Samaru Journal of Agricultural Education (SJAE). **Vol. 7:2** **ISSN 0794 – 7860**
Published by Agriculture and Veterinary Complex, A.B.U., Zaria

Profitability and Technical Inefficiency among Toll Feed Mills in Nigeria

[1]I. Sani, [2]S.A. Rahman, [3]M.A. Damisa, [3]T.K. Atala, [1]I.J. Sambo, [1]S.A. Makama and [3]A.A. Hassan
[1]National Agricultural Extension and Research Liaison Services, ABU Zaria
[2]Federal University Gashua
[3]Institute for Agricultural Research/Faculty of Agriculture. ABU Zaria

ABSTRACT: The study assessed the technical efficiency of poultry toll feed industries in Nigeria. It examined the efficiency of input used; profitability level;determinantsof profitabilityand constraints to feed production. Primary data were collected using a set of structured questionnaire from a sample of 134 toll mills from 12 states across the 6 geo-political zones of Nigeria. The data were analysed using descriptive statistics, net income and stochastic frontier analysis. The findings indicated that the toll feed mills were characterized with an average of 15 years milling experience, operating on average of 5days/week,producing an average of 16.5 tonnesof feed per day. The mills produced mainly feed in mash form for broilers, pullets, layers and cockerels withan average of ₦14, 277.07 profitfrom the production of 1000Kg of poultry feed and a return to Naira invested of ₦0.1766. The mills were found to be technically inefficient with mean technical efficiency of 0.82 which is below the frontier value of 1. The determinants of profitability include, distance to ingredient sources, source of power, number of months ingredients are available, access to credit, mill size. Some of the constraints to more efficient and profitable poultry feed production identified include: adulteration of feed ingredients, fluctuation in prices and seasonal nature of the ingredients availability. Based on the findings it can be concluded that feed production was profitable. It was therefore, recommended that the mills should have access to more credit facilities to ensure expansion and reduction of costs through bulk purchase and storage of feed formulation ingredients.

Keywords: *Technical efficiency; Toll feed mills; Poultry feed; Net Income, Profitability*

INTRODUCTION

The downturn in the Nigerian economy in the early eighties coupled with the massive devaluation of the Naira caused many workers to lose their jobs in both the public and private sectors. According to Tinuke (2013), Nigeria's economic condition escalated to a crisis during the 1983-84 period when government in the Federation could not meet its financial obligations and about 256,150 workers were retrenched in the public sector during the period compounding the problems of an already bad economy as unemployment increased. This has forced many people to seek investment in crops and livestock sectors including agro-processing through feed milling activities (Oyedeji, 2006).

This was also the time the poultry industry began to recover from the effects of the ban on maize importation in 1983 which affected the poultry feed milling industry. Traditionally, the bulk of maize being used at that time was being imported as local supplies continued to be inadequate as a result of drought, diseases and lack of adequate administration of the strategic reserves (Oyedeji, 2006). Local sources of protein ingredients also collapsed leading to an acute shortage of groundnut and soybean cakes. Feed milling and poultry business

saniisiaku2004@yahoo.com

almost collapsed. To save the situation, Livestock Feeds Limited a subsidiary of Pfizer embarked on a project of teaching farmers how to compound their own feeds through the use of their concentrate or 5% premises if concentrates or finished feeds were not available (Oyedeji, 2006). This was a major turning point as local fabricators of feed mills sprang up leading many farmers to own their own feed plants using concentrates, premixes or basic ingredients.

The Nigerian economy relies heavily on oil exports with agriculture almost relegated to the background despite its importance in employment, revenue, food and raw materials generation(ATA,2011). Arable land is 33% of the total land mass. Major agricultural produce include; cocoa, peanuts, palm oil, maize, rice, sorghum, wheat, millet, cassava, yams, rubber; cattle, sheep, goats, poultry (local and foreign chickens, turkey, quails, guinea fowl, etc.), pigs; timber; fish. The labour force stands at 50.13 million; with agriculture taking 70%, industry 10%, services 20% (2014 NPC est).

In Nigeria, commercial feed milling commenced in 1963 by Pfizer, (Now Livestock feed Plc). The number of feed mills in the country has been increasing since then. The number of feed millers grew to 303 as at 1983 with a combined installed capacity of 1039 tonnes per hour. Feed production rose from 640,000 tonnes in 1980 to 2.4 million tonnes in 1985, this then declined to about 1.0 million tonnes by 2008 (Eruvbetine, 2009). The feed industry comprises two sectors: the small-scale and the commercial sectors. The commercial sector manufactured nearly 1.7 million tonnes or 65.4 percent of the country's poultry feed while the Toll millers and farm mixed feed mills constitute the remaining 35% of the total poultry feed produced in the country(Fagbenro and Adebayo, 2005).

Although the intensive production of poultry has risen steadily over the years, a major constraint to its expansion is inadequate feed supply. The poor quality of feeds available in the industry generates high poultry mortalities, stimulates low productivity and consequently, produces a low rate of return on investment (Fagbenro and Adebayo, 2005; and Oladejo, 2012). An efficient feed mill industry is therefore crucial to the sustainability of viable livestock and poultry production enterprises. There are however, few studies that have been carried out on poultry feed production in some southern States of Nigeria. These include studies by Mbanasor and Jonas (2006), Hassan *et al.*, (2005), Oladejo (2012), Mukaila *et al.*,(2012),and Oladoja and Olusanya(2009). Most of these studies found that there is a high level of inefficiency among the feed mills sampled. This thereforenecessitates this study which examined level of profit and technical efficiency of toll millers in Nigeria and provides answers to the following questions:

This study therefore, examined the production efficiency of poultry toll feed mill business in Nigeria. Specifically it examined:

i) the characteristics of toll feed mills in Nigeria;
ii) the profitability level of the toll feed mills;
iv) thepoultry toll feed mills'technically efficient and
v) the determinants of technical inefficiency in toll feed milling in the study area.

METHODOLOGY

Study Area: The study covers the six geopolitical Zones of Nigeria. Nigeria has a land area of 351,649 sq miles (910,771 sq km) with a population of 177,155,754 (NPC, 2014). It lies between Latitudes 4^{o} to 14^{o} North and between Longitudes $2^{o}2'$ and 14^{o} 30' East.

Sampling Technique and Sample Size: A three-stage sampling technique was used. The first stage involved the purposive selection of two states from each geopolitical zone. The second stage involved the selection of areas that have high concentration of poultry mills in the selected states. The third stage involved random selection of sample mills, in states having a high number of toll feedmills. In states with a few toll mills, the whole population of the millers was chosen. Kaduna and Kano States were selected from the North West, Niger and Kwara States North Central zone, while Bauchi and Gombe were chosen from the North East Zone. Oyo and Ogun States from the South West Zone, Edo and Akwa Ibom from the South South Zone; while Abia and Enugu States were selected from the South East. A total of 134 toll feed millers were used for data collection.

Table: 3. 1: Sample frame for Poultry Toll Feed Milling Industries from 12 seleted states of Nigeria

Location	States	Sampling frame	Sample Toll mills
North West	Kaduna	65	22
	Kano	50	21
North Central	Kwara	35	8
	Niger	25	6
North East	Bauchi	2	1
	Gombe	1	1
South West	Oyo	115	28
	Ogun	87	27
South East	Abia	20	8
	Enugu	20	7
South South	Edo	20	2
	Akwa Ibom	11	3
Total		**450**	**134**

Source: Various State Feed Millers Association, PAN, ADPs and NAERLS zonal offices.

Cross-sectional data were collected for this study through the administration of structured questionnaire. Information collected from the millers include: experience of owners/operators of the feed mills and their educational level, mill capacity, type of technology used, location of the mill, access to and availability of electricity, distance from sources of inputs, access to credit and membership of millers association. Production information collected include: quantity of inputs such as maize, soybean, groundnut cake, maize, rice and wheat bran, palm kernel cake and fish meal used in feed production, the outputs and their prices, various costs (fixed and variable) incurred in the production process, revenue generated and the problems of the feed mills.

Analytical Techniques: The analytical techniques that were used for this research to achieve its objectives include: descriptive statistics for the attributes/characteristics of the mills usingfrequency counts, percentages and mean, Net Income Analysisto determine the net income accruing to the feed mills and the average rate of return per Naira invested in the milling industry and stochastic frontier

production function for the estimation of production efficiency and its determinants using the Maximum Likelihood Estimation (MLE) technique.

Model Specification:

Net Farm Income

$NI = \sum PiYi - \sum Pjxj + \sum Fk$……...(1)

Where;

NI = Net Income from feed sales (₦/Kg),

Yi = Output (Quantity of Feed produced, in Kg),

Pi = price of output (Selling price of feed in ₦/Kg),

Pj = price of inputs used in feed production in ₦/Kg),

Xj = Quantity of Variable Inputs used in Kg),

Fk = Cost of Fixed Inputs such as Depreciation on machinery, Rent charge, Tax, (₦),

$\sum$ = summation sign.

Empirical stochastic frontier model specification

The Cobb–Douglas frontier production function was used in this study. Taylor and Shonkwiler (1986) noted that as long as interest rests on efficiency measurement and not on the general structure of the production technology, the Cobb–Douglas production function provides an adequate representation of the production technology. The stochastic frontier model is specified as:

$$\ln Y_i = ß_0 + ß_1 \ln x_1 + ß_2 \ln x_2 + ß_3 \ln x_3 + ß_4 \ln x_4 + ß_5 \ln x_5 + (V_i - U_i) \quad \ldots\ldots(2)$$

Where;

$\mathbf{Y_i}$ = output of feed from the i^{th} mill (Kg),

$\mathbf{x_1}$= Mill Size (Kg/production cycle)

$\mathbf{x_2}$ =quantity of feed ingredients (Kg/production cycle), that is quantity of maize, maize bran, wheat bran, soybean cake, ground nut cake, palm kernel cake, limestone, bone meal, methionine, lysine and vitamin premix in all in Kg.

$\mathbf{x_3}$ = labour (manhours/production cycle),

$\mathbf{x_4}$ = electricity consumed (kilowatts/production cycle),

$\mathbf{x_5}$ = diesel fuel (Litres/production cycle),

$\mathbf{V_i}$ = A random error term ("white noise") assumed to be independent of $\mathbf{U_i}$, identical and normally distributed with zero mean and constant variance $N(0, \delta^2_v)$, which accounts for the random variation in output by factors that are beyond the control of the millers,

$\mathbf{U_i}$ = A random variable called technical inefficiency effects (disturbance term). This is associated with technical inefficiency of production of millers involved which are assumed to be independent of V_i. They are non-negative truncations at zero or half normal distributions with $N(0, \delta^2_u)$,

In = the natural logarithm (to base e),

$\mathbf{ß_0 – ß_5}$ = parameters that were estimated. Estimation of equation (2) was accomplished using the Maximum Likelihood Estimation (MLE) technique available in the computer program called frontier version 4.1 developed by Coelli (1996).

Technical inefficiency model: A part from determining the miller's technical efficiency in poultry feed production, this study also identified their determinants of technical inefficiency in terms of socio-economic characteristics. In this respect, an inefficiency

model, which assumes that the inefficiency effects are independently distributed having **N** (O, δ^2_u) distribution and mean $\mathbf{U}_i$ was used, (Coelli and Battese, 1996). The model was used to achieve objective (iv)and specified as follows.

$$-Ui = \gamma_0 + \gamma_1 w_1 + \gamma_2 w_2 + \gamma_3 w_3 + \gamma_4 w_4 + \gamma_5 w_5 + \gamma_6 w_6 + \gamma_7 w_7 + \gamma_8 w_8 + \gamma_9 w_9 + \gamma_{10} W_{10} + \gamma_{11} W_{11} + e_i \quad \ldots\ldots(3)$$

Where;

$\mathbf{U_i}$ = Technical inefficiency of the ith mill,
$\mathbf{W_1}$ = Operating capacity of the mills/day,
$\mathbf{W_2}$= Access to credit (amount of loan obtained in ₦),
$\mathbf{W_3}$ = Year of feed milling experience (measured in number of calendar years),
$\mathbf{W_4}$ = Average Distance to source of major ingredients (In Kilometres)
$\mathbf{W_5}$ = Source of power (1= National Grid, 0 = Generator),
$\mathbf{W_6}$ = Number of millers/competitors nearby (Number of mills),
$\mathbf{W_7}$ = Access to major market for output (distance from market outlets in Kilometres),
$\mathbf{W_8}$ =Years ofMembership of miller's association (number of years of cooperative participation),
$\mathbf{W_9}$ = Number of employees/operators,
$\mathbf{W_{10}}$ = Number of Months ingredients are available during the season (Number of calendar months)
$\mathbf{W_{11}}$ = Number ofYears ofEducation of operators (Number of years spent in School)
$\mathbf{e_i}$= Error term, While
$\gamma_0, \gamma_1 \ldots \gamma_{11}$are parameters to be estimated.

RESULTS AND DISCUSSION

Socio-economic characteristics of Poultry Feed Industries in Nigeria:

The result on the characteristics of millers based on their experience and years of operation, mill capacity and membership of association is shown in Table 2. The result shows that most of the feed millers have considerable number of years of experience as owners and operators of the business. The toll mill operators have years of milling experience ranging from 2 to 12 years with a mean of 6 years. 60% of the respondents are members of millers association with an average of 5 years of membership. The average capacity of the mills is 8.5 tonnes per day operating on the average of 5 days/week using 1-2 shifts in a day. The average number of feed batches produced or milled per day is 5 which take about 1.5 hours to produce 2 tonnes. The mills also spend on the average 7work hours per day with an average of 5.5 hours per shift for those millers having more than one shift per day. The result also shows that the feed millers operate at 65% of their installed capacity in majority of the months of the year. These findings are similar with those of Oladejo, (2012) and Mbanasor and Jonas (2005) who both studied efficiency of poultry feed production enterprises in Lagos and Abia States respectively.

Table 2: Characteristics of feed mills based on years of operation, mill size and hours of operations

Variables	Toll Mills			
	Min	**Max**	**Mean**	**S. dev**
Years in feed mill business	1.00	18.00	6.34	0.57
Year of cooperative	3.00	17.00	5.25	2.43
Mill size	4.00	15.00	8.54	10.83
Batches mill/day	1.00	7.00	5.03	1.65
output/batch	1.00	5.00	2.41	2.17
Hours/batch	1.00	2.00	1.54	0.23
Hours in a day	5.00	10.00	7.12	2.07
Shift length	5.00	8.00	5.50	0.82
Output/day	8.00	30.00	16.40	7.71
Days mill/week	5.00	6.00	5.00	0.68
Installed capacity	4.00	15.00	8.54	10.83
Achieved capacity (%)	40.00	80.00	65.34	9.36

Efficiency of the Poultry Feed Industries

The estimates of the specified Cobb-Douglass stochastic production function together with the specified technical inefficiency effects for the toll mills yields the result of the value of gamma (γ) = 0.71 is statistically significant at the 1% level, which implies that 71% of the variation in feed output from the toll mills was due to the inefficiency effect. Thus, the Cobb-Douglas functional form is an adequate representation of the data by confirming the presence of the one-sided error component in the model; which renders the use of Ordinary Least Square (OLS) estimation techniques inadequate in representing the data. The sigma (σ^2) on the other hand was 0.256 and significant at 1%, indicating the correctness of the specified assumption of the distribution of the composite error term.The result in Table 3 on the estimated coefficients for parameters for the toll mills shows that mill size and feed ingredients havepositive coefficients and significant at 1 and 5% respectively. Electricity is positive but not significant, while labour and diesel were negative but not significant. It implies that a 1% increase in mill size, feed ingredients will increase feed output of the toll millers by 0.44%, and 0.104%. This shows that some resources are being underutilized while others are over utilized by the toll mills. The result of this study is similar to the study of Mbanasor and Jonas, (2006) who found mills in Abia state having both positive and negative estimates of their coefficients. In the study, they found the coefficient of raw materials and depreciation on fixed assets to be positively related to output while labour and enterprise or mill size were negatively related to output of the mills. Therefore, the toll millers can improve on their level of efficiency by increasing the Mill size and Feed ingredients utilization, while decreasing labour and diesel fuel utilization by 0.26% and 0.09% respectively.

Table 3: Maximum Likelihood Estimation results of stochastic frontier production function

Parameters	Coeff.	Std error	t-ratio
Constant	-0.453	0.081	-5.64***
Mill size ($X_{1)}$	0.44	0.102	4.309***
Feed Ingredients (X_2)	0.102	0.153	2.349**
Labour mandays (X_3)	-0.255	0.648	-1.392
Electricity kilowts(X_4)	0.031	0.106	0.294
Diesel Litres(X_5)	-0.090	0.165	-0.547
Variance Parameters			
Sigma Squared	0.256	0.048	5.362***
Gamma	0.709	0.009	72.66***
LogLikelihood Function	152.229		
LR test of the one-sided error	140.421		

$\sigma = \sigma_v^2 + \sigma_u^2$, $\gamma = \sigma_u^2/\sigma^2$ ***P<0.001, **P<0.05, *P<0.10 values in parentheses are standard errors

Technical efficiency indices

The result in Table 4 showed the distribution of technical efficiency indices.The average T.E. of the toll mills was 0.82 (82%), with a minimum of 0.61 (61%) and maximum of 0.99 (99%). Also, for the average performing toll mill to operate at 100%, it needs 17% cost saving (i.e. 1-0.0.82/0.99x100). Similarly, for the least efficient toll mill to attain the most efficient level, it needs 38% savings (i.e. 1-.61/0.99x100).

These values showed that majority of the millers are technically inefficient, this supports the findings of Mbanasor and Jonas (2005). It also supported the results of a similar study by Munkaila *et al., (*2013) estimating the technical efficiency of poultry feed production in Ogun and Oyo States reported an average technical efficiency level of 0.88 with a range of between 0.70 and 0.99

Table 4: Frequency distribution of technical efficiency estimates

Technical Efficiency Range	Freq	%
0.51 - 0.60	1	0.75
0.61 - 0.70	23	17.16
0.71 - 0.80	40	29.85
0.81 - 0.90	42	31.34
0.91 - 0.99	28	20.90
Total	**134**	**100**
Average	0.82	
Maximum	0.99	
Minimum	0.61	

Technical inefficiency effects

Having confirmed that the feed millers were technically inefficient, the study went further to investigate the causes of the inefficiency. The result of technical inefficiency model for the toll mills in Table 5 was used to explain the inefficiency effects of variables that were either positive or negative and significant. Source of power/electricity was positive and significant at 1%. This indicates that the toll mills who operated mainly with power generating sets have increased technical inefficiency in feed production. This could be attributed to lower operating capacity of the diesel powered generators compared to electricity powered mills and diesel costs are higher than electricity costs. This conformsto the result obtained by Wadud and White (2002) in the study of determinants of technical inefficiency of farms in Bangladesh where they found farmers using diesel power to extract water were less efficient when compared with those using electricity.

Number of competitors nearby is also positive and significant at 1%. This indicates that toll mills that are farther away from other mills are more technically inefficient than those close to other mills. This could be as a result of benefits such as reduced transportation costs, availability of near markets for ingredients and availability of infrastructural facilities such as water, roads network and electricity that could be derived from localization of industries.

Educational level of the operator as expected is positive and significant also at 1%. This shows that mill operators with low level of schooling tend to be more technically efficient than those with higher years of schooling or high level of education. This can be explained in the sense that mill operation is technical and depends more on experience on the job rather than through long years in school. This conforms with findings of Coelli and Battese (1996) in a study at Kanzare village in India, where farmers with higher years of schooling were found to be less efficient.

Other variables such as distance to ingredient sources, has negative coefficient and significant at 1%. This implies that toll millers who obtained their feed ingredients from distant places especially the production region tend to be more efficient than those sourcing their ingredients from nearby sources. It is well known that prices tend to be lower at production areas than at consumption zones. Toll millers with resources can obtain large consignments from distant markets at lower costs than from nearby markets.

Distance to output market has also a negative coefficient and significant at 1%. This indicates that those toll mills that are able to take their feed to distant markets are more technically efficient than those selling in nearby markets. In distance markets there is less competition and you open new markets for products to move thereby reducing storage of products which ensures continuous production. Selling products in nearby markets full of competitors increases technical inefficiency.

Number of months ingredients are available is also having negative coefficient and significant at 1%. This shows that technical inefficiency effects are lower on toll mills with the highest number of months in which feed ingredients are available. Those mills with lesser months will be normally technically inefficient due to low production activities during off season.

Other inefficiency variables such as operating capacity, access to credit, years of milling experience and number of employees were statistically not significant at all levels.

Table 5: Socioeconomic factors influencing technical efficiency

Variables	Coeff	Std Error	t-ratio
Constant γ_0	-1.530	0.459	-3.335***
Operating Capacity γ_1	0.0011	0.004	0.243
Access to credit γ_2	0.0001	0.0009	0.118
Years of milling operation γ_3	0.0096	0.0076	1.263
Distance to ingredient sourcesγ_4	-0.2042	0.023	-9.068***
Source of Electricity γ_5	0.1022	0.018	5.754***
Number Competitors γ_6	0.2322	0.036	6.521***
Distance to Output Market γ_7	-0.0551	0.0063	-8.786***
Number of Employees γ_9	0.0020	0.0079	0.258
Educational level of operator γ_{10}	0.1228	0.0394	3.119***
Months ingredients available γ_{11}	-0.0718	0.0245	-2.929***
sigma-squared	0.2558	0.048	5.362***
Gamma	0.7094	0.0098	72.656***
Log likelihood function =	152.230		
LR test of the one-sided error =	140.421		

*Note: ***, **, * values Sig. at 1%, 5% and 10%

The implication of the above findings is that the mills can increase their level of efficiency by reducing those variables with positive coefficients and at the same time increasing those with negative coefficients. These findings were similar to those of Mbanasor and Jonas(2006) who found experience of operator and level of technology to be positively related with efficiency, while credit status and membership of cooperative society were negatively related with technical efficiency.

Net income estimation (Profitability)

The analysis of net income was carried out so as to determine the level of profits associated with poultry feed production as shown in Table 6. The result of the analysis per 1000Kg of feed revealed that the net income realized by the toll mills was₦14, 277.07 when all cost items of ₦80,855.82 were deducted from the gross income of ₦95,132.89 in the analysis. Theresult shows that poultry feed production is profitable.The values of return per ₦1.00 invested in the toll mills was ₦0.1766. By improving on their technical and allocative efficiencies, the millers can still make more returns than what they are currently enjoying. To improve on this profit level, the millers will have to reduce the over utilized inputs to an acceptable level and look for ways of reducing costs through the purchase of ingredients when prices are low especially during harvest. This finding supports the findings of Oladejo (2012), Munkaila *et al*(2012) and Mbanasor and Jonas 2005 who both found poultry feed production as a profitable venture in their studies of efficiency of poultry feed production enterprises in Lagos, Oyo and Ogun and in Abia States respectively.

Table 6: Costs and returns associated with poultry feed production per 100Kg of feed

Items of Cost and Returns (₦)	Total
a. Variable Cost	
Feed Ingredients	79220.87
Power/Electricity	570.49
Bagging	800
Total variable cost	**80571.36**
b. Fixed Cost	
Salary	180.75
Rent	7.8
Dep. On equipment	12.16
Tax	9.4
Utilities	74.35
Total fixed cost	**284.46**
Revenue**(₦)**	95132.89
Feed cost**(₦)**	80855.82
Profit	14277.07
Return per Naira Spent	0.1766

CONCLUSION

The result of the survey revealed thatthe toll mills operate below frontier levels due to inefficiency. Some characteristics of the toll feed mill operators, such as milling experience, access to credit, educational level of operator, operating capacity are positive and significant, implying that an increase in any of these millers characteristics will increase efficiency and consequently the output of the feed mills. Also characteristics of mills such distance to source of inputs, source of power, distance to output market, and number of employees have the tendency to reduce technical efficiency. The inability of the conventional commercial feed mills to meet the ever increasing demand for poultry feed, increase in costs of finished feed, increased level of education and investments by different actors in all the segments of the poultry industry in Nigeria gave rise to the emergence of toll mills. They operate close to the farms rendering milling services for a fee and at the same time selling feed ingredients for on farm production of feed. Reducing some of the constraints and inefficiency variables that affect the toll mills could go a long way towards providing high quality and affordable poultry feed to the farmers and at the same time higher profits to the toll mills.

POLICY RECOMMENDATIONS

Based on the empirical results obtained from this study, the following recommendations are deemed very expedient to improve upon the cost efficiency levels of the toll feed mills. It is very evident from the findings of this study that the source of power for operating a feed mill has a crucial role to play in improving the cost efficiency levels of the toll millers. The toll mills should think of how to get linked to the National grid or relocate to more industrial areas to form clusters where electricity supply is guaranteed. The empirical result of this study also showed that obtaining feed ingredients from distant markets in faraway production regions and its subsequent storage for use during off season, improved cost efficiency. In view of this, the toll

millers need a large capital outlay which can be provided through the Bank of Industry and Bank of Agriculture. The toll millers should explore these avenues as this could help improve their efficiency level.

REFERENCES

Agricultural Transformation Agenda (ATA) 2011: Federal Ministry of Agriculture & Rural Development Abuja, Nigeria. *ATA Main Report 9th September, 2011*.

Ajibefun, I.A and Abdulkadiri A. O. (1999). An Investigation of Technical Inefficiency of Production of Farmers under the National Directorate of Employment in Ondo State, Nigeria, *Applied economics Journal*. 6: 111-114.

Coelli, T.J. (1996) A guide to FRONTIER version 4.1 a Computer Programme for Stochastic Frontier Production and Cost Function Estimation. CEPA Working 96/07 University of New England, Armidale, Australia.

Coelli, T.J. and Battese, G.E (1996): Identification of factors which influence the Technical Efficiency of Indian Farmers. *Australian Journal of Agricultural Economics* 40: 103-128.

Fagbenro, O. A. and Adebayo, O. T. (2005): A Synthesis of the Formulated Animal And Aquafeed Industry In Sub-Saharan Africa: A review of the animal and aquafeed industries in Nigeria. CIFA Occasional Paper No. 26 FAO Rome.http://www.fao.org/docrep/008/a0042e/a0042e05.htm22nd March, 2013.

Farrel, M.J. (1957): The Measurement of Productivity and Efficiency. *Journal of Royal Statistic Society*,120:253-281 FMOA (1989).

Hassan A.A. (2002): Comparative Economic Analysis of Poultry Egg production using Commercial and Homemade feed in Kaduna State. *An Unpublished M.Sc. Thesis*, Department of Agric Economics and Rural Sociology, A.B.U. Zaria.

Hassan A.A., Nwanta J. and Mohammed A. (2005).Profitability analysis of poultry egg production in Kaduna State.*Nigerian Veterinary Journal*, 27(1): 8 -16.

Mbanasor J. A. and Jonas C.N. (2006): Efficiency of Indigenous Poultry Feed Production Enterprises in Abia State, Nigeria.www.unidep.org/Release3/Conferences/AES_2006/IDEP-AES-06-31PM 26thSeptember12

Munkaila, A. A; Taiwo, A. G. and Adeeko A. L (2012): Economic Analysis of Feedmill Industries in Ogun and Oyo States, Southwest of Nigeria. *Research Journal.*Vol. 2 No. 1: 24-30.

National Population Commission (NPC) (2014): Population estimates for Nigeria for July 2014. *www.population.gov.ng/*

Ojo, S.O. (2003): Productivity and Technical Efficiency of Poultry Egg Production in Nigeria. *International Journal of Poultry Science.* 2; (6): 459-464.

Oladejo, J.A. (2012), Economic Analysis of Feed Mill Industry in Lagos State, Nigeria. *International Journal of Research in Management Economics and Commerce*.2; (4): 39-52

Oladoja M. A. and Olusanya T. P (2009).Impact of Private Feed Formulation and Production as a Tool for Poverty Alleviation among Poultry Farmers in Ogun State.*International Journal of Poultry Science* 8 (10): 1006 – 1010. ISSN 1682-8356 Asian Network for Scientific Information

Oyedeji, G. O. (2006). Feedmill Management in Nigeria. A Handbook for Animal Scientists, Feedmillers,

Agriculture Students and Allied Professionals.University Press Ibadan ISBN 978-074-995-0.PP. x-xiii.

Oyediji, G. (2015). Trend in the Production of Animal Feed in Nigeria and the way forward.A paper presented at a three daystraining session organised for students of the Nigerian Institute of Animal Science Lagos Nigeria. June, 2015.

Tadesse, B. and Krishnamoorthy, S. (1997). "Technical Efficiency in Paddy Farms of Tamil Nadu: An Analysis Based on Farm Size and Ecological Zone". *Agricultural Economics Journal*. 16: 185-192.

Taylor, G.T. and Shonkwiler, J.S. (1986).Alternative Stochastic Specification of the Frontier Production Function in the Analysis of Agricultural Credit Programs and Technical Efficiency, *Journal of Development Economics*. 21: 149-160

Tinuke, M. F. (2013): Reducing Unemployment through the Informal Sector in Nigeria. *International Journal of Management Sciences.* Vol. 1, No. 7, 2013, 232-244

Udoh, E. J. and Etim, N. A. (2009)."Efficiency of Rice Farmers in Akwa Ibom State, Nigeria: Potentials for Food Security and Poverty Alleviation".*Journal of Farm Management.* 16(3): 731-735.

Wadud A. and White B. (2002): "Determinants of Technical Inefficiency of Farms in Bangladesh. *Indian Economic Review, New Series* Vol. 37, No.2 (2002) Pp. 183-19