



Analysis of Urban Aquaculture Business Performance in Maiduguri Metropolis of Borno State, Nigeria

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ABSTRACT

This study examines the business performance of urban aquaculture enterprise in Maiduguri Metropolis of Borno State. The random sampling technique was used in selecting 84 fish farms in the Metropolis. Primary data were used for the study, which was collected through interview method with the aid trained enumerators. The indicators used to assess the farm business performance were net farm income (NFI), rate of return on investment (RRI) and operating profit margin ratio (OPMR). The result revealed net farm income of ₦ 856,550.00 per farm in the study area. The rate of return on investment was 65.65% and operating profit margin of 56.76%. The main constraints face of the fish farmers is the high cost of feed and low price of the product. The study recommends that farmers should be train on feed formulation to reduce their feed cost and they should be enlightened on methods of fish preservation to void low prices of output.

Key words: protein pattern, catfish, SDS-PAGE, toxicant, stress

INTRODUCTION

The fisheries sub-sector plays a crucial role in the socioeconomic life of people in Nigeria. The sub-sector contributes about 3.5 % to the nation's Gross Domestic Product (GDP). It employs about 4.3% of the nation's population and responsible for about 50% of high quality animal (fish) protein intake in the nation (FAO, 2013). Fish has been medically recommended, particularly for pregnant women, children and sick because of its high-level of digestible protein and lack of cholesterol, preventive recipe for a heart attack (Kareem *et al.*, 2012).

The demand for protein in general and fish in particular has been increasing in the country as a result of increased awareness of its health benefits, income growth, and urbanization as well as population growth. The annual demand for fish in the nation is estimated at about 2.66 million tons, while the total supply from domestic sources is less than 0.7 million tons (Federal Ministry of Agriculture and Rural Development) (FMARD, 2011). The artisanal fishery, which is the traditional source of fish in the nation is fast depleting as a result of over-exploitation, insecurity and other bad practices. As a result of this, increased demand for the product could not be met by the domestic captured fisheries from natural lakes and rivers. The widening gap between the increased demand for fish and the apparent limited growth potential of natural production of captured fisheries led to the evolution of various forms of culture base systems like aquaculture (Kolding, 1993). Nigeria has a great potential to attain self-sufficiency in fish production through increase investment in aquaculture enterprise. However, the nation's self-sufficiency in production and supply fish products is still a mirage (Azionu *et al.*, 2005).

Aquaculture is the practice of producing fish under controlled environment is a major source of protein for many poor people in most part of the world (UNEP, 2006). It is mainly undertaken by a large

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number of small farmers in Nigeria. They are responsible for about 80 % of the domestic fish production in the nation (Oladejo, 2010). Nigeria is the leading producer of fish in Africa (Ekunwe and Emokaro, 2009). Borno State serves as the major source of fish supply to the nation through captured fisheries from various lakes like Lake Chad, River Ngada and River Yobe. However, due to the present state of the insurgency, the supply of these water bodies is no longer forthcoming as the people were virtually forced to vacate their communities and villages.

Aquaculture is believed to a viable option to the declining captured fisheries and overcome the ever depleting supply and meets the ever-increasing demand of the product (Nwosu, 2009; Ugwumba and Okoh, 2010; Ajao, 2012). This could be achieved by encouraging more people to go into urban aquaculture through, especially, in Maiduguri Metropolis where the insurgency has crippled the artisanal fisheries and all other farming activities in the State. Urban aquaculture is a viable option because it can be carried out within the farmer's compound or backyard as it requires little space to operate. Hence, empirical study of the aquaculture business performance could reveal whether the business is viable or otherwise. It was against this background that this study was conducted to examine the aquaculture business performance of urban aquaculture enterprise in Maiduguri Metropolis of Borno State. The Specific objectives were to examine the inputs and output levels in an aquaculture enterprise in the study area, determine profitability of aquaculture enterprise and identify the constraints facing urban aquaculture enterprises in the study area

METHODOLOGY

The study area

The study was conducted in Maiduguri Metropolis of Borno State. It lies between latitude 11°15' and 45 'N and longitude 11°3' 5'E, with a total mass of about 50,778 square kilometers. It shares boundaries with Konduga to South and Jere local government area to the Northeast. Maiduguri Metropolis has a population of 521, 492 people, which was projected to be 706, 597 for 2017 based on an annual growth rate of 2.8 per cent (NPC, 2006). The study area is characterized by dry and rainy seasons. It has a short rainfall period of about three months that lasts from July to September with an average of 647 mm per annum. The temperature ranges between 35°C and 44°C for the greater part of the year (Borno State Diary, 2013). The vegetation of the study area comprises of trees, shrubs and grasses. The major food crop cultivated are maize, millet, sorghum, rice, wheat, cowpea and groundnut as well as vegetables such as onion, tomato, cabbage, lettuce, spinach and watermelon. Livestock commonly produced are cattle, sheep, goat, poultry and fish farming (Ibrahim, 2012). Aquaculture is becoming a major farming activity in the study area.

Sampling technique and data collection

Urban Maiduguri Metropolis comprise of Maiduguri Metropolitan Council (MMC), Jere Local Government Area, parts of Konduga Local Government Area and certain parts of the Mafa Local Government Area. Simple random sampling was used to select 84 fish farmers across urban Maiduguri Metropolis. The sampled fish farmers were traced through their various associations. Primary data were employed in the study. Primary data were used for the study. The data were collected through questionnaire method with the assistance of trained enumerator. Interview method with the aid of a structured questionnaire, the data that were gathered comprises of information on the socioeconomic variables, input, output and the constraints of fish farmers.

Analytical techniques

The analytical technique that was used for this study is descriptive statistic and the net farm income analysis.

Statistical analysis

The descriptive statistics such as percentage, frequency and mean were used to describe the relationship inputs used and the level of output obtained and the constraint faced by aquaculture enterprise in the study area.

Farm business analysis

The farm business analysis measures were used to assess the performance of the aquaculture farming enterprise. The indicators used in this work were the Net Farm Income (NFI), rate of return on investment (RRI) and operating profit margin ratio (OPMR). The other indicators were computed because net farm income alone is not a good measure of profitability. Net farm income is an absolute money (Naira) amount, which makes it difficult to use as a sole measure of profitability. It should be considered more as a starting point for profitability than as a good measure of profitability itself (Kay *et al.*, 2008), hence the financial ratios were also computed to determine the business efficiency of aquaculture enterprise in the study area. The variable cost component of aquaculture enterprise computed were cost of fingerlings, feeds used, labour, Medicare, and fuel. The fixed costs were depreciation on pond, scoop net, plastic bowl, generator and borehole. The straight line method was used to compute depreciation on the fixed inputs used. The total revenue was computed by multiplying the total weight of fish produced by the sale prices.

Net farm income analysis

Net farm income is a very useful tool in determining the profitability of farm enterprises (Olukosi and Erhabor, 2005). It is the amount by which revenue exceeds the total cost of production (expenses). It represents the amount available to produce a return to the resources used to produce that profit. Net farm income analysis was used to determine the net income accruing to aquaculture enterprise per batch of fingerlings produce. The Net Farm Income (NFI) is gross revenue less total cost of production. Net farm income was computed as:

$$NFI = \sum_{i=1}^n P_i Y_i - \sum_{j=1}^m C_j X_j - \sum_{k=1}^k F_k \dots \dots \dots \text{equa 1}$$

Where:

- NFI = Net farm income (₦)
- Y = Fish output (₦)
- P = Unit price of the fish (₦)
- C = Cost of variable input (₦)
- X = Quantity of variable inputs
- i = Number of inputs used (where i=1, 2, 3 . . . n)
- j = Number of fixed inputs (where j=1, 2, 3 . . . m)
- F = Quantity of fixed inputs
- k = Cost of fixed inputs
- ∑ = Summation sign

Rate of return on investment

The rate of return on investment measures the extent to which a Naira invested in the aquaculture business contributes to total revenue. It is expressed as a percentage and hence allows easy comparison with the same values from other farms within a given locality. The higher the ratio, the higher would be the financial efficiency of the business concern. It is computed as:

$$RRI = \frac{NFI}{TC} \times 100 \dots \dots \dots \text{equation 2}$$

Where: RRI = Rate of return on investment, NFI = Net farm income, TC = Total cost

Operating profit margin ratio (OPMR)

This ratio computes the operating profit as a percentage of total revenue. It shows the percentage of the income that is required to cover the operating expenses, excluding the principal and interest payments. A higher value means that the business is making more profit per Naira of revenue. It is computed as:

$$OPMR = \frac{\text{Operating Expense}}{\text{Value of Farm production}} \times 100 \dots\dots\dots \text{equation 3}$$

It is essential that farms with low operating profit margin ratio should concentrate on improving this ratio before expanding the scale of operation. It does little good to increase total revenue if there is little or no profit per Naira of revenue (Kay *et al.*, 2008).

Depreciation

The fixed inputs used were depreciated using the straight line method. Depreciation is the difference between the purchase value (P) and the salvage value (S) divided by the life of the asset. It is computed as:

$$D = \frac{P-S}{N} \dots\dots\dots \text{equation 4}$$

Where, D = Depreciation (₦), P = Purchase value (₦), S = Salvage value (₦), N = Lifespan of the assets, Net farm Income (NFI) and the financial ratios were computed to measure farm business performance of aquaculture enterprises in the study area and hence achieve objective ii of the study.

RESULTS AND DISCUSSION

Level of inputs and output of urban aquaculture enterprise

Table 1 the level of inputs usage and output of urban aquaculture enterprise in Maiduguri Metropolis. The main inputs of urban aquaculture are fingerlings, feed, labour, Medicare, and fuel to produce fish yield (kg). The average stocking rate of aquaculture in the study area was 3500 fingerlings, with minimum and maximum of 500 and 10,000 fingerlings respectively. The result revealed that aquaculture enterprise in the study area use 2142.25 kg, 101 man days, 67, 333.44 and 464 of feed, labor, Medicare and fuel respectively to produce 664 kg of fish in an average duration of six months.

Table 1: Level of inputs usage and outputs, per head fish produce urban aquaculture in Maiduguri Metropolis

Variables	Mean	Minimum	Maximum
Fingerlings (kg)	3500.00	500.00	10,000.00
Feed (kg)	2142.25	2240.25	4253.75
Labor (hours/man-day)	101.25	67.50	202.50
Medicare (₦)	29,325.45	45.30	90.33
Fuel (₦)	48.00	64.75	192.50
Fish output (kg)	3450.50	307.50	12,750.00

Source: Field Survey, 2016

Farm business performance

The indicators used to measure the farm business performance were the net farm income (NFI), rate of return on investment (RRI) and operating profit margin ratio (OPMR). The result (Table 2) revealed net farm income of ₦ 856,550.00 per farm in the study area. The rate of return on investment was 65.65%, indicating that about 67 kobo would be realized for every Naira invested aquaculture in the study area. This implies that urban aquaculture in Maiduguri Metropolis is a financially successful farming business venture. Similarly, the operating profit margin was 56.76%, implying that the income realize in the business can cover the operating expenses. The decision rule is that the higher the ratio, the viable the investment. It is suggested that the business should keep operating so long as it could able to cover up its variable cost or operating expenses (Olukosi and Erhabor, 2005; Kay *et al.*, 2008). This

result corroborates with those of Esu *et al.* (2008) and Issah *et al.* (2014) which reported a profit of ₦ 774 and ₦ 774, 223.50 respectively catfish farmers in Akwa Ibom and small scale cat fish farming in Kaduna State.

Table 2: Net farm income of urban aquaculture in Maiduguri Metropolis

Variables	Total Value (₦)	Percentage
Gross Revenue	2161, 250.00	
Variable Cost		
Fingerlings	122,500.00	9.24
Feeds	871,500.00	65.72
Labor	84,000.00	16.89
Medicare	35,000.00	2.64
Fuel/Maintenance	120, 200.00	5.51
Total Variable Cost	1, 226,700.00	
Fixed Cost		
Plastic bowl	10,000.00	
Scoop net	4,000.00	
Depreciation	64,000.00	
Total Fixed Cost	78,500.00	
Total Cost	1, 304,700.00	
Net Farm Income	856, 550.00	
Average Rate of Return	66%	
Operating Profit Margin Ratio	57%	

Source: Field Survey, 2016

Constraints faced by urban enterprise in Maiduguri Metropolis

Table 3 revealed the main constraints faced by urban aquaculture enterprise in the study area. The constraints were ranked according to their importance. The result revealed that the high cost of feed (30.66%) ranked first as the main constraint faced by urban aquaculture enterprise in Maiduguri Metropolis. This could be attributed to the recessionary situation the nation currently found herself. The persistent and consistent increase in the general price of goods and services is the present state of the nation's economy. Low sale price of the product (22%) ranked second major constraint of urban aquaculture. This might be the result of the present state of insurgency in which the majority of the people was displaced. They are economically crippled and handicapped with little or no source of income. Inadequacy of capital (17.15%) ranked third.

Urban fish farmers lack capital for expansion of their enterprises. They mainly invest from their personal savings which is a meagre amount. As a result of this, they were forced to operate on a small scale ranging from 500 to 3500 fingerlings stocking rate (Table 1). High mortality (16.79%) ranked fourth. This could be reason why they were forced to sell at low prices. Inadequate extension service (12.41) is the least constraint (fifth) faced by the urban aquaculture enterprise in the study area. This implies that fish farmers felt little or no need for extension services. This could be due to the fact that most of the respondents belong to one cooperative society or the other where they can exchange information on the new innovations and techniques of aquaculture. Similar findings were reported by Agboola (2011), Olanunmi and Yusuf (2014) and Kingsley *et al.* (2014) in their study of improving farming productivity towards achieving food security in Osun State, resource-use efficiency in small-scale fish farming in Osun State and resource-use efficiency among small-scale fish farms in Cross Rivers State and respectively.

Table 3: Constraints Faced by urban aquaculture in Maiduguri Metropolis

Problems	Frequency	Percentage (%)	Rank
High cost of feed	84	30.66	1 st
Low sales price	63	22.90	2 nd
Inadequate capital	47	17.15	3 rd
High mortality rate	46	16.79	4 th
Inadequate extension services	34	12.41	5 th
Total	274	100	

Source: Field Survey, 2016

Conclusion and recommendations

From the result presented, it could be concluded that urban aquaculture enterprise can be said to be successful and viable agro- industry with a good return on investment. It is highly suited to the present state of insurgency as movements are highly restricted. However, to further improve on their business performance, the result of the study recommends the following:

- i. The farmers should be train on the technique of feed formulation to reduce their fed cost.
- ii. The farmers should be enlightened on methods of fish preservation to void low prices of output.
- iii. The government should provide the fish farmers with formal credit to expand the scale of their production

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