 million (AICP, 2007). Poultry husbandry in Enugu State can be classified into extensive system (~75%) involving rearing of domestic chickens, turkeys, and ducks mainly in the rural areas and intensive system (~25%) involving rearing of exotic chickens, and turkeys (NBS, 2007) mostly in the urban and semi urban areas. The intensive system has two major types: urban commercial (large, medium, and small), and backyard enterprises (UNDP, 2006; MacArthur and Christine, 2007). Prior to the highly pathogenic avian influenza (HPAI) epidemics in Nigeria, poultry production flourished in Enugu State. It was the best source of widely acceptable and nutritious animal protein. It made considerable contributions to food security and played a vital role in creating business opportunities for large, medium, and small entrepreneurs. It was a major source of sustenance for families, women, and children, and employed a large population of school leavers. The state capital (Enugu) and surrounding urban areas have designated live bird markets and poultry slaughter and processing slabs that provided employment for a good number of youths although none of these markets had mechanized slaughter, processing, and waste handling facilities.

Avian influenza (AI) or "bird flu" is a contagious disease of animals caused by virus of the family Orthomyxoviridae and the genus influenza virus. The AI viruses belong to Group A based on difference between their nucleoprotein and matrix protein antigens; Group 5 of haemagglutinin and Group 1 of neuraminidase classifications; thus referred to as Influenza A (H5N1). Isolated cases of highly pathogenic avian influenza (HPAI) virus (subtype H5N1) infection occurred in poultry farms in Enugu State in 2007 but it was quickly contained such that the disease did not assume epidemic status. However, the scare took a toll on investments in the poultry sector as farmers could not profitably market both mature birds and table eggs. This interrupted the growth in the sector (AICP, 2007; Diao and Nwafor, 2009), as many farmers lost their capital. A good number downsized their operation while others diverted to other businesses.

Prior to the HPAI epidemic in Nigeria, there were no scientific documentations of poultry population in Enugu State or record of the number and categories of poultry farms, and farmers involved in poultry production in the state in available literature. It was therefore difficult to obtain the necessary data or information needed to formulate intervention strategies during the HPAI outbreak in Enugu State. The objective of the present study was to conduct a survey of poultry farms in the seventeen (17) local government areas (LGAs) of Enugu State, Nigeria.

## MATERIALS AND METHODS

This study involved the physical enumeration of poultry farms and

chickens in stock as well as collection of socio-economic data of farmers using structured questionnaires and interviews. A total of 68 enumerators (4 per LGA) made up of agricultural extension workers belonging to the Enugu State Agricultural Development Program, State and Local Government Departments of Agriculture were mobilized for the survey (farm enumeration only) which lasted for two weeks.

### The study area

The study area was Enugu State of Nigeria located 6°30'N and 7°30'E. The State shares borders with Abia State and Imo State to the south, Ebonyi State to the east, Benue State to the northeast, Kogi State to the northwest and Anambra State to the west. Enugu has well drained soil and benign weather all year round and sits at about 223 m (732 feet) above sea level (NBS, 2007). Two seasons namely, rainy, and dry seasons characterize the climate of Enugu State. Enugu State has 17 Local Government Areas, and a total population of over 3.3 million people (NBS, 2007). Enugu the capital of Enugu State acquired township status in 1917 and became strategic to British interests (UNDP, 2006). Economically, the State is predominantly rural and agrarian, with a substantial proportion of its working population engaged in farming, although trading (18.8%) and services such as education, craft, construction, artisans, transportation etc. (12.9%) are also important. In the urban areas trading, craft, and construction works are the dominant occupations.

### Study population

All the seventeen LGAs in Enugu State were surveyed during the study. A poultry farm was defined as one that intensively or extensively rears exotic breeds of birds either as large, or medium, or small or backyard scale. A total of 384 farms were enumerated during the study.

### Data collection and analysis

Primary data on the distribution and characterization of poultry farms were obtained through physical enumeration of poultry farms and birds in stock in each farm and this was carried out within a space of two weeks in 2008. This study was a sub-section of a bigger study on the Socio-economic Impact of HPAI on Poultry Farmers in Enugu State which was achieved through administration of structured questionnaires to farmers and interviews during a period of 3 months stretching from November, 2008 to February, 2009. The full questionnaire which was titled Socio-economic Impact of Avian Influenza on Poultry Farmers in Enugu State was used to collect information, which included bio-data of the farmers, name of farm (business/company name where applicable), farm location (name of village or street, town, local government area), age of farm, farm full capacity, number of birds in stock at time of survey, and breed of poultry in stock etc. Individual farm capacities and birds in stock in a LGA were summed to obtain the total farm capacity and birds in stock, respectively for that LGA. Local Government Areas were subjectively rated according to their level of urbanization (Scale: 1-5) (1 = very rural; 2 = rural; 3 = semi urban; 4 = urban; 5 = very urban or most urbanized); and this was correlated with number of farms, farm capacity, and number of birds in stock. Data on farm capacity, and number in stock were subjected to statistical analysis and results presented as means  $\pm$  standard error. Comparison between farm capacity and number in stock for each LGA was done using the independent samples t-test. Pearson correlation (2-tailed) was used to correlate the relationship between level of urbanization and some of the farm variables.

**Table 1.** Distribution of poultry farms in Enugu State according to local government area.

LGA	Farms (no.)	Farm capacity	
		Mean $\pm$ SEM*	Range
Aninri	20	450.0 $\pm$ 77.5	200 -1500
Awgu	19	1524.2 $\pm$ 558	200-10000
Enugu East	13	22734.6 $\pm$ 12226.5	250-140000
Enugu West	30	16601.7 $\pm$ 12230.4	200-370000
Enugu South	52	2517.31 $\pm$ 639.3	150-24000
Ezeagu	10	2100.0 $\pm$ 455.1	300-5000
Igboetiti	11	478.2 $\pm$ 165.5	200-2100
Igboeze North	30	511.0 $\pm$ 74.3	30-2000
Igboeze South	27	338.4 $\pm$ 56.1	200-1500
Isiuzo	17	2123.5 $\pm$ 701.7	300-10000
Nkanu East	12	1170.8 $\pm$ 243.6	250-2500
Nkanu West	24	1982.5 $\pm$ 427.4	200-10000
Nsukka	20	2687.5 $\pm$ 1067.0	200-20000
Oji River	16	1703.1 $\pm$ 317.9	300-5000
Udenu	29	1365.2 $\pm$ 315.7	200-7500
Udi	36	6226.4 $\pm$ 3465.4	200-120000
Uzo-Uwani	18	268.9 $\pm$ 23.26	200-500

SEM\*: Standard error of mean.

## RESULTS

A total of 384 farms (mean = 22.6/LGA) were enumerated during the survey with the highest number of farms recorded in Enugu South (52), Udi (36), Enugu North (30), Igboeze North (30) and Udenu LGAs (29) (Table 1). The least numbers of poultry farms were recorded in Ezeagu (10), Igbo-Etiti (11), Nkanu East (12) and Enugu East LGAs (13) in ascending order. Overall farm capacity (mean  $\pm$  SEM) in Enugu State during the survey was 3,802.6  $\pm$  1,113.3. Enugu East LGA had the highest mean farm capacity of 22,734.6  $\pm$  12,226.5 birds followed by Enugu West at 16,601.7  $\pm$  12,230.4 and Udi LGAs at 6,226.4  $\pm$  3,465.4 (Table 1). The least farm capacity of 268.9  $\pm$  23.26 birds was observed in Uzo-Uwani LGA (Table 1). Mean farm capacities of more than 5000 birds (large scale commercial farms) accounted for only 17.6% of the number of farms in Enugu State during the survey. This was followed by those of 2000-5000 birds (medium scale farms) (29.4%). The highest percentages of farms (52.9%) were those of small scale (250-1900 birds). The minimum and maximum farm capacity recorded for Enugu South, Enugu North, Nsukka, Udi and Enugu East LGAs were 15-24,000, 200-370,000, 200-20,000, 200-120,000 and 250-140,000, respectively (Table 1). The following LGAs (Aninri, Ezeagu, Igbo-Etiti, Igboeze North, Igboeze South, Nkanu East, Oji River, and Uzo-Uwani) had minimum and maximum capacities in the range of 250-1900 birds (Table 1).

Birds in stock in poultry farms in Enugu State during the current survey averaged 2770.0  $\pm$  1009.5 birds (Table 2).

The LGAs with mean stock volume of above 5000 birds constituted 11.8%, while those of medium scale operations (mean stock of 2000-5000) constituted only 5.9%. The highest percentages of LGAs (76.5%) stocked between 250-1900 birds on the average or were predominantly small scale while only one LGA (Uzo-Uwani) representing 5.9% of all LGAs had mean stock volume of below 250 birds showing that the majority of operations in this LGA during the survey were of the backyard scale.

There were significant variations ( $p < 0.05$ ) between mean farm capacity and the mean number of birds in stock in each of the LGAs of Enugu State during the period of the survey (Table 3). Generally, mean number of birds in stock during the survey accounted for over 60% of mean farm capacity for each LGA except Oji River LGA in which birds in stock were only 41.3  $\pm$  30.1% of mean farm capacity.

The distribution of poultry farms in LGAs of Enugu State according to scale of operation showed that Aninri, Igbo-Etiti, Igboeze North, Igboeze South, Nkanu East, and Uzo-Uwani LGAs had no large scale poultry farms (Table 4). Aninri, Igboeze South, and Uzo-Uwani also had no medium scale poultry farms. Enugu South LGA had the highest number of large scale farms (9) with average farm capacity of 10,777.8 birds followed by Enugu North (8), Enugu East and Udi (6 each), Isiuzo and Nsukka LGAs (4 each). Large farms in Enugu North LGA were the largest in farm capacity (mean farm capacity = 57,500.0 birds), followed by Udi (34,333.3 birds) and Enugu East (25,250.0 birds).

**Table 2.** Birds in stock (Mean  $\pm$  SEM<sup>\*</sup>) in poultry farms in Local government areas of Enugu State.

LGA	Farms (no.)	Birds in stock	
		Mean $\pm$ SEM <sup>*</sup>	Range
Aninri	20	347.3 $\pm$ 51.0	200-1000
Awgu	19	832.5 $\pm$ 247.3	200-5000
Enugu East	13	13588.5 $\pm$ 6978.9	200-70000
Enugu West	30	15424.7 $\pm$ 12090.5	200-365000
Enugu South	52	1388.0 $\pm$ 346.0	100-10000
Ezeagu	10	1616.2 $\pm$ 553.0	250-5750
Igboetiti	11	566.0 $\pm$ 218.0	200-2100
Igboeze North	30	323.67 $\pm$ 37.2	200-1235
Igboeze South	27	300.4 $\pm$ 47.2	200-1200
Isiuzo	17	1525.6 $\pm$ 598.6	200-10000
Nkanu East	12	530.1 $\pm$ 165.3	50-2200
Nkanu West	24	1014.9 $\pm$ 193.8	200-3500
Nsukka	20	1613.6 $\pm$ 647.9	0.0-12000
Oji River	16	513.8 $\pm$ 111.2	0.0-1500
Udenu	29	978.6 $\pm$ 289.5	200-7060
Udi	36	4369.3 $\pm$ 2182.5	200-70000
Uzo-Uwani	18	228.3 $\pm$ 16.2	200-440

SEM<sup>\*</sup>: Standard error of mean.**Table 3.** Comparison between farm capacity and birds in stock according to local government areas of Enugu State.

LGA	Farm capacity	Bird in stock	Stock percent of farm capacity	Difference (%)
Aninri	450.0 $\pm$ 77.5	347.3 $\pm$ 51.0	91.5 $\pm$ 27.0	8.5 $\pm$ 27.0
Awgu	1524.2 $\pm$ 558	832.5 $\pm$ 247.3	89.6 $\pm$ 27.2	10.4 $\pm$ 27.2
Enugu East	22734.6 $\pm$ 12226.5	13588.5 $\pm$ 6978.9	68.0 $\pm$ 24.0	32.0 $\pm$ 24.0
Enugu West	16601.7 $\pm$ 12230.4	15424.7 $\pm$ 12090.5	70.6 $\pm$ 27.6	29.4 $\pm$ 27.6
Enugu South	2517.31 $\pm$ 639.3	1388.0 $\pm$ 346.0	73.4 $\pm$ 31.8	26.6 $\pm$ 31.8
Ezeagu	2100.0 $\pm$ 455.1	1616.2 $\pm$ 553.0	72.3 $\pm$ 31.3	27.7 $\pm$ 31.3
Igboetiti	478.2 $\pm$ 165.5	566.0 $\pm$ 218.0	154.8 $\pm$ 227.3	-54.8 $\pm$ 227.3
Igboeze North	511.0 $\pm$ 74.3	323.67 $\pm$ 37.2	103.4 $\pm$ 160.6	-3.4 $\pm$ 160.6
Igboeze South	338.4 $\pm$ 56.1	300.4 $\pm$ 47.2	93.0 $\pm$ 16.2	7.0 $\pm$ 16.2
Isiuzo	2123.5 $\pm$ 701.7	1525.6 $\pm$ 598.6	77.9 $\pm$ 20.8	22.1 $\pm$ 20.8
Nkanu East	1170.8 $\pm$ 243.6	530.1 $\pm$ 165.3	61.5 $\pm$ 43.3	38.6 $\pm$ 43.3
Nkanu West	1982.5 $\pm$ 427.4	1014.9 $\pm$ 193.8	89.2 $\pm$ 163.7	10.8 $\pm$ 163.7
Nsukka	2687.5 $\pm$ 1067.0	1613.6 $\pm$ 647.9	76.0 $\pm$ 31.7	24.1 $\pm$ 31.7
Oji River	1703.1 $\pm$ 317.9	513.8 $\pm$ 111.2	41.3 $\pm$ 30.1	58.7 $\pm$ 30.1
Udenu	1365.2 $\pm$ 315.7	978.6 $\pm$ 289.5	69.0 $\pm$ 25.3	31.0 $\pm$ 25.3
Udi	6226.4 $\pm$ 3465.4	4369.3 $\pm$ 2182.5	79.5 $\pm$ 24.0	20.5 $\pm$ 24.0
Uzo-Uwani	268.9 $\pm$ 23.26	228.3 $\pm$ 16.2	88.0 $\pm$ 14.3	12.0 $\pm$ 14.3

Values are means  $\pm$  SEM.

The highest numbers of medium sized farms were recorded in Enugu North and Nkanu West LGAs (9 each), followed by Oji River and Udenu LGAs (6 each), Enugu South and Nkanu East LGAs (5 each). The majority of small scale operations were found in Enugu South LGA (32), Igboeze North and Udi LGAs (26 each), Udenu and Aninri LGAs (20 and 16, respectively).

Backyard poultry farms (< 250 birds' capacity) abound in Igboeze South LGA (18), more than in other LGAs followed by Uzo-Uwani (10). No backyard scale of operation was recorded in Enugu East, Ezeagu, Isiuzo, Nkanu East, and Oji River LGAs. Consequently, small and medium scale poultry farms accounted for the highest number and percentage of poultry farms for

**Table 4.** Distribution of poultry farms by scale (size) in Local government areas of Enugu State, Nigeria (large:  $\geq 5000$ ; medium: 2000-5000; small: 250-1900; and Backyard:  $\leq 250$ ).

LGA	Large scale				Medium scale				Small scale				Backyard			
	No	Capacity	Min.	Max.	No.	Capacity	Min.	Max.	No.	Capacity	Min.	Max.	No.	Capacity	Min.	Max.
Aninri	0	-	-	-	0	-	-	-	16	494.4	250	1800	4	200.0	200	200
Awgu	2	7500	5000	10000	2	3000.0	2000	4000	12	613.3	250	1000	3	200.0	200	200
Enugu East	6	25250.0	5500	100000	4	3750.0	2000	4500	3	1016.7	250	1800	0	-	-	-
Enugu West	8	57500.0	5000	370000	9	3111.1	2000	4000	12	820.8	250	1500	1	200.0	200	200
Enugu South	9	10777.8	5000	24000	5	2700.0	2000	4000	32	601.6	250	1500	6	191.7	150	200
Ezeagu	1	5000.0	5000	5000	4	2750.0	2000	3500	4	875.0	300	1400	0	-	-	-
Igboetiti	0	-	-	-	1	2100.0	2000	2000	7	364.3	250	500	3	203.3	200	210
Igboeze North	0	-	-	-	1	2000.0	2000	2000	26	496.2	250	1500	3	143.3	30	200
Igboeze South	0	-	-	-	0	-	-	-	9	600.0	300	1500	18	207.6	200	240
Isiuzo	4	6625.0	5000	10000	1	4000.0	4000	4000	12	466.7	300	1000	0	-	-	-
Nkanu East	0	-	-	-	5	2100.0	2000	2500	7	507.1	250	900	0	-	-	-
Nkanu West	1	10000	10000	10000	9	2933.3	2000	4200	13	844.6	280	150	1	200	200	200
Nsukka	4	10000.0	5000	20000	2	3000.0	2000	4000	11	486.4	250	1000	2	200.0	200	200
Oji River	1	5000	5000	5000	6	2500	2000	3000	9	805.6	300	1500	0	-	-	-
Udenu	2	6250.0	5000	75000	6	2600.0	2000	4000	20	564.5	280	1500	1	200.0	200	200
Udi	6	34333.3	5000	120000	2	2500.0	2000	3000	26	490.4	250	1200	1	200.0	200	200
Uzo-Uwani	0	-	-	-	0	-	-	-	8	350.0	250	500	10	204.0	200	230

most of the LGAs, and across farms in Enugu state during the period of this study (Figure 1).

## DISCUSSION

The higher percentage of small and medium scale operations (250-1900, and 2000-5000 bird capacities, respectively) in almost all the LGAs of Enugu State suggest that the greatest number of poultry farmers in Enugu State engage in small and medium scale poultry farming. It is also probable that most farmers in Enugu State are sole proprietors; operating poultry farming as part-time business thus lack the capacity for large scale farming. Alternatively, it is probable that these sizes of operations could be the most

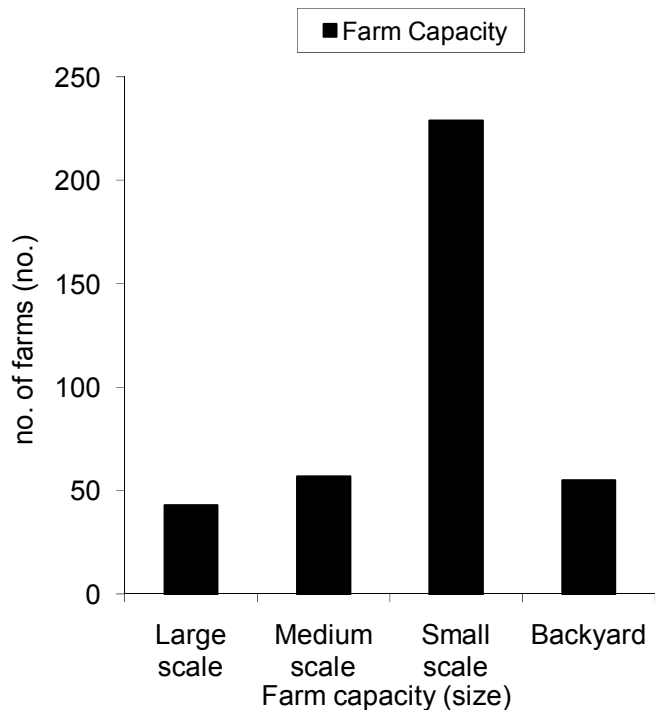
economically viable, operationally stable socially and environmentally sustainable in the state. The high SEM value of 1009.5 of farm capacities reflects the considerable variation in farm capacities among LGAs in the state. Generally, LGAs with the highest farm capacities also had the highest numbers of birds in stock. The significant differences between farm capacity and birds in stock for each LGA is probably because most farms enumerated at the time of this study were recently recovering from the economic impact and the scare of the outbreak of HPAI.

The ratings of urbanisation reflect the degree of socio-economic development and presence of infrastructural facilities that support poultry production; these include availability of high profile markets, high consumer population, good roads,

electricity, storage facilities such as cold rooms, water, highly technical human resources (veterinarians), sources of raw material (feed stuffs), feed millers etc. This research shows that urbanisation is closely related to increased number and scale of poultry farms.

It was commonly observed that the establishment of a big poultry farm in a catchment area soon stimulate interest in poultry production in other inhabitants with many venturing into the enterprise first, on a backyard or small scale. This explains why backyard and small scale farms exist as clusters.

The negative correlation of backyard farms with level of urbanisation means that as LGAs get more and more urbanized, backyard poultry production dwindles. This may be due to increases



**Figure 1.** Distribution of poultry farms according to scale of operation: Large scale:  $\geq 5000$  birds; medium scale: 2000-5000 birds; small scale: 250-1900 birds; and backyard:  $\leq 250$  birds.

in volume of production (shift to higher scale of production) as a result of increases in demand, and/or the enforcement of sanitation laws which may not support the rearing of poultry in human habitations.

## CONCLUSION AND RECOMMENDATION

Backyard, small, and medium scale poultry farms accounted for over 88% of poultry farms in Enugu State. Availability of socio-economic infrastructures encouraged the establishment and development of poultry production. The opening up of more rural areas with good roads, electricity, improved markets and other infrastructural facilities will encourage more entries into poultry production in Enugu State, Nigeria.

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