

PROFITABILITY OF AQUACULTURAL PRACTICE; A CASE STUDY OF FISH FARMERS IN IKEDURU LOCAL GOVERNMENT AREA OF IMO STATE

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ABSTRACT

The study was carried out to examine the profitability of aquacultural practice in Ikeduru Local government area of Imo state and made use of both primary and secondary data. The main instrument for collecting the primary data was structured questionnaire. The population of the study was forty five registered fish farmers in Ikeduru L.G.A and a sample of twenty five fish farmers were drawn out from the population. A random sampling technique was employed. Data collected include socio economic characteristics (Age, sex, marital status, educational qualification and years of experience), total revenue, total variable cost, net income and total fixed cost. The data were analyzed using inferential statistics. The descriptive analysis showed that a large proportion of fish farm was age 31 – 50 years, 60% had formal education (secondary education), 80% are married, 60% male farmers, 40% with year of experience between 5 – 10 years and 34% trained formally in fish farming and financed their fish production through personal savings. Equally evident from the result is that the average net income of fish farmers was N155, 868 while the profitability index was 0.33, which implies that for every one naira invested in fish production by farmers, a return of N1.33 and a profit of N0.33 were obtained. The multiple regression result revealed that fish output was significantly determined by size, farming experience, educational attainment and training in fish farming. The coefficient of determination R^2 value of 0.6805 indicates that 68.05% of the variation in the value of fish output was explained by the socioeconomic characteristics listed. Multiple regression also revealed that fish output was significantly determined by feed, capital, labour and other variable costs. The coefficient of determination R^2 value of 0.7520 indicates that 72.50% of the variation in the value of fish output was explained by feed, capital, labor and other variable costs (fingerlings, medication, maintenance, etc). The study concluded that fish production in the study area is economically rewarding and profitable. It is capable of improving the standard of living of the people by creating employment and augmenting income. Therefore it is recommended that fish farmers there should be encouraged with grants, credits and subsidy from the government financial institutions so as to boost their startup capital.

KEYWORDS: Profitability, Socio-Economic, Fish Farming, Gross Margin

INTRODUCTION

Fish is a highly nutritious food, containing high amount of proteins with high bio-chemical value for humans. In addition, it is a very good source of polyunsaturated fatty acid (P. U. F. A) Known to be beneficial in preventing cardiovascular disease. In addition to its nutritious flesh, fish is a valuable source of vitamin A and D especially to infants

and children (Areola, 2007). Fish is a cheap source of animal protein and has no religious taboo or any known cultural limitation, affecting its consumption unlike pork and meat, (Eyo, 2001). Attention has been focused recently on the relationship between fish consumption and reduced incidence of cardiovascular diseases. The benefit has been attributed to the nature of fat and fish, for fish oil, unlike other fats in other food is the only type that supplies Omega 3 poly unsaturated fatty acids which help in preventing asthma, arthritis. (Wand, 1995)

The United Nations Population fund (UNPF, 1993) posited that the demand for agricultural products is expected to reach unprecedented levels in the near future as the world population is estimated to double in fifty years time to about 11 billion with ninety eight percent of the population growth likely to be in the developing countries. Potentials therefore exist for demand-supply imbalance. In Nigeria, Poverty is found to be made pronounced and severe in the agricultural sector (NBS, 1998, 1999). There is also high rate of rural-urban migration, high prices of food items and precarious food security situation (Okunmadewa, 2001). This makes the citizens vulnerable by diet associated diseases. Recent estimate shows that at least forty-one percent of the Nigerian population is food insecure and 16% being severely under-nourished (Olayemi, 1998). Nigeria has a land area of 923, 768 km² with a continental shelf area of 47,934km² and length of latitude of 853km. It also has a vast network of inland waters like rivers, flood plains, natural and man-made lakes and reservoirs (Shimang, 2005). The inland water mass was estimated to be about 12.5 million hectares of land waters capable of producing 512, 000 metric tonnes of fish annually.

Aquaculture, which is the rearing of related fish species under scientifically controlled conditions in an enclosed environment such as ponds, where they feed, grow, breed and are harvested for consumption or for sale (Iweama, 2002) can therefore contribute beneficially to fish production. It is relatively new activity for small scale farmers (Satia, 2004) and (Omitoyin, 2007) have shown that fish farming is a profitable enterprise with socio-economic variables like household size, educational status of farmers, years of experience, volume of initial capital, poor quality fish feed, good quality fish pellet. Fish farming is practiced both in large scale and small scale providing additional income for farmers and boosting the domestic production of fish in Nigeria. Fish farmers however require information on the cost analysis and returns associated with investment in fish production as well as factors influencing profitability in farming. This would serve a guide towards making sustainable profits. Therefore, the study aims at assessing the profitability determinants and problems of fish farming in Ikeduru local government area of Imo State.

RESEARCH HYPOTHESIS

H₀= There is no significant relationship between the socio-economic characteristics of the fish farmers and profitability in fish farming in Ikeduru L.G.A.

H₁ = There is significant relationship between the socio-economic characteristics of the fish farmers and profitability in fish farming in Ikeduru L. G. A.

RESEARCH METHODOLOGY

The study was carried out in Ikeduru local government area in Owerri agricultural zone of Imo State. Ikeduru is one of the 27 L.G.A in Imo State. It lies between longitudes 6^o51' and 7^o28'E and latitudes 5^o10' and 5^o37'N. It shares boundaries with Mbaitoli L.G.A, Mbano L.G.A and Owerri North L.G.A. It is a semi-urban L.G.A. where most of the citizens are farmers with few civil servants. It has high agricultural potential with available arable lands for growth of

tropical crops such as yam, cassava, cocoyam, maize, okra and vegetable are cultivated in the area, equally, livestock grow in the area include, sheep, goats, pigs, poultry. Also they are one of the major areas in Imo where fish farming is practiced (ADP, 2013). Random sampling technique was employed to select twenty five (25) fish farmers out of forty five (45) registered fish farmers with the Agricultural development programme (ADP). Structured questionnaire were administered to obtain information on socio-economic characteristics of farmers, costs associated with fish farming, revenues realized per period of time and the problem usually encountered. Personal observation method was used to gather information on issues of common concern to the farmers. Other sources of information included records of activities kept by the fish farmers was obtained through the assistance of extension agents in the area. The socio-economic data was analyzed, using descriptive statistics and gross margin analysis was used to measure costs and returns of fish production and multiple regression analysis was used to determine the relationship between revenue from fish farming and the various socio-economic factors affecting fish production. The following implicit functions are specified as model.

Gross Margin Analysis

$$GM = TR - N = TVC$$

Where GM = Gross Margin

TR = Total Revenue

TVC = Total Variable Cost

NI = Net Income

TFC = Total fixed cost

Multiple Regression Functions

$$Y = f(x_1, x_2, x_3, x_4, x_5, x_6, e, \dots)$$

$$Y = f(x_1, x_2, x_3, x_4, e, \dots)$$

Where Y = Net revenue from fish production in Naira

X₁ = Age of farmers

X₂ = Sex

X₃ = Household Size

X₄ = Farming experience

X₅ = Educational attainment

X₆ = Training in fish farming

e = Stochastic error term

$$Y = f(x_1, x_2, x_3, x_4, e, \dots)$$

Where Y = Net revenue from fish production in Naira

X_1 = Feed

X_2 = Capital

X_3 = Labor

X_4 = Other variable cost (fingerlings, medication, maintenance, etc)

e = Stochastic error term

The functional forms of the model are as follows:

Linear: $Y = a_0 + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + a_5 x_5 + a_6 x_6$

Double Log: $\log Y = \log a_0 + a_1 \log x_1 + a_2 \log x_2 + a_3 \log x_3 + a_4 \log x_4 + a_5 \log x_5 + a_6 \log x_6 + e$

Semi Log: $Y = \log a_0 + a_1 \log x_1 + a_2 \log x_2 + a_3 \log x_3 + a_4 \log x_4 + a_5 \log x_5 + a_6 \log x_6 + e$

The regression coefficients $a_0, a_1, a_2, a_3, a_4, a_5, a_6$, were estimated by ordinary least square (OLS) technique. The magnitude of the coefficients of multiple determination, the signs and statistical significance of the regression parameters and measures by t-tests were used to determine the lead equation. The f- test was used to determine the significance of the equations.

RESULTS AND DISCUSSIONS

Table 1 presents the results on Socio-economic characteristics of major stakeholders in fish farming in Ikeduru Local government area of Imo State, Nigeria.

Table 1: Socio-Economic Factors in Fish Production (Farmers Personal Characteristics)

Factor	Frequency Distribution (%)			
	Age of farmers (yrs)	Less than 30 24%	31-50 56%	More than 50 20%
Gender	Male 64%	Female 36%		
Literacy level (Educational Qualification)	Primary 12%	Secondary 60%	NCE, OND, B. Sc, HND 28%	
Marital Status	Single 20%	Married 80%		
Year of Experience	Less than 5years 20%	5-10 40%	11-15 24%	Above 15 16%
Training in Fish Farming	Untrained 66%	Trained 34%		

Source: Field Data: 2013

Table 2: Cost and Return Analysis for Average Fish Farmers

Items	Frequency Distribution (%)	
	Amount(N)	
Fingerlings	7,200	2.26
Labor	32,280	10.40
Feeding	86,480	27.03
Medication	4,540	1.42
Maintenance	5,900	1.85
Water	46,160	14.42

Table 2: Contd.,

Miscellaneous expenses	34,120	10.67
Total Variable Cost =N217,680		
Fixed Cost		
Pond Construction	74,600	23.32
Equipment	4,132	1.29
Land	23,520	7.35
Total Fixed Cost = N102,252		
Sales from Fish = N475,800		

Source: Field Data 2013

From the data in Table 1, the fish farmers in Ikeduru L.G.A. are dominated by male. This was indicated by 64% score of the respondents. It also shows that 56% of the fish farmers in Ikeduru are aged between 31-50 years. It equally shows 60% of the fish farmers attended secondary school. This indicates that a good number of them attended school. Table 1 also shows that 80% of the fish farmers are married which indicates that the business gives them the avenue to take economic responsibility of the farmers. The table also indicates that the majority of the farmers had a wide range of farming experience (5-10years). This indicates that with their long experience in fish farming their conduct and performance will be enhanced. Table 1 also shows that 66% of the fish farmers are not trained.

The socio-economic factors affecting revenue of the fish farmers is presented in table 3. The linear functional form was chosen as the lead equation based on statistical and econometric reasons which included having the highest magnitude of the coefficient of multiple determination (R^2) the number of significant variables, the conformity of the signs borne by the variable to a priori expectation as was the significant of the regression result (f-ratio). The coefficient of multiple determination R^2 value was 0.6805 which implies the 68.05 percent of the variations in the socio-economic characteristics was explained by the included variable in the model, the ratio was significant at 1% level of significance which attests the goodness of fit of the model. The significant variable influencing the fish farmers were age of farmers, sex, household size, family experience and training in fish farming.

The estimation of the production factors affecting revenue from fish farming is presented in table 4. The double log form was chosen as the lead equation and therefore was discussed. The choice of the lead equation was informed by statistical and econometric reasons which included having the highest magnitude of the signs borne by the variable to a priori expectation as was the significant of the regression result (F-ratio). The coefficient of multiple determination R^2 value was 0.7520 which implies that 75.2 percentages of the variations in the revenue of the fish farmers was explained by the included variable in the model. The f- ratio was significant which attests to the goodness of fit of the model. The entire variables included in the model were significant.

Table 3: Socio Economic Factors Influencing Revenue from Fish Farmers

Functional Form	Dependent Variable	Regression Coefficient							R^2	Adjusted R^2	F-Ratio
		Intercept	X^1	X^2	X^3	X^4	X^5	X^6			
Linear	Y	39016.79 (3.89)***	-0.736 (1.67)*	2.932 (3.32)***	0.189 (3.02)***	(118.927 (3.610)***	-1538.353 (-1.20)	13811.17 (1.77)*	0.6805	0.5409	4.82***
		9.334 (16.13)***	-0.012 (-0.38)	0.613 (2.00)**	1.5402 (5.05)***	0.012 (0.46)	0.008 (-0.22)	1.68204 (1.83)*	0.4504	0.3205	2.62***
		-99202.15 (-1.03)	-1097.721 (-1.55)	26425.26 (2.70)***	817.640 (0.05)	2549.344 (2.68)	1849.265 (2.68)**	99972.055 (1.30)	0.5575	0.4099	3.78***
Double Log	Log Y										

Source: Field data 2013

***= Significant at 1% *= Significant at 10%

***= Significant at 5% += Lead equation

(...)= t-ratio

Table 4: Factors Affecting Revenue from Fish Farmers

Functional Form	Dependent Variable	Regression Coefficient					R ²	Adjusted R ²	F-Ratio
		Intercept	X ¹	X ²	X ³	X ⁴			
Linear	Y	2.801 (1.86)*	0.099 (4.91)***	-2.15e-05 (-1.03)	0.231 (3.28)***	0.0972 (0.14)	0.4977	0.4577	2.47**
Exponential		1.061 (4.40)***	0.007 (2.12)**	-3.95e-06 (-1.18)	2.96e-05 (2.39)**	0.0361 (1.65)*	0.5862	0.5211	3.54***
SemiLog	Y	-4.151 (-0.67)	0.237 (0.69)	-0.774 (-1.08)	1.716 (2.46)**	1.318 (2.60)**	0.4231	0.3869	2.17**
Double Log	Log Y	0.740 (3.34)	0.290 (2.59)***	1.73e-04 (2.24)**	-0.775 (-2.32)	0.065 (4.32)***	0.7520	0.7122	4.64***

Source: Field data 2013

***= Significant at 1%

**= Significant at 5%

*= Significant at 10%

+ = Lead equation

(...)= t-ratio

From the data in table 1, the fish farmers in Ikeduru LGA are dominated by males. This is indicated by 64% score of the respondents, age distribution of fish farmers shows that 56% of fish farmers are aged between 31-50 years, education qualification shows that majority of the fish farmers attended both primary, secondary and tertiary school and will be able to apply such in the process of fish production and marketing. This indicates that a good number of them are able to understand the market trend and can apply such in the process of fish marketing and production and equally able to decode market information especially in the areas of changing price thus they become affective and efficient in the trading activities. Marital status of fish farmers shows that 80% of them are married which indicates that majority of them had a wide range of farming experience (5 – 10 years). This indicates that with their long experience in fish farming, their conduct and performance will be enhanced. The table also shows that 66% of the farmers are not trained fish farmers which indicates that majority of them are not formerly trained fish farmers but their practice is borne out of long term experience. These results compares favorably with Aromolaran (2000).

Table 2 shows the cost and return analysis for average fish farmer. The result shows that the average total revenue was 475,800 naria which accrued from the sale of fish while the total cost was 319,932 naira arising from the fingerlings, labor, feeding and construction, land, equipment, etc. The net income was 155, 868 naira and the profitability index was 0.33 indicating that out of every N1.33 kobo earned, about 33 kobo was returned to the farmer as profit.

Table 4 shows that the coefficient of feed was significant at 1% of significance and positively related to revenue. This implies that as the amount of feed fed to the fish increases, revenue also increases. The increase in income/revenue is brought about by increased output as a result of increased feed consumption and hence faster growth and maturity. This is in line with the findings of Adeniyi et al. (2010) who also found out that expenditure on feed forms the major part (74.63%) of the total production of fish production in his study area and hence it is an important determinant of success or otherwise in the venture. The coefficient of capital was significant at 5% level of significance and positively related to revenue implying that the increased capital investment in fish farming would lead to increase in output and hence revenue. The coefficient of other variable cost items like fingerlings, medication, and maintenance was significant at 1% and positively related to the revenue through increase in output. This conforms to the findings of Adewuyi et al. (2010), Analysis of Profitability of fish farming in Ogun State, Nigeria, saying that large amount of money is spent by fish farmers in the purchase of variable items. The coefficient of farmers' gender was significant at 10% level of significance and

negatively related to revenue from fish farming. This could be added to more control of farm produce resources by men than their women counterpart. Research results suggest that men have higher access and control of productive resources than women including access to credit and this infringes positively on their productivity. The coefficient of household was significant at 1% level and positively related to the revenue of the fish farmers. This implies that revenue increase with increase in household size. Iheke (2010) noted that farm households rely on more members of their households than hired workers for labor on their farms. According to Nwaru (2004), this is so if members are not made up of the age of very young people, otherwise scarce capital resources that should have been employed for farm production will be channeled for the upkeep of dependent household members.

The coefficient of farming experience was at 1% and positively related to revenue. This implies that revenue from fish farming increases with the increase in the number of years spent by the farmers in fish farming. It has been noted that farmers would count a lot more on their farming experience for increased productivity rather than their educational attainment (Obasi, 1991; Nwaru, 1993 and Olomola, 1998). The result has some positive implications for increase in fish productivity with a concomitant increase in income. According to Nwaru (2004), as the number of years a farmer has spent in the farming business may give an indication of the practical knowledge he has acquired on how he can overcome some certain inherent farm production problems. The coefficient of training in fish farming is significant at 10% and positively related to the revenue of the fish farmers. This implies that revenue from fish farming increased if the farmers have had training in fish farming. In other words, *centeris paribus*, those who have received training in fish farming produce higher output than their counterparts who have not. This compares favorably with the findings of Aromolan (2000), Analyzing resources use efficiency on fish farms, A case study of Abeokuta zone, Ogun State, Nigeria. The implication of this is that there is a considerable level of profitability in fish farming in the study's finding area. Based on these, because of the considerable influence of the socio-economic characteristics on the profitability in fish farming in Ikeduru LGA at 1%, 5% and 10%, the null hypothesis that there is no significant relationship between the socio economic characteristics of fish farmers and profitability in fish farming in Ikeduru L.G.A is rejected and the alternative is accepted.

CONCLUSIONS AND RECOMMENDATIONS

The study examined the profitability of aquaculture activities and socioeconomic characteristics of fish farmers in Ikeduru LGA. The study has showed that fish farming is a profitable business as judged by the size of the net income, net income percentage, profitability index, and these fish farmers also made a substantial financial contribution to the family from the profits of the business. In spite of the profitable nature of the enterprise, the fish farmers encountered problems facing them which include high cost of feed, training in fish farming, inadequate capital marketing, etc. If these problems are solved or at least minimized, fish farming in Ikeduru will be more profitable and farmers will earn higher returns for their produce.

Based on the findings of the study, the following policy recommendations are made, fish farmers should be encouraged with grants, credits and subsidies from government financial institutions so as to increase their startup capital, buy more products in other to cover costs and make more profits. This is because the ownership structures revealed that most of the fish farms were owned by individuals who had little access to finance. Adequate training program on fish production should be organized for fish farmers in the study area for the dissemination of research findings to fill the gap created by poor contact with extension agents. Training helps in unlocking the talents, entrepreneurial activities of an

individual and equips them with knowledge and how best to allocate their resources for optimum productivity. Fish farmers are advised and encouraged in forming cooperative societies and associations so that they can solve most of the fish marketing problems encountered diplomatically with the help of the association. Government should stabilize control and bring down the prize of petroleum products especially diesel so that transportation cost will reduce, government can also provide means of transportation at a subsidized to cushion the effect of high transportation cost.

REFERENCES

1. S. A. Adewuyi; B. B Philip; I. A. Ayinde, and D Akerele: Analysis of Profitability of fish farmers in Ogun State, Nigeria. *J. Hum. Ecol* (2010), 31 (3): 179 – 184.
2. O. B Adeniyi, S. A. Omitoyin, and H. I. Aderibigbe: Profitability of Aquacultural practices: Emperical experience from fish farmers in Epe local government area of Lagos State: *Nigerian Journal of Fisheries*, Vol. 7 (1 & 2), October, 2010.
3. F. O. Areola: Fish Marketing and Export of Potentials of fish and Fisheries Product, Nigeria: *A paper presented at the educative and formative agricultural workshop and aqua- exhibition (2007): Sustainable fisheries livelihood management and food security in Nigeria.*
4. A. B. Aromolaran: Analyzing Resource use efficiency on fish farms: A case study of Abeokuta zone, Ogun State, Nigeria. *Aquafield 1* (2000) (1): 12 – 21.
5. A. A. Eyo: Fish processing technology in the Tropics. *University of Ilorin, Press, NIFFR New Bussa, Nigeria. Fisheries Series No. 5, National Agricultural Extension and Research* (2001) pp. 403.
6. R. O. Iheke: Migrant remittances, Resource Use and Welfare among Rural Small Holder Arable Crop Farm Households in Southern Eastern Nigeria: Ph. d Dissertation Michael Okpara University of Agriculture (2010). pp. 53.
7. O. A. Iweama: *Essential Agricultural Science for Senior Secondary Schools* (2002). pp. 36.
8. Nwaru J. C. (1993): *Relative production efficiency of Cooperative farms in Imo State, Nigeria.* M. Sc thesis, Federal University of Technology, Nigeria. Pp. 65.
9. Nwaru J. C. (2004): *Rural Credit Markets and resource use in Arable Crop Production in Imo State of Nigeria.* Ph. d dissertation, Michael Okpara University of Agriculture. pp. 90.
10. Obasi P. C. (1991): *Resource Use efficiency in Food Crop Production: A case study of the Owerri Agricultural zone of Nigeria.* M. Sc thesis, University of Ibadan, Nigeria. Pp. 55.
11. Okunmadewa, F. Y. (2001): *Poverty and Agricultural Sector in Nigeria.* Pp. 3
12. Olayemi, J. K. (1998): *Elements of Applied Econometrics, a publication of the Department of Agricultural Economics, Ibadan, Nigeria.* University of Ibadan.
13. Olomola, A. (1998): *Agricultural Credit and Production efficiency.* Pp. 2.
14. Omitoyin, B. O. (2007): *Introduction to fish farming in Nigeria,* Ibadan University Press. Pp. 91.

15. Shimang, G. N. (2005): *Fisheries development in Nigeria, Problems and Prospects*. Representation by the federal director of Fisheries in the Federal Ministry of Agriculture and Rural Development on homestead fish farming training for serving and retiring public servants in the Federal Ministry of Agriculture and Rural Development, FCT, Abuja. Pp. 110.
16. United Nations Population Fund, (1993): *Manual on Agricultural Credit*. Pp. 27.

