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PROFITABILITY AND UTILIZATION CONSTRAINTS TO LOCAL FLOATING FEED FOR CATFISH ENTERPRISES IN OSUN STATE NIGERIA

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ABSTRACT

The high percentage that the cost of feeding covers in the catfish production enterprise calls for the search of a less expensive substitute to the imported feed commonly used by fish farmers in the nation hence the need for this research and this research looked into the level of profitability of catfish farming enterprise using local floating feed in Osun State, the constraints and solutions to the enterprise in the state.

Multi-stage sampling technique was used to obtain primary data from the respondents with the aid of a well-structured questionnaire, 180 locally pelleted floating feed users. Data were collected on the cost and returns of the enterprise, constraints to the enterprise and the likely solution.

It was discovered that the enterprise is profitable with a net farm income of N1,008,769.30 and gross margin of N1,039,814.79, the rate of return, operating expenses ratio and other profitability ratios confirm the profitable nature of the enterprise. Importance ranking index was used to rank the constraints identified by the farmers and the Inability to access funds to expand production, High Cost of extruder and other machines, need to use higher volume/quantity than the imported, Unstable market price of feed ingredients and Rough appearance and less attractive saint/odour in order of importance were identified by the farmers. Also, Government loan at low interest rate, Provision of floating feed machine and other tools at low cost, Provision of good quality water, Stability of market price of fish and fish feed ingredients and Improvement on the feed by a research institute in order of importance were identified by the farmers as solution to the problems.

It can be concluded that aquaculture production is a profitable investment considering the size of gross revenue obtained from the study, the feed has a significant contribution to fish production. In order to make feed available at a relatively cheaper price for small scale catfish farmers, commercial feed millers should collaborate with relevant institutes and other relevant agricultural research centres to work out alternative substitutes to the currently imported fish meal that constitute the highest cost in feed formulation also the government should encourage financial institutions to give loans to serious minded investors at considerable interest rates but with proper monitoring

INTRODUCTION

Aquaculture was introduced to Nigeria in the early 1950s and fish production through aquaculture has risen steadily from a few hundred kilograms to over 45,000 metric tonnes in 200[7]. The industry produced over 85,000 tonnes of fish in 2007 [9].

The fishery sector is estimated to contribute 3.5 percent of Nigeria's Gross Domestic Product (GDP) and provides direct and indirect employment for over 6 million people. Despite the popularity of farming in Nigeria, the fish farming industry can best be described as being at the infant stage when compared to the large market potential for its production and marketing.

There is a growing recognition of the considerable potential of small-scale aquaculture, which may diversify farmers' livelihoods and increase income, while simultaneously reducing risk and vulnerability to food insecurity. Small scale fish farmers account for over 70 percent of producers and this group can be further divided into commercial and non-commercial (subsistence farmers). These farms comprise of holdings ranging from one pond of 0.05ha to several ponds with a total water surface area of about one hectare.

Despite the abundance fisheries resources and the relatively high consumption of fish in Nigeria which is the largest single consumer of fish products in Africa [9,11], its domestic output of 0.62 million metric tonnes still falls short of demand of 2.66 million metric tonnes [9]. A supply of deficit of 2.04 million metric tonnes is required to meet the ever-increasing demand for fish in Nigeria. This large deficit between the demand and supply of fish is augmented by massive importation of frozen fish. However, it has been shown that Nigeria can substitute fish importation with domestic production to create jobs, reduce poverty in rural and peri-urban areas where 70 percent of the population live and ease the balance of payment deficitsFeed is, without question, the single most expensive input in intensive fish culturing [2] especially for catfish which needs a high protein diet (as it is cannibalistic). This is due to the fact that the costs of most imported ingredients (fish meal, wheat offal, soybeans, corn products) are usually high. Research has shown that most imported feedstuff can be replaced by locally available feedstuff. This, therefore, entails the production of fish feed from locally available materials using local technology especially the local feed extruder which will help the small-scale fish farmers to be able to determine the quantity the fish can consume at a time instead of using sinking pellets which quantity consumed cannot be ascertained each time fish are being fed.

The major obstacle to intensive aquaculture profitability is feed availability, importation and subsequently its high price [5]. For aquaculture to thrive and bridge the already existing wide gap between fish demand and supply especially in Nigeria, the vital role of locally pelleted floating feed in reducing production cost cannot be over emphasized. According to [22], feed constitutes the largest proportion of the total variable cost of catfish production, corroborated by Lawal [14] who reported that, fish feed is the most important component of any fish farm enterprise and it constitutes between 60 and 70 percent of the total recurrent cost of production, which to a large extent determines the viability and profitability of fish farming enterprise.

Contemporary observations show that small scale catfish farmers spend bulk of their capital on fish feeds which prices rise from time to time since they are over dependent on foreign floating feed, and the price of a kilogram of catfish is not increasing. Most small-scale catfish farmers face the challenge of raising an average size well acceptable in the market for lack of enough capital to procure the exact amount of feed they need for production. They do not have the ability to raise reasonable quantity, and even to expand their production.

Therefore, local production of fish feed is very crucial to the development and sustainability of

aquaculture in Nigeria. Most especially, the rural areas and peri-urban with the aim of reducing the cost of production and increase the profitability in fish culturing among small scale fish farmers.

Akegbejo and Adeoye (2012) [2] estimated the costs and return from fish farming exercise in South-West Nigeria. The cost and return analysis reveal that the cost of fish fingerlings accounted for the largest proportion (45.3 percent) of the cost of fish farming in the study area. This was followed by cost of fish feeds (42.0 percent). This shows that large amount of money was spent by fish farmers for the purchase of feeds and fingerlings. This finding is in agreement with Okwu and Acheneje [18] who recorded fish feed and fingerlings as the two farming components that eat deep into the farmers variable costs.

Feeding takes more than 60% of the cost of producing catfish in Nigeria, this is as a result of the high cost of importing the feed contents into the nation. Nigeria is blessed with the ingredients that are used for the production of the feed hence the introduction/construction of machines and tool that can pelletize the feed ingredients.

There is a need to examine how local floating or pelletized feed has helped in increasing profit margin of small-scale fish farmers. Most feed ingredients they need to produce fish feeds are readily available in the country and more so they are easy to access. In the process of reviewing the performance of the farmers that use local floating feed, this research tried to provide answers to the following research questions:

- What is the level of profitability of farmers using local floating feed?
- What are factors that influence the use of local pelleted floating feed among small scale fish farmers?

METHODOLOGY

Study area

The study was carried out in Osun State and it took six months between months of June 2016 and January 2017. Osun State is located in the south-west geopolitical zone of Nigeria. The State is bounded by Ogun State to the South, Kwara State to the North, Oyo State to the West and Ondo State to the East. The State lies in the geographical coordinates of latitude 7.5876° N, 4.5624° E. The two distinct climatic seasons are the rainy season which is between the months of March and October, and the dry season between the months of November and early March. It is one of the land-locked States of the Federal Republic of Nigeria. It covers an estimated area of 8,062 square kilometers [20]. The State runs an agrarian economy with a vast majority of the populace taking to farming. The State is a typical rain forest with mean annual rainfall varying between 880mm and 2600mm and is characterized by the forest vegetation and limited to freshwater fisheries. The state has 30 Local Government Areas (LGAs). Osun State, according to the state Department of fisheries is divided into six fisheries zones. It has the highest proportion of fish farmers compared with other States in South-western Nigeria [3].

A multi-stage sampling technique was used in the selection of the respondents for the study in the State. In the first stage, six LGAs was purposively selected, namely: Orolu, Osogbo, Egbedore, Ejigbo, Ede North, and Olorunda. These are among the prominent catfish producing LGAs in Osun State according to the Fishery Department of Osun State Ministry of Agriculture and Natural Resources.

Second stage involved random selection of three major catfish producing towns/villages from each of the selected LGAs. Third stage involved purposive selection of ten small scale catfish farmers in each town/village totaling 180 small scale catfish farmers sampled. The selection of small-scale catfish

farmers was done according to Olaoyeet *al*.,(2013) [19] who stated that small scale catfish farms range from homestead concrete ponds (25m^2 to 40 m^2) to small earthen ponds (0.02-0.2 hectares).

Method of Data Collection

The research was conducted in the year 2016 between the months of march and July. Primary data were collected using a pre-tested structured questionnaire. The data collected included production variables such as; species of fish cultured, type of pond used, size and capacity of fish pond used, number of fish cultured (stocking rate), feeding (feed brand name), medication, fish quantity harvested, return per naira invested (Revenue Cost Ratio) and marketing taking into consideration the cost involved in carrying out each operation were sought for.

Analytical Techniques

Budgetary analysis

Budgetary analysis was used to determine and compare the cost and returns of the small scale catfish farmers. The equation can be expressed as:

$$TR = P \times Q \quad \text{.......(1)}$$

$$GM = TR - TVC \quad \text{.......(2)}$$

$$TC = TFC + TVC \quad \text{.......(3)}$$

$$\text{Profit } (\lambda) = TR - TC \quad \text{.......(4)}$$

Where;

GM = Gross Margin (₦)

TR = Total Revenue (₦)

TVC = Total Variable Cost (₦)

TR = Total Revenue (₦)

TFC = Total Fixed Cost (₦)

P = Price of catfish/Kg (₦) and

Q = Output of catfish (kg)

Importance Indices

Importance ranking index was used in order to identify the relative importance of constraints to cat fish production in the study area. This study employed the method by Alimi et al., (2004) and Baruwa, 2004). For construction of the indices, catfish farmers where asked to list and rank the constraints to catfish production in an ordinal scale (1 was assigned to the most important, 2 the next important and sequentially in descending order of importance) and it is specified as:

$$\mathbf{A} = \begin{vmatrix} f_{11} & f_{12} \dots & f_{1n} \\ f_{21} & f_{22} \cdots & f_{2n} \\ \vdots & \vdots & \vdots \\ f_{m1} & f_{m2} \cdots & f_{mn} \end{vmatrix} \quad \text{.......(5)}$$

$$\mathbf{B} = \begin{vmatrix} W1 \\ W2 \\ . \\ . \\ Wm \end{vmatrix} \quad \text{.......(6)}$$

$$\mathbf{C} = \boldsymbol{AB} = \begin{vmatrix} f_{11} & f_{12} \dots & f_{1n} \\ f_{21} & f_{22} \cdots & f_{2n} \\ \vdots & \vdots & \vdots \\ f_{m1} & f_{m2} \cdots & f_{mn} \end{vmatrix} \begin{vmatrix} W1 \\ w2 \\ . \\ . \\ Wm \end{vmatrix} = \begin{vmatrix} C1 \\ C2 \\ . \\ . \\ Cm \end{vmatrix} \quad \text{.......(7)}$$

Matrix A gives the distribution of catfish farmers on each type of constraints facing catfish enterprise

according to constraint type ranking. The matrix indicates that there are m constraint types to be put in n categories of rank. Matrix B is the weight attached to each of the ranks, W1 is the weight attached to rank j where i=j, i= 1, 2…m and j=1, 2 …n. W1is the weight attached to rank 1, W2 to rank 2 e.t.c. Matrix C gives the product of matrices A and B (AB). It is the total value of importance attached to each constraint types. For example C2= f_{21w1}+. . . . .+f_{2nwm} =total value of impotence attached to constraint type 2. C1 is the total value of importance attached to constraint type i.Importance rating for constraints type i= $\frac{1}{\lambda 1} C1$

Where $\lambda 1$ = f_1 = total number of farmers selecting constraint type I as important.

Importance index = $\frac{C1}{f_i} \times \frac{f_{i1}}{\sum_{i=1}^{m} f_{i1}}$

Likert Scale

A psychometric response scale primarily used in questionnaires to obtain participant's preferences or degree of agreement with a statement or set of statements. Likert scales are a non-comparative scaling technique and are unidimensional (only measure a single trait) in nature. Respondents are asked to indicate their level of agreement with a given statement by way of an ordinal scale, named after Dr.Rensis Likert, a sociologist at the University of Michigan who developed the technique. This was used to identify and rank the constraints facing poultry egg production. This was employed to get the suggestion off the respondents on the solutions to the problems they have identified.

RESULTS AND DISCUSSION

Cost and returns to locally pelleted floating cat fish enterprise in Osun State

The result of costs and returns of small-scale catfish enterprise using locally pelleted floating feed is presented in Table 1. It was found that 98.14 percent of the total cost of production was on variable inputs. Cost of local floating feed accounted for 86.52 percent, suggesting that a high amount of money was spent on feed, this finding is in agreement with [20] who claimed that large amount of money spent by fish farmers in catfish production was majorly for purchase of fish feeds. The cost of fish seed covered up to 4.67 percent of the total cost; this was followed by the cost of labour (4.53 percent), net (0.61 percent), transport (1.69 percent), cost of lime (0.072), while cost of phostosine (0.034) constituted the least in the variable cost of production. Depreciation on pond was 1.63 percent of the total cost and this constituted the highest proportion of the fixed cost incurred in small scale catfish production enterprise in the study area. This is followed by depreciation on pipe (0.10 percent), scale (0.10 percent) and depreciation on other fixed inputs (0.0293 percent).

The mean value of the total variable and fixed costs were ₦1,636,351.12 and ₦31,045.49 respectively while the mean value of the total cost was ₦1,667,396.61. Net farm income was ₦1,008,769.30, indicating that the enterprise is profitable with the gross margin of ₦1,039,814.79.

Profitability ratios included in this study are profit index which gives a value of 0.38 indicating that from every ₦1.00 generated from the enterprise, a net income of ₦0.38 is earned; the rate of return was 0.60 which implies that from every ₦1.00 invested into the enterprise, a net income of ₦0.60 is realizable and the operating expenses ratio whose value is 0.61 shows that from every ₦1.00 generated from the enterprise ₦0.61 is invested as a running cost into the investment. Also, the benefit

cost ratio was 1.60, implying that for every ₦1.00 invested on catfish production, ₦1.61 is realizable as income. All these ratios confirm that catfish farming with the use of local floating feed is a profitable enterprise.

Table 1: Enterprise budget (₦) for the production of catfish for a cycle production (6 months) period

S/N	Item	Mean amount(₦)	Percentage of revenue/costs
1	**Revenue**:		
a	Total Revenue (5,582.44kgcatfish @ ₦ 479.39 per kg)	2,676,165.91	
2	**Variable costs**:		
	Cost of fish seed	77,944.44	4.67
	Feed cost	1,442,642.58	86.52
	Cost of labour	75,565.03	4.53
	Cost of Net	10,088.89	0.61
	Cost of lime	1,200.69	0.072
	Transport	28,205.56	1.69
	Cost of phostosine	562.03	0.034
	Cost of electricity	141.90	0.0085
b	Total Variable Costs (TVC)	1,636,351.12	98.14
C	Gross Margin (GM) = (TR – TVC)	1,039,814.79	
3	**Fixed costs**:Depreciation on		
	Pond	27,180.95	1.63
	Pipe	1,715.35	0.10
	Elbow	377.30	0.023
	Cap	105.22	0.0063
	Scale	1,666.67	0.10
d	Total Fixed Costs (TFC)	31,045.49	1.86
e	Total Costs (TC) = (TFC + TVC)	1,667,396.61	100
f	Net Farm Income (NFI) = (TR – TC)	1,008,769.30	
g	Rate of return on investment (ROI)=f/e *100		0.60
h	Operating Expenses Ratio (OER) = b/a		0.61
i	Benefit Cost Ratio (BCR) = a/e		1.60
j	Profitability index (PI) = f/a		0.38

Source: Field Survey, 2015

Constraints to the use of locally pelleted floating feed in small scale fish farming

Several factors were identified as constraints to fish production and productivity in the study area and these were described according to Table 2. Among the constraints identified by fish farmers using local floating feed, Inability to access funds to expand production was ranked highest because money facilitates the expansion of an enterprise and also increase productivity. Next in order of importance was high cost of extruder and other machines, this has prevented a lot of catfish farmers from using local floating feed, ranking third was need to use higher volume/quantity than the imported because it was discovered by the farmers that they use more quantity of locally made feed to feed their fishes to the point of satisfaction. Unstable market price of feed ingredients followed and last on the list was

rough appearance and less attractive saint/odour of the locally extruded feeds. This corroborate the findings of [5,13&18] who stated that high cost of feed, unavailable formal credit and unstable price of fish were considered as serious constraints of catfish farmers to fish productivity. They also claimed that local fishmeal production is minimal in Nigeria and cannot meet the demand of the feed industry and hence the bulk of the country's fishmeal requirement is imported with lengthy customs clearing process.

Table 2: Constraints to the use of locally pelleted floating feed in small scale fish farming

Constraints	Importance rating		Importance index	
	Mean	Standard deviation	Index	Rank
Inability to access funds to expand production	4.20	1.91	218	1
High Cost of extruder and other machines	3.61	1.28	127	2
Need to use higher volume/quantity than the imported	3.12	1.40	65	3
Unstable market price of feed ingredients	2.38	1.42	24	4
Rough appearance and less attractive saint/odour	1.94	1.11	12	5

Source: Field Survey, 2015

Table 3: Solutions to constraints facing the use of locally pelleted fish feed by the farmers

Suggested Solutions	**Frequency**	**Percentage**
Government loan at low interest rate	88	48.9
Provision of floating feed machine and other tools at low cost	45	25.0
Provision of good quality water	34	18.9
Stability of market price of fish and fish feed ingredients	9	5.0
Improvement on the feed by research institute	4	2.2
Total	180	100

Source: Field Survey, 2015

Solutions to fish farming as suggested by the farmers

Farmers in the study area suggested several solutions to fish production and productivity and were stated according Table 3. Provision of loan at low interest rate by the government was the major solution suggested by the small scale catfish farmers. This was identified by most (48.9 percent) of the respondents as the major way out of the problems facing the local floating feed catfish enterprise. This was closely followed by Provision of floating feed machine and other tools at low cost with (25.0 percent), also Provision of good quality water followed with (18.9 percent). Stability of market price of fish and fish feed ingredients and Improvement on the feed by research institute were the forth and fifth solution suggested by the farmers with (5 percent) and (2.2 percent) respectively.

CONCLUSION AND RECOMMENDATION

The available data shows that there is significant room for improvement in small scale catfish production in the study area. On the whole, the findings show that catfish enterprise was profitable

and fish farming has a great potential to boost the animal protein supply to meet the protein demand of the nation. It can be concluded that aquaculture production is a profitable investment considering the size of gross revenue obtained from the study.

Feed has a significant contribution to fish production. In order to make feed available at a relatively cheaper price for small scale catfish farmers, commercial feed millers should collaborate with relevant institutes and other relevant agricultural research centers to work out alternative substitutes to the current imported fish meal that constitute highest cost in feed formulation also the government should encourage financial institutions to give loans to serious minded investors at considerable interest rates but with proper monitoring. This will help to increase farmers' production levels and profitability.

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