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Author Affiliation:

Department of Forest Economics and Extension, Forestry Research Institute of Nigeria, Ibadan, Nigeria

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Determinants of market outlet among catfish farmers: Empirical evidence from Kwara state, Nigeria

Bolaji Kofoworola Adedigba, Jatto KA, Ahmed Ahmed Olaitan, Oke DO

ABSTRACT

The study assessed the determinants of market outlet among catfish farmers in Kwara State, Nigeria. The research was based on reports of withdrawal of farmers from fish farming to other agricultural enterprises. A three-stage random sampling technique was used to select 250 respondents this was because they were few in number and scattered all over the state with the inflow of river Niger. Data was collected using structured questionnaires. The data generated from the survey were analysed using descriptive statistics and a multinomial logistic regression model. The descriptive analysis revealed that the average fish farming experience stood at about 7 years and 64.8% of them did not receive any form of credit whereas, the average production capacity per cycle stood at about 2300 catfish and the average distance to the market was 5.06 kilometres. Also, the majority (41.6%) of the catfish farmers sold their product at the local market, 31.2% at urban markets, and 27.2% at the farm gate. The factors influencing the choice of the local market were having at least secondary education ($p < 0.05$) and distance to the market ($p < 0.1$) which were negative and significant, whereas, the choice of the urban market outlets were influenced by gender ($p < 0.05$), age of the farmer ($p < 0.1$), and having at least secondary education ($p < 0.01$) which were positive and significant while, distance to the market ($p < 0.1$) was negative and significant. The major problems associated with catfish farming in the study area were identified to include; capital (71.8%), high cost of feeds (62.1%), and high cost of transportation (60.5%) amongst others. The study, therefore, recommend that credit facilities should be provided and training on fish farming should be organized to encourage the enterprise.

Keywords: Market, Catfish, Farmers, Multinomial logistic regression

1. INTRODUCTION

The African catfish (*Clarias gariepinus*) is an important aquaculture species in various regions of the world. Nigeria contributes more than 67% of the total global production, followed by Uganda, Cuba, Sudan, Hungary, Netherlands, Benin, and Brazil (FAO, 2019). Aquaculture in Nigeria is primarily freshwater based. According to Olagunju, (2020), the African catfish is the most prevalent cultivated species due to its efficient food conversion ratio (FCR) and ability of rapid growth rate that allows for two cycles to be accomplished in a year. It can also withstand different adverse environmental conditions. The increase in population has generated a large market for catfish resulting in an intensification of culture with high growth in small-to-medium-sized farms and the establishment of large-scale intensively managed fish farms (Miller and Atanda, 2011). Aquaculture, especially catfish farming, has been recognised as a major way to enhance fish production in Nigeria and it is capable of moving the country towards self-sufficiency in fish production (Ugwumba, 2005).

The global demand for fish, particularly in Nigeria, has been on the rise with supplies not meeting up with the demand. Oyinbo and Rekwot, (2013) reported that there are about 2.66 million tonnes annual fish demand in Nigeria and a trivial domestic production of about 780,000 tonnes, resulting in about 1.8 million tonnes demand-supply gap. Long-distance to markets and lack of good roads is a source of major concern for rural smallholder farmers in developing countries. Moreover, difficult market access leads to subsistence rather than market-oriented production systems and consequently restricts opportunities for income generation (IFAD, 2003). Barret, (2008) asserted that market access has been identified as one of the stern factors affecting the performance of smallholder agriculture in developing countries, and in particular, least developed countries.

The farmers are confronted with challenges of transporting their produce to the markets which often necessitate them to sell at the farm gate. Thus, the majority of smallholder farmers still produce largely for subsistence needs, producing small marketable surpluses and facing thin markets (Akinlade et al., 2013). Also, inaccessibility and inadequate storage facilities, and difficulties in accessing reliable information on products and prices prevent the smallholder farmers from participating in competitive markets, often restricting them to non-contestable markets controlled by a few, dominant purchasers (World Bank, 2008; Osmani and Hossain, 2015). Mostly, very few smallholder farmers commercialize their products in formal markets (Bongiwe et al., 2012).

Despite the potential of fish farming in Nigeria, there have been reports of growing withdrawal of farmers from fish farming to other agricultural enterprises (Olagunju, 2020). This study was, therefore, carried out to assess the determinants of market outlet among the catfish farmers in Kwara State, Nigeria with a view to provide insights on market accessibility. The specific objectives were to describe the socio-economic characteristics of the catfish farmers, determine the factors influencing the choice of market outlet among the catfish farmers, and examine the problems associated with catfish farming in the study area. The result of the study could guide policymakers while also drawing attention to the sustainability of the enterprise.

2. MATERIALS AND METHODS

Study area

This study was conducted in Kwara State with a total of sixteen Local Government Areas. The state has a population of 1,566,469 and a total land size of 3,682,500 hectares. It is located between latitudes $7^{\circ}45'N$ and $9^{\circ}30'N$ and longitude $2^{\circ}30'E$ and $6^{\circ}25'E$. The annual rainfall varies between 1,000mm and 1,500mm. The average temperature varies between $30^{\circ}C$ and $35^{\circ}C$. It also has an estimated figure of 203,833 farm families with the majority living in rural areas. Kwara State is divided into four zones by the Kwara State Agricultural Development Project (KWADP) in consonance with ecological characteristics, cultural practices, and the project's administrative convenience. These are Zone A: Baruteen and Kaima Local Government Areas; Zone B: Edu and Patigi Local Government Areas; Zone C: Asa, Ilorin East, Ilorin South, Ilorin West, and Moro Local Government Areas; and Zone D: Ekiti, Ifelodun, Irepodun, Offa, Oyun, Isin and Oke-Ero Local Government Areas.

Sampling procedures and sampling size

The population for this study comprised the catfish farmers in the state. This study employed a three-stage sampling technique in the selection of respondents. Firstly, the respondents in Zone C due to the presence of high-profile catfish farmers in the area were purposively selected. The second stage involved the random selection of four LGAs (Asa, Ilorin East, Ilorin South, and Ilorin West). The

third stage involved the random selection of catfish farmers in each of the selected LGAs based on the proportion of catfish farmers in the zone, drawing from the list of all catfish farmers in the area as compiled by the researchers, giving a total of 250 sample size (Table 1).

Table 1 Proportion of catfish farmers in the study area

LGAs	The proportion of catfish farmers
Asa	80
Ilorin East	60
Ilorin South	60
Ilorin West	50
TOTAL	250

Field survey, 2022

Method of data collection

A cross-sectional data from a farm survey of catfish farmers were used for the study. The data were collected from August to November in the year 2022 from primary sources through the use of a structured questionnaire and personal interviews to obtain information on demographic and farm characteristics such as age, gender, household size, marital status, educational status, catfish farming experience, and choice of market outlet as well as the problems associated with catfish marketing in the study area.

Analytical Techniques

Descriptive statistics such as frequency distribution tables, percentages, and mean were used to describe the socio-economic characteristics of the catfish farmers and the problems associated with catfish farming in the study area. The multinomial logistic regression model was used to determine the factors influencing the preferred choice of market outlet among the catfish farmers in Kwara State, Nigeria. The model was specified as:

$$P_{ij} = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + \cdots + B_nX_n + \varepsilon_i$$

Where;

B_i = Parameters to be estimated; $\varepsilon_i = N(0, \delta^2)$; P_{ij} = Choice of market outlets (Farm Gate = 1 (Reference category); Local Market = 2; and Urban Market = 3)

The independent variables are:

X_1 = Gender (1 = Male, 0 = Female); X_2 = Age of the farmer (Years); X_3 = Educational status (Years); X_4 = Fish farming experience (Years); X_5 = Access to credit (1 = Yes, 0 = No); X_6 = Number of catfish produced (Numbers); X_7 = Distance to Market (Km); X_8 = Access to storage facilities (1 = Yes, 0 = No); X_9 = Vehicle Ownership (1 = Yes, 0 = No)

The reference category chosen for this study is the "Farm Gate" option which is the common market outlet amongst the catfish farmers in the state. Multinomial logistic regression was used because it permits the analysis of decisions across more than two categories, allowing the determination of choice probabilities for different categories (Olufadewa et al., 2018).

3. RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

Table 2 presents the socio-economic characteristics of the respondents. Results revealed that the majority (71.2%) of the households were headed by males while 86.4% of the respondents were in their economic active age because the average age of the respondents stood at 44 years in the study area. Concerning the educational status of the respondents, the majority (63.2%) of the respondents had tertiary education while only 11.2% had no formal education. This implies that most of the respondents are highly educated. Most (53.6%) of the respondents had a fish farming experience of between 6 and 10 years. The average experience stood at about 7 years in the study area. Also, respondents that did not receive any form of credit were in the majority (64.8%) in the study area.

Table 2 Socio-economic characteristics of the respondents

Variables	Label	Frequency (n=250)	Percent (%=100)	Mean
Gender	Female	72	28.80	-
	Male	178	71.20	-
Age of household head	21-40	98	39.20	-
	41-60	118	47.20	44.07
	61+	34	13.60	-
Education of household head	No Formal	28	11.20	-
	Primary	12	4.80	-
	Secondary	52	20.80	-
	Tertiary	158	63.20	-
Fishing experience	1-5	96	38.40	-
	6-10	134	53.60	6.77
	11-15	16	6.40	-
	16+	4	1.60	-
Access to credit	Did not receive	162	64.80	-
	Received credit	88	35.20	-
Management system	Earthen pond	136	10.40	-
	Concrete tank	116	46.40	-
	Plastic tank	42	16.80	-
	Concrete and Plastic tank	66	26.40	-
Production capacity per cycle	1000-2000	128	51.20	-
	2001-3000	94	37.60	2315.20
	3001-4000	28	11.20	-
Source of water	Tube well	90	36.00	-
	Borehole	116	46.40	-
	Tube well & Borehole	8	3.20	-
	Stream/River	36	14.40	-
Distance to market (km)	1-5	136	54.40	-
	6-10	106	42.40	5.06
	11-15	8	3.20	-

Field survey, 2022

Highlights of the management system of the respondents revealed that the majority (46.4%) of the respondents were engaged in the concrete tank as their main system, followed by the concrete and plastic tank (26.4%), while respondents with earthen ponds (10.4%) as their primary source are the least in the study area. Concerning the production capacity per cycle of production, about half (51.2%) of the respondents produced between 1000 and 2000 whereas, 37.6% of the sampled respondents produced between 2001 and 3000 catfish. The average production capacity of the respondents stood at about 2300 catfish in the study area.

Furthermore, the result of the source of water used indicated that the majority (46.4%) are using borehole, followed by tube wells (36%) while 14.4% of them use Stream/River as their source of water. Lastly, the majority (54.4%) of the respondents reported a distance to the market of about 1-5 kilometres from their farm to the market place whereas the estimated average distance to the market was 5.06 kilometres. This implies that catfish farmers must cover a long distance while transporting their produce from their farms to the market.

The preferred choice of a market outlet for the catfish farmers

Table 3 presents the distribution of catfish farmers according to their preferred choice of market outlet. The result revealed that the majority (41.6%) of the catfish farmers sell their product at the local market, 31.2% of the catfish farmers sell their output in the urban markets while the remaining 27.2% of the catfish farmers sell their output at the farm gate. Many catfish farmers opt for the local market outlet because it is closer to their farms and convenient to sell them at that place. The result conforms to the findings of Olufadewa et al., (2018) where the local market was the most patronized market outlet of the farmers.

Table 3 Distribution of catfish farmers according to their choice of market outlet

Market outlet	Frequency (n=250)	Percent (%=100)
Farmgate	68	27.20
Local market	104	41.60
Urban market	78	31.20

Field survey, 2022

Factors influencing the choice of market outlet

The result of the multinomial logistic regression analysis of the factors influencing the choice of market outlet adopted by the respondents in Kwara State is presented in (Table 4). The chi-square value of 48.52 which was significant at a 1% level shows that the model had a good fit for the data. Each regression slope here was interpreted as the predicted change in log odds of belonging to the comparison group (relative to the baseline group) per unit increase on the predictor. The coefficient of having at least secondary education of (0.565) was significant at 5%, implying that having a higher level of education increased the likelihood of adopting the local market outlet by 0.565 relative to the adoption of the farm gate. That is, the higher the level of education, the higher the likelihood of opting for the local market outlet.

Table 4 Multinomial logistic regression estimates of the factors influencing the choice of market outlet

Variables	Local market		Urban market	
	Coef.	Std. Err.	Coef.	Std. Err.
Gender	0.716	0.525	1.368**	0.616
Age	0.0134	0.0230	0.0429*	0.0248
At least secondary education	0.565**	0.237	0.933***	0.301
Fish farming experience	0.0216	0.0803	-0.000650	0.0912
Access to credit	0.113	0.688	-0.556	0.745
Production capacity	0.000194	0.000334	0.000219	0.000378
Distance to market	-0.210*	0.120	-0.238*	0.133
Access to a storage facility	-0.265	0.635	-0.760	0.687
Vehicle ownership	-0.0917	0.624	0.743	0.667
Constant	-1.755	1.709	-4.909**	2.013
LR chi2(18)	48.52	-	-	-
Prob > chi2	0.0000	-	-	-
Log-likelihood	-122.23691	-	-	-
Pseudo R2	0.2454	-	-	-
Observations	125	-	-	-

Note: The base category for the market outlet is farm gate, at most primary for education, female for gender, no access for credit, storage, and vehicle respectively. *** p<0.01, ** p<0.05, * p<0.1

Similarly, the coefficient of distance to market ($p<0.1$) of -0.210 was negative and significant, implying that an increase in the distance to the market reduces the likelihood of adopting the local market outlet relative to the farm gate option. Concerning the choice of the urban market outlet as a market outlet option, the coefficients of gender ($p<0.05$), age of the farmer ($p<0.1$), and having at least secondary education ($p<0.01$) were positive and significant suggesting that having a male as farmer increases the probability of choosing urban market outlet as a market outlet than having a female as a farmer. Also, the coefficient of the age of the farmer (0.0429) at a 10% significant level implies that for each one-unit increase in the age of the farmer, the likelihood of adopting the urban market outlet reduces by 0.0429 relative to the adoption of the farm gate option.

That is, the higher the age of the farmer, the higher the likelihood of opting for the urban market outlet. The coefficient of having at least secondary education of (0.933) was significant at 1%, implying that having a higher level of education increased the likelihood of adopting the urban market outlet by 0.933 relative to the adoption of the farm gate. That is, the higher the level of education, the higher the likelihood of opting for the urban market outlet. On the other hand, the coefficient of distance to the market (-0.238) was negative and significant at 10%, implying that an increase in the distance to the market reduces the likelihood of adopting the urban market outlet relative to the farm gate option. From these findings, it is evident that the major factors influencing the choice of market outlet among catfish farmers in Kwara State were gender, age of the farmer, having at least a secondary level of education, and distance to the market.

Problems associated with catfish farming

The problems faced by the catfish marketers were summarized and presented in (Table 5). In the table, the problems with catfish farming were identified and ranked. The capital was the most critical problem as the majority (71.8%) of the respondents reported that capital was the major problem associated with catfish farming in the area. This result conforms to the finding of Njoku and Offor (2016); Asa and Obinaju, (2014) who reported Catfish farming requires a huge capital outlay, especially for pond construction.

It was followed by the high cost of feeds (62.1%). Also, the high cost of transportation accounted for 60.5% and this result conforms to the findings of Akinkali and Jamabo, (2011), who opined that unavailability of adequate transport and lack of adequate capital are hindrances to the effective distribution of goods from one point to another. The least problems with catfish production in the study area, on the other hand, as revealed in Table 5 were; inadequate water supply (16.1%), inefficient road access (13.7%), and mortality of fish (7.3%) respectively.

Table 5 Problems associated with catfish farming in the study area

Problems	*Responses (n=495)	Percent (%=100)	Percent of Cases (%=399.2)	Rank
Inadequate capital	89	18.00	71.80	1st
Low demand for the product	53	10.70	42.70	4th
Lack of quality fingerlings	24	4.80	19.40	7th
Price instability	45	9.10	36.30	5th
Inefficient road access	17	3.40	13.70	9th
Mortality of fish	9	1.80	7.30	10th
High cost of transportation	75	15.20	60.50	3rd
Inadequate water supply	20	4.00	16.10	8th
Inadequate processing facilities	24	4.80	19.40	7th
Inadequate storage facilities	31	6.30	25.00	6th
High cost of feeds	77	15.60	62.10	2nd
High cost of maintenance	31	6.30	25.00	6th

Field survey, 2022

*Multiple responses

4. CONCLUSION AND RECOMMENDATION

The study focused on the factors influencing the choice of market outlet adopted by the respondents in Kwara State. The descriptive analysis revealed that the majority of the households were headed by males while the average age of the respondents stood at 44 years with the majority of them having tertiary education. The average fish farming experience stood at about 7 years and 64.8% of them did not receive any form of credit whereas, the average production capacity per cycle stood at about 2300 catfish in the study area while the average distance to the market was 5.06 kilometres. The result revealed that the majority (41.6%) of the catfish farmers sell their output at the local market, 31.2% of the catfish farmers sell their output in the urban markets while the remaining 27.2% of the catfish farmers sell their output at the farm gate.

The factors influencing the choice of the local market are having at least secondary education and distance to market were negative and significant while the choice of the urban market outlet as a market outlet option are gender, age of the farmer, and having at least secondary education which were positive and significant whereas, distance to the market was negative and significant. The major problem associated with catfish farming in the study area were identified to include capital, high cost of feeds, and high cost of transportation amongst others. The study, therefore, recommended that credit facilities and sustainable fish farming training should be provided to support the farmers in their operations and to make the enterprise attractive to the youths.

Informed consent

Written & Oral informed consent was obtained from individual participants included in the study.

Conflicts of interests

The authors declare that there are no conflicts of interests.

Ethical approval

The ethical guidelines for Human Subjects are followed in the study.

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The study has not received any external funding.

Data and materials availability

All data associated with this study are present in the paper.

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