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The performance of poultry egg farms after the 2006 avian influenza outbreak in north central, Nigeria

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Abstract

The study assessed the performance of the poultry egg farms after the outbreak of avian influenza in 2006 in the north central part of Nigeria. Seventeen poultry (17) farms were purposefully sampled for the study. The net farm income model, simple descriptive statistics and data envelopment analysis were used as analytical tools. The result shows that the poultry farms are making profits after the losses obtained due to the outbreak of avian influenza (AVI). The revenue from eggs and spent layers constitutes 52.3 % and 47.7 % of the total revenue respectively. The medium size farms are however making higher profits and are more technically efficient than the small size poultry farms. The technical efficiency scores for the small scale farms range from 0.23-1 with a mean of 0.51, while that for the medium size farms range from 0.38-1 with a mean of 0.73. The major constraints affecting poultry egg production include; fluctuations in egg production and high cost of feeds as well as vaccines. The study concluded that the performance of poultry egg farms in Nigeria can be enhanced through improvements in technical efficiency or an increase in scale of operation. The provision of subsidies to poultry farmers by the government was however recommended to ease the high production cost.

Key words: Avian Influenza, Egg, Poultry, Nigeria

Introduction

Poultry production provides gainful employment and income to a sizeable proportion of the population. The high demand for poultry products, the success of exotic breeds and the ease of mastering the factors, make poultry business a very attractive enterprise (Sani et al., 2000). Poultry eggs have also attained industrial importance as a major ingredient in the baking of confectionaries and the use of the egg albumen in making of shampoo and book binding (Mayhew and Penny, 1988). Poultry egg is however an excellent rich source of animal protein of high biological value in respect of lipids, vitamins such as A, D, B, Phosphorus and other nutritionally important substances it contains. Poultry products (meat and eggs) provide the much needed animal protein to mankind. Poultry eggs contribute to palatability of many dishes by adding about the same amount of animal protein as pork and poultry meat does (Alabi and Isa, 2002).

Despite the significance of the poultry egg production enterprises to the national economy, animal protein consumption in Nigeria is below the United Nations Food and Agricultural Organization recommended minimum of 20g for developing countries as against the 75g optimal daily requirement for normal growth and development (FAO, 1992). According to Olayemi (1998), the average animal protein intake per caput per day in Nigeria was mere 7.6g. In addition, poultry farms in Nigeria suffered a severe setback with the outbreak of the Avian Influenza in 2006. This further compounded the already precarious protein deficiency prevailing in the country. However, poultry farmers are gradually bouncing back but the total recovery of the sector may take some time and will require efforts from the government, non governmental organizations and most importantly the poultry farmers themselves. The study is significant, essentially in the sense that it can serve as a guide on the nature of interventions to be provided to revamp the poultry industry in Nigeria after the avian influenza outbreak.

The objective of the study was to assess the current performance of poultry egg farms especially after the 2006 outbreak of avian influenza in north central Nigeria. In addition, the constraints affecting the poultry industry were also identified. The performance of the poultry farms was assessed by examining the cost and returns as well as the technical efficiency in egg

production. These variables were examined because, in order for a firm to maximize profit, it must produce the maximum output given the level of inputs employed (i.e. be technically efficient) (Kumbhaker and Lovell, 2000). Furthermore, the estimation of technical efficiency will reveal the potentials for increase in egg production which obviously diminished with the outbreak of avian influenza in 2006.

Materials and Methods

The study was conducted in Lafia which is located within the Guinea savanna zone in north central Nigeria. The area has an estimated land area of about 2733km^2. Lafia has an annual temperature of about 32^{0}C, which is favorable for agricultural production. Annual average rainfall is about 1288mm. A purposive sampling technique was adopted in selecting seventeen (17) poultry farms in the study area. This was because after the outbreak of avian influenza in 2006, some poultry farmers became skeptical especially with regards to the provision of information on their experiences during the outbreak. Thus, only the poultry farmers willing to be interviewed were used for the study. Data was collected with an interview schedule. Data were collected on socio-economic variables such as age, educational qualifications, number of birds, motive of production, sources of chicks, breeds of birds etc, inputs variables which include; labour, medication, day old chicks, feeds and the number of eggs collected. Simple descriptive statistics, Net Farm Income model, Data Envelopment Analysis and a five point Likert scale were used to analyze the data collected.

Data Envelopment Analysis

Data Envelopment Analysis is a non parametric method of measuring efficiency using mathematical programming rather than regression analysis. Farell (1957) introduced a linear-programming model to measure the technical efficiency of a firm with reference to a bench mark technology characterized by constant returns to scale. Charnes et al. (1978) introduced the method of Data Envelopment Analysis (DEA) to circumvent the problem of efficiency measurement for decision making units (DMUs) with multiple input and multiple outputs in the absence of market prices. They coined out the phrase, decision making units, in order to include non market agencies like schools, hospitals and courts which produce identifiable and measurable outputs from measurable inputs but generally lack market prices of outputs (and often some inputs as well). A DMU is regarded as a firm or production unit (Yusuf and Malomo, 2007).

The output-oriented model estimates the proportional increase in outputs as inputs remains unchanged. Assuming that there is data available on K inputs and M outputs in each of the N decision making units (i.e. poultry farms) and input and output vectors are represented by the vectors x and y, respectively for the ith farm. The data for all farms may be denoted by the K N input matrix (X) and M N output matrix (Y). The envelope form of output-oriented VRS DEA model which is the most widely used is then specified according to Coelli, et al. (1998) and Sharma et al. (1999) as follows:

$\text{Min}\theta\lambda\ \theta$

$\text{St} \quad -y_1 + Y\lambda \geq 0$

$\theta x_1 - X\lambda \geq 0$

$NI'\lambda = 1$

$\lambda \geq 0$

Where the value of θ obtained signifies the efficiency score for the ith DMU. It will satisfy $\theta \leq 1$with a value of 1 indicating a point on the frontier hence a technically efficient DMU (Farrell, 1957). Thus, the linear programming problem needs to be solved N times and a value of θ is provided for each farm (DMU) in the sample.

The Net Farm Income was used to determine the cost and returns of poultry egg production. Net Farm Income is the surplus resulting from business operation, which could be withdrawn without reducing the future scale of the business. Net Farm Income is the difference between the gross income and the total cost of production. Thus:

NFI = GI–TVC-TFC

Where:

NFI = Net Income

GI = Gross income (Income from eggs, spent layers and poultry droppings).

TVC = Total Variable Cost

TFC = Total Fixed Cost

The Variable Cost includes the costs of the following: Labour, feeds, medication and litter materials. While the Fixed Cost considered include the depreciated costs of Feeders and Drinkers. Due to inadequate record keeping, the depreciated cost of poultry housing was however not considered for the study. The straight line method of depreciation is expressed as follows.

$$D = \frac{\text{Initial Cost} - \text{Salvage Value}}{\text{Life span (n)}}$$

Inputs considered are:

Cost of day old chicks (N), Feeds (kg), Water (litre), Liter materials (kg)/Bag, Labour (Man day/hour), Cost of medication (N). The outputs considered are: Egg (Number of crates), Spent layers (N) and Poultry droppings (N).

The respondents also gave their perceptions on the level of severity of the constraints affecting poultry eggs production with the aid of a five point Likert scale of strongly disagreed (1), Disagreed (2); No opinion (3); Agreed (4) and Strongly agreed (5). A Likert scale is a

psychometric scale commonly used in questionnaires, and is the most widely used scale in survey research, such that the term is often used interchangeably with rating scale even though the two are not synonymous. When responding to a Likert questionnaire item, respondents specify their level of agreement to a statement. The scale is named after its inventor, psychologist Rensis Likert. Often five ordered response levels are used, but the scale can range from three to ten levels. Perception scores were thereafter computed for each constraint. The grand mean perception score was then computed by dividing the sum of all the mean perception scores by 12. A constraint is considered a major constraint if its mean perception score was greater than the grand mean score and a minor constraint if the reverse is the case.

Results and Discussion

The sources of day-old chicks for the sampled farms are presented in Table 1. The result shows that majority of farmers (52.9%) obtained their day old chicks from Jos, a town in located in the north central part of Nigeria, and about 200 km away from the study area. This is due to the proximity of Lafia to Jos. Others obtained their day-old chicks from Niyya farm (about 400 km away, also in the North Central Nigeria) and Zartech farm in Ibadan, southwestern Nigeria which is about 900km from the study area. Majority of the sampled farmers obtained their stock from day old. None of the farmers purchased their birds at one week and at the point of lay.

Table 1: Source of day old chicks

Source of Chicks	Frequency	Percentage
Jos (ECWA farms Ltd)	09.0	52.9
Kaduna (Niyya farms)	02.0	11.8
Ogun (Ota farms)	04.0	23.5
Ibadan (Zartech farms)	02.0	11.8
Total	17.0	100.0

Table 2: Size of flock/scale of operation

Range and scale of operation	Frequency	Percentage
Small scale farms (100 – 499 Birds)	05.0	29.5
Medium Scale (500 – 4999 Birds	12.0	70.5
Total	17.0	100.0

From the 17 sampled farms, 12 farms (70.5 percent) are medium scale farms, while only 5 farms (29.5) are small scale farms Table 3. There were no large scale farms within the study area at the time of the survey. In addition, this finding implies that the outbreak of AVI could have resulted into changes in the scale or size of poultry farms in the study area.

The result in Table 3 shows that the deep litter system of poultry production was found to be the most preferred system in the study area, it accounted for 94.1 percent out of the number of sampled farms. This, according to the respondents, is due to high cost of the Battery cage system.

Table 3: System of production by the farmers in the study area

System of Production	Frequency	Percentage
Deep litter system	16.0	94.1
Battery cage system	00.0	00.0
Both	01.0	05.9
Total	17.0	100.0

The cost and returns component in poultry egg production are presented in Table 4. The result shows that the total variable cost (N404920) accounted for more than 90% of the total cost (N408684.1). The total variable cost was however dominated by the cost of Day old Chicks, which was about 67.4% of the variable cost. The same pattern was also observed in both the small and medium size poultry farms. The total revenue was N803333.3, and the revenue from the sales of eggs constituted about 52.3%. The remaining 47.7% represents the revenue from the sales of spent layers. In terms of net returns, the poultry farms irrespective of size were all making profits after the outbreak of AVI but the net returns obtained were lower than the values that Rahman and Yakubu (2004) reported in the study area before the outbreak of AVI. However, the medium size farms obtain higher net returns compared to the small scale farms. This implies that the poultry farms are gradually regaining the confidence of their consumers as returns are once again in the positive territories. In a study by Ojo et al. (2007), it was observed the total revenue from poultry products before the outbreak of the influenza virus in Nigeria was far greater than what it was after the outbreak. After the outbreak, poultry farmers ran into a great loss (negative returns) due to the fact that poultry producers lost the confidence of their consumers and couldn't make as much as they were earning before the outbreak. Most importantly, the positive returns obtained in this study clearly shows the effectiveness of the efforts of the government at all levels in Nigeria as well as numerous organisations such as the World Health Organisation and the Food and Agricultural Organisations in curbing the deadly AVI outbreak in Nigeria. However, further assistance is required especially by NGOs on issues such as bio safety or bio security on poultry farms *vis a vis* the on farm formulation of poultry feeds in Nigeria.

All the poultry farmers in the study area were categorized based on the technical efficiency scores obtained from the DEAP software (Table 5). The technical efficiency scores for the small scale farms

Table 4: Cost and returns in poultry egg production

Inputs	Small scale COST (₦)	Medium scale COST (₦)	All COST (₦)	%
Feeds	33132.0	77308.0	110,440.0	27.3
Medication/Vaccines	2112.0	3168.0	5280.0	01.3
Labour	6525.0	7975.0	14500.0	03.6
Water	225.0	275.0	500.0	00.1
Litter materials	360.0	840.0	1200.0	00.3
Day old chicks	109,200.0	163800.0	273,000.0	67.4
Total Variable Cost	151,554.0	253,366.0	404,920.0	100.0
Fixed Cost				
Feeders	623.9	762.6	1386.5	37.0
Drinkers	832.2	1545.44	2377.6	63.0
Total Fixed Cost	1456.1	2308.0	3764.1	100.0
Total Cost	153,010.1	255,674.0	408,684.1	
Returns on eggs	167,933.3	251,899.9	419,833.3	52.3
Returns on spent layers	134,225.0	249,275.0	383,500.0	47.7
Total Revenue	302,158.32	501,174.98	803,333.3	100.0
Net Returns	149,148.23	245,500.94	94,6492.2	

Table 5: Technical efficiency scores in poultry egg production

Class interval	Frequency	
	Small Scale Farms	Medium Scale Farms
– 0.35	01.0 (20.0)	00.0 (00.0)
0.36 – 0.69	03.0 (60.0)	05.0 (42.0)
0.70 – 1.00	01.0 (20.0)	07.0 (58.0)
Total	05.0 (100.0)	12.0 (100.0)
Mean	51.0	73.0

Table 6: Constraints affecting poultry egg production

Constraints	Remarks	
	Small scale farms	Medium scale farms
A. High mortality of chicks	1.17 NC	2.76C
B. Egg eating by layers	2.00 NC	3.11NC
C. Cannibalism and pecking	2.05 NC	3.25NC
D. Disease outbreak	2.53 NC	4.29C
E. Fluctuation in egg production	4.16 C	2.16C
F. High cost of feeds	4.20 C	4.15C
G. High cost of vaccines	3.91 C	2.96C
H. Low market demand	2.56 NC	1.54NC
I. Inadequate capital for expansion	4.41 C	4.35C
J. Inadequate access to credit	4.12 C	4.22C
K. Inadequate extension services	4.12C	2.70 NC
L High cost of labour	4.16 C	2.53NC

Key: C = Major constraint NC = Minor constraint

range from 0.23-1 with a mean of 0.51, while that for the medium size farms range from 0.38-1 with a mean of 0.73. This implies that the medium size poultry farms were technically more efficient than the small sized poultry farms. The mean technical efficiency score for all the sampled farms was 0.62. This result implies that egg output in the study area can be increased by about 38% with the existing level of input usage. However, egg output can be increased by 49% and 27% for the small and medium size farms respectively. This will only be possible if the poultry farmers adopt the techniques and management practices of the best practiced poultry farms in the study area (farms with efficiency scores of 1 i.e., 100%). Majority of the small scale poultry farmers (60%) clustered toward a technical efficiency of between 0.36 – 0.69. On the other hand, majority of the medium scale farms (58%) had high efficiency scores of between 70-100% percent. This suggests that technical efficiency increases with farm size among the sample poultry farmers in the study area. The finding concurs with that of Helfand (2003) who observed that farm efficiency initially falls and then increases as farm size increases.

An examination of the constraints listed in Table 6 shows that the five major constraints affecting both the small and medium size poultry farms after the AVI outbreak in the study area at the time of survey include; fluctuation in egg production (Item E), high cost of feeds (Item F), high cost of vaccines (Item G), inadequate capital for expansion (Item I) and inadequate access to credit (Item J). The high cost of inputs especially feeds and vaccines can prevent any planned increase in the scale of production. A peculiar problem faced by the small scale farms was inadequate extension services. Generally speaking in Nigeria,

extension services tend to favour crop farmers in terms of both the frequency of extension visits and technologies introduced. Inadequate access to extension services by the small size farms can also be responsible for the observed low level of technical efficiency compared to the medium size farms.

Conclusion

The production of poultry egg after the Avian Influenza outbreak in North central Nigeria is still profitable and there exists a significant scope to increase poultry egg production and profitability especially through improvements in technical efficiency and scale of operation. In addition, the provision of subsidies to poultry farmers by the government on inputs such as feeds and vaccines can go a long way to reduce the cost of production.

References

Alabi, R.A. and Isa A.O. 2002. Poultry production constraints: The case of Esan West L.G.A. of Edo state, Nigeria. *African Journal of Livestock Extension,* 1:58-61

Charnes, A., Cooper, W.W. and Rhodes, E. 1978. Measuring the efficiency of decision making Units. *European Journal of operation Research,* 2: 429 – 444.

Coelli, T.J., Rao, D. S. and Battese, G. E. 1998. *An Introduction to Efficiency and Productivity Analysis*. Kluver Academic Publishers, Norwell, MC.

FAO. 1992. FAO production year book. Volume 45, Rome.

Farell, M.J. 1957. The measurement of Productive Efficiency. *Journal of Royal Statistical Society,* Series A (general) 21: 253-81

Helfand, M.S. 2003. Farm Size and the Determinants of Productive Efficiency in the Brazilian Center-West Contributed Paper Selected for Presentation at the 25th International Conference of Agricultural Economists, Durban, South Africa. August, 16-22.

Mayhew, S. and Penny A. 1988. Tropical and sub-tropical foods. Macmillan Publishers Ltd: London.

Mijindadi, N.B. 1981. Production Efficiency of Farms in Northern Nigeria unpublished PhD Thesis, Cornel University, USA.

Kumbhaker, S.C. and Lovell, C.A.K. 2000. Stochastic Frontier Analysis. Cambridge, University Press UK.

Olayemi, J.K. 1998. Food Security in Nigeria. Research Report No. 2. Development Policy Centre, Ibadan. Pp: 1-78.

Rahman, S.A and Yakubu, A. 2004. Analysis of poultry egg production, distribution and consumption in parts of Nasarawa state, Nigeria. *International Journal of Natural and Applied Sciences,* 1(1):1-4.

Sharma, K.R., Leung, P.S. and Zaleski, H.M. 1999. Technical, Allocative and Economic Efficiency in Swine Production in Hawaii: A comparison of parametric and non parametric Approach. *Agricultural Economics,* 20 (1):23-35.

Sani, R.M., Tahir, I. and Kushwa S. 2000. Economics of Poultry Production in Bauchi state: A case study of Bauchi L.G.A. *Nigeria Journal of Animal Production,* 27 (1): 109-133.

Yusuf S.A. and Malomo, O. 2007. Technical Efficiency of Poultry Egg Production in Ogun state: A Data Envelopment Analysis (DEA) Approach. *International Journal of Poultry Science* 6(9):622-629.

Ojo, O.M., Ojezele, M.O. and Okoruwa, V.O. 2007. The Economic Effect of Avian Influenza on Poultry Production in Southwest Nigeria.