DETERMINANTS OF TECHNICAL EFFICIENCY OF SMALL - SCALE BROILER PRODUCTION ENTERPRISES IN BENUE STATE, NIGERIA.

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ABSTRACT

This study analyzed the technical efficiency of small-scale broiler production in Benue State, Nigeria. Purposive and simple random sampling technique was employed to select 205 respondents during the 2015 and 2016 session. The data for the study were obtained using structured questionnaire. Descriptive and inferential statistics such as stochastic frontier production function were used to achieve the objectives of this study. Result indicated that the mean technical efficiency was 0.76 which suggest that the broiler farmers were not technically efficient and there exist scope for improvement in the level of technical efficiency. The results also showed that the respondents were not scale efficient in their broiler production activities. High costs of feed, inadequate fund and disease control were the major constraints that are faced by farmers. The study recommended that credit should be made available to broiler farmers by both private and public financial institutions at low interest rates to enhance increase in flock size.

Keywords: Broiler Production, Benue State, Feed Cost, Technical Efficiency.

INTRODUCTION

The agricultural sector plays significant role in the economics of developing countries, especially in sub-Saharan Africa (SSA). Despite such importance, productivity has remained low and this is no exception in Nigeria (World Bank, 2008). The agricultural sector is almost entirely dominated by small-scale resource poor farmers living in rural areas, with farm holdings of 1 to 2 hectares, which are usually scattered all over wide areas (Alimi, 2012). The poultry sub-sector is the most commercialized (capitalized) of all the sub sectors of the Nigerian agriculture. Poultry meat and egg offer considerable potential for meeting human needs for dietary animal supply (Folorunsho and Onibi, 2005). Poultry production in the past was not counted as an important occupation in some communities; the fowl was used in the past as a means of knowing the time. Nowadays, poultry production has developed and occupies a place of pride among the livestock enterprise due to its rapid monetary and animal protein (Lascinde, 2000). Protein is an important organic compound utilized by the body for the replacement of broken down body...
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cells and tissue and is important for maintenance of the general body metabolism. Despite this foundational role played by protein in the human body, many scientists have repeatedly called attention to a serious imbalance between protein supplies and human requirements in Nigeria (Lascinde, 2000). Agriculturists and nutritionists have however unanimously agreed that developing poultry would be the fastest means of bridging this protein deficiency gap in the country. It was found that, as early as 1968/1969 poultry products contributed about 0.4% of the total protein intake on per capital basis (CBN, 2006).

The poultry industry in Nigeria has undergone a significant transformation from peasant to modern production system. This can be found in the countryside and urban centers today (CBN, 2006). Because of increase in population and demand for animal protein, different sources of poultry protein are available, one of which is the broiler, which serve as a good source of animal protein. Studies have shown that animal protein, apart from its profitability in terms of income to the farmers, is essential for normal physical and mental development of man (Food and Agricultural Organization, 2007). In a large number of low-income countries, small-scale household production is the largest system of poultry production and a substantial source of income and nutrition for poor households. In Ghana, for example, rural poultry account for 60-80 percent of the national poultry population (FAO, 2006). In a small-scale poultry production, the poultry are kept under low-input, low-output conditions and managed by the women and children of the household (Shinde and Srivastava, 2007).

Small-scale commercial poultry production farms are generally characterized by flocks’ size ranging from 50-1000 birds of local breeds or exotic-breeds (Shinde and Srivastava 2007). Omotosho and Ladele (1998) classified poultry farm of 1000 birds and below as small scale. Farmers usually provide housing structure made of local materials, purchase part of their feeds, use vaccines and veterinary services whenever available. This system is more prevalent in urban and semi-urban areas. output is usually sold to nearby urban centers with varying degrees of organization in the marketing system, (Shinde and Srivastava, 2007).

The role of the poultry industry in Nigeria has assumed a significant status over the years in terms of social, economic and dietary importance to both country and citizenry. The Food and Agriculture Organization reports that Nigeria produces above 550,000MT of poultry meat per annum and 700,000MT of eggs (FAO 2010). This attracts some form of interest because apart from bridging the protein deficiency gap in our diets, it also empowers the people especially the rural poor economically. Interestingly, poultry meat and eggs are consumed animal protein without (or little if any at all) religious or cultural prohibitions in Nigeria. It was recorded that the poultry industry contributed about 25% of the country’s Agricultural, Gross Domestic Project (GDP) (FAO, 2010) and meets the needs of man in meat and egg supply, organic fertilizers, research, medicine and aesthetic value (Atteh, 2004).

However, inadequate capital, illiteracy and lack of technical experience are some of the most important socio-economic
factors inhibiting poultry production in Nigeria. The technical aspect is of serious concern because the combination of these limited resources and inputs have important implications on the output level and to a large extent the trading of meat and poultry products globally (Lande et al., 2004). Hence the capacity to develop technical production practices that are consistent with environmental and economic conditions is important to boost poultry production in Nigeria. Therefore, the question of how technically efficient the producers are arises.

Objectives

1. Determine the input-output relationship in broiler production in the study area.
2. Determine the Technical efficiency of small-scale broiler farmers in Benue State.
3. Identify the constraints to small scale broiler production in the study area.

MATERIALS AND METHODS

The Study Area

The area of this study is Benue State of Nigeria. Benue State was created in 1976 and is located in the middle belt region of Nigeria with the capital at Makurdi. Benue State lie approximately between latitudes 6°30′N and 8°10′N of the equator and longitudes 6°35′E and 8°10′E of the Greenwich meridian (BNARDA, 2005).

Benue State is considered as one of the hottest States in Nigeria with an average minimum and maximum temperature of 21°C and 38°C respectively. It is in the southern guinea savannah ecological zone, which has a typical climate with the clearly marked seasons of dry season (late October to March) and wet season (April to early October). The State annual rainfall ranges from 1700mm in the southern part to 120mm in the northern ecology of the State.

The important feature of the State is the river in which the State derived its name from. The State share boundaries with five States, Nassarawa to the North, Taraba to the East, Cross-River to the Southeast Enugu to the Southwest and Kogi to the west. The southern part of the State is also bounded with republic of Cameroun.

Benue State has a land mass of about 33, 955km² with 23 local government areas. Geographically and agriculturally, Benue State is divided into three zones, Zone A (Katsina-Ala, Ukum, Ushongo, Vandiekya, Logo Kwande and Konshisha Local Government Areas) Zone B (Gboko, Tarka, Buruku, Gwer East, Gwer West, Guma and Makurdi Local government areas), Zone C (Ado, Agatu, Apa, Otukpo, Ohimini, Okpokwu, Ogbadibo, Obi and Oju Local Government Areas).

The State has a total population of 4,219,244 million people (National Population Commissions 2006). About 80% of the State population is directly involved in agriculture. It is also called the food basket of nation, because the State produces agricultural products in large quantities. Some farmers in the study area have taken poultry production as their source of livelihood.

Population and Sampling Procedure.
The population of the study consist of all poultry farmers who are involved in broiler production. Sample was selected using multi-stage sampling techniques. In the first stage, Benue State was divided into three development agricultural zones - Zone A, B and C. In the second stage, one Local Government Area (LGA) was purposively selected from each of the three agricultural development zones as created by BNARDA. The LGA selected are Makurdi LGA in zone B, Kastina-Ala LGA in zone A and Otukpo LGA in zone C. These LGA were selected based on the intensity of activities of poultry (broiler) productions. Following data collected from these LGA on broiler producers by the Federal Ministry of Agriculture (FMA), the sampling frame for the study was obtained to be 1025. In the final stage sample size was obtained by selecting 20% proportionately from the sample population of broiler farmers from the selected LGAs in the three zones. Simple random sampling technique therefore was used to select thirty-six broiler farmers from Kastina-Ala LGA, One hundred and twenty-nine (129) broiler farmers from Makurdi LGA and forty (40) broiler farmers from Otukpo LGA. The sample size for the study was 205 broiler farmers. The sampling plan for the study is shown in table 1.

Data Collection and Analysis

Data for this study were obtained from primary sources with the use of a well-structured questionnaire administered through trained enumerator acting as extension agents. Data on socioeconomic characteristics of respondent, input allocation and constraints associated with broiler production were obtained for the study. Prior to the administration of the questionnaire, the questionnaires were pre-tested and necessary corrections were made. Content validity was used to determine adequacy of the research instrument. In the process, the instrument was thoroughly examined by appropriate experts independently. The experts gave their opinion on the adequacy and relevance of the instrument to the objectives of the study. The observation was harmonized and necessary correction were effected on the instrument before the field survey commenced.

The reliability of the instrument was determined using the test-retest method. Twenty copies of the questionnaire were administered to some respondent in the study area. After a month the same instrument was administered to the same respondents. The scores obtained were correlated using Pearson’s product moment correlation. A correlation coefficient of 0.72 was obtained. The value indicates reliability of the instrument for the study.

The data collected for this study were analyzed using both descriptive and inferential statistics. The descriptive statistics such as mean, frequency and percentages was used to analyze the constraints associated with broiler production while the Cobb Douglas function of the stochastic frontier production model was used to determine the technical efficiency of small scale broiler farmers because when linearized in log, the function is easy to fit and the coefficients are elasticities.

Model Specification

Technical Efficiency Model
The production functional form of the Cobb-Douglas Stochastic frontier model is given below: $Y_i = B_0 X_1^{b_1} X_2^{b_2} \ln Y_i = B_0 + B_1 \ln X_1 + B_2 \ln X_2 + B_3 \ln X_3 + B_4 \ln X_4 + B_5 \ln X_5 + V_i - U_i \ldots (1)$

$\ln$ = Natural logarithm to base 10
$Y$ = Total output of the broiler (kg)
$B$s = The parameters estimated
$X_1$ = Flock size (number)
$X_2$ = Labour used per production cycle (man-day’s)
$X_3$ = Quantity of feeds used per cycle (kilogram)
$X_4$ = Quantity of water used (Litres)
$X_5$ = Cost of medication (Naira)
$V_1$ = Random errors which are assumed to be independently and identically distributed.
$U_1$ = Non-negative random variable associated with technical inefficiency of production.

**A priori expectation** was that $b_1, b_2, b_3, b_4 > 0$ while $b_5 < 0$

The inefficiency of production was modeled in terms of the factors that are assumed to affect the efficiency of production of the farmers. Such factors are assumed to be independently distributed such that $U$, is obtained by truncation (at zero) of the normal distribution with hardness $\delta^2$ and mean $U$ where the mean is defined by

$U_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + \delta_7 Z_7 + \delta_8 Z_8$

Where $\delta$ = a factor of unknown parameters to be estimated.

$Z_1$ = Age of farmers (years)
$Z_2$ = Level of education (number of years spent in formal school)
$Z_3$ = Farming experience (years)
$Z_4$ = Household size (number living together in a house)
$Z_5$ = Farm size (number of broiler kept per cycle)
$Z_7$ = Extension contact (number of extension contacts in a year)
$Z_8$ = Marital status (1= married, 0 = not married).

**RESULTS AND DISCUSSION**

Input – Output Relationship in Small-Scale Broiler Production in Benue State.

Table 2, summarize the estimates from the stochastic production function of small-scale broiler farmers in the study area. The maximum Likelihood Estimates of the parameters of the estimated model showed that all the coefficients of the variables of the production function, except for cost of medication conformed to a priori expectation and were positive. The result indicates that flock size, feed and water were the inputs that significantly affected broiler output.
Specifically, flock size, feed and water used were positive and significantly influenced broiler output of farmers at 1 percent level of probability. The estimated coefficient of flock size was 0.066 and was significant (p < 0.01), indicating that an increase in stock size will lead to an increase in the output of broilers. According to Iheanacho and Amos (2001), an increase in flock size means that more inputs will be used and consequently, it means that more increase could be experienced in the output of broilers, by increasing the number. This further agrees with the findings of Oladeebo and Ambe-Lamidi (2007), that variables of total number of birds stocked and feed intake by the birds were positive and significant in broiler production. Subahash et al. (1999) and Ajibefun (2000) demonstrated that increases in feed intake and stock size will bring about a corresponding increase in output.

The estimated coefficient for feed intake was 0.010 and was significant (p<0.01), indicating that an increase in feed intake by the birds will increase their output. Effiong (2005), Etim (2009), Ike (2011), Ezeh: Anyiroyo and Chukwu (2012) and Areerat – Todsade et al. (2012), demonstrated that feed intake and stock size were significant determinants of output in broiler production. This is because if the birds are given the right quantity and quality of feed they will grow well in terms of size and weight. This will eventually increase output of broiler for farmer. In addition, if farmers increase their stock size this will also increase output of broiler and then their revenue will also increase.

The coefficient of water used was also positive, meaning that as water use increased, more output accrued to the farmers. This can however, be possible to a certain limit, due to the law of diminishing returns. Iheanacho and Amos (2001) also observed that in production this kind of relationship is expected where the available input is efficiently managed along with other resources in order to avoid diminishing returns. Emenyonu et al. (2006) reported that the coefficient of water was positive but an insignificant determinant of the output of broilers.

The coefficient of medication cost was also positive. However, its coefficient was not significant at either 1% or 5% level. This shows good management resulting to less health problems for the birds. This is in line with the findings of Oladeebo and Ambe-Lamidi (2007), who observed that hygiene in poultry production must be taken serious as this will reduce disease and increase broiler output.

The estimated production function equation is:

\[ \ln Y = -0.689 + 0.066X_1 + 0.001X_2 + 0.010X_3 + 0.006X_4 + 0.026X_5 \ldots \ldots \]

From the nature of the Cobb-Douglas SPF, the coefficients that are also known to be the estimated parameters of variable are the elasticity of production of the variables. Result presented in Table 2 showed the partial elasticities of production with respect to the explanatory variables and it indicated the relative importance of the factors used in broiler production. From the findings, the elasticity of feed intake was 0.01 meaning that a 1% change in feed intake will bring about a 10.0% change in output of broilers if other factors are held constant. This result compares favorably with the findings of Etuk et al. (2007) who reported elasticity coefficient of 0.26 for feed intake.
in the study of Broiler production in Cross River State.

Labour had an elasticity of 0.001 meaning that for a 1% change in labour input, output of broilers would change by 0.1% Medication cost had an elasticity of 0.026, meaning that a 10% change in medication cost would bring about 2.60% increase in output of broiler production in the study area. The elasticity of flock size was 0.066 indicating that a 10% change in flock size would bring about a 6.6% change in the output of broilers. All the variable elasticities were less than unity indicating that output of broiler production is inelastic with respect to the above factors. As a result, a change in the use of these variables would lead to a less than proportionate change in the output of broilers. In summary, the variables specified in the model had inelastic effect on output. The sum of the elasticities represents the return to scale.

The summation of the elasticities of the inputs that served as the measure of total resource productivity was less than one, suggesting that the respondents were operating at decreasing returns to scale. In other words, they were producing in stage 2 of the production function. This is an indication that broiler farmers could benefit from economies of scale linked to increasing returns in order to enhance production. At this rational stage (stage II), production could be increased by using more of the factors with positive elasticities especially flock size, which was observed to be the most important factor in broiler production in the study area. This agrees with the result of Alabi and Aruna (2005), who reported return to scale of 0.29 in their study of family poultry production in the Niger - Delta region of Nigeria. They concluded that the farmers were in stage 1 (inefficient stage) of the production process. The return to scale was 0.11 with respect to flock size, feed, water used, medication and labour used. Technically, small-scale broiler farmers are in stage 1 of their production cycle as the output is increasing at increasing rate relative to quantity of input use. This also implies that 1 percent increase in all inputs lead to more than 0.11 percent increase of output.

**Determinants of Technical Inefficiency of Small-scale Broiler Farmers in Benue State.**

Results of the diagnostic statistics presented in Table 2 indicated that there were technical inefficiency effects in broiler production in the study area. This was confirmed by the significant value of the gamma coefficient. A gamma (Γ) value of 0.29 indicates that 29.0% of the variations in the output of broiler production by the respondents was attributable to technical inefficiency effects alone, while 71.0% was due to random effects. In addition, the generalized likelihood ratio was significant at 1% level, suggesting the presence of one sided, error component. This means that inefficiency factors were significant in the stochastic frontier model. As indicted in the table, the estimated sigma square (σ²) was significant at 1 percent level of probability for small-scale broiler farmers indicating goodness of fit and correctness of the specified distribution assumption of the composite error terms.

The estimated coefficients of the technical inefficiency effects model indicated that farm experience, marital status, and education had significantly influenced technical inefficiency of small-scale broiler
farmer in Benue State. Household size and marital status and access to extension services reduced significantly the effect of technical inefficiency of smallholder broiler farmers in the study area. The coefficients of marital status and household size were negative and significant at 1 percent level of probability. The implication is that technical inefficiency effects in small-scale broiler production in Benue State declined with increase in these variables. In order words, farmer’s marital status, and household size have negative effects on technical inefficiency in small-scale broiler production.

This is important for achieving effective utilization of inputs in small-scale broiler production in Benue State. The findings of Bravo-Ureta and Pinheiro (1997) who reported that household size has influences on technical efficiency in guinea fowl production in Pakistan conform to this study. This means that large household size may utilize farm labour which helps in reducing direct labour cost and creates formidable basis for improved technical efficiency in broiler production in Benue State (Mubmik and Flinn, 1998). However, this result disagrees with the findings of Nwachukwu and Onyenweaku (2007), Onyenweaku and Nwaru (2005), which showed household size to increase technical inefficiency in broiler production.

The negative sign of the coefficient in marital status indicates that married people are faced with more responsibility hence they pay more attention to their business. This will result in the reduction in the levels of technical inefficiency or an increase in technical efficiency. This implied that married farmers were technically efficient due probably to increase in the availability of cheap labour to manage the farm as compared to single farmers who depended solely on their labour and possibly hiring during critical periods of labour requirement for the accomplishment of operations. This finding is not in consonance with the study by Ashagidigbi et al. (2011) who found a positive coefficient for marital status in Plateau State, Nigeria.

Technical Efficiency Estimates of Small-Scale Broiler Farmers in Benue State

The technical efficiency estimates summarized in table 3 indicate that small-scale broiler farmers in Benue State had technical efficiency varying from 20 to 86 percent with a mean of 76 percent. The wide range of values indicates large variations in performance across farms. The implication of this result is that broiler farmers in the study area were not utilizing their production resources efficiently. The foregoing result suggests that most of the broiler farmers in the study area had not yet reached the production frontier, indicating that they were not obtaining maximum output possible from their given quantum of inputs. In other words, technical efficiency among the respondents could be increased by 24 percent in the study area through better use of available production resources, given the current state of technology.

This would enable the farmers obtain maximum output possible from their given quantum of inputs, and hence increase their farm incomes, thereby facilitating expansion in broiler production.

The implication of the foregoing result is that if the average broiler farmer in the sample were to achieve the technical efficiency level of his or her most efficient
counterpart in Benue State he or she would realize 14 percent more productivity. This suggests that the scope for efficiency gains is large (Percentage increase in mean efficiency = \[(1 - \text{mean efficiency}/\text{maximum efficiency})]\)*100). Technical efficiency in broiler farming in the study area could be increased by up to 24 percent on average, using the current production technology. By simple analogy, this implies that broiler productivity in the study area could be greatly enhanced using current production technology, if key factors that currently constrain production efficiency are adequately addressed.

Specially, 0.5 percent of small-scale broiler farmers had technical efficiency of 0.31 to 0.60; 98.5 percent had technical efficiency of 0.61 to 0.90. None of the farmer attained the frontier efficiency. The most efficient farmer has efficiency of 86 percent. The respondent was 43 years, married with 7 years of farming experience in the business. The farmer also has household size of nine and has post-secondary education.

Broiler production was a secondary occupation with farm size of 300 broilers while the least efficient farmer had 20 percent efficiency. They will both require 14 and 80 percent more efforts to get to the frontier efficiency respectively.

**Constraints Faced by Small-Scale Broiler Farmers in Benue State**

The study revealed the various challenges faced by the sampled broiler farms in the study area (table 4). The constraints were ranked with one as the topmost and 11th as the least problem. Thus, the constraints with the highest frequency ranked the most pressing problem while the least frequency score is the least pressing.

The result revealed that majority of farmers were faced with the problem of high cost of feed, inadequate funds and disease control problems (97%) and ranked 1st. This may be due to the fact that the farmers are subsistent, inexperienced and do not have access to extension agents to cater for these problems. High cost of medication (96.6 percent) ranked 2nd was another problem faced by farmers. This is due to high cost associated with imported drugs. High cost of day old chicks (93.6 percent) ranked 3rd was another problem faced by farmers.

Lack of Storage facilities (66.5 percent) ranked 4th was also a problem faced by small-scale broiler farmers and this may be because rural areas where the farmers operate are less developed. The result further revealed that access to extension services (65 percent), was ranked 5th as another factor that hinders small-scale production. This may be due to the limited extension to farmer ratio (1:2500) in Nigeria. Unavailability of quality feed (55.2 percent) and high mortality rate (46.8 percent) were other constraints in small-scale broiler production.

**CONCLUSION AND RECOMMENDATIONS**

The results suggest that most of the broiler farmers in the study area had not yet reached the production frontier, indicating that they were not obtaining maximum output possible from the given quantum of inputs. In other words, technical efficiency among the respondents could be increased by 24 percent in the study area through better use of available production resources given the current state of technology. This would enable the farmers obtain maximum output possible from
their given inputs and hence increase their farm incomes thereby facilitating expansion in broiler production.

The results further showed that high cost of feed, inadequate fund and diseases control were the major constraints that are faced by the farmers.

Based on the findings of the study the following recommendations were made:

i. The efficiencies of the farmers can be increased by constant and regular introduction of new techniques and innovation in poultry farming. This can only be made possible however, by an efficient and effective government driven extension system which will propel regular training and retraining.

ii. Government and policy makers should encourage farmers to embrace more of mechanization by providing them with subsides, leasing at affordable prices and creating a framework which will enable them have easy access to them.

iii. Broiler producers’ cooperative societies should be established, to facilitate accessibility to loan by members, as well as joint purchase of costly facilities like cold room, cooling vans and feed mill, which an individual cannot purchase on his/her own.

REFERENCES


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Table 1: Sampling Plan

<table>
<thead>
<tr>
<th>LGA</th>
<th>Sampling Frame</th>
<th>Sample proportion</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Katsina-Ala</td>
<td>180</td>
<td>0.2</td>
<td>36</td>
</tr>
<tr>
<td>Makurdi</td>
<td>645</td>
<td>0.2</td>
<td>129</td>
</tr>
<tr>
<td>Otukpo</td>
<td>200</td>
<td>0.2</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>1025</td>
<td>0.2</td>
<td>205</td>
</tr>
</tbody>
</table>

Source: Federal Ministry of Agriculture, Poultry Value Chain (2014)

Table 2: Maximum Likelihood Estimates for Parameters of the Stochastic Frontier Production Model for Broiler Production in Benue State.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter</th>
<th>Estimate</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stochastic Frontier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>$\beta_0$</td>
<td>-0.689</td>
<td>0.074</td>
</tr>
<tr>
<td>Ln (Flock size)</td>
<td>$\beta_1$</td>
<td>0.066</td>
<td>4.754***</td>
</tr>
<tr>
<td>Ln (Labour)</td>
<td>$\beta_2$</td>
<td>0.001</td>
<td>0.037</td>
</tr>
<tr>
<td>Ln (Feed)</td>
<td>$\beta_3$</td>
<td>0.010</td>
<td>22.751***</td>
</tr>
<tr>
<td>Ln (Water)</td>
<td>$\beta_4$</td>
<td>0.006</td>
<td>6.649***</td>
</tr>
<tr>
<td>Ln (Medication)</td>
<td>$\beta_5$</td>
<td>0.026</td>
<td>0.876</td>
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<tr>
<td>Inefficiency Model</td>
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<tr>
<td>Constant</td>
<td>$\delta_0$</td>
<td>0.027</td>
<td>0.022</td>
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<tr>
<td>Age</td>
<td>$\delta_1$</td>
<td>0.001</td>
<td>1.473</td>
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<tr>
<td>Sex</td>
<td>$\delta_2$</td>
<td>0.007</td>
<td>0.880</td>
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<tr>
<td>Education</td>
<td>$\delta_3$</td>
<td>0.009</td>
<td>2.633***</td>
</tr>
<tr>
<td>Farm experience</td>
<td>$\delta_4$</td>
<td>0.007</td>
<td>1.904*</td>
</tr>
<tr>
<td>Household size</td>
<td>$\delta_5$</td>
<td>0.006</td>
<td>-5.165***</td>
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<tr>
<td>Extension Access</td>
<td>$\delta_6$</td>
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<td>-0.041</td>
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<tr>
<td>Marital Status</td>
<td>$\delta_7$</td>
<td>-0.000</td>
<td>-4.758***</td>
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<tr>
<td>Variance Parameters</td>
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<tr>
<td>Sigma Squared</td>
<td>$\sigma^2$</td>
<td>0.004</td>
<td>10.283***</td>
</tr>
<tr>
<td>Gamma</td>
<td>$\gamma$</td>
<td>0.290</td>
<td>1.962**</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2016

*** t-ratio is significant at 1 percent level of significance
** t-ratio is significant at 5 percent level of significance
* t-ratio is significant at 10 percent level of significance.
### Table 3: Distribution of Respondents by Technical Efficiency Estimates.

<table>
<thead>
<tr>
<th>Technical Efficiency</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10 - 0.30</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>0.31 - 0.60</td>
<td>2</td>
<td>1.0</td>
</tr>
<tr>
<td>0.61 - 0.90</td>
<td>200</td>
<td>98.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>203</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Source: field survey, 2016.*

### Table 4: Constraints Faced by Small-Scale Broiler Farmers in Benue State, Nigeria.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Rank **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate Funds</td>
<td>197</td>
<td>97</td>
<td>1</td>
</tr>
<tr>
<td>High Cost of Feed</td>
<td>197</td>
<td>97</td>
<td>1</td>
</tr>
<tr>
<td>Disease Control Problem</td>
<td>197</td>
<td>97</td>
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<td>High cost of drugs</td>
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<tr>
<td>High cost of day old chicks</td>
<td>190</td>
<td>93.6</td>
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<tr>
<td>Lack of storage facilities</td>
<td>135</td>
<td>66.5</td>
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<tr>
<td>Inadequate extension service</td>
<td>132</td>
<td>65</td>
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<tr>
<td>Unavailability of quality feed</td>
<td>112</td>
<td>55.2</td>
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<td>High mortality</td>
<td>95</td>
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<td>10.2</td>
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<td>Thieves</td>
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<td>9.4</td>
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<td>High tax charges</td>
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<tr>
<td>Shortage of chicks</td>
<td>11</td>
<td>5.4</td>
<td>11</td>
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*Source: Field Survey, 2016. Multiple Recorded.*

**Ranks are arranged in descending order of importance.**