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Annals of Biological Research, 2011, 2 (3) : 62-74
(http://scholarsresearchlibrary.com/archive.html)

ISSN 0976-1233
CODEN (USA): ABRNBW

Improving Fish farming Productivity towards Achieving Food Security in Osun State, Nigeria: A Socioeconomic Analysis

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ABSTRACT

This research work was conducted to investigate the economic returns of fish farmers in Osun State. A multi-stage sampling technique was employed in administering a combined open and closed- ended questionnaire. Data were collected on various socio-economic characteristics affecting farmers' output which include: sex, age, farming experience, level of education, household size, nature of involvement, etc. The data were analyzed using analytical tools like descriptive statistics, budgetary analysis and regression analysis. The descriptive statistics covers socioeconomic characteristics of the respondents assessed using frequency distribution tables. The budgetary analysis shows higher revenue to large, medium and small- scale farmers in that order. The regression analysis made use of seven independent variables to capture their effect on fish output. Four functional forms viz linear, semi- log, double log and exponential functions were fitted. The effects of the variables are best seen to be measured and explained by the linear function. Resource use efficiency indicates that all the variables are under- utilized except for lime and fertilizer that were over utilized. The study highlights some problems facing the business such as: poaching, expensive feed cost, scarcity/ high cost of fingerlings as well as seasonality of water. Co-operative organization, awareness creation, integrated fish farming, organizing seminars/conferences/workshops, subsidy on major inputs and farm hygiene was recommended.

Key words: Aquaculture, Fish production, Profitability and efficiency.

INTRODUCTION

Aquaculture has primarily been a developing world activity, especially in the Asian countries. Asia accounts for 87% of global aquaculture production by weight, while China alone is responsible for about 68% of the global production. Also, India and Southeast Asia accounted for about 15% of production in 1997 [1]. The composition of overall fisheries production has steadily shifted away from developed countries and towards developing countries. [1] said that developing countries have more than doubled total fish production since 1973, while production from developed countries had remained virtually unchanged. The shift in aquaculture in particular, especially in Thailand and Malaysia has created a major source of export revenue. Developing nations are being transformed from the status of net importers of fisheries products to that of large net exporters. [2] made a statement that fisheries products represented a major source of export revenue for developing countries, amounting to over US $ 20billion per annum in late 1990s. This exceeded the values obtained from the exports of meat, dairy, cereals, vegetables, fruit, sugar, coffee, tobacco and oilseeds in 1997 from developing countries. [3]. Much of the increase in Asian aquaculture is attributable to expanded area and improved productivity. Putting all these statistics into consideration, African countries have no significant contribution to the boom in aquaculture production; hence there is need for an in-depth study into an aquaculture economic analysis in the continent and Nigeria in particular.

[4] studied pond fish culture in Western Nigeria and discovered that pond fish culture was an enterprise which was viable. Who stated that a well-built fish dam was a lifetime investment capable of fully paying back its fixed (investment) cost in 5 to 10 years at the maximum and that the estimated cost of N750 per hectare of small-scale ponds appeared to be safe, which could be fully paid back in three years. With a proper management, a 4-ha pond stocked with tilapia was, according to him, capable of yielding a gross margin of N380 as against N850.00 when cultured with carp. [5] examined the resource-use efficiency in fish farming in the Cross River and Ondo States of Nigeria. Who stated the major objectives of estimating input-output relationships in fish farming, estimated the elasticity production and returns to scale and determined the optimum resource use level in the study areas. A cross-sectional study of 47 fish farms was made. The study showed that resources were efficiently utilized in fish farms in the two states. The computed elasticity of production showed that the fish farmers were operating in Stage II of the production process, which is the rational zone of production. It was also found that the farms were enjoying increasing returns to scale. The study went further to identify shortage of fingerlings, scarcity of feeds and inadequate training as the major problems hindering the development of fish farms in the two states. [6] compared the ability of fish farms to meet protein needs with that of leguminous crops in Nigeria. Who stated that in a well managed fish farm, up to 3000 kg of fish could be harvested annually on a sustainable yield basis per hectare, noting that this was six times more than cowpea and three times more than peanut for the same unit area. While arguing that this did not suggest that fish farms should replace crops, it did at least showed that aquaculture was not less paying than crops. [7] stated that intensification of fish production from pools in an African floodplain, through water management, fertilization and stocking with fingerlings, was technically a success. Who discovered that fish production per hectare was 171% greater in managed ponds compared with unmanaged ponds and in terms of income derived from labor inputs for pond management, the returns per man hour compared favorably to alternative activities? [8] stated that since 1984, there has been a surge of interest in large-scale commercial farms owned and/or operated by a ‘new breed’ of influential, wealthy and sometimes knowledgeable or skilled Nigerians, whose interest in the sector has been kindled by awareness created by the various fisheries administrations on the one hand and by a series of reforms enacted by Government in favor of agricultural development after the oil boom era, on the other hand. In the private sector, there were about 2000 rural fish ponds, 3000 homestead

ponds and over 50 commercial farms. In the public sector, there were more than 30 fish seed production units and hatcheries, a large pool of trained manpower, as well as training and research facilities for aquaculture. However, most public sector units were operating below capacity due to inadequate and unreliable releases of funds, shortage of input supplies, problems of management and insufficient motivation of staff. On the other hand, progress in the private sector was hampered by inadequate supply of quality fish seeds and feeds, low performing extension services, as well as the long and, at times, painful procedures to have access to land and institutional credit. Therefore, this study aimed at improving fish farming Productivity towards achieving food security in Osun State, Nigeria: A Socioeconomic Analysis

Specifically, the objectives of the study were to:

1. Identify and describe the socio-economic characteristics that influence fish farming in the study area.
2. Determine the costs and returns to the enterprise and hence its profitability.
3. Determine the resource use efficiency in fish farming.
4. Identify the problems and constrains of fish farming in the study area.

MATERIALS AND METHODS

Area of study

The study covers Osun State (South western Nigeria). Osun state has a total landmass of 9 125Km². It lies between latitude 7^0 & 8^0 N and is bounded in the North by Kwara state, in the north-east by Kogi state, in the east by Ondo state and bounded in the south by Ogun state. The rainfall pattern of Osun state is wide and diverse ranging from 125mm (minimum in the dry season). Thus there are two rainfall peaks. Administratively, Osun state is divided into 30 local government plus 1 area office with an estimated population according to 2006 census of 3 423 535. But going by the Osun state Agricultural Development Programme (ADP) method of administration, the state is divided into three zones: Iwo, Oshogbo and Ilesha zones. This study covers the three zones but does not cover all the local government areas in each zone of the state. Therefore, selected local government areas from each zone were used.

Sample size, Sample Frame and Sampling Technique

The survey approach to information gathering is adopted for the study. A preliminary visit to the Osun State Ministry of Agriculture and Natural Resources (Fisheries Department) revealed that there are about 364 registered farmers which spread across the state. Multistage random sampling method is adopted for the selection of a total of 105 farmers on whom open and close ended questionnaire were administered. The three ADP zones in the state are taken as the first stratum. One or two local governments are purposively selected from each zone. Thirty five respondents/farmers were selected and interviewed in different villages in each of the local Governments. However, only ninety questionnaires are recovered and the analysis was based on these.

Method of Data Collection

The data were collected from two categories: Primary source and secondary sources. Primary data were collected with the aid of open and closed ended questionnaires. The questionnaire is based on the objectives of the study, i.e. data based on socio- economic data, various cost incurred in production (fixed and variable costs). Returns on sales of the fish, problems facing the producer generally and suggestions for improvements on such problems will be obtained.

Secondary sources include information obtained from publications, textbooks, FAO Publications, Federal Department of Fisheries, Research reports from Nigeria Institute of Oceanography and Marine Research (NIOMR), National Bureau of Statistics and CBN reports.

Method of Data analysis

The data collected for the study were analyzed using using descriptive, budgetary and regression techniques. The descriptive analysis involved the use of frequency distribution, percentages and tabulation of data. The budgetary and regression techniques are expatiated upon below.

The budgetary technique is used to determine the profitability of the enterprise. Gross margin analysis basically measures the difference between total returns and total variable cost. Gross Margin of fish farming is the difference between the total value of production (total revenue) and the variable costs of production. The total revenue refers to the gross income accruing to fish farms as a result of the sales of table-sized fish. This is obtained by multiplying the unit price of average table-sized fish by the quantity sold. The variable costs are those costs that vary with the level of output. In this study the relevant variable costs items are fish feed, fingerlings, labor, and fertilizer/lime among others. The fixed costs items under fish farming are land, pond construction, hatchery construction, trucks and other equipment. The addition of total variable cost and total fixed costs gives the picture of the overall cost incurred in production. However, for the purpose of arriving at fixed cost of the fish farms for a given year, the straight line depreciation method was used taken into consideration, the expected life span of the different fixed cost items. Using the straight line method, the annual depreciation expenses are calculated on the fixed cost which is used to get the net farm income.

Gross margin (GM) is expressed as:
GM= TR- TVC
NFI= GM-TFC
Where GM= Gross margin/ha
TR= Total revenue (₦)
TVC= Total variable cost (₦)
TFC= Total fixed cost (₦)
NFI= Net farm income (₦)
TGM= Total Gross margin/ha

Fixed costs were depreciated using straight line method represented as $\frac{V-S}{N}$ where

V= Original value of fixed input
S= Salvage value
N= No of economically useful life

Regression analysis

This is a statistical tool that measures the relationship between independent variables (regressors) and the dependent variable (regressand). In this study, the regression analysis was carried out to examine the factors affecting revenue from fish output. A production function was fitted to available data. The production function establishes the proportion of variation in the dependent variable that can be explained by the independent variables.

The implicit form of production function is:

$$Y= f(X_1 , X_2, X_3, X_4, X_5, X_6, X_7 \ldots\ldots X_n\ \ U)$$

Where Y= Naira value of measured table fish per production period (₦/production period)
$X_{1=}$ Cost of feeding in a production period (₦/production period)
$X_{2=}$ Cost of fingerlings used in a production period (₦/production period)
X_3= Cost of hired labor used (₦/production period)
X_4= Family labor used per production period in mandays
X_5= Cost of fertilizer used per production (₦/production period)
X_6= Size of fish farm in hectare (ha)
X_7= Production experience of respondents (years)
X_n = for other variables identified on the field
U = error term

Four functional forms, (linear, semi-log, double log and exponential) were fitted to the production function in order to investigate which production function has the best fit for the phenomena. The lead equation was chosen based on economic, statistical and econometric criteria.

The explicit forms of the four functional equations were:
Linear:
$Y= bo +b_1X_1 +b_2 X_2+b_3 X_3 +b_4 X_4 +b_5 X_5 +b_6 X_6 +b_7 X_7 \ldots\ldots X_n + U)$
Semi-log:
$Y= bo +b_1logX_1 +b_2 logX_2+b_3 logX_3 +b_4 logX_4 +b_5 logX_5 +b_6 logX_6 +b_7 logX_7 \ldots\ldots X_n + U)$
Double log:
$LogY= bo +b_1logX_1 +b_2 logX_2+b_3 logX_3 +b_4 logX_4 +b_5 logX_5 +b_6 logX_6 +b_7 logX_7 \ldots\ldots X_n + U)$
Exponential function:
$Ln\ Y= bo +b_1X_1 +b_2 X_2+b_3 X_3 +b_4 X_4 +b_5 X_5 +b_6 X_6 +b_7 X_7 \ldots\ldots X_n + U)$

It is expected that the value of each of the variables i.e. b_1-b_7 will be positively related to the total value of the outputs. In other words, the more the amount expended on these variables the more the value of production ceteris paribus.

The marginal value product was calculated from the three functional forms as follows:

Linear: $MVP_x = b_iP_y$
Semilog: $MVP_x = {}^{b1}/_{x1}$
Double log: $MVP_x = {}^{biy}/_{xi}$
Where Xi = Xi………..Xn
Y= Geometric mean of Y
X= Geometric mean of X
b = regression coefficient

RESULTS AND DISCUSSION

This section presents the results and discussion emanating from the study. In subsequent subsections I present the characteristics of fish farmers, budgetary analysis, factors affecting the performance of fish farming as captured by regression analysis as well as problem faced by fish farmers in Osun state.

Selected Characteristics of Fish Farmers:

Table i: Summary of selected Characteristics of farmers

Variables	Category	Frequency	Percentage
Age	21-30	4	4.4
	31-40	14	15.4
	41-50	38	42.2
	51-60	26	28.98
	□60	8	8.9
Total		90	100
Gender	Male	86	95.6
	Female	4	4.4
Total		90	100
Educational level	No formal education	19	21.1
	Primary school	12	13.3
	Secondary school	20	22.2
	Tertiary institution	39	43.3
Total		90	100
Sources of labor	Hired	21	23.3
	Family	32	35.6
	Family+ hired	36	40
	Family+ exchange	1	1.1
Total		90	100
Sources of fingerlings	Hatcheries	59	65.6
	Own farm pond	3	3.3
	Government farm	26	28.9
	Others	2	2.2
Total		90	100

Source: field survey

Age

Table 1 shows that most (42.2%) of the respondents were between the ages of 41 - 50, while 28.9% were in the age bracket of 51 – 60 years, next to this were those in the age bracket (31-40) which accounted for 15.6%. The youth (21-30) and the aged (□60) constitute the minority as they form 4.4% and 8.9% respectively. The implication is that majority of the respondents are still in their active age, the youth (21-30) might still be in school while the old (□60) might not have the strength and the agility that the work requires.

Gender

The results in Table 1 show that majority (95.6%) of the respondents were male while the female constitute 4.4%. This shows the extent of gender sensitivity on occupation like farming. This could be attributed to the fact that agricultural production is faced with a lot of risk and uncertainties and women are risk aversed, so also is the result of drudgery that aquaculture business is involved in.

Educational level

Education is an important factor influencing management and the adoption of any technology. Table 1 shows that the respondents were found to be distributed over a wide range of educational backgrounds consisting of 21.1% with no formal education, 13.3 % had primary education, 22.2% had secondary education, 43.3% had tertiary education most of whom are civil servants either (active or retired), teachers, medical doctors and a host of other professionals. This is in agreement with a similar study conducted by [9] in Ibadan metropolis, and is an indication of high literacy level which may be required for effective management of fish farms.

Sources of labor

The main source of labor was a combination of hired and family labor. Farmers that uses hired labor alone constitute 23.3% while those who employed the usage of family labor constitute 35.6%. Higher percentage of family labor above hired labor indicates that most farmers operate small-scale business. Those who use the combination of the two form the majority as they constitute 40% of the work force.

Sources of fingerlings

The availability of fingerlings within the reach is of economic importance in agricultural business. Fingerlings are production factor which can either be raised by the farm or purchased from other sources. The distribution from table 1 depicts that 65.6% of the respondents in the study area depend on hatcheries as source of fingerlings, 28.9 claimed that they source fingerlings from government farms, 3.3% raised their own fingerlings by themselves while 2.2% source fingerlings from other source(s). However, those farms that source their fingerlings from either government or hatchery claimed that nearness to their farm informed their decision of where to purchase.

Table ii: Distribution of Fish Farmers by Types of Fingerlings Used

Types of finger lings	frequency	Percentage
Clarias spp	48	53.3
Tilapia	6	6.7
Clarias + Tilapia	24	26.7
Clarias + Tilapia+ Carp	1	1.1
Heterotis + Clarias+ Tilapia	5	5.6
Tilapia+Heteroclarias+ Heterobranchus	4	4.4
Tilapia+ Clarias+ Heterobranchus + Heterotis	1	1.1
	90	100

Source: field survey

Table 2 shows that majority (53.3%)of the farms raised clarias spp alone, followed by those with the combination of Clarias+ Tilapia (26.7%) 6.7% raised tilapia, 5.6% raised heterotis + clarias+

tilapia, 4.4% favoured the culture of tilapia+heteroclarias+ heterobranchus , while 1.1% of the respondents raises clarias + tilapia+ carp and tilapia+ clarias+ heterobranchus + heterotis .

The guiding principle in the selection of cultured fish species include: growth rate of the fish, short food chain of the species, good table quality as well as readily available market which is a function of their demand. From the table, it can be noted that about 38.9% of the fish farmers combine two or more species on their farms. Tilapia remains the most combined with other species.

Table iii: Sources of Credit

Source of credit	frequency	percentage
Personal saving	40	44.4
Friends and relatives	3	3.3
Bank loan	5	5.6
Cooperative societies	12	13.3
Savings and cooperative	19	21.1
Relatives and cooperative	4	4.4
Savings, Bank loan and cooperative	3	3.3
Savings and Bank loan	4	4.4
Total	90	99.8

Source: field survey

Credit plays a vitae role in enhancing productivity. The study shows that majority of the farmers do not have access to credit as shown in Table 3, a good proportion of the respondents (40%) began by using their own savings, sales and gifts or loan from families and relatives as well as friends. This is due to the fact most banks attracts high interest rates and most farmers, have no collateral. Because of this poor access to credit, farmers cannot expand their scope of business.

Profitability of fish farming in the study areas

Table IV: Profit Analysis of Fish farms

	Large farm	Medium farm	Small farm
Total revenue	27 244 032	3 973 958.3	624 900.76
Total variable cost	10 911 741	1 035 863	443 345.06
Gross margin	16 332 291	2 938 093.3	181 555.70
Total fixed cost	142 000	53 250	29 823.04
Profit	16 190 291	2 884 843.3	151 732.66

Source: field survey

Profitability of fish farming is given in Table 4; across the farms, feed, labor and fingerlings constitute significant proportion of the total variable costs. For instance, an average large scale fish farmer spends about 76% of its variable costs on feed compared with 10% spent on fingerlings and 7.7% spent on labor. In line with this, the medium-scale fish farms spend about 44% and 34% on labor and feed respectively, while it spend 14.8% on fingerlings. Also the small-scale fish farm spends 31% on feed as well as 27.9% and 21.1% on labor and fingerlings respectively. In sum, at least 80% of the total variable costs by fish farmers are on feed, labor and fingerlings. The fixed cost items constitute only 1.3% of total cost of fish farms by large-scale producers. The fixed cost components of the total cost for small and medium scale farms are 6.3% and 4.9% respectively.

In absolute terms, an average large scale fish farm makes a profit of ₦16 190 291, while medium and small-scale fish farms make a profit of ₦2 884 843.3 and ₦151 732.66 in that order. Judging from the above, it can be said that the small farms are not making enough profit, while the large farms are benefiting most followed by the medium scale farmers. This is due to the fact that most large farms practice integrated fish farming for the by-products and end products from one farming activity are often recycled and used as feed for the fishes, also enjoy economies of scale. These account for the enormous output of the large farms. On the other hand, small farms are not making enough profit because most of them practice on part term basis, hence do not devote much time, effort, attention, input and more importantly, most of them lack the technical know how.

Factors affecting the performance of Fish Farms

The regression analysis was carried out to examine the factors affecting revenue from fish output. The results of the multiple regressions for the estimated equations are:

Linear:

$$Y= 840.256+ 2.770X_1+ 2.117X_2+ 1.067X_3+ 116.461X_4- 2.425X_5- 25719.055X_6+ 7812.9364X_7$$
(0.34) (6.405) (4.395) (3.200) (1.203) -(0.910) -(0.781) (2.171)

Semi log:

$$Y= -986483.8+ 57277.261X_1+ 59676.741X_2+ 4138.895X_3+ 9313.578X_4+ 1596.682X_5 + 2081.339X_6 +$$
-(6.088) (4.607) (4.282) (1.020) (0.910) -(0.355) (0.206)

$$20482.710X_7$$
(0.892)

Double log:

$$Y= 6.414+ 0.283X_1 +0.273X_2+ 1.209 \text{ x}10^{-2} X_3 +1.334 \text{ x}10^{-2} X_4 +1.664 \text{ x}10^{-2} X_5 +1.828\text{x}10^{-3}X_6 +9.657\text{x}10^{-2}X_7$$
(12.101) (6.963) (6.092) (0.911) (0.412) (-1.131) -(0.055) (1.286)

Exponential:

$$Y=11.184+1.323\text{x}10^{-5}X_1+9.475\text{x}10^{-6}X_2+1.356\text{x}10^{-6}X_3-6.562\text{x}10^{-5}X_4-6.628\text{x}10^{-6}X_5–0.393X_6+ 4.259\text{x}10^{-2}X_7$$
(99.664) (6.677) (4.295) (0.888) -(0.148) -(0.543) -(2.609) (2.584)

On the basis of selection criteria, viz: apriori expectatation in terms of sign and magnitude of the coefficient, the economic rationale, the significance of the coefficients and the overall performance of the model, [10] and [11], the linear functional form was eventually considered as the lead equation, because the adjusted R^2 is the highest and most of the variables were significant at 1% and 5% with appropriate signs on most of them. The apriori expectation is that the sign should be positive for all the variables and that the variables should significantly accounted for by the dependent variables at 1%, 5% or 10% level.

The result of the lead equation shows that the coefficient of determination (R^2) is 0.735 which implies that about 74% of the variations in the value of fish output is jointly explained by the included variables (X_1 - X_7) while the remaining 26% may be due to error terms and other factors that may not be accounted for by the farmers. The F- value of 30.833 indicates that the overall equation is statistically significant at 1% level. From the result, it is evident that four of the variables significantly explain the variation in the value of fish. Except for the production experience that is significant at 5% level, all other variables have significant influence on fish value at 1%.

In consonance with the apriori expectation, the regression coefficients of cost of feed, cost of fingerlings, and cost of hired labor are positive and significant which implies that a unit increase in any of those inputs will lead to an increase in the value of output, family labor (X_5) is also positive but not significant. Despite this, a unit increase in its value will also lead to an increase in the fish output which invariably leads to increase in gross margin. Contrary to expectation, cost of lime and fertilizer as well as size of pond are negative and non-significant which implies that a unit increase in the cost of lime and fertilizer and a unit increase in pond size leads to a decrease in fish output. The reason that could be adduced for the formal are that fertilized pond cannot be fertilized economically if the water is muddy or there is excess amount of water flowing through the spillway. In the same vein, if slaked lime or builders' lime that is poisonous to the fish and dangerous to handle are used it could be as a result of wrong application. The usual sign in the case of pond size may be due to the fact that its maintenance might not be done in conformity with technical details involved. Alternatively, if the pond is not properly stocked, it will lead to a decrease in fish output as the pond will not be used optimally for production to cover operational cost.

The responsiveness of value of fish output to changes in the value of input differs. For instance, a 1% increase in the value of cost of feed(X_1), value of fingerlings(X_2), hired labor (X_3), family labor(X_4) and production experience(X_7) respectively lead to 0.36%, 0.34%, 0.13%, and 0.18% increase in the value of fish output. On the other hand, a 1% increase in the cost of lime and fertilizer(X_5) and pond size (X_7) will lead to 0.04% decline in both variables. The value of fish output is inelastic in response to changes in the values of all inputs.

Marginal value productivity and resource use efficiency

In order to examine the efficiency of the input usage, the relationship MVP=r was used. Where MVP is the marginal value product. The term 'r' represents the price per unit of input. For this purpose, since analysis was carried out using naira value, then the relevant identity is dy/dx=1. Where dy/dx is now the MVP and ₦1 represent the value of input. Following from the above,

MVP = 1 implies efficient use of resources
MVP > 1implies under utilization of resources
MVP < 1 implies over utilization of resources

Table V: Marginal Value Products of the Variable Inputs Used

Variable inputs	Marginal value product (MVP)
Value of feed (X_1)	831
Value of fingerlings (X_2)	635
Hired labor (X_3)	318
Family labor (X_4)	34938.3
Value of lime and fertilizer (X_5)	-727.5

Source: Computed from regression result

None of the variables was used to the point of the economic efficiency; it is evident that since the MVP value for feed (X_1), fingerlings (X_2), Hired labor (X_3) and family labor (X_4) are positive and greater than 1, this is under utilization of these resources. On the other hand, the MVP value for lime and fertilizer (X_5) is negative indicating that they have been over utilized. Following from this, it pays to increase the usage of feeds, fingerlings and both hired and family labor while reducing the quantity of lime and fertilizer to improve the efficiency of these inputs.

Problems of the fish farmers

The major problems faced by the fish farmers in the study area were presented in Table 6. Twenty and twenty one of the farmers respectively claimed that poaching and the menace of the predators were their problems, forty five complained bitterly of paucity of fund as a major factor inhibiting their productivity as well as future expansion. Eighteen of the respondents claimed that the non availability/ high cost of fingerlings constitute a problem to them, while twenty nine and twenty one respectively complained of high cost of feed and market price fluctuation. Eleven complained of problem of preservation/ storage/processing while four claimed that problem of land acquisition constitute a cog in their wheel of progress, others include disease/ pest infestation which five of them claimed as well as problem of water shortage during the dry season which two claimed to be facing. It is therefore very important to note that the problems were not exclusive but interwoven.

Table 6: Major problems of fish farmers in the study are Table Vi: Major Problems of Fish Farmers in the Study Area

Major problem areas	No of respondents
Poaching	20
Predator	21
Finance	45
Non availability/ High cost of fingerlings	18
High cost of feed	29
Market price fluctuation	21
Preservation/storage/processing	11
Land acquisition	4
Disease/ pest infestation	5
Water shortage during dry season	2

Source: Field survey

CONCLUSION

Policy Implication of Findings and Observation

Having more male fish farmers than their female counterparts implies that fish farming activities are gender sensitive/biased. The bulk of those who are involved in aqua cultural business are able bodied men in their active age. Hence, the state have potential to sustain fish farming for many more years. Most of the farmers operate on a small scale, as they are just able to raise funds through their meager personal savings. This implies that they cannot expand the scope of their business, and so cannot reap scale economies.

The large scale farmers sampled generate highest gross margin and as a result are able to make more profit due to the fact that they enjoy economies of scale. Most of them also practice integrated farming and are able to utilize labor for more than one farming operations as a labor saving device. Fish farming will not be attractive if the cost of feed, labor and fingerlings continue to increase as shown in the result obtained.

Farmers in the study areas were economically inefficient in the utilization of their production inputs. Underutilization in the case of feed, fingerlings and hired labor could be attributed to high cost.

Given the poor storage and processing facilities of farmers sampled, expansion of business without guaranteed marketing may not materialize.

Recommendations

Co-operative organization becomes imperative in order to encourage farmers who source capital from personal savings as this will help alleviate their financial problem. Farmers should explore every available credit opportunities within their community, such as commercial banks, credit and thrift societies among others. Government could also place more emphasis on credit facilities toward agricultural production in general and fisheries in particular; such include Agricultural Credit Guaranteed Scheme Fund which enhanced credit availability to the farmers and taking care of tangible proportion of any default so as to encourage the commercial banks to make credit facilities available to farmers.

Given the level of profit that accrues to fish farmers studied, there is need for awareness to be created to unemployed youth by government agencies and non governmental organization to encourage fish farming.

Integrated fish farming should be encouraged as waste products from one farming activity could serve as input into fish farming, thereby reducing cost of production. In addition, there should be an increase in the feed input to the optimal level for there to be increased productivity of fish farmers in the study area. Feed is the singular most important input in fish production; therefore, there must be adequate level of quantity and quality of feed input being fed to the fish if a reasonable level of productivity is to be achieved by the farmers toward achieving food security. Apart from the common commercial feeds, farmers should look inward into their environment for the consideration of other items that could be fed to fish as supplements. These include maggots, certified blood meal, condemned day-old-chicks from hatcheries, to mention a few.

Although farmers sampled had tertiary education, there is need to improve on the technical know how of fish farmers through seminars and workshops for those farmers who were not originally trained as fish farmers.

Major inputs in fish farming such as improved fish seeds, fishing materials, processing/storage facilities, fish feed should be subsidized for all fish farmers.

Farm hygiene and fencing should be encouraged to minimize predation and poaching revealed in the study areas.

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