ECONOMIC VIABILITY OF CATFISH PRODUCTION IN NEW BUSSA AREA OF NIGER STATE, NIGERIA

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Abstract

Aquaculture plays a significant role in Nigeria's economy in terms of Gross Domestic Production (GDP) and job creation, though its potential has not been fully utilized. This study therefore examined the economic viability of catfish production in New Bussa area of Niger State, Nigeria. The study examines the socio- economic characteristics of the farmers, cost and return relationship of catfish farmers and determined the factors that affect catfish production in the study area. New Bussa town of Borgu Local Government Area of Niger State in Nigeria was purposively selected for this study due to their high level of involvement in fishing activities.Forty two fish farmers were randomly selected from the study area. Primary and Secondary source of data were used. Data collected were analysed using descriptive statistics, budget analysis and multiple regression analysis. Results showed that the average total cost per kilogram of fish was ₦309.61K and the average total revenue per kg of fish was ₦ 428.26k. This gives a net profit of ₦ 118.65per kilogram of fish produced per cycle (6 months). The study revealed significant relationship between total revenue and cost of feed, educational level, size of pond, number of fingerlings and labour. The study also showed that the sum total of elasticity of variables was less than one, that is. 0.93. This indicates that fish production in the study area is in stage II of stages of production which is the rational stage of production; hence this suggested that catfish farming is viable in the study area.

Keywords: Profitability; New- Bussa; Catfish; Nigeria, Viability;

Introduction

Fisheries play an important role in the agricultural sector of the Nigerian economy. In terms of Gross Domestic Product (GDP), Adekoya (2005) reported that fishery sub-sector has recorded the fastest growth rate in agriculture to the GDP. With above mentioned role of fishery to Nigeria economy, the potentials of land availability in Nigeria cannot also be underestimated. Nigeria has land potentials of 923,768km^2 with a continental shelf area of 47,934km^2 and a length of coast line of 853km with vast network of inland waters like rivers, flood plains, natural and manmade lakes and reservoirs (Shimang 2005; Adewumi 2011; CBN2005). The inland water mass is estimated to be about 12.5 million hectares capable of producing 512,000 metric tons of fish annually (Shimang 2005)

In spite the high yield of fish from the inland water body, study has also shown that there is decline in landing fishery from capture fisheries, an indicator that fish stocks have approached or even exceeded the point of maximum sustainable yield. Aquaculture therefore remains the only viable alternative for increasing fish production in order to meet the protein need of the people (FDF 2005). The history of aquaculture in Nigeria is more of history of catfish production. Catfish culture constitutes the essential backbone basis of aquaculture in Nigeria therefore the hope of fish supply in Nigeria hang on its development (FDF 2005).

Amiengheme (2005) enumerates the important of Fish as a source of protein to large teaming population of Nigeria and stressed further that it provides 40% of the dietary intake of animal protein to the average Nigerian and more than 60% of the total protein intake in adults especially in rural areas. Fish as food has nutritional profiles which play great roles in terms of human daily protein requirement needs. Study shows that fish provides the body with essential amino and fatty acid, reduce the risk of sudden death from heart attacks and has the potential to decrease the risk of bowel cancer as well as reduces insulin resistance in skeletal muscles(Olagunju, 2007).

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.

Awareness on the potential of aquaculture to contribute to domestic fish production has continued to increase in the country. Invariably the rapid increase in Nigeria's population has resulted in a huge increase in the demand for animal protein which is essentially higher in quality than plant protein. This stems from the need to meet the much needed fish for domestic production and export.

Despite the increase in the major sources of animal protein such as livestock and poultry industries, Nigeria still remains 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 (Olapade, 2005). This indicates the large deficit in fish supply in Nigeria

Niger State is largely surrounded by inland water which makes it possible for the people in Niger State to be involved in inland fishing activities thereby neglecting the potential of pond raised fishing which may be better off than the inland fishing in terms of income and convenience.

With the above mentioned high potential for aquaculture, the average protein intake in Nigeria of about 19.38/output/ day is low and far below FAO requirements of 65g/ output/day (Olajide 2008)]. The low protein intake is an indication of shortage of high quality protein food in the diet of Nigerians. The protein deficiency in diet among other things is associated with the inability of fish farming industry to supply the required quantity of fish.

In spite of the presence of a fishery research centre in the study area known as National Institute for Freshwater Fisheries Research (NIFFR) which could provide a great opportunity for the people in Niger State to take up aquaculture as a means of livelihood, yet very few people in the state embark on fish culturing. This may be as a result of lack of effective coordination between production and marketing in the area or low level of awareness on catfish profitability.

Apart from the common problems faced by catfish farmers such as lack of proper marketing channels, fluctuation in price of inputs amongst others, stakeholders in fishery subsectors are often affected by different socio economic circumstance in their ability to add value which limits their potential of fish and products to impact on their livelihood.

It is against this background that this article is embarked upon with a view to providing answers to research questions that could be faced by practicing and prospective catfish farmers, which bring about the following specific objectives to be addressed.

i. To identify the socio-economic characteristics of catfish farmers

ii. To examine cost and return relationship of catfish farming and

iii. To determine the factors that affects the catfish production

Material and methods
The study area
The study was conducted in New Bussa, Borgu Local Government Area of Niger State in Nigeria. The town is located in southern part of Niger state in North Central Geo-Political zone of Nigeria on Latitude of 9° 52' 19" N and Longitude of 4° 30' 53" (NPC, 2006).The town was resettled from Old Bussa to New Bussa during the construction of Kainji Hydro-electric Power station in 1968.It has a land area of about 11,782.5 square kilometres and the population of the town is put at over 187,000with a mean annual rainfall of 1,000 – 1500mm (S.B.S,Niger State, 2011). About 80% of this

population engages in peasant farming (S.B.S,Niger State, 2011). The climatic condition, soil type, topography and vegetation cover in the state support the cultivation of several crops of economic importance like cassava, vegetable , millet, rice, yam, cowpea, sorghum, water melon. The favourable climatic condition made it possible for livestock farming.

Sampling technique
New Bussa in Borgu Local Government Area was purposively selected for the study on the basis of their high involvement in fish farming and also the location of the National Institute for Freshwater Fisheries Research (NIFFR). Forty two(42) fishermen were randomly selected for interviews. This number was arrived at from the record of the NIFFR in the study area. Primary and secondary data were used. The primary data involved the administration of a structured questionnaire to fish farmers. The data were collected on production variables such as; type of fish culture, size and capacity of fish pond, species and number of fish cultured, stocking, feeding, medication, harvesting and marketing taking into consideration the cost involved in carrying out each operation. The secondary data were sourced from the appropriate organization, journals, Newspapers, textbooks and other relevant materials

Analytical techniques
A descriptive analytical tool comprising measures of central tendency and dispersion percentages, frequency and tabulation was used to describe the socio-economic characteristics of farmers. The budgeting technique using Net Farm Income (NFI) and Profitability Ratio analysis was used to determine the profitability of catfish production, while production function was employed to determine the productivity of the farm.

Net farm income analysis (NFI)
Net Farm Income was used in estimating profitability of catfish production. The difference between the gross revenue (GR) and total cost (TC) gives the Net Revenue (NR), Net farm income (NFI) is expressed as equation (1):

$$NFI = GR - TC \ldots\ldots\ldots(1)$$

where
NFI = Net Farm Income
$TC = (TVC + TFC) = P_x . X$
$GR = P_y . Y$
GR = Gross Return / Pond
P_y = Unit Price of Output
Y = Quantity of Output
P_x = Unit Price of Input
X = Quantity of Input
TC = Total Cost (₦)
TFC = Total Fixed Cost (₦)

TVC = Total Variable Cost (₦)

Profitability ratio
The performance and economic worth of the respondents can be determined by the use of the following Profitability ratios:

i.   Benefit Cost Ratio;   BCR =TR/TC
ii.   Expense Structure Ratio; ESR = FC/VC
iii.   Rate of Return;   ROR = NR/TC
iv.   Gross ratio;   GR = TC/TR

Production function
The production function postulated for fish farmers in the study area is implicitly presented by equation (2)

$$Q = F(X_1, X_2, X_3, X_4, X_5, X_6, U_i) \quad .....(2)$$

Where:
Q = Total income (₦)
X_1 = level of education (yrs.)
X_2 = number of Fingerlings
X_3 = Hour spent on daily off farm activities (Hour)
X_4 = pond size (M^3)
X_5 = cost of feeds (₦)
X_6 = Labour input (man-day)

U_i = Error term assume to have a zero mean and
The linear, Semi -log, Cobb-Douglas production functions were evaluated using ordinary least square method.

Results
Socio-economic and demographic characteristics of the fish farmers
The results of socio-economic and demographic characteristics of the fish farmers are presented in Table 1.
The results reveal that male was 66.73% of the total percentage, while the remaining 33.27% was for female participation. The majority of the catfish producers were married (71.40%) while 28.60% were single. Most of the catfish farmers were within the age bracket of 27-39 years. The mean age of the producers was 38 years. The modal household size was between 1to 5, while the mean household size was 5. Table 1 also shows that 95.24% of the farmers had some forms of education (Quranic 7.15%, Primary education 28.57%.Secondary education 26.19%, Higher education 33.33%).

Table 1: Socio-economic and demographic characteristics of the fish farmers

Characteristics	Frequency	Percentage
i. Gender		
Male	28	66.7
Female	14	33.33
Total	42	100.00
ii. Marital Status		
Married	30	71.40
Single	12	28.60
Total	42	100.00
iii. Age (Years)		
14-26	1	2.39
27-39	25	59.52
40-52	14	33.33
53-65	2	4.76
Total	42	100.00
Mean	**38**	
iv. House Size		
1-5	29	69.05
6-10	11	26.19
11-15	2	4.76
Total	**42**	**100.00**
Mean	**5**	
v. Level of Education		
Quranic Education	3	7.15
Secondary Education	11	26.19
No formal Education	2	4.76
Primary Education	12	28.57
Higher Education	14	33.33
Total	**42**	**100.00**

Source: Field Survey, 2016

Cost and return analysis of fish production.

Table 2: Estimated costs and returns of catfish production to farmer in Naira

S/N	Item of Cost	Quantity	Unit Cost (₦)	Cost/month (₦)	Total cost for 6 months	%
	A. (Variable Cost)					
1	Juveniles / fingerlings	7156	23		164,588.00	7.80
2	Feeds			261,291.09	1,567746.54	74.31
3	Family labour	1900 man-hour for 6 months		1,691.00	10,146.00	0.48
4	Hired labour	3370 man-day for 6 months		22,693.58	136,161.40	6.45
5	Medication				6,096.00	0.29
6	Electricity			3000	18,000.00	0.85
7	Transportation			6,121	36,728.00	1.74
8	Security			10,000	60,000.00	2.84
9	Others				30,500.00	1.45
	Total				**2,029,965.94**	**96.22**
	B. (Fixed Cost)					
1	Water rate			2521.83	15,130.98	0.72
2	Depreciation (ponds/equip)			10,006.78	60,040.68	2.85
3	Insurance,tax, levy &commission				4500	0.21
	Total				**79,671.66**	**3.78**
	Total Cost (A+B)				**2,109,637.6**	
	C. (Revenue)					
	Quantity of fish sold	**6,813.82**	**428.26**		**2918087.50**	
	NFI = C – (A + B)				**808,449.90**	

Source: Field Survey, 2016

Note: Depreciation on ponds/equipment was calculated using the straight line depreciation method. The official exchange rate is one dollar to ₦195, though the value fluctuates time to time. Average cost per kilogram is ₦309.61 and price per kilogram is ₦428.26

The costs and returns analysis as shown in Table 2 revealed that variable cost in catfish production includes cost on juveniles or fingerlings, feeds, family labour, hired labour, medication, electricity, transportation and security and this constitutes 96.22% of the total cost of production while the fixed cost constitutes 3.78%. The results indicates that the cost of fingerlings/juveniles is7.80%, feed 74.31% and hired labour 6.45% were the major variable costs incurred in fish production. The price per table size fish was ₦428.26. The quantity of fish actually sold was 6,813.82. The analysis also indicated that the cost of production was ₦2,109,637.6 and the total revenue of ₦2,918,087.50was realized, making a net income of ₦808, 449.90.

Profitability estimates
Table 3: Estimates of profitability ratio

Parameter	Fixed Cost	Variable Cost	Total Cost	Total Revenue	Net Revenue	Ratio
BCR	--	--	2,109,637.60	2,918,087.50		1.38
ROR	--	--	2,109,637.60	--	808,449.90	0.38
GR	--	--	2,109,637.60	2,918,087.50	--	0.72
ESR	79,671.66	2,029,965.94	--	--	--	0.04

Source: Field Survey, 2016

Table 3 shows that Benefit Cost Ratio (BCR) was 1.38, Rate of Return (ROR) was observed to be 38%, The Gross Ratio (GR) was observed to be 0.72 and the Expense Structure Ratio (ESR) value of the enterprise is 0.04

Estimated production function
In determining the factors affecting fish production, a structural relationship was specified. Total revenue was regressed on the demographic characteristics of the farmers and other independent variables such as cost of feeds, size of ponds. Though three functional models (linear, semi-log and double log) were used, the linear was chosen. The choice of the production function is predicated on its conformation to *apriori*expectation in terms of signs and magnitude of the coefficient, the number of significant variables and the coefficient of multiple determinations

The regression result is presented as:
$$Q = -5250869 + 0.211X_1^{**} + 0.505X_2^{**} - 0.014X_3 + 0.305X_4^{**} - 0.186X_5^{*} + 0.117X_6^{*}$$
$$\quad (-1.058) \quad (2.009) \quad (2.540) \quad (-0.231) \quad (2.550) \quad (-1.768) \quad (2.010)$$
$$R^2 = 0.972 \qquad\qquad F = 70.731$$
**= Significant at 5%;
* = Significant at 10%

The value in parenthesis under regression coefficients are the t-values.
The R^2 for the estimated regression showed that about 97% of variation in total revenue of fish's farmers in the study area was explained by the explanatory variables with the remaining 3% unexplained; this is due to random variable (Ui). Four of the estimated coefficients (that is, educational level(X_1), number of fingerlings (X_2), size of pond (X_4) and labour (X_6) have positive signs. The coefficients of hours spent on farm (X_3) and cost of feed (X_5) had negative signs

Elasticity of production and return to scale
The total sum of elasticity of production of the variables as shown in Table 4 and was found to be less than unity that is 0.938.

Table 4: Elasticity of production and return to scale of fish farmers in the study area

Independent variables	Elasticity of production
X_1	0.211
X_2	0.505
X_3	− 0.014
X_4	0.305
X_5	− 0.186
X_6	0.117
Return to scale	0.938

Source: Field Survey, 2016

Discussion
The analysis of the result reveals that catfish production is male dominated, that is, it is gender sensitive. This shows that catfish production is mostly produced by male counterpart; this is in accords with research conducted by Olagunju (2007) and Adewuyi(2010). This is because catfish production requires high human energy for operation. The study reveals that catfish production is majorly carried out by married people; this may means that most of the catfish farmers may make use of family labour in production activities. The mean age of the producers which was observed to be 38 years means that most of the farmers are within the age of active labour force that are ready to put up their best for production processes. This is contrary to. Olagunju.who observed that no age discrepancy among cat fish farmers.The mean household size which was 5, this mean that he size of the family determines the availability of family labour. The household size therefore suggests that farmers are likely to use family labour. Furthermore, the study shows that 95.24% of the farmers had some forms of education. The implication of this is that the respondents will be very receptive to new innovations in their methods of production.
The price per table size fish was ₦428.26. The quantity of fish actually sold was 6,813.82. The total cost of production was ₦2,109,637.6 and the total revenue of ₦2,918,087.50 was realized, making a net income of ₦808,449.90. The analysis indicated that fish production was highly profitable. This high profit margin has also been confirmed by Kudi (2008) and Olagunju (2007).
Benefit cost ratio (BCR) is one of the concepts of discount method of project evaluation. As a rule of thumb, a project with benefit - cost ratio greater than one, equal to one or less than one, indicate profit, break-even or loss respectively. Since the ratio is greater than one (1.38), this indicates that the enterprise is profitable even with little capital invested into it. It is therefore possible to have higher value of BCR with increased capitals and skilled labour. Rate of Return (ROR) which was observed to be 38% means that for every N1.00 invested, 38 kobo is gained by the respondent. The Gross Ratio (GR) is 0.72 which implies that from every N1.00 returns to the enterprise, N72 is being spent. The Expense Structure Ratio (ESR) value of

the enterprise is 0.04 which implies that about 0.4% of the total cost of production is made up of fixed cost component. This make the business worthwhile since increase in the production with variable cost will increase the total revenue leaving the fixed cost unchanged.

Educational level, number of fingerlings, size of pond and labour which have positive signs means that any increase in magnitude of these variables will lead to increase in total revenue that will be received by the fish farmers and those variables with negatives signs like hours spent on farm and cost of feed means a negative relationship with total revenue. In other words the reduction in the uses of those variables will bring about increase in total revenue to be received by fish farmers. Level of education; number of fingerlings and the size of pond used were significant at 5% level while cost of feed and labour input was significant at 10%.

The total sum of elasticity of production of the variables was less than unity that is 0.938 indicating decreasing returns to scale. This suggests that fish production in the study area had a decreasing positive return to scale. Each additional unit results in a smaller increase in product than the preceding unit. Fish production in the study area fall within the rational stage (Stage II) of the production function, the implication of this been that the more input one puts in, the higher the profit even though at a declining rate.

Conclusion

The analysis of viability of catfish production in the study area reveals that catfish production is a profit oriented agribusiness and the enterprise is yet to extend to new emerging markets. The business is highly profitable; the factors that contribute to the profitability of the business are level of education, size of the ponds and the amount of labour input.

It is therefore recommended that capacity building should be organised by both public and private individuals in order to raise the level of catfish production participation and increasing the employment status of the economy in the long run.

Also, educational level of the existing catfish farmers should be improved either by the catfish producer association or the government so as to bring about improvement in methods of production.

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