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Economic Efficiency and Profitability of Catfish (*Clarias gariepinus*) Production in Isoko Area of Delta State, Nigeria.

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ABSTRACT

The study specifically examined the economic efficiency and profitability of catfish production in Isoko area of Delta. Purposive and simple random samplings were respectively used to select data for the study. Descriptive statistics and net margin analysis were used in analyzing the data. The results show that feed, fingerlings, pond size and water were statistically significant. The results further revealed that feed and fingerlings pond size were some of the factors that influence profitability of catfish production in the study area as a 10% increase in feed will lead to 2.06% increase in output while a 10% increase in fingerlings will lead to 2.1% increase in output. The response of output to pond size was however low as 10% increase in pond size resulted in a partly 1.2% increase in fish production. Results also indicated a gross margin of ₦424,190.00, net margin of ₦224,020.00 and gross return to cost ratio as 1:31:1 per hectare. Estimates of allocative efficiency were 0.0004 for feed, 0.655 for fingerlings, -4.126 for labour and 6.412 for pond size. Feed, fingerlings and labour were over utilized while pond size was underutilized. This shows that farmers were inefficient in resource utilization. It is suggested that there should be a decrease in the use of labour and increase in pond utilization. Commercial fish mill and modern hatcheries should be established in the study area to address the problem of high cost of feed and availability of quality fingerling.

Keywords: Economic, Efficiency, Profitability, Catfish.

Introduction

Fishing like other hunting activities has been a major source of food for human race and contributes towards reducing the unsavory outbreak of anemia and kwashiorkor. Fishing comprises of artisanal coastal/brackish water and artisanal Inland river/lakes. Output of fish production in Nigeria in 2004 was estimated at 504,700 metric tonnes. Artisanal coastal/brackish water was 229,100 metric tonnes (45.3%), inland river/lakes were 201,700 metric tonnes (39.9%) and aquaculture/fish farming was 52,000 metric tonnes (10.3%) according to Food

and Agriculture (2004). The Federal Ministry of Agriculture and Water Resources (2008) reported that domestic fish supply in Nigeria is inadequate and this is partly a day of 10g compare to daily intake of 36g recommended by Food and Agricultural Organization (2007). Therefore, there is need to increase fish production to meet local demand through aquaculture.

Aquaculture is defined as the rational rearing of fish and other aquatic organisms in pond, reservoir, cages, or other enclosures in lakes and coastal waters Njoku (2006). Fish farming (pisciculture) is a branch of aquaculture which deals with the growing of fish in a controlled environment which could be pond (concrete or earthen), Vats (wooden or fibred glass) and plastic enclosure Nwokoye, Afuluenu and Effiong (2007). Fish farming is becoming widely practiced in Nigeria, according to F.A.O (2007) though Nigeria still imports about 560,000 metric tonnes of fish estimated at about $400 million annually. This is to augment the shortfalls in domestic supply which amounts to about 400,000 metric tonnes annually hence; Nigeria is one of the largest importers of fish in the developing world. To solve the country's high demand for fish, Nigeria must turn to their under-utilized inland water resources to improve fish production. Fish farming is a strategy that can be employed to utilize the abundant land and water resources to increase domestic fish production in Nigeria. However, expansion in fish farming has being rather slow as many fish farmers face a number of constraints including lack of quality fingerlings and good quality feeds Olagunju (2007), Isoko Area is not in any way isolated from these constraints. In recent times, there has being improvement in fish farming in Nigeria with a statistics indicating that Nigeria is a leading aqua cultural producer in Africa, with output of over 15,489 metric tonnes per annum F.A.O (2007) which contributes about 4% of the Nation's agricultural G.D.P Federal Ministry of Agriculture and Water Resources (2008).

The most commonly cultured species of fish in Nigeria includes: Catfish *(Clarias gariepinus)*, tilapia (*Oreochromis niloticus)* and carp *(Cyprinus carpio)*. Many farmers focus on catfish as they are hardy and can survive different culture systems and diverse environments, grows very fast, has low bone content, high fecundity, improved survival of fry and adapts to supplemental feed Adediran (2002); Osawe (2004). Catfish has superior value of two or three times that of tilapia F.A.O (1993). They estimated that 60% of the fish consumed is catfish and it is increasingly contributing to the market which till date remains a live fish market. This is surely opening up employment opportunities for both rural and urban fish farmers as it stands as a principal source of livelihood and provide animal protein for millions of Nigerians.

Materials and Method

The study area was Isoko area of Delta State, it comprises of two local government areas: Isoko North and South. Isoko North has it's headquarter in Ozoro with 10 major communities while Isoko South headquarter is Oleh, and with 10 major communities also and smaller villages under these communities. Geographically, Isoko area is enclosed roughly by longitude 60^0 5', and 60^0 25' East and latitude 50^0 40', and 50^0 40', North.

The total land area is about 1,100 square kilometer with a population of about 371,867; out of which 186,211 are male and 185,655 are female NPC (2006). The main economic activities are agriculture, small scale commercial and industrial enterprises. Because of the rivers, streams, creeks and lakes, fishing is widespread; currently fish farming is on the increase in different parts of Isoko land. Two stage simple random techniques were used to select respondents for the study. Stage one was a purposive selection of 11 communities from each of the two local government areas to give a total of 22 communities. The second stage was random selection of 120 fish farmers from the sample frame of 326 which made up the sample size for the study. Data collected were based on 2011/2012 production year. Data analyses were facilitated by means of descriptive statistical analysis and net margin analysis.

Net Margin Analysis

The net margin analysis according to Arene (2002) is the excess of gross margin over fixed cost.

It is represented explicitly as;

$$NM = GM - TFC\ (Annual\ depreciation\ of\ fixed\ asset) \quad (1)$$
$$GM = TR - TV$$

Where,

NM = Net Margin (₦)
GM = Gross margin (₦)
TR = Total Revenue (₦)
TVC = Total Variable cost (₦)
TFC = Total Fixed cost (₦)

$$Gross\ Margin = (TR - TVC) \quad (2)$$

Less annual fixed costs
Depreciation of water pump (₦)
Depreciation of equipments (₦)
Depreciation of pond structure (₦)
Interest on capital (if any) (₦)

A positive net margin indicates profit while otherwise implies loss incurred.

Results and Discussion

Socio-economic Characteristics of Catfish Producers

Socio-economic characteristics in table 1.1 indicates that there were more males (87%) participating in catfish production than female (13%). This marked difference in gender could be attributed to the common believe that fishing or fish farming is a man's vocation which involves close supervision and monitoring. The findings agree with that of Ugboma (2010) that the nature of fish farming involves close monitoring of daily activities. The mean age of the farmers was 39 years. However farmers in the age bracket 31-50 years represented 81% of the farmers. It shows that farmers are relatively young within the energetic stage for the daily activities in catfish production, thus productivity might be high. It was observed that most farmers were married with large family sizes, which they use as a labour source. This result corresponds with that of Obinne and Uche (2000), Nkamigbo and Okeke (2013) who reported that their family members serve as readily available labour force.

Cost, Return and Revenue in Catfish Production per Hectare

Table 1.2 shows the net return / total cost ratio of 1:31:1 which implies that for every one naira spent on catfish production result to 31 kobo profit. However, it is pertinent to note that the total variable cost is 72% of total production cost which means that fish farmers should have sufficient cash at hand for the day to day running of the venture. The return to scale is the addition of the estimated coefficients.

The estimated equation is given below as:
$Output = 0.000206Fd + 0.000182Fs - 0.337Lr + 0.7595Ps + 1.503Wr$
$Output = 1.925 > 1$ Thus, it is an indication increasing return to scale.

This study collaborates with those of Ugwumba and Chukwuji (2010) and Emokaro, Ekunme and Achille (2010). That of Ugwumba and Chukwuji shows that catfish production in Anambra state was profitable with a gross margin of ₦734,850,89, net farm income of ₦712,659,89 and return on investment of

0.61. While Emokaro, Ekunme and Achille (2010) result shows that an estimated average annual gross revenue of $5,723 and an average net profit of $2,576, a mean gross margin of $2945.16, a net profit margin of 51.46%, and a cost benefit ratio of 1:82. Both indicate that catfish farming is a profitable business.

Farmers Responds to Constraints of Catfish Production.

The problem of catfish farmers were analyzed by means of table, percentage and mean. The mean ranks for each identified problem was calculated and the very severe problem was determined by the highest mean score (cost of feed and lack of capital). Result of the analysis in Table 1.3 shows that lack of capital and cost of feed needs urgent attention. Catfish production is capital intensive thus requires much money for a reasonable investment to yield profit. Due to lack of capital, farmers resort to using substandard feed and other supplements as feeds and other management practices to cut down production cost which invariably affect the level of profitability and the quality of fish produced. Feed contributes about 2.7% increase to total output of catfish production. Thus poor quality of feed leads to reduction in the total level of profitability and the quality of catfish produced.

Scarcity of quality fingerlings, high cost of transportation and inadequate water supply also causes severe problem. The quantities of fingerlings hatched by few private farmers are inadequate for all the farmers and some of them are of low quality. Farmers are therefore compelled to import most of the fingerlings from neighboring State or make use of the available low quality seeds. High cost of transportation and inadequate water supply are due to hike in price of fuel. Erratic supply of power makes farmers resort to the use of generating set which adds to the overall cost of production. Other non-severe constraints are land acquisition (3.4), flooding (3.0), Poaching (3.2) and poor storage facilities (2.4) poses less problems.

Conclusion and Recommendations

Catfish farming is a profitable business in the study area given the total gross margin of ₦424,192.00, net farm income of ₦224, 020.00, net margin to total cost ratio of 1:31 which signifies that for every one naira invested had a return of 31kobo per hectare of pond area. The study also indicated that there was increasing return to scale of 1.9 in the study area which implied stage II of the production function. This level of profitability though encouraging, is still affected by high cost of feeds. Thus profitability in the next few years will not be sustained unless measures are taking to arrest the rising cost of feed which

contribute 72% of total production cost. It is recommended that fish farmers should employ the use of more ponds and improve water quality, holding steady the fixed input level, feed, labour and fingerlings, the establishment of modern commercial catfish mills in the study area for production of quality feed to enhance profit margin. It is also recommended that the initial capital outlay should be given to farmers as an incentive to encourage more fish farmers, in view of meeting the increasing demand of protein intake locally and creation of employment opportunity.

Table 1.1: Socio-economic Characteristics of Respondent (n=120)

Parameter	Frequency	Percentage	Mean
Gender			
Male	104	87	Male
Female	16	13	
Age			
21 – 30	12	10	
31 – 40	64	52.3	
41 – 50	34	28.3	39.3
51 – 60	6	5	
61 – 70	4	3.3	
Marital status			
Single	34	28.3	
Married	78	65	Married
Divorced / widower	16	6.7	
Household			
4 – 6	42	35	
7 – 9	58	48.3	8
10 – 12	16	13.3	
13 – 15	4	3.3	
Educational Level			
No. formal education	10	8.3	
Primary school	24	20	Secondary education
Secondary school	50	41.7	
Tertiary education	36	30	
Years of Experience			
1 – 3	38	31.7	
4 – 6	54	45	5
7 – 9	16	13.3	
10 – 12	12	10	

Source: Computed from Field Survey Data, 2013.

Table 1.2: Cost, Return and Revenue in Catfish Production/ha.

Items	Unit	Quantity	Price/Unit (₦)	Amount (₦)
Total Revenue				
Mature life fish	Kg	2333	400.00	933,600.00
Variable Cost				
Feed	Kg	900	400.00	360,000.00
Fingerlings	No	1128	15.00	16,920.00
Labour mandays	122	500.00	61,000.00	
Fuel / Water	Litre	361	70.00	25,270.00
Transportation				36,270.00
Miscellaneous				9,950.00
Total Variable Cost				**509,410.00**
Fixed Cost				
Land/Pond Construction				126,290.00
Farm Structure				53,560.00
Generator / Other Machines				30,320.00
Total Fixed Cost				**200,170.00**
Total Cost (TVC + TFC)				**709,580.00**
Gross Revenue				**933,600.00**
GM (TR – TVC)				424,190.00
NM (GM – TFC)				224,020.00
Net Return / Total Cost Ratio				**0.31**
Return to Scale				**1.9**

Source: Computed from Field Survey Data, 2013.

Table 1.3: Farmers Responds to Constraints of Catfish Production.

Constraint	Frequency	Percentage	Ranking					Mean
			5	4	3	2	1	Ranking
Lack of capital	116	97	91	23	4	2	0	4.7
High cost of feed	108	90	72	42	5	1	0	4.5
Scarcity of catfish seed	84	70	53	29	31	6	1	4.0
High cost of transportation	78	65	33	38	48	5	0	3.9
High cost of labour	70	58	20	35	40	25	5	3.4
Land acquisition	48	33	13	40	16	31	20	2.9
Inadequate water supply	46	38	25	32	51	8	0	3.5
Poaching	42	35	31	15	38	21	15	3.2
Flooding	34	28	17	31	32	15	20	3.0
Poor storage facility	18	15	5	17	28	50	15	2.4

Note: 5 = Very Severe, 4 = Severe, 3 = Not Severe, 2 = Mild, 1 = Not Constraint.
Source: Field Survey Data, 2013.

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