

ANALYSIS OF TOTAL FACTOR PRODUCTIVITY OF CATFISH (*Clarias gariepinus*) PRODUCTION IN JOS METROPOLIS, PLATEAU STATE, NIGERIA.

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ABSTRACT

This study focused on the Productivity of catfish production was conducted in Jos-Metropolis, Plateau State, Nigeria. Primary data was collected with the aid of questionnaires from 75 farmers drawn through multistage random sampling technique. Descriptive statistics and Productivity index were tools used to achieve the objectives. Findings shows that 51% of the farmers were married having an average household size of 5 persons and their average age was 34 years. Also, 89% of respondents had formal education and 83 % of farmers had farming experience of 1-5 years and with an average of 3 years, 87% of respondents had no access to extension service while 81% of respondents were not of any cooperative association. Result further indicate that 100% catfish farmers' catfish farmers were super-optimally productive as their TFP index was above the optimal scale. The study recommends that; To maintain their super-optimum production, farmers should take advantage of their high level of education in their production management and adoption of technologies and farmers should also take advantage of cooperative membership for bulk purchase of inputs at reduced costs.

Key words: Total Factor Productivity, Catfish Production, Jos metropolis, Plateau state, Nigeria.

INTRODUCTION

Aquaculture refers to cultivation of aquatic organisms under controlled or semi-controlled conditions for economic and social benefits (Ucha *et al.*, 2018). Literature revealed that aquaculture has the potentials of satisfying mankind's quest for fish and fish products. For instance, Amao, *et al.*, (2016) reported that aquaculture is capable of supplying the world with about 53 million tons of fish each year and over 7 percent of the animal protein for man consumption. Fish farming is one of the vital sectors that are being explored as it is the best and cheapest source of animal protein for human consumption. Fish farming otherwise known as aquaculture, is the production of fish under a controlled environment by manipulating some stages of their life cycle to ensure maximum yield. It is an important source of food, income generation, employment and recreation for people around the world (Ucha *et al.*, 2018).

The importance of fish for adequate health and body developments of man are well documented (Ume and Okworonkwo, 2013). Fish contains n -3 (DHA; EPA) and n - 6(AA) unsaturated fatty acid as major antidote for people with high blood pressure, diabetic and obesity patients, (Anyanwu, *et al.*, 2009) It is rich in vitamins A, D and E for curing sight problem, rickets disease and sterility respectively (FAO, 2011). Furthermore, fish contains minerals (iodine and selenium) which is used for healing goiter disease (Oladejo, 2010). Apart from nutritious essence, fishing and fisheries-related activities according to Food Agriculture Organization (FAO), (2012) are important sources of employment and job opportunities. For instance, Nigeria is ranked first in Africa with two million people employed in fisheries and aquaculture followed by Morocco with almost 1.4 million people and Uganda with 1 million (CBN, 2013). However, in terms of fishers, Morocco is ranked first with 870,000 fishers, followed by Nigeria with 790,000 and Uganda; 470,000 and Mali; 350,000 fishers in that order (FAO, 2007). Nigeria has the most processors with over one million people employed in fisheries processing, followed by Morocco with slightly over 500,000, then Uganda 420,000 and Ghana 385,000 followed suite (FGN, 2011).

Feeding an expected global population of nine (9) billion in 2050, of which Nigeria's will be 377.46 million is a daunting challenge that is engaging researchers, technical experts, and leaders the world over. (Igoche *et al.*, 2019 and Statista, 2023). According to Iwu *et al.*, (2019), Nigeria is the largest aquaculture

producer in Africa with production output of over 15,489 tonnes per annum. However, one of the major challenges of fish farming as with most other forms of production is inefficiency and low return on investment. Hence, increasing productivity at the farm level is one of the pre-requisites for sustainable aquaculture (Iwu *et al.*, 2019). It is against this backdrop that the following objectives; i. describe the socioeconomic characteristics of respondents ii. determine the profitability of catfish production and iii. determine the total factor productivity of respondents were drawn.

MATERIALS AND METHODS

The study was conducted in Jos Metropolis which comprise of both Jos-North and Jos-South Local Government Areas of plateau state. It lies within latitudes 9°45'00"N to 09°57'00"N and longitudes 8°48'00"E to 8°58'00"E. Jos is the administrative capital of Plateau State. Jos Metropolis covers parts of Jos North and Jos South Local Government Areas (LGAs). Jos North has a population of 429,300, with a projected population of 631,923 in 2020 based on 2.8% growth rate (National Population Census (NPC), 2006). Jos South on the other hand is located 15 kilometer south of Jos-North, and has Bukuru as the council headquarter. It has a population of 306,716, while the projected population figure for 2020 is 451,482 – this is based on 2.8% growth rate (NPC, 2006). Data for this study was obtained from primary source using structured questionnaire. A Multistage random sampling procedure was employed in the selection of catfish farmers in Jos North and South who were purposively selected based on the intensity of catfish production in these areas. Gwom district (the only district in Jos North) was chosen in Jos North LGA while two districts namely; Du and Vwang districts were selected in Jos North and South LGA respectively. A total of 75 catfish farmers were randomly selected from a sample frame of 750 fish farmers, representing 10% of all the catfish farmers as obtained from the Fish Association of Nigeria (FISON, Plateau state chapter).

Descriptive statistics and total factor productivity index were used for this study and to achieve objectives I and ii. Descriptive statistics such as frequency distribution tables and mean. Total factor productivity (TFP) is a method of calculating agricultural productivity by comparing an index of agricultural inputs to an index of outputs (Jean-Paul, 2009). This can be computed following Key and McBride (2005) as the output ratio of the output to the total variable cost (TVC):
$$\frac{TFP}{TVC} = \frac{Y}{TVC} = \frac{Y}{\sum P_i X_i} \dots \dots \dots (1);$$

Where: Y = quantity of output, TVC = total variable cost, P_i = unit price of the i^{th} variable input, and X_i = quantity of i^{th} variable input. This methodology ignores the role of total fixed cost (TFC) as it does not affect either the profit maximization or the resource-use efficiency conditions (Fakayode *et al.*, 2008).

Therefore, equation 1 can be rewritten as; $TFP = \frac{Y}{AVC} \dots \dots \dots (2)$. The interpretation of TFP index are as follows; Index: (< 0.1), ($1.0 - 1.09$) and (≥ 1.10) being interpreted as Sub-optimal, Optimal and Super-optimal respectively. This was also used to achieve objective ii.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Catfish farmers

Table 1 shows that 37.3% of the respondents were within the age range of 28-37 years, 1.3% were within age range > 68 years bracket while the average age of the respondents was 34 years. This result shows that most of the farmers in the study area are within productive and active age range. The result also indicates that 51% of the respondents were married while 49% of the respondents were singles. The male catfish farmers were 75% while the females were 25%, thus indicating that the male catfish farmers were more than their female counterpart. About 64% of the catfish farmers in the study area had tertiary education showing they are educated to the extent of taking strategic management decisions in catfish production. This finding is consistent with that of Igoche *et al.* (2019). Majority (83%) respondents had 1-4 years of experience in catfish production. The household size 1-5 person had the highest (59%) number of persons in their household with an average of 5 persons. Most (87%) of the catfish farmers had no access to extension in the study area while most (81%) of the respondents did not belong to any cooperative association.

Table 1: Socio economic characteristics of catfish farmers in the study area

Variable	Frequency	%	Variable	Frequency	%
Age			Education level		

18-27	22	29.3	No formal education	11	14.7
28-37	28	37.3	Primary	4	5.3
38-47	19	25.3	Secondary	12	16
48-57	3	4	Tertiary	48	64
58-67	2	2.7	Farming experience		
68-77	1	1.3	1-4	62	82.7
Mean	34		5-8	10	13.3
Standard deviation	10.199		9-12	3	4
Gender			Total	75	100
Male	56	75	Mean	3	
Female	19	25	Standard deviation	2.464	
Marital status			Access to extension services		
Single	38	50.7	Access	10	13.3
Married	37	49.3	No access	65	86.7
Household size			Member of cooperative		
1-5	44	58.7	Membership	14	18.7
6-10	28	37.3	Non-membership	61	81.3
11-15	3	4	Total	75	100
Mean	5				
Standard deviation	2.818				

Source: Field survey, 2021.

Total Factor Productivity of Catfish Production

The result of Total Factor Productivity in table 3 shows that 100% catfish farmers were super-optimally productive as their TFP indices were above the optimal scale, which indicated the managerial ability of least cost combination of high quality inputs and production technologies in the production process capable of returns beyond the optimum. On the other hand, none of the catfish farmers were either less productive or hovered around the optimal scale, rather, the respondents were all in the super-optimal category (>1.1) in their production processes. By implication, all the catfish farmers tend to be more productive having high percentage of optimally productive. The high productivity could be attributed to the super-efficient catfish farmers utilize their input mix, which yielded high catfish output in their respective farms in the study area. This is similar to the findings of Folorunso and Bayo (2020) where they found that 98% male and 100% female potato farmers were super-optimally productive as their TFP indices were above the optimal scale, which indicated super-optimal input mix allocation in the production process.

Table 3: Total factor productivity of catfish production per annum.

Variable	Value(₦)	Variable	Value(₦)	%contribution
Output		Input		
Smoked fish	311,304.0	Fingerlings	652.7	0.2
Fresh fish	301,67.0	Feed	217, 609.2	77.8
Fingerlings	15,394.7	Labour	2, 861.5	1.0
Total Value	628,697.0	Drugs	10. 444.3	3.7
Output		Fuel	26,637.2	9.5
		Water	21, 492.1	7.7
		Total value of Inputs	279, 697.0	100
		Total Value Productivity	2.25	

Source: Field Survey, 2021.

CONCLUSION AND RECOMMENDATIONS

The findings of the study indicated that catfish production was optimally productive. The study recommends that; To maintain their super-optimum production, farmers should continue to take advantage of their high level of education, farming experience in their production management and

adoption of technologies while also *taking advantage of cooperative membership for bulk purchase of inputs at reduced costs.*

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