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Analysis of Profitability of Fish Farming in Ogun State, Nigeria

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ABSTRACT This study was conducted in Ogun state, Nigeria and made use of both primary and secondary data. The main instrument for collecting the primary data was structured questionnaire. The descriptive analysis showed that a large proportion (68%) of the fish farmer had formal (tertiary) education and financed their fish production through personal savings. Equally evident from the result is that an average total cost of ₦394,380 was incurred per annum by fish farmers while gross revenue of ₦ 715030.30 was realized with a gross margin of ₦ 574314 and a profit of ₦ 320650. The rate of return on investment of 0.55 implies that for every one naira invested in Fish production by farmers, a return of ₦1.55 and a profit of ₦0.55 were obtained. The multiple regression result revealed that fish output was significantly determined by pond size, labour used, cost of feeds, cost of lime and cost of fingerlings. The coefficient of determination, R^2 value of 0.462 indicates that 46.2% of the variation in the value of fish output was explained by pond size, quantity of labour used, cost of feed, cost of lime and cost of fingerlings The degree of responsiveness of the value of fish output to changes in the independent variables shows that a percent increase in the values of pond size, labour, feeds, fertilizer, lime, fixed input and fingerlings will lead to 0.029%, 0.057%, 0.005%, 0.534%,0.007% , 0.79% and 0.001% in the value of fish produced respectively. The study concluded that fish production in the study area is economically rewarding and profitable. It is capable of creating employment, augmenting income and improving the standard of living of the people. Therefore, it recommended government participation in fish farming to boost the quantity of fish available for consumption.

1. INTRODUCTION

The Nigerian fishing industry comprises of three major sub sectors namely the artisanal, industrial and aquaculture. The awareness on the potential of aquaculture to contribute to domestic fish production has continued to increase in the country. This stems from the need to meet the much needed fish for domestic production and export. Fish species which are commonly cultured include *Tilapia spp, Heterobranchus bodorsalis, Clarias gariepinus, Mugie spp, Chrysichthys nigrodigitatus, Heterotis niloticus, Ophiocephalus obscure, Cyprinus carpio and Megalo spp.* Fish culture is done in enclosures such as tanks.The aquaculture sub sector contributes between 0.5% and 1% to Nigeria's domestic fish production.

The rapid increase in population of the world has resulted in a huge increase in the demand for animal protein (which is essentially higher in quality than plant protein). The average protein intake in Nigeria which is about 19.38/output/ day is low and far below FAO requirement of 65g/ output/day. The nutritional requirement is particularly crucial in a developing country such as Nigeria where malnutrition and starvation are the major problems faced by million of rural dwellers .The low protein intake is an indication of shortage of high quality protein food in the diet of Nigerians. The consumption has been estimated to be 1.56267metric tones Tabor (1990).

Although fishing started over 40 years ago, aquaculture has not significantly contributed to domestic fish production. Equally estimated was the possible creation of 30000 jobs and generation of revenue of US$160 million per annum by the aquaculture industry.

Fish has been recognized to contribute 55% to the protein intake in Nigeria. However, local fish production has been below consumption with imports accounting for aboutUS$48.8m in 2002 (Central Bank of Nigeria 2004).Despite the increase in the major sources of animal protein such as livestock and poultry industries, the problem of protein deficiency still continues unabated. The protein deficiency in diet is equally associated with the inability of fish farming industry to supply the required quantity of fish. The situation causes poor health, low efficiency, low productivity and poor standard of living and decline in the contribution of fishery industry's

contribution to the Gross Domestic Product (GDP).The industry now contributes only2.0% of the GDP and accounts for 0.2% of the total global fish production. Nigeria is one of the largest importers of fish with a per capita consumption of 7.52kg and a total consumption of 1.2million metric tones with imports making up about 2/3 of the total consumption. This indicates the large deficit in fish supply in Nigeria Olopade and Olaokun (2005). It is therefore expedient to examine the profitability of fish farming in the study area to identify possible areas that require improvement. The development of the fish industry will increase local production of fish and save much of the foreign exchange being used for fish importation. Specifically, it has a special role of ensuring food security, alleviating poverty and provision of animal protein.

The study will therefore describe the socio-economic status of fish farmers, determine the profitability of fish farming and examine the determinants of fish output in the study area.

1.1 Research Hypothesis

H_0: There is no significant relationship between the quantity of fish produced and the educational level of fish farmers.

H_1: There is a significant relationship between the quantity of fish produced and the educational level of fish farmers.

2. RESEARCH METHODOLGY

This study was conducted in Ogun state, Nigeria and made use of both primary and secondary data. The main instrument for collecting the primary data was structured questionnaire. Information were collected on input and output in fish farming and socio-economic characteristics of fish farmers through personal interview. The primary data were supplemented with secondary data from journals, books and publications from National Bureau of Statistics, Central Bank of Nigeria and Nigeria Institute for oceanography and marine Research (NIOMR). A total sample of 82 fish farmers were selected randomly from the list of fish farmers with the assistance of extension agents from Ogun state Agricultural Development Programme (OGADEP) for the study.

Data analysis was done using the descriptive statistics, budgetary technique and multiple regression technique.

2.1 Budgetary Technique

The budgetary technique involves the cost and return analysis. It was used to determine the profitability of fish farming in the study area.

2.1.1.Model Specification

$\Pi = TR - TC$……..Equation 1
$TR = PQ$…….....….. Equation 2
Where
Π = Total Profit (₦)
TR=Total revenue (₦)
TC= total Cost (₦)
P= Unit price of output (₦)
Q= Total quantity of output (₦)

2.1.2 The Regression Model

The multiple regression model was employed to determine the influence of socioeconomic factors on the fish output level. The model is specified as follows

$Q=f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, e)$ ....Equation 3

Q is the value of fish output in naira

X_1 represents the pond size measured in square metres

X_2 is the quantity of labour used in fish production in mandays

X_3 is the cost of feeds measured in naira

X_4 represents the cost of fertilizer in naira

X_5 stands for the cost of lime in naira

X_6 represents the cost of fixed inputs in naira

X_7 is the cost of fingerlings measured in naira

e= Error term

Following Olayemi (1998) the relationship between the endogenous variable and each of the exogenous variables were examined using linear, exponential, logarithm and quadratic functional forms. Based on the value of the coefficient of determination (R^2), statistical significance and economic theory that support fish production, the lead was chosen

3. RESULTS AND DISCUSSION

3.1 Descriptive Analysis

Evidence from the descriptive analysis of socio economic characteristics of respondents in the study area in table 1 shows that male fish farmers constituted about 87.7% as compared to the female farmers that represent 12.3%. This

Table 1: Socio economic characteristics of fish farmers

	Frequency	*Percentage (%)*
Education		
Primary	3	3.7
Secondary	68	82.9
Tertiary	11	13.4
Total	82	100.0
Age		
10-20	3	3.7
21-30	21	25.6
31-40	41	50.0
41-50	13	15.9
>50	4	4.8
Total	82	100.0
Marital Status		
Married	58	63.7
Single	24	25.3
Total	82	100.0
Sex		
Male	71	86.6
Female	11	13.4
Total	82	100.0
Household Size		
1-4person	33	40.7
5-8	29	35.4
>8	1	1.2
No response	19	23.2
Total	82	100.0
Total	108	100.0
Farming Experience (Years)		
<5 yrs	51	62.2
5-10yrs	25	30.1
11-15 yrs	3	3.8
>15yrs	3	3.8
Total	82	100.0
Times of Feeding		
1 time	10	12.2
2 times	44	53.7
3 times	24	29.3
4 times	2	2.4
5 times	2	2.4
Total	82	100.0
Contact with Extension Workers		
0 time	64	78.0
1 time	5	6.1
2 times	8	9.8
3 times	4	4.9
5 times	1	1.2
Total	82	100.0
Training on Fish Farming		
Formal training	25	30.5
No formal training	57	69.5
Total	82	100.0
Mode of Farming		
Par time	59	71.9
Full time	23	28.1
Total	82	100.0
Sources of Finance		
Personal savings	68	82.9
Friends	1	1.2
Relatives	2	2.4
Cooperatives	9	11.0
Bank loans	2	2.4
Total	82	100.0
Sources of Feeds		
Purchase	68	83.9
Households waste	7	8.5
Others	7	8.5
Total	82	100.0
Farming Experience (Years)		
<5	50	61.7
5-10	25	30.8
11-15	3	3.7
>15	3	3.7
Total	82	100.0

Source: Field survey data 2007.

indicates the dominance of men in fish production in the study area. The fish farmers whose age fall between 31 – 40 years constituted the majority. On the whole, 96.3% fall into the economically active group of 20 – 50 years. The result of the marital status shows that majority 63.7% of the fish farmers were married. It is also evident that most of the respondents (71.9%) were part time fish farmers. A large proportion (68%) of them fish farmer had formal (tertiary) education and finances their fish production through personal savings. The farmers can therefore be said to be literate since only small proportion of them had no formal education. The result compares favourably with Aromolaran (2000) .The distribution of the household size indicates that the household size ranged from 2 to 13 while the average fish pond size was found to be 355m^2. The study also revealed poor extension visits to fish farmers who mostly operated on part-time basis. Also 74 (90.3%) of them obtained their fingerlings from farm gate while 84.2% purchased the feeds and 10.5% used household wastes. The descriptive analysis also indicates that most fish farmers (53.7%) fed their fish twice daily to achieve high yield while majority of them (57%) had no formal training on fish farming. The most common breeds of fingerlings utilized by fish farmers were Claris, Heteroclarias and Tilapia.

3.2 Profitability Analysis

The study examines the profitability of fish production in the study area. To determine the profit level, attempts were made to estimate the cost and return from fish farming. The input used, cost, yield or output data generated from the farmers were used to undertake the cost and return analysis for assessing the profitability of fish

production in the study area. The cost and return analysis is presented in the table 2. The result reveals that the cost of fingerlings accounted for the largest proportion (12.4%) of the total cost of fish production. This is followed by cost of feeds (11.7%).The lime cost and labour cost accounted for 3.2% and4.9% of the total cost respectively. This clearly shows that large amount of money is spent by fish farmers in the study area for the purchase of fingerlings and feeds. The fixed cost of production consists of cost of fixed assets such as pump, vehicles, aerators and pond which accounted for 61.6% of total production cost.

Table 2: Average cost and return of fish production

Item (Annual)	*Amount (#)*	*% of total cost*
Fertiliser	13695.72	3.4
Feeds	46450.77	11.7
Lime	12742.34	3.2
Fingerlings	48898.57	12.4
Labour	19519.13	4.9
Total variable cost	140716.3	
Fixed inputs	243287	
Total cost	394380	
Total returns	715030.30	
Profit	320650	
ROI	0.55	
ROIC	0.81	

Source: Computed from Field survey data 2007

Equally evident from the result an average total cost of ₦394380 was incurred per annum by the respondents while gross revenue of ₦ 715,030.30 was realized thereby returning gross margin of ₦ 574,314 and a profit of ₦ 320650. The rate of return on investment of 0.55 implies that for every one naira invested in rice production by farmers, a return of ₦1.55 and a profit of ₦0.55 were obtained.

The implication of this is that there is a considerable level of profitability in fish farming in the studys findings area. This result is consistent with the finding of Ashaolu et al. (2005) from their studies on profitability on fish farming. The rate of return per capital invested (RORCI) is the ratio of profit to total cost of production .It indicates what is earned by the business by capital outlay Awotide and Adejobi (2007). The result revealed that the RORCI of 80% is greater than the prevailing bank lending rate, 20% implying that fish farming in the study area is profitable. If a farmer takes loan from the bank to finance fish farming, he will be 60k better off on every one naira spent after paying back the loan at the prevailing interest rate.

3.3 Multiple Regression Result

The regression analysis was carried out to examine the determinants of factors effecting fish output in the study area. Based on the econometric and statistical criterion, the double logarithm was chosen as the lead equation and the results as presented in the table 3. The multiple regression result revealed that fish output is significantly determined by pond size, labour used, cost of feeds, cost of lime and cost of fingerlings. The coefficients are in line with the *a priori* expectation. Hence, the more the amount expended on labour, lime and feeds, the more the amount that will be realized from fish farms in the study area. The result is consistent with the finding of Yusuf et al. (2002). The result equally suggests the need for fish farmers to purchase more of these inputs to increase their revenue from fish production. Similarly, policies that will ensure availability of these inputs to fish farmers at affordable price should be put in place. The positive relationship between value of fish and pond size indicates that with increase in the size of fish pond, more fish will be produced. This is not surprising because all things being equal the

Table 3 The regression result of the determinants of fish output in the study area

Variable	*Coefficient*	*Beta*	*T*	*Significant*
Constant	6.238	-	4.882	.000*
Pond size	0.195	.204	2.234	.029**
Labour	0.363	.174	1.934	0.57
Feed	0.266	.263	2.888	0.005*
Fertilizer	0.0266	.056	0.625	0.534
Lime	0.06121	0.248	2.780	0.007*
Fixedinput	0.140	0.163	1.783	0.79
Fingerling	1.481E-05	0.316	3.33	0.001*
R^2 = 0.462;	F stat = 9.074			

*variable significant @1% ** Variable significant @5%
Source: Computd from Field survey data 2007.

quantity of fish produced is directly proportional to the pond size.

Based on the significance of labour used at 5%, the null hypothesis that the fish output is not affected by the quantity of labour used is rejected and the alternative is accepted. The coefficient of determination, R^2 values of 0.462 indicates that 46.2% of the variation in the value of fish output is explained by pond size, quantity of labour used, cost of feed, cost of lime and cost of fingerlings. Also, 53.8% of the variation in the value of fish is determined by other factors not considered.

Table 4 shows that the regression coefficient, standard error, F ratio and the level at which the t-ratio was significant for each of the independent variables. The performance of the analysis of variance in table 4 shows that F ratio of 9.074 was significant at 0.01 alpha level. This provided the evidence that a combination of pond size, cost of labour, cost of feeds, lime, fertilizer, fixed inputs and cost of fingerlings had joint impact on the fish output in the study area. The beta weight ranged from 0.056 to 0.316. The result implies that out of seven independent variables considered, fingerling is the most important input. It has the highest value of 0.316. This is followed by the quantity of lime while fertilizer is the least. This is not surprising because irrespective of the efforts and management practices, the output from a fish farm will be determined by the quantity and quality of fingerlings used.

3.4 Elasticity of Production and Return to Scale

The magnitude of elasticity of production is one of the economic concepts of measuring efficiency in resource-use (Oludimu 1987). The total sum of elasticities of production of the significant variables, 0.834 as shown in table 5 was less than unity. This suggests that fish production in the study area had a decreasing return. The implication is that each additional unit of the inputs will results in a small increase in the value of fish output than the preceding unit. This shows that production occurred among fish farmers in the study in stage 2, a rational stage of production. In stage 2, the sum of elasticities of production is greater than zero but less than one The implication is that the more the inputs used, the higher will be the value of fish even though at a decreasing rate. This finding is consistent with that of Olagunju et al. (2007) in their study on economic viability of cat fish production in Oyo state, Nigeria. The degree of responsiveness of the value of fish output to changes in the independent variables shows that a percent increase in the values of pond size, labour, feeds, fertilizer, lime, fixed input and fingerlings will lead to 0.029%, 0.057%, 0.005%, 0.534%,0.007% , 0.79% and 0.001% in the value of fish produced respectively. With the production result, increase in the utilization of labour and feeds is likely to boost the fish output substantially.

Table 5: Elasticity of production and return to scale of fish farmers

Independent variables	*Elasticities of production*
Pond size*	0.195
Labour*	0.363
Feed*	0.266
Fertilizer	0.0266
Lime*	0.06121
Fixed input	0.140
Fingerling*	1.481E-05

Source: Computed from field survey data 2007.
*Significant Variable@5% .

4. CONCLUSION AND RECOMMENDATIONS

Based on the value of benefit indicators, it can be concluded that fish production in the study area is economically rewarding and profitable. It is capable of creating employment, augmenting income and improving the standard of living of the people.

Based on the findings of the study, the following policy recommendations are made:

Adequate training programme on fish production should be organized for fish farmers

Table 4: Analysis of variance.

Source of variation	*Sum of square*	*Df*	*Mean square*	*F-ratio*	*Sig.*
Due to regression	41.060	7	5.866	9.074	0.000
Due to Residual	47.837	74	0.646		
Total	88.897	81			

Source: Computed from Field survey data 2007.
*Significant at 1%

in the study area for the dissemination of research findings to fill the gap created by poor contact with extension agents.

The ownership structure revealed that most of the fish farms were owned by individuals who had little access to finance. Therefore, government participation in fish farming should be encouraged in the area to boost the quantity of fish available for consumption.

Fish farming in the area is male dominated. Females need to be encouraged to participate in fish farming in the area as a means of augmenting their income and improve their standard of living.

Fish farmers should be organized into formidable groups such as cooperative to enjoin economies of scale in the purchase of inputs and sale of output. The formation of the cooperative should also be done towards ensuring labour availability.

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