VARIABLE COST STRUCTURE OF CATFISH PRODUCTION IN OBIO AKPOR LOCAL GOVERNMENT AREA OF RIVERS STATE, NIGERIA

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ABSTRACT

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The variable cost structure of catfish production was studied in Obio Akpor Local Government Area in Rivers State of Nigeria. The effect of various variable cost items on the output and profitability of catfish production was evaluated. A multistage purposive sampling technique was used to select locations and respondents. Descriptive statistics and multiple regression analysis were used in analysing the data. The result showed that the major cost item was feed which constituted about 76% of total variable cost. The determinants of output were farming experience, costs of fingerlings, medication and utilities while the determinants of profitability were costs of feed, fingerlings and medication. It is imperative that government should subsidize catfish feed in order to reduce the cost of catfish feed. A reduction in the cost of feed will lead to an increase in the profit of catfish farmers and an increase in the profit of catfish farming will attract more people into catfish production and this will contribute to reduction in unemployment.

INTRODUCTION

Hunger and malnutrition are prevalent in Nigeria. Hunger is prevalent due to food shortage and the consequent high prices of food items, while malnutrition is prevalent probably due to inadequate protein supplies. The menu of the majority of the population consists primarily of carbohydrates. Protein, especially of animal origin is relatively expensive. Paradoxically, Nigeria is richly endowed with ample natural resources for the production of fish, beef, chicken, mutton, chevron and other animal and livestock products. For instance, about 1.75 million hectares of inland water surface is available and suitable for aquaculture (FAO, 2006) listed in the reference). In spite of its rich natural resource endowment for fish production, there is a wide gap between domestic production and demand for fish. For instance, in 2010, Nigeria's fish consumption was about 1.2 million metric tons while domestic production was estimated at about 200,535 tons (FAO, 2012) listed in the reference). Nigeria imports about 0.7 million metric tons of fish valued at about $500 million annually, thus making Nigeria the largest importer of frozen fish in Africa (FMARD, 2011). FMARD (2011) projected that fish demand will increase from 1,430,000 tons in 2000 to 2,175,000 tons in 2015 with a supply deficit of 1,444,752 tons. According to Adekoya and Miller (2010), artisanal fisher folks supply about 500,000 metric tons of domestic fish production. It is estimated that investment in catfish production will yield a 100% return within a payback period of 90days (Emokaro *et al.*, 2010).

Cost is one of the major factors constraining domestic production of fish especially in relation to variable (production) cost items. Farmers require working capital with which to finance the purchase of production inputs. Issa *et al*. (2014) reported that personal savings was the major source of capital investment in catfish farming in Kaduna State. Working capital comprises stocks of raw materials, manufactured inputs and final goods (Levacie and Rebmann, 1982). There are indications that over 99% of the total financial capital available to farmers is invested on working capital goods (Onyebinama, 2000). Consequently, an analysis of the variable cost structure of catfish production is therefore an important economic endeavour in order to identify the items that constitute the main elements of the variable cost structure of catfish production. This is with a view to making recommendations that will provide the basis for policies that will lead to a reduction in production costs. A reduction in production costs will probably lead to higher profits, attract more farmers into catfish production and consequently increase output. In addition there is a paucity of empirical information on the relationship between variable cost items and the output and profit of catfish farmers. This study will also fill this gap.

METHODOLOGY

The study was carried out in Obio-Akpor Local Government Area of Rivers State. Rivers State is one of the 36 states in Nigeria. It is located in the South-South region of Nigeria with Port Harcourt as capital. It is located in the rain forest region and is rich in oil mineral. Obio-Akpor is one of the 23 local government areas in Rivers State. It is located between latitudes 4^{o} 45´ N and 4^{o} 60´ N and longitudes 6° 50´ E and 8° 00´ E. Its headquarters is in Rumuodomaya. It is bounded by Port Harcourt Local Government Area in the South, Oyigbo in the East,

Ikwerre in the North and Emohua in the West. It covers an area of 260km^2 with a population of 878,890 (NPC, 2006). Obio-Akpor Local Government Area has 62 communities. The major occupations of the people are farming and fishing. The Ikwerre people are the indigenous people of the area. A multistage sampling technique was used in the study. In the first stage, out of the 62 communities, five (5) communities were purposively selected based on the availability and predominance of catfish farmers in these areas. The five (5) communities were Elizuo, Rukpokwu, Rumuokwota, Rumuorim and Rumuokoro. The list of catfish farmers in each selected community was compiled. The list formed the sampling frame for the selection of catfish farmers. Using the sampling frame, a random sample of eight (8) catfish farmers was selected from each community, bringing the sample size to a total of forty (40) catfish farmers. Primary data were collected from the farmers using a questionnaire. The questionnaire was administered on the farmers on a single visit using an enumerator.

Data analysis involved the use of descriptive statistics, means, percentages, frequency tables and the ordinary least squares regression technique. Descriptive statistics was used to analyse the socioeconomic characteristics of the farmers and the cost structure of catfish production while the multiple regression technique was used to analyse the effect of the cost items on the output and profit of catfish farming. The implicit form of the regression model was specified as follows:

$Y = f(X_1, X_2, X_3 \ldots X_9)$

Y = Output/profit

X_1 = Fish farming experience

X_2 = Level of education of farmers

X_3 = Sex – 1 = male, O = female

X_4 = Cost of labour

X_5 = Cost of feed

X_6 = Cost of fingerlings

X_7 = Cost of medication

X_8 = Cost of utilities (water & electricity)

X_9 = Handling cost (transportation, packing, loading, offloading, storage)

RESULTS AND DISCUSSION

Socioeconomic characteristics of catfish farmers

The socioeconomic characteristics of catfish farmers are shown in Table 1. Most of the farmers (about 95%) were between 20 and 49 years old, an indication that most of the catfish farmers were relatively young. The mean age of the farmers was about 37years. The indication is that catfish production is probably a viable livelihood activity for young people and can be harnessed for reducing youth unemployment. Age is one of the factors that affect the managerial competence of farmers. Older farmers are more likely to be risk averse and this will probably adversely affect innovativeness. Younger farmers are likely to be more innovative and this will positively influence output.

Most of the catfish farmers (about 85%) had at least complete secondary education. This is an indication that most of the farmers are literate. Literacy will probably place the farmers in a better position to understand the complex and intricate web of product and factor markets, and also stimulate the adoption of improved production technologies (Adebayo, 2012). Ultimately output will probably increase. Most (about 73%) of the farmers had households of size 1 – 5. The mean household size was about 5. This indicated that the catfish farmers had relatively small households. This is probably due to the fact that most of the farmers were young. Also there are indications that catfish production is not labour intensive. This obliterates the need for large households that provide free family labour.

Most (about 78%) of the farmers were males. In the study area, due to culture, tradition and land tenure practices women have limited access to productive resources especially land. land is usually the only collateral that farmers can provide for credit (debt capital) necessary for investment in the farm business. In addition, land is necessary in catfish production for the construction of ponds. The limited access of women to productive resources especially land probably accounted for the dominance of men in catfish production in the study area. Adebayo, (2012) also reported that catfish production in Ido Local Government Area of Oyo State is dominated by men and that most of the catfish farmers were between 30 and 50 years old with a mean age of 42.5 years. Farming experience was limited to at most 5 years for most (about 63%) of the farmers. This will probably adversely affect the farm business. Williams *et. al*. (2012) posited that the ability to manage the fish farm efficiently depends on the level of experience. A low level of experience will probably adversely affect output and productivity.

The number of fingerlings used was at most 10,000 for most (about 85%) of the farmers. The number of fingerlings will be limited by the pond size and this is an indication that most of the farmers were smallholders.

Smallholdings will in turn limit the scale of production leading to scale diseconomies. This will adversely affect profit.

Table 1: Socio-economic characteristics of catfish farmers

Variables	Number	Percentage
Household size		
1 – 5	29	72.50
6 – 10	9	22.50
11 – 15	2	5.00
Total	40	100
Mean (4.85)		
Age		
20 – 29	7	17.50
30 – 39	20	50.00
40 – 49	11	27.50
50 – 59	1	2.50
60 – 69	1	2.50
Total	40	100
Mean (36.6)		
Sex		
Female	9	22.50
Male	31	77.50
Educational experience		
No formal education	0	0.00
Primary	6	15.00
Secondary	12	30.00
Tertiary	22	55.00
Farming experience		
1 – 5	25	62.50
6 – 10	13	32.50
11 – 15	2	5.00
Total	40	100
Mean (5.1)		
Marital status		
Single	14	35.00
Married	25	62.50
Separated	1	2.50
Divorced	0	0.00
Number of fingerlings		
0 – 10,000	34	85.00
11,000 – 21,000	4	10.00
22,000 – 32,000	1	2.50
33,000 – 43,000	1	2.50
TOTAL	40	100
Mean (5770.5)		

Source: field survey 2015

Variable cost structure of catfish production

The variable cost structure of catfish production is shown in Table 2. The variable cost items of catfish production included labour, feed, fingerlings, medication, utilities (water and electricity) and handling (storage, loading, off loading and transportation). The major cost item was feed. The cost of feed constituted about 75.6% of total production (variable) cost. Fingerling was the next major cost item followed by utilities. The cost of fingerlings and utilities constituted about 13.7% and 4.3% of the total variable production cost respectively. This is an indication that feed is the major determinant of catfish production cost. Commercial fish feed is largely imported. Imported fish feed is likely to be expensive given the depreciation of the local currency (Naira) in the foreign exchange market. The implication is that commercial fish farmers will buy feed at higher prices. This probably accounted for the high cost of feed. The high cost of feed will adversely affect the profit from catfish production and act as a disincentive to increased output. Osuigwe (2005) posited that the yield of fish per culture unit (technical term used by the author) and thus the profit from fish farming depended to a large extent on the amount of feed used.

Table 2: Variable cost structure of catfish production

Cost items	Mean cost (₦)	Total cost (₦)	Percentage
Labour	15,485	619,400	3.22
Feed	364,300	14,572,000	75.64
Fingerlings	66,091.25	2,643,650	13.72
Medication	4,050	162,000	0.84
Utilities (water and electrically)	20,655	826,200	4.29
Handling (storage, packing, offloading/loading and transportation)	11,083.	441,909	2.29
Gross Total		19,265,159	100

Source: Field Survey 2015

Determinants of the output of catfish production

The determinants of the output of catfish production are shown in Table 3. Fish farming experience (X_1), costs of fingerlings (X_6), medication (X_7) and utilities (X_8) were the significant determinants of output. Fish farming experience and cost of fingerlings were positively related to output while cost of medication and utilities were negatively related to output. These results indicated that the output of catfish farmers increased as the farming experience and cost of fingerlings increased. On the other hand the output of catfish farmers decreased with increasing cost of medication and utilities.

Catfish farmers are likely to be better skilled with experience. This will enhance their technical and managerial competences which will probably positively affect output. The scale of production is most likely a function of the number of fingerlings. The cost of fingerlings will increase as the number of fingerlings increased. An increase in the number of fingerlings will positively influence output. As a result output will increase as the cost of fingerlings increased. An increase in the cost of medication and utilities will probably limit the scale of production since an increase in scale of production will lead to higher cost of medication and utilities. A limit in the scale of production will adversely affect output. Consequently output will decrease as the scale of production decreased due to increasing cost of medication and utilities. (There is a paucity of empirical information on relationship between variable cost items and output and profit of catfish farmers. This study is expected to fill the gap).

Regression results of the determinants of the profitability of catfish production.

The regression result of the determinants of the profitability of catfish production is shown in table 4. The coefficient of multiple determination indicated that the variables included in the model accounted for about 84% of the observed variation in the net revenue of catfish farmers in the study area. The cost of feed (X_5), cost of fingerlings (X_6) and cost of medication (X_7) were the significant determinants of the net revenue of the catfish farmers. The cost of feed and medication were negative determinants of the net revenue while the cost of fingerlings was a positive determinant of net revenue. These results indicated that the net revenue of catfish farmers increased as the cost of fingerlings increased and decreased as the cost of feed and medication increased. An increase in the cost of feed and medication will lead to an increase in the total cost of catfish production thereby reducing net revenue. On the other hand, the cost of fingerlings is a function of the number of fingerlings used. The scale of production is also a function of the number of fingerlings. The number of fingerlings determines the output of the catfish farmer. The total revenue of the farmer is a function of output. Therefore, total revenue will increase as the output increases. Ultimately, net revenue will increase. (There is a paucity of empirical information on relationship between variable cost items and output and profit of catfish farmers. This study is expected to fill the gap).

CONCLUSION AND RECOMMENDATIONS

In the study area, catfish production is dominated by men. Catfish farmers in the study area are relatively young with a mean age of about 37 years. This is an indication that catfish production is a viable livelihood activity for young people and can be harnessed as a means of reducing youth unemployment (See the section on age under socio-economic characteristics). Feed is a major factor in the catfish production mix accounting for more than 70% of the total variable cost. Therefore, concerted effort should be made to ensure that catfish feed is not only available but also affordable. It is imperative that government should subsidize catfish feed in order to reduce the cost of production for catfish farmers.

The output and profit from catfish farming were positively influenced by farming experience and cost (number) of fingerlings used. Catfish farmers require training to enhance their experience and an adequate supply of fingerlings to enable them take advantage of scale economies.

Table 3: Determinants of the output of catfish production

Variable	Linear	Double log	Semi-log	Exponential[+]
Constant	1.207E6	3.197	5.561E7	12.972
	(-0.846)	(2.085)	(4.538)	(20.841)
Farm experience (x_1)	53317.343	0.170	738373.85	0.119
	(-0.531)	(1.207)	(-0.655)	(2.718)***
Level of education (x_2)	69849.840	0.120	659750.733	0.029
	(0.967)	(0.624)	(0.430)	(0.916)
Sex (x_3)	502311.291	0.058	14935.790	0.066
	(-0.782)	(-0.333)	(-0.011)	(0.236)
Labour (x_4)	0.112	0.166	487280.033	2.020E-5
	(0.004)	(1.371)	(0.505)	(1.505)
Feed cost (x_5)	0.122	-0.018	76413.516	-1.017E-7
	(0.229)	(-0.538)	(0.292)	(-0.439)
Cost of fingerlings(x_6)	58.435	0.985	3.197E6	1.186E-5
	(12.287)***	(11.923)***	(4.842)***	(5.712)***
Cost of medication(x_7)	114.877	-0.166	1.248E6	-9.653E-5
	(1.644)	(-1.856)*	(1.745)*	(-3.163)***
Cost of utilities (x_8)	1.285	0.017	655469/043	-6.640E-6
	(0.156)	(0.250)	(1.236)	(-1.851)*
Handling cost (x_9)	18.482	0.023	370487.818	2.887E-7
	(1.226)	(0.197)	(0.401)	(0.044)
F – ratio	52.769	35.265	7.545	13.023
R^2	0.941	0.914	0.694	0.796

values in parentheses are t-ratios, *** = significant at 1%; ** = significant at 5%; * = significant at 10%.

Table 4: Regression results of the profit of catfish production

Variable	Linear	Double log +	Semi-log	Exponential
Constant	1.211E6	2.619	5.173E7	12.972
	(-0.850)	(1.092)	(4.243)	(15.535)
Farm experience (x_1)	53553.096	0.062	889880.468	0.136
	(-0.534)	(0.274)	(-0.793)	(2.443)
Level of education(x_2)	69911.015	0.095	51900.109	0.032
	(0.969)	(0.319)	(0.340)	(0.796)
Sex (x_3)	503061.923	-0.151	209721.734	0.302
	(-0.784)	(-0.538)	(0.151)	(0.828)
Labour (x_4)	0.944	0.095	371503.338	1.689E-5
	(-0.031)	(0.503)	(0.387)	(0.973)
Feed cost (x_5)	-0.878	-0.154	109331.506	-2.754E-7
	(-1.656)	(-3.006)***	(-0.420)	(-0.909)
Cost of fingerlings (x_6)	57.424	1.282	3.169E 6	1.369E-5
	(12.082)***	(8.397)***	(4.823)***	(5.176)***
Cost of medication (x_7)	114.395	-0.273	1.139E6	0.000
	(1.638)	(-1.947)***	(1.602)	(-2.920)***
Cost of utilities (x_8)	0.255	0.031	713016.753	2.831E-6
	(0.031)	(0.263)	(1.351)	(0.491)
Handling cost (x_9)	17.521	0.061	355015.440	-2.847E-6
	(1.163)	(0.329)	(0.386)	(-0.338)
F – ratio	48.536	16.255	6.813	9.112
R^2	0.936	0.835	0.671	0.739

Values in parentheses are t-ratios, *** = significant at 1%; ** = significant at 5%; * = significant at 10%.

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