PROFIT EFFICIENCY IN FISH SMOKING IN ILAJE LOCAL GOVERNMENT AREA OF ONDO STATE, NIGERIA.

By

S.A Adewuyi.*, P.A Okuneye*, I.A Adeosun** and O.M Alaba *

*Department of Agricultural Economics and Farm Management
Federal University of Agriculture, Abeokuta

**Department of Aquaculture and Fisheries Management
Federal University of Agriculture, Abeokuta

Correspondence Author: elisam99@yahoo.com

Abstract

Fish processing has evolved to be a major business in the fishery sub-sector. This study estimated the profit efficiency of the respondents in the use of resources in the study area. In all, primary data collected from one hundred and twenty (120) respondents were used in estimating the models. The data were analysed using the Stochastic Frontier Profit Function analysis. The maximum likelihood estimates of the stochastic frontier profit function revealed that, with the exception of wage rate in crayfish smoking, profit decreased as the price of fresh fish and wage rate increased in all the fish types. Direct relationship existed between the profit and the level of capital of the bonga ($p<0.05$) and crayfish ($p<0.01$) smokers. Access to credit facilities ($p<0.05$) and membership of processing association ($p<0.05$) were the socio-economic factors that influenced the profit efficiency of the crayfish smokers. Fish smoking experience ($p<0.05$) influenced the profit efficiency of the catfish smokers while formal education ($p<0.05$) and duration of smoking ($p<0.01$) influenced the profit efficiency of the bonga fish smokers. The study recommended that fish smokers, especially, crayfish smokers should be encouraged to join processing association since this will enhance acceptability to credit facilities which will eventually increase their profit efficiency.

Key words: Profit, Efficiency, Fish, Smoking, Ondo State

IJAFS 4, 2013, 4: 421 - 427
Accepted for publication, June, 2013.
Cite as IJAFS 4 (1&2), Pp 421-427

Introduction

The aquatic food production globally has more than doubled since 1970, with a total of approximately 93.2 million metric tonnes in 1997 (Delgade *et al*., 2003). Fish is an important source of food and income to many people in the developing world. In Africa, 5 percent of the population (about 35 million people) depend wholly or partly on the fisheries sector, mostly artisanal fisheries, for their livelihood. Fish harvesting, handling, processing and distribution provide livelihood for millions of people as well as providing foreign exchange earnings to many countries (Al- Jufaili and Opara, 2006).

Studies have shown that smoked fish trade has been increasing, both in terms of the quantity of products and fish species traded, as well as the number of people it engages and the markets served (Essuman, 1992). In Nigeria, the continuing increase in fish export income corroborates the government's growth strategy for the sector as articulated in vision 2020 to raise the share of GDP from 1.1% in 1995 to about 5% in 2020. Smoking is the removal of most of the water from the flesh and the depositing of preservating chemical on the fish flesh.

Fish processing is largely motivated by the economic objective of earning a positive economic return arising from the value addition. Meeting this objective requires efficient utilization of scarce resources. However, there could be intervening variables which may prevent decision units to realize this objective. Thus, there is a need to examine profit efficiency in fish smoking in the study area and to identify factors that influence these in this sector. An approach that can be used to solve the problem of efficient utilization of scarce resources focuses on three questions: first, whether farmers are economically (technically and allocatively) efficient in fish smoking and second, what factors determine their level of efficiency? Thirdly, what steps or incentives need to be put in place for different fish processors to enhance their level of efficiency? Answers to these questions provide a clue on how we can assist smokers to be efficient in utilizing the resources employed in fish smoking.

The crucial role of efficiency in increasing agricultural output has been widely recognized by researchers and policy makers. It has remained an area of important research both in developed and developing countries. This is particularly so in developing economy where resources are meager and opportunity for developing and adapting better technology are dwindling (Ali and Chaudhary, l990). The reason behind estimating efficiency is that if decision making units are not making efficient use of existing technologies, then efforts designed to improve efficiency would be more cost effective than introducing a new technology as a means of increasing output (Shapiro, 1983). Efficiency measurement is important because it leads to a sustainable resource savings, which have important implications for both policy formulations and management (Bravo-Ureta and Evenson, 1994).

Ogunjobi (1999) stated that efficiency measurement is important for the following reasons: firstly, it is a success indicator and performance measure by which production units are evaluated. Secondly, it is only in measuring efficiency and separating its effects from the effects of the production environment that one can explore hypothesis concerning the sources of efficiency differential. Thirdly, identification of sources of inefficiency is important to the institution of public and private policies designed to improve performance, as this will provide the mechanism for monitoring the performance of a production system or unit. Efficiency measurement is estimated separately by estimating technical and allocative efficiency from a production frontier.

However, this may fail to capture inefficiencies associated with different factor endowments and input and output prices across farms (Abdulai and Huffman, 2000). This is due to the fact that farmers face different endowments and different optimal operating points. Lau and Yotopolous (1971) had earlier suggested incorporation of firm specific prices and fixed factors as arguments in estimating the model to make it firm specific. This helps to transform a production function into a profit function. The profit function, unlike the production approach, combines both technical and allocative concepts in a profit relationship, and any error in production decisions are translated into lower revenue for the producer (Ali *and Sha* 1992) and, hence, lower profit efficiency. Profit Efficiency is the ability of a firm to attain the highest possible profit, given the prices and levels of fixed factors of the firm (Ali and Flinn, 1989).

Methodology

The study was carried out in Ilaje Local Government Area of Ondo State, Nigeria. A multistage sampling technique was employed for this study. In stage one, a purposive sampling technique was used to select six wards out of the twelve wards in Ilaje Local

Government Area based on prevalence of fish smoking activities. Two villages were selected from each ward using simple random sampling technique in stage two. Simple random sampling technique was further used in selecting thirteen (13) fish smokers from each village.

Data were collected from one hundred and fifty (156) fish smokers in the study area with the aid of questionnaire out of which one hundred and twenty (120) were fit for the analysis.

Model specification

A stochastic frontier normalized profit function was specified as:

$\pi = f(P_{ij,} Z_{kj)} \exp.(V_j - U_j)$

Where:

π is the normalized profit defined profit in naira divided by the firm specific price of smoked fish .

P_{ij} is the price in Naira of i-th variable input (fresh fish, labour, salt, transportation, charcoal) faced by the j-th fish smoker divided by the price of smoked fish.

Z_{kj} is the level of k-th fixed factor (smoking kilns, rent and storage facilities) on the j-th firm.

V_i is a normal random variable that is independently and identically distributed. M,. |

U_i is a non-negative one-sided truncation at zero with normal distribution. It measures the economic inefficiency relative to the frontier that is within the control of the decision unit, assuming there is efficient management. It is a description of distance of each firm to the stochastic frontier profit function (Л*).

The profit efficiency (PE) of an individual fish smoker is defined as the ratio of the observed profit to the corresponding stochastic frontier profit, that is,

$PE = \pi / \pi^* = f(P_{ij,} Z_{kj)} \exp.(V_j - U_j) / f(P_{ij,} Z_{kj)} \exp.(V_j) = \exp.(-U)$

Where π =Observed profit

π^* = stochastic frontier profit

The profit inefficiency model

The model was used to examine the effects of the included variables on the economic efficiency of the fish smokers and specified as:

$U_i = \delta_0 + \delta_1 D_1 + \delta_2 D_2 + \delta_3 D_3 + \delta_4 D_4 + \delta_5 D_5 + \delta_6 D_6$

Where:

U_i = Inefficiency effect

D_1 = Experience in fish smoking (years)

D_2 = Access to credit (dummy: 0 if No, 1 if yes)

D_3 = Age (years)

D_4= Education (years)

D_5 = Duration of smoking (hr)

D_6 = Membership of fish processing association (dummy: 0 if No, 1 if yes)

δ = Parameters to be estimated

Result Presentation and Discussion

Table 1.Frequency distribution of profit efficiency of fish smokers in the study area.

Profit efficiency range (%)	*Bonga Fish*		*Cat Fish*		**Cray Fish**	
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
1-10	0	0.00	0	0.00	1	1.96
10-20	2	3.77	0	0.00	0	0.00
21-30	2	3.77	0	0.00	0	0.00
31-40	4	7.55	1	6.25	3	5.88
41-50	9	16.98	0	0.00	3	5.88
51-60	11	20.77	1	6.25	11	21.57
61-70	2	3.77	1	6.25	3	5.88
71-80	8	15.09	5	31.25	9	17.65
81-90	7	13.21	3	18.75	15	29.41
91-100	8	15.09	5	31.25	6	11.77
Total	53	100.00	16	100.00	51	100.00
Mean profit efficiency	-	64.47	-	79.59	-	71.08
Minimum profit efficiency	-	18.28	-	33.77	-	3.62
Maximum profit efficiency	-	99.95	-	97.92	-	94.34

Field Survey Data, 2010

Frequency distribution of fish smokers by their profit efficiency

Table 1 above shows a wide variation in the level of efficiency across the three groups of fish smokers. The profit efficiency of the bonga fish smokers ranged from 18.28% to 99.95% with the mean efficiency of 64.47% (Table 2). Majority (37.75%) of the bonga fish smokers have profit efficiency ranging from 41 to 60%. If the average bonga fish smoker was to achieve the economic efficiency of her most efficient counterpart, she will realize a 35.5% cost saving, that is, 1-(0.6447/0.9995). The most profit inefficient bonga fish smokers will realize a cost saving of 81.71%, that is, 1-(0.1828/0.9995) to achieve the profit efficiency of her most efficient counterpart.

It is further revealed that the profit efficiency of the catfish smokers ranged from 33.77% to 97.92% with the mean efficiency of 79.59% (Table 3). Most (50%) of the catfish smokers have profit efficiency ranging from 71 to 90%. If the average catfish smoker was to achieve the profit efficiency of her most efficient counterpart, she will realize an 18.72% cost saving, that is, 1-(0.7959/0.9792). The most profit inefficient catfish smokers will realize a cost saving of 65.51%, that is, 1-(0.3377/0.9792) to achieve the profit efficiency of her most efficient counterpart.

The profit efficiency of the crayfish smokers ranged from 3.62% to 94.34% with the mean efficiency of 71.08% (Table 4). Most (21.41%) of the crayfish smokers have profit efficiency ranging from 81 to 90%. If the average crayfish smoker was to achieve the profit efficiency of her most efficient counterpart, she will realize a 24.66% cost saving, that is, 1-(0.7108/0.9434). The most profit inefficient crayfish smokers will realize a cost saving of 61.63%, that is, 1-(0.3620/0.9434 to achieve the profit efficiency of her most efficient counterpart.

Table2: Estimated Stochastic Frontier Profit Function for Fish smokers in the study area.

Variables	***Parameter Estimate***		
	Catfish	*Bonga fish*	*Crayfish*
Constant term	1.564	-1.579	-5.471***
Fresh fish	-0.796***	-0.484**	-0.737***
Wage rate	-0.102***	-0.509***	0.025
Firewood	1.064***	0.714***	0.846***
Capital)	-0.243***	0.344**	0.801***
Inefficiency model			
Fish smoking Experience (Years)	0.098**	0.019	0.075
Access to credit (dummy)	-0.431	-0.510	-2.693**
Age (years)	-0.062	-0.192	-0.058
Education (years)	-0.225	-0.328**	0.775**
Duration of smoking (hours)	0.110	0.081***	-0.351
Membership of fish processing association (dummy)	0.506	0.506	-3.193***
Sigma-square	0.071	0.217	1.299
Gamma (γ)	0.996 ***	0.999***	0.982***

Source: Stochastic Frontier Analysis Computer Software Output
*** Significant at 1%, ** Significant at 5%

Fish smoking experience has no significant relationship with profit efficiency of bonga fish smokers. The respondents that have access to credit were more economically efficient than their counterparts with no access. Access to credit enables recipients to procure the necessary inputs at a right time and in right amount which can eventually translate into increased profit efficiency. This is consistent with the findings of Hyuha (2006) in a study of profit efficiency among rice producers in Uganda. Age was found to decrease profit inefficiency. This means that as the bonga fish smokers increase in age, they become economically efficient. Formal education was found to increase profit efficiency of bonga fish smokers. These results are consistent with Ali and Byerlee (1991). Bonga fish smokers become inefficient as the duration of smoking increased. This may result from utilisation of excess firewood and other inputs since the products need more time to dry up when compared to smoked crayfish. Bonga fish smokers that were members of processing association were less economically efficient than those that were not members.

The result in table 2 reveals that all the estimates are significant at 1%. The negative signs of fresh fish and wage rate indicate that as the cost per kilogramme of fish and wage rate decrease, more profit accrue to the catfish smokers. Inverse relationship existed between the level of capital and profit accruing to catfish smokers. This may suggest that the smokers were not maximising the use of the existing capital. The capital used in catfish smoking is drum ovens and storage facilities which include baskets and other local materials for fish preservation. Acquisition of capital that will not be used in fish processing will lead to reduction in profit.

Direct relationship between the profit of crayfish smokers and wage rate per manday of labour indicates that as wage rate increased, profit also increased. However, the effect was not significant

Formal education increased profit inefficiency of crayfish smokers. Crayfish smokers that were members of processing association were more profit efficient than those that were not members.

All the estimates of stochastic frontier profit function parameters for the bonga fish conform to *a- priori* expectation. The estimates of fresh fish and capital were significant at 5% while that of wage rate and firewood were significant at 1%. The negative signs of fresh fish and wage rate of labour indicate that as the cost per kilogramme of fish and wage rate decrease, more profit accrue to the bonga fish smokers. The result also shows that with the injection of more capital (smoking kilns, storage facilities) to bonga fish smoking, higher profit will accrue to the processors.

Conclusion and Recommendations

The study attempted to analyse the profit efficiency in fish smoking in Ilaje Local Government Area of Ondo State, Nigeria. Characterizing the fish smokers according to fish smoked provided some socio-economic variables that influences profit efficiency. The bonga fish and crayfish smokers that have access to credit were more profit efficient than their counterparts with no access. Age was found to decrease profit inefficiency in all the fish types. Formal education was found to increase profit efficiency of bonga fish smokers while it increased profit inefficiency of crayfish smokers. Bonga fish smokers become profit inefficient as the duration of smoking increased. Duration of smoking increased profit efficiency of crayfish smokers. Bonga fish smokers that were members of processing association were less profit efficient than those that were not members. On the other hand, crayfish smokers that were members of processing association were more profit efficient than those that were not members.

The minimum, maximum and mean profit efficiency for bonga fish smokers were 18.28%, 99.95% and 64.47% respectively. Catfish smokers have minimum, maximum and mean profit efficiency of 33.77%, 97.92% and 79.59% respectively. 3.62%, 94.34% and 71.08% were the minimum, maximum and mean profit efficiency for the crayfish smokers.

Different socio-economic effects influenced profit efficiency of bonga, catfish and crayfish smokers. Lack of labour, seasonal nature of the business and lack of electricity were some of the constraints militating against fish smoking in the study area. Others include lack of market information, lack of access to credit and transportation problem.

The findings of this study have revealed the importance of some socio-economic characteristics in influencing profit efficiency. Based on these, the study therefore recommends that:

1. Credit facilities should be made available to the fish smokers especially the bonga and crayfish smokers.
2. Fish smokers, especially, crayfish smokers should be encouraged to be members of the association. This will also be an avenue for the spread of innovation or new technologies in fish processing.
3. Fish smokers in the study area should attend programmes that will increase their knowledge of and efficiency in fish smoking.

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