International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 4 Issue 5, July-August 2020 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Estimating Farm Level Technical Efficiency and Elasticity of Production among Small Scale Catfish Farmers in Alimosho Local Government Area, Lagos State, Nigeria

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ABSTRACT

This research work broadly estimated the farm level technical efficiency and elasticity of production among small scale catfish farmers in Alimosho Local Government Areas of Lagos State, Nigeria. The study in its specific objectives described the socio-economic characteristics of the catfish farmers in the study area; and analyzed the technical inefficiency of the catfish farmers in the study area. The study employed the use of cross-sectional data from household survey conducted on a sample of 80 catfish farmers in the study areas. The data were collected with the aid of structured questionnaire and were later analyzed. The study employed the following analytical tools in order to analyze the data collected from the field: Descriptive Statistics as well as Inferential Statistical Model such as Stochastic Frontier Approach.

The mean age of the farmers in the study area was 44 years. Majority of the catfish farmers are married. The catfish farmers in the study are well educated. The catfish farmers in the study have large households with an average household size of 7 persons. The mean year of farming experience was 9 years for the catfish farmers. This research revealed that about 70 % of the male catfish farmers were married in the study area.

Among the catfish farmers, the variables that significantly influence catfish output in the study are included labour quantity employed (1%), fingerling quantity (1%) and pond size (1%). The estimated sigma square (s2) for the catfish farmers were 0.0209 (significant at 1%). The estimated gamma (g) parameter of catfish farmers revealed that 99% of the variations in the catfish output among the catfish farmers in the study area are due to the differences in their technical efficiencies. The fingerling quantity was the most important variable factor of production among the catfish farmers in the study area. The RTS for the catfish farmers was 1.175 in the study areas.

How to cite this paper: Adeleke, O. A | Akintola, R. O | Fajobi, D. T | Adeleke, H. M "Estimating Farm Level Technical Efficiency and Elasticity of Production among Small Scale Catfish Farmers in Alimosho Local Government Area, Lagos State, Nigeria" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-5, August 2020, pp.830-837, URL: www.ijtsrd.com/papers/ijtsrd33008.pdf

IJTSRD33008

INTRODUCTION

Nigeria is a maritime nation with a vast population of over 160 million people and a coastline which measures approximately 853 kilometres, and in the nation's agricultural sector, fisheries occupy a unique position as the sub-sector, with contribution to the agricultural share of gross domestic product estimated to be 1.3% out of the total 40.9% agricultural share of gross domestic product in the year 2010, and as such fish production as an enterprise has the capacity to significantly fuel the development of the nation's agricultural sector (Osagie, 2012).

The importance of fish farming especially catfish farming to the sustainability of the fishery industry cannot be over emphasized, even as majority of domestic food fish supply (81.6%) has been through artisanal activities. But regrettably, supplies from the artisanal sub-sector have been on the decline, and for instance, from 90% in 1990 to 84.2% in 1994, 81.6% in 2003 and down to 40% in 2006. This drop was primarily attributed to insecurity along Nigeria's coasts and waterways, higher energy costs and over-fishing (Tobor, 1990;; Adekoya, 2004; Inoni, 2007; GAIN, 2007).

Catfish are hardy, tolerate dense stocking, and thrive in a wide range of environmental conditions. They are easily spawned under proper conditions, yet will not spawn when placed in the grow-out ponds, which gives the farmer control over the production process (Rana, 2007). Consequently, the catfish is vital to the sustainability of the aquaculture industry in the country as it possessed such good qualities as capacity to survive in different culture systems and diverse environments, grow very fast, high fecundity, improved survival of the fry and adaptation to supplemental feed. All of these qualities placed catfish farming in the frontline to serve as the only way of boosting fish production and thereby move the country towards self-sufficiency in food fish supply (Osawe, 2004)

Fish products constitute more than 60% of the total protein intakes in adults especially those living in the rural areas (Adekoya, 2004). Food fish is cheaper and possess nutrient profile superior to all terrestrial meat (beef, pork, chicken, etc.) being an excellent source of high quality protein and high digestible energy (Nwuba and Onuoha, 2006; Lawal et al, 2008). But the local fisheries supply in Nigeria is inadequate and this is partly responsible for the current low daily animal protein intake per head per day of 10 g compared to FAO recommended 36 g.

An aquaculture transformation agenda plan (which was to be implemented, monitored and evaluated through fish farm development program, fish seeds and feed mill development program, fish pen and cage culture development program and fish post-harvest management and marketing program) was developed to increase annual fish production from the current production of 0.78 million metric tonnes to 3.0 million metric tonnes in order to achieve self-sufficiency in fish production and supply by the year 2015, as a way to bridge the demand-supply gap (Tijani, 2011). It was however, noted by Oyinbo et al. (2013) that fishery extension program should be included as a component of the fishery transformation plan of Nigeria so as to facilitate the delivery of fishery extension services to fish farmers, fish marketers, fish feed millers and other actors in the fish value chain.

Despite all the effort of National Accelerated fish Production Project (NAFP) in Nigeria toward improving the efficiency of fish farmers as well as to increase per capital income of indigenous fish farmers, the project did not yield the expected outcomes due to poor implementation, poor monitoring and evaluation of the project. As at 2007, the domestic fish production from artisanal water was 551,700 metric tonnes as against the present nation's demand of about 1.5 million metric tonnes estimated. The shortfall was said to be bridged by the importation of 680,000 metric tonnes thus consuming about N50 billion in nation's foreign reserve (Odukwe, 2007).

Efficiency is a very important factor for productivity growth and hence in an economy where resources are scarce and opportunities to use new technologies are limited, inefficiency studies indicate the potential possibility to raise productivity by improving efficiency without necessarily developing new technologies or increasing the resource base (Bifarin et al., 2010). Measuring technical efficiency at the farm level, identifying important factors associated with the efficient production systems would serve as a panacea to assessing potential for developing sustainable aquaculture (Kareem et al., 2008).

Efficiency is an important factor of productivity growth especially in developing agriculture where resources are meagre. The analysis of efficiency is generally associated with the possibility of farms producing a certain optimal level of output from a given level of resources or certain level of output at least cost. Battese and Coelli (1995), Yao and Liu (1998), Ohajianya, et. al, (2006), Parikh and Shah (1995) distinguished between at least two types of efficiencies.

Technical efficiency refers to the ability of firms to employ the "best practice" in an industry so that not more than the necessary amount of a given set of inputs is used in producing the "best" level of output (Ajibefun, et. al, 2002; Mijindadi, 1980; Ohajianya, 2006; Onyenweaku and Nwaru (2005); Anyanwu and Ezedinma, 2006). Criticisms have been raised about the interpretation of efficiency measures (Pasour,1981; Ellis, 1988). To avoid many of these criticisms levied upon efficiency concepts, Ellis (1988) advised that the producers' performance should be estimated only in terms of technical efficiency. This according to him is because measures of technical efficiency rely less heavily on assumptions of perfect knowledge, perfectly competitive markets and the profit maximization objective.

Sarker, et. al, (1999) reported that efficiency can be estimated by separately estimating technical and allocative efficiencies from a production frontier using farm survey data. Technical efficiency is defined as the ratio of farmer's actual output to the technically maximum possible output, at given level of resources. Allocative efficiency is expressed as the ratio of the technically maximum output, at the farmer's level of resources to the output obtainable at the optimum level of resources (NPC, 2006).

This study will therefore estimate the farm level technical efficiency and elasticity of production among small scale catfish farmers in Alimosho Local Government Areas of Lagos State, for the purpose of bringing out the areas in which the farmers need to be empowered so that the fish farmers will be able to maximize advantage in catfish production and make effective utilization of various production resources available to them. In addition, an underlying factor behind this work is that fish farmers were not making efficient use of existing technology to improve farm level efficiency. Based on the statement of the problem above, this research work was carried out, to investigate and provide answers to the following questions: (1.) What are the socio-economic characteristics of the catfish farmers in the study area? (2.) How technically efficient are the catfish farmers in the study area with respect to the available resources of the farm?

The general objective of the study was to estimated the farm level technical efficiency and elasticity of production among small scale catfish farmers in Alimosho Local Government Areas of Lagos State. Based on the general objective, the specific objectives are to: describe the socio-economic characteristics of the catfish farmers in the study area; and analyze the technical efficiency of the catfish farmers in the study area.

The hypotheses of this study include: (i) H_0: $\delta = 0$; Socio-economic characteristics of the catfish farmers have no significant relationship on their technical efficiencies; (ii) The catfish farmers are not technically efficient in the study area; and (iii) H_0: $\gamma = 0$; that is, there are no technical inefficiency effects in catfish production enterprise in the study area.

MATERIAL AND METHODS

This study was carried out in Alimosho Local Government Area of Lagos State, which is located in the north-western part of Lagos State. It is located at latitude 6.61056 ° N and longitude 3.29583 ° E with a temperature range of 28 °C to 33 °C. It occupies a land area of 173.6 square km (67 square miles). Geographically, the River Owo demarcates the study area from Ado-Odo/Ota Local Government Areas of Ogun State on the northern and western side. Towards the east, it is bounded by Ifako-Ijaye, Agege and Ikeja Local Government Areas of Lagos State. The old Abeokuta expressway forms the frontier line between the Local Government Areas. On the southern part, the study area is bounded by Oshodi/Isolo, Amuwo Odofin and Ojo Local Government Areas of Lagos State. It is the largest local government area in Lagos state with 1,277,714 inhabitants according to the official 2006 Census. It is estimated that the population will increase to 1,592,911 by 2013 based on national Population Commission (NPC) annual growth rate of 3.2%.

The study used a multi-stage random sampling technique. The first stage involved purposive selection of Alimosho Local Government Areas in Lagos State. The second stage involved random selection of political wards from which the list of catfish producing areas obtained from the information units of each LGA. A total of 80 catfish farmers were interviewed with the aid of a structured questionnaire.

The primary data collected for this study include socio-economic characteristics of the catfish farmers (such as age, gender, years of formal education or educational level, marital status, household size, years of experience in farming, among others). Input-output data of the catfish farmers as pertained to the production season were also collected. Output data included quantity and values of catfish output, market prices, while input data include quantity and cost of inputs.

The analytical techniques employed in this study include: the descriptive statistics, and stochastic frontier production model. The descriptive statistics was used to discuss the socio- economic characteristics of the catfish farmers in the study area; and Stochastic Frontier Production Function (Cobb Douglas functional form) was used to analyze the technical inefficiency and elasticity of production of the catfish farmers in the study area. For the sake of this study, the stochastic frontier production functions in which Cobb-Douglas as proposed by Battese and Coelli (1995) represents the best functional form of the production frontier and also as confirmed by Yao and Liu (1998) was applied in the data analysis in order to better estimate the efficiency of catfish farmers.

The model of the stochastic frontier production for the estimation of the TE is specified as:

$$\ln Y_i = \beta_0 + \beta_1 \ln X_{1i} + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + \beta_4 \ln X_{4i} + V_i - U_i \quad \text{................(1)}$$

Where subscript i refers to the observation of the ith farmer, and

Y = output of catfish (Kg)

X_1 = feed quantity (kg)

X_2 = labour quantity (man day)

X_3 = fingerling Quantity (kg)

X_4 = pond size (m^2)

β_i's = the parameters to be estimated

ln's = natural logarithms

V_i = the two-sided, normally distributed random error

U_i = the one-sided inefficiency component with a half-normal distribution.

For this study, it is assumed that the technical inefficiency measured by the mode of the truncated normal distribution (i.e. U_i) is a function of socio-economic factors (Yao and Liu, 1998). Thus, the technical efficiency was simultaneously estimated with the determinant of technical efficiency defined by:

$$U_i = \delta_0 + \delta_1 Z_{1i} + \delta_2 Z_{2i} + \delta_3 Z_{3i} + \delta_4 Z_{4i} + \delta_5 Z_{5i} \quad \text{.................................} \quad (2)$$

Where:

U_i = technical inefficiency of the ith farmer

Z_1 = Age of farmer (years)

Z_2 = Marital status

Z_3 = Educational level

Z_4 =Family size

Z_5 = Farming experience

The above equation was used to examine the influence of some of the catfish farmers' socio-economic variables on their technical efficiency. Therefore, the socio-economic variables in equation above were included in the model to indicate their possible influence on the technical efficiencies of the catfish farmers.

In the presentation of estimates for the parameters of the above frontier production, two basic models were considered. Model 1 is the traditional response function in which the inefficiency effects (U_i) are not present. It is a special case of the stochastic frontier production function model in which the parameter γ = 0. Model 2 is the general frontier model where there is no restriction in which γ, $\sigma^2 s$ are present. The estimates of the stochastic frontier production function were appraised using the generalized likelihood ratio test, and the T-ratio for significant econometric relevance.

RESULTS AND DISCUSSION

Socio-economic Characteristics of Respondents

Age of Respondents: From the result of the descriptive statistics in Table 1, 8.75% of the respondents were within the age range of 20-30 years; 32.5% of them were within the age range of 31-40 years were; 33.75% of them were within the age group of 41-50 years; 20% of them were within the age range of 51-60years; and only 5% of them were above 60 years of age. From the analyses above, 95% of the respondents were within the age range of 20 – 60 years, with mean age of 43.76, indicating that majority of the respondents were active workforce, and as such will still be able to active supervise and effectively monitored activities in their catfish production enterprises in the study area.

Marital Status of Respondents: From the result of the descriptive statistics in Table 1, 6.25% of the respondents were single, 70% of them were married, 15% of them were divorced and the rest 8.75% were widowers. Most of the respondents were married, which is an indication that they are likely to have a number of dependants, which can affect their food security status, and who may likely be used to provide family labour for the catfish production enterprises in the study area.

Household Size of Respondents: The household size is an important socio-economic characteristic, because it often times determines how that household size distribution of sampled farmers. From the result of the descriptive statistics in Table 1, 7.5% of the respondents had about 4 members in their household, and 92.5% of them had between 5 – 10 members, with mean size of 6.81. This may be regarded as fairly large household size. It is likely that a large household can serve as source of family labour.

Level of Education of Respondents: From the result of the descriptive statistics in Table 1, 6.25% of the respondents had no formal education, 22.50% of them had primary education, 37.50% of them had secondary, and the rest 33.75% of them had tertiary education. From the analyses above, a greater number of the respondents had secondary education.

Years of Farming Experience: The number of years of farming of any farmers is expected to determine how he will organize his resources in order to achieve level of production. From the result of the descriptive statistics in Table 1, 73.75% of the respondents had about 10 years of fish farming experience, 20% of them had between 11-20 years of fish farming experience, and 6.25% of them had between 21-30 years of fish farming experience, with the mean of 8.87years. The years of farming experience of farmers are expected to affect their level of productivity and efficiency.

The Stochastic Frontier Production Function Analysis

The ordinary least square (OLS) (Model 1) and the maximum likelihood parameter estimates (MLE) (Model 2) of the stochastic production frontier models which were specified as Cobb-Douglas frontier production function for catfish farmers are presented in Table 2. The coefficients of the variables are very important in discussing the results of the analysis of data. These coefficients represent percentage change in the dependent variables as a result of percentage change in the respective independent variables.

In model 1, the significant variable among the catfish farmers in the study area include: labour quantity (at 1%), fingerling quantity (at 1%) and pond size (at 1%). Other variable which is feed quantity is not significant at all known levels of significance. The implication of the above findings is that in the study area, the major limiting factors of the catfish enterprise are labour quantity, fingerling quantity and pond size. In the preferred model (model 2), the significant variables include: labour quantity (at 1%), fingerling quantity (at 1%), and pond size (at 1%). Feed quantity is not significant at all the known levels of significance.

All the significant variables such as labour quantity, fingerling quantity and pond size have positive signs indicating that they greatly impact positively on catfish output in the study area. Among the above three major significant inputs, fingerling quantity has the highest coefficient with a value of 0.7245 (Table 2) in the preferred models (model 2) and therefore, it exists as the most limiting factor that greatly determine what catfish output would be like among the catfish farmers. The variables with positive coefficient imply that any increase in such variables would lead to an increase in catfish output of the farmers.

The estimated sigma square (σ^2) of the catfish farmers is 0.0252 and highly significant at 1% level of significance. The estimated gamma (γ) parameter of the catfish farmers is 0.999 which is not significant at level of significance. The value is large and significantly different from zero. This means that 99.9% of the variations in the catfish output in the study area is due to the differences in their technical efficiencies. This result is consistent with the findings of Yao and Liu (1998); Ajibefun et al., (2002).

The analysis of the inefficiency model shows that the signs and significance of the estimated coefficients in the inefficiency model have important policy implications on the technical efficiency (TE) of the catfish farmers. Among the catfish farmers in the study area, the inefficiency variables that were significant include age, marital status, educational level, family size and farming experience. The coefficient of age and marital status were negative thereby conforming to *a priori* expectation with the implications that they are negative with inefficiency but positively influence the technical efficiency of the catfish farmers in the study area. Educational level, family size and farming experience had positive relationship with the technical inefficiency of the catfish farmers with the implications that they are positive with inefficiency but negatively influence the technical efficiency of the catfish farmers in the study area.

The estimated productivity parameters such as elasticities of production and returns to scale are discussed in Table 3. Among the catfish farmers, the estimated elasticities of the explanatory variables of the preferred model (Model 2) show that labour quantity, fingerling quantity and pond size were all positive (increasing) to catfish output indicating that the use and allocation of these variables was profitable and as such a unit increase in these inputs will eventually result in an increase in the catfish output of the farmers. While, feed quantity is negative (decreasing) to catfish output indicating that the use and allocation of this variable was not profitable and as such a unit increase in this input will eventually result in a decrease in the catfish output of the farmers.

The elasticity of catfish output with respect to fingerling quantity has the highest value among the catfish farmers. These findings indicated that fingerling quantity has the most important variable factor of production among the catfish farmers in the study area and should be readily attended to. The analysis of result of the Return To Scale shows that the RTS for the catfish farmers is 1.175 in the study area. Thus, the catfish farmers are experiencing increasing returns to scale and are operating in the irrational zone of production (stage 1).

The predicted technical efficiency estimates obtained using the estimated stochastic frontier models for the individual catfish farmers in the study area presented in Table 4. The predicted catfish farm specific technical efficiency (TE) for the catfish farmers' indices ranged from a minimum of 39.43% to a maximum of 91.30% for the farms, with a mean of 54.47%. Thus, in the short run, an average catfish farmer has the scope of increasing his/her catfish production by about 45.53% (i.e.100% – 54.47%) by adopting the technology and techniques used by the best practiced (most efficient) catfish farmers. Such catfish farmers could also realize 40.33% cost savings (i.e.1 – [54.47/ 91.30] in order to achieve the TE level of his/her most efficient counterpart (Bravo-Ureta and Evenson, 1994; Bravo-Ureta and Pinheiro, 1997). The above findings unfolds the capacity of an average catfish farmers to increase his/her technical efficiency level to a tune of 45.53% and in turn attain a cost-saving status of about 40.33% that the most technically efficient catfish farmer had enjoyed in his/her catfish production enterprise using the available production techniques and technology in the study area. A similar calculation for the most technically inefficient catfish farmer reveals cost saving of about 56.81% (i.e., 1 – [39.43/91.30] as shown in Table 5.

The decile range of the frequency distribution of the TE in Table 4 indicates that about 5.0 % of the catfish farmers had TE of over 70 % and 62.50% had TE ranging between 51 % and 70 %.The above findings from the analyses of the most technically inefficient catfish farmer revealed that he/she has an untapped ability to realize a cost-saving of about 56.81%. To realize this latter cost-saving status, the catfish farmers would have to employ the right amount of the various production inputs, maximize the use of available technology as well as proper supervision of their catfish farms to the activities of thieves and intruders on their farms.

Table 1: Socio-Economics Characteristics of the Catfish Famers In Alimosho L.G.A, Lagos State

Variables	Frequency	Percentage
Age		
20-30	7	8.75
31- 40	26	32.50
41- 50	27	33.75
51- 60	16	20.00
> 60	4	5.00
Total	80	100
Marital Status		
Single	5	6.25
Married	56	70.00
Divorced	12	15.00
Widower	7	8.75
Total	80	100
Household Size		
≤ 5	6	7.50
6-10	74	92.50
Total	80	100
Educational Level		
Non-formal	5	6.25
Primary	18	22.50
Secondary	30	37.50
Tertiary	27	33.75
Total	80	100
Years of Farming Experience		
≤ 10	59	73.75
11- 20	16	20.00
≥21	5	6.25

Table 2: Maximum Likelihood Estimates for the Parameters of the Stochastic Frontier Production Function for Catfish Farmers in Alimosho Local Government Area, Lagos State, Nigeria.

Variables	Parameters	Model 1	Model 2
General Model (Production Function)			
Constant	β_0	0.8875	1.0590
Feed quantity	β_1	-0.0429 (-0.515)	-0.0998 (-1.601)
Labour quantity	β_2	0.2774 (2.665)*	0.3886 (4.556)*
Fingerling Quantity	β_3	0.6933 (10.079)*	0.7245 (12.310)*
Pond Size	β_4	0.1445 (3.642)*	0.1617 (5.347)*
Inefficiency Model			
Constant	δ_0	-	0.425(1.138)
Age	δ_1	-	-0.0015 (-0.654)
Marital Status	δ_2	-	-0.0279 (-0.011)
Educational Level	δ_3	-	0.0410(1.951)***
Family size	δ_4	-	0.0198(1.853)***
Farming experience	δ_5	-	0.0076(1.703)***
Variance Parameters			
Sigma Squared	σ^2	-	0.0209 (2.826)*
Gamma	γ	-	0.999 (0.238)
Log Likelihood Function		-	41.15

Notes: * =1% level; ** = 5%; *** = 10% (Figures in parentheses are t- values).
Source: Computed from Field Survey Data, 2015.

Table 3: Elasticities (εP) and Returns-to-Scale (RTS) of the catfish farmers in Alimosho Local Government Areas of Lagos State

Variables	Elasticity Coefficient
Feed quantity	-0.0998
Labour quantity	0.3886
Fingerling Quantity	0.7245
Pond Size	0.1617
RTS	1.175

Table 4: Decile Range of Frequency Distribution of Technical Efficiencies of the Catfish Farmers in Alimosho Local Government Areas of Lagos State.

Decile Range (%)	Technical Efficiency	
	No	%
>90	1	1.25
81-90	1	1.25
71-80	2	2.50
61-70	13	16.25
51-60	37	46.25
41-50	25	30.0
31-40	2	2.5
21-30	-	-
Minimum	39.43%	
Maximum	91.30%	
Mean	54.47%	

Table 5: Summary of Cost Savings According to Efficiency Indicator by Catfish Farmers in Alimosho Local Government Areas of Lagos State.

Efficiency Indicator		Value of Savings (%)
	Most Technically Efficient	40.33
TE	Most Technically Inefficient	56.81

Source: Field Survey 2015.

SUMMARY, CONCLUSIONS AND RECOMMENDATION

This research work broadly estimated the farm level technical efficiency analysis of catfish production in Alimosho Local Government Areas of Lagos State, Nigeria. The study in its specific objectives described the socio-economic characteristics of the catfish farmers in the study area; and analyzed of the technical efficiency of the catfish farmers in the study area. The study employed the use of cross-sectional data from household survey conducted on a sample of 80 catfish farmers in the study areas. The data were collected with the aid of structured questionnaire and were later analyzed.

The study employed the following analytical tools in order to analyze the data collected from the field: Descriptive Statistics like frequency counts and percentages as well as Inferential Statistical Model such as Stochastic Frontier Approach. The null hypotheses stated were tested by the use of tools such as generalized likelihood ratio test and t-ratio test.

The mean age of the farmers in the study area was 44 years, and this revealed that they were still in their active productive age group. Majority of the catfish farmers are married. The catfish farmers in the study are well educated, and hence will be able to adopt best management practices as prescribed by the various technologies available at their disposals. The catfish farmers in the study have large households with an average household size of 7 persons. The mean year of farming experience was 9 years for the catfish farmers. This research revealed that about 70 % of the male catfish farmers were married in the study area.

Among the catfish farmers, the variables that were significant included labour quantity employed (1%), fingerling quantity (1%) and pond size (1%). The estimated sigma square (s^2) for the catfish farmers were 0.0209 (significant at 1%). The estimated gamma (g) parameter of catfish farmers revealed that 99% of the variations in the catfish output among the catfish farmers in the study area are due to the differences in their technical efficiencies. This finding indicated that fingerling quantity was the most important variable factor of production among the catfish farmers in the study area. The RTS for the catfish farmers was 1.175 in the study areas.

The predicted catfish farm specific technical efficiency (TE) for the catfish farmers' indices ranged from a minimum of 39.43% to a maximum of 91.30% for the farms, with a mean of 54.47%. The findings here revealed the capacity of an catfish fanners to increase his/her technical efficiency level to a tune of 46% and in turn attain a cost-saving status of about 40.33% that the most technically efficient catfish farmer had enjoyed in his/her catfish production enterprise using the available production techniques and technology in the study area. The range of the frequency distribution of the TE indicates that about 5 % of the catfish farmers had TE of over 70% and about 62.50% had TE ranging between 51% and 70% respectively.

The catfish farmers were not fully technically efficient in the use of production resources; In the short run, an average catfish farmer has the scope of increasing (his/her catfish production by about 45.53% by adopting the technology and techniques used by the best practiced (most efficient) catfish farmers, and such catfish farmers could also realize 40.33% cost savings in order to achieve the TE level of his most efficient counterpart (Bravo-Ureta and Evenson, 1994; Bravo-lreta and Pinbeiro, 1997); the most technically inefficient catfish farmer revealed cost saving of about 56.81%; About 5 % of the catfish farmers had *TE* of over 70 % and about 62.50% had TE ranging between 51 % and 70 %.

The socio-economic characteristics as educational level, family size and farming experience had significant influence on their *TE* in the study area; and for the catfish farmers, the variables that significantly affected their technical efficiencies include labour quantity, fingerling quantity and pond size. Labour quantity, fingerling quantity and pond size carried positive signs while feed quantity carried negative sign.

The policy implications and recommendations of this study based on the major findings include: catfish production in the study area should be encouraged more among the young and better-educated farmers who will be able to adopt the new and improved technologies which are both labour and cost - saving in nature bearing in mind the goals of maximizing the use of endowed resources of land, labour, capital and others in the study area; the extension services should be directed towards training and teaching the farmers recent agricultural practices that are fish specific. New and improved technological innovations like the use of labour-saving device should be developed and farmers should be made to have access to such at affordable prices.

Further studies on this research area should investigate the differentials in the technical efficiency of the farmers based on certain risks inherent and peculiar to their production system.

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