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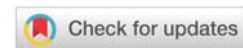
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Research Article

Econometric Analysis of Factors Determining Market Outlets Choice of Cultured Fish Farming Entrepreneurship among Nigerian Youths from the Blue Economy

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Abstract

Catfish farming is important because of its high-quality protein source, and it bridges the gap between domestic fish demand and supply. This study was aimed at evaluating the factors determining market outlets' choice of cultured fish among youths and middle-aged fish farmer entrepreneurs in Nigeria. This is to enhance the profitability and sustainability of cultured fish among youth fish farmers, thereby improving the national food security. Primary data were collected with the use of a structured questionnaire administered to 320 respondents using a multistage random sampling technique. The data were analysed using descriptive statistics, a market outlet choice model with multinomial logit, and multiple regression analysis. The Wald ratio of 499.90 with a p -value of 0.00 of the Multinomial Logit Regression (MLR) revealed that the model as a whole is statistically significant. The MLR model revealed a significant relationship at 1% between sex ($p = 0.003$), quantity of fish for sale ($p = 0.004$), access to market information ($p = 0.000$), and 10% between cost of fish sold ($p = 0.089$) and processors' market outlet relative to wholesalers. It also revealed that significant relationships at 1% existed between sex ($p = 0.008$), cost of fish sold ($p = 0.003$), quantity of fish for sale ($p = 0.000$), access to market information ($p = 0.000$), and retailers' market outlet relative to wholesalers. The model further revealed significant relationships at 1% between sex ($p = 0.000$), access to market information ($p = 0.000$), cost of fish sold ($p = 0.001$), and consumers' market outlet relative to wholesalers. The adjusted R^2 value obtained in the multiple regressions of the determinants of revenue of the marketers showed that 52.93% of the total variation in the dependent variable was accounted for by variation in the independent variables. The result showed that sex ($p = 0.000$), total market cost ($p = 0.000$), and distance to the market ($p = 0.000$) were significant at 1% while years of education ($p = 0.021$) was significant at 5%. Due to the significant relationship of these variables, the alternate hypothesis was accepted. Marketers should source information to market their product, and the government should assist in setting up easily accessible markets for cultured fish youth farmers.

Introduction

Aquapreneurship is a very prosperous business among blue economies globally, and active ages can be successful if one has entrepreneurial determination and can employ the right agribusiness strategies [1,2]. Fish farming business is the system in which fish are reared either for commercial purposes or for domestic private consumption, along with its health benefits. The fish business increases income, diversifying

diets, and empowering youth and active aged populations among Africans. Millions of Nigerian youth and active ages are involved in aqua culturing ventures because fish farming is one of the numerous ways to create self-employment [1,3]. Fish, as a major aquatic food, is a major source of aqua-business to boost the economy of the African growing population. Fish is a healthy and nutritious source of protein that is popular around the world. Nigeria is one of the largest aquaculture producers in Africa, with a high demand and preference for fish production

for the expanding population [4–6]. It was reported that Nigeria has an estimated capacity to generate \$13.125 million annually from fish reefs and new emerging sectors of the blue economy, thereby boosting the nation's Gross Domestic Product (GDP) [7,8]. The potential role of aquaculture to achieve goals for improving smallholder income, dietary diversification, and women's empowerment is making great progress to help the challenging economy [6,9,10]. Fisheries and aquaculture make up 3% – 4% of Nigeria's annual GDP. The sector is also a key contributor to fulfilling the population's nutritional requirements, accounting for about 50% of the supply of animal-source food, and it is an important source of essential dietary nutrients [3,12,13]. Additionally, fisheries, aquaculture, and associated value chains generate employment and income for a significant number of fishers, fish farmers, and fish traders [1,14,15]. Despite the potential for fish production through aquaculture, artisanal and inland fisheries, domestic fish production still falls far below demand. As a result, the country imports half of the fish it consumes. To reduce the level of fish imports and decrease the drain on foreign exchange, the government of Nigeria has selected aquaculture as one of the priority food value chains targeted for expansion and development [14–20]. The fisheries sector is integral to the global economy, contributing 2.09%. They play key roles in socio-economic development, poverty reduction, and nutrition security. Products from fisheries contribute significantly to the high-quality protein and micronutrient intake among poor rural and urban households. They are also a major capital and collateral reserve for most crop farming households. More than 70% of Nigeria's total domestic fish supply originates from artisanal small-scale fishers from coastal areas [21]. Nigeria is the leading country in the production of African catfish and African bonytongue. The great quantity of land, inland water surface, and coastland, which are suitable for fish farming, has placed Nigeria in a much advantaged position to develop aquaculture further. Fish production is an important constituent of global food security and aquatic ecosystem management [22]. Fish farming, on the other hand, is considered a key agricultural sector of food production all over the world. It is viewed as a crucial agricultural activity that can reduce nutritional deficiencies considerably on a global scale and therefore reduce poverty effectively [6,23]. Moreover, aquaculture or fish cultivation offers a major source of animal protein and contributes heavily to household diets, livelihood, and economic development in many countries and regions of the world [6,24]. Nigeria is not left out. In the agricultural sector of the Nigerian economy, aquaculture has been recorded as having the fastest growth rate. Since 2000, it has been growing at 13.6% per year, contributing significantly to economic development. The business plan showed that a good fish farmer in Nigeria can make a Return on Investment (ROI) of between 40 to 100% within a relatively short time. Nigeria is blessed with a large number of rivers, lakes, and natural water resources. Therefore, there are great opportunities for setting up new careers, businesses, and income sources through commercial fish farming in Nigeria [1,25]. Fish marketing is the performance of activities that are involved in the flow of fish and fish products from the point of initial production to

the point of the final consumer [26]. Marketing information is important in assisting growers at the crop planning stage before planting and to sell surplus produce [27]. Therefore, this study evaluated the factors determining market outlets' choice of cultured fish farming entrepreneurship among Nigerian youths in the blue economy.

Objectives of the study

- To identify the cultured fish marketers in the study area.
- To examine the factors that determine the market outlet choice decision of cultured fish marketers in the study area. This was achieved with the use of a market outlet choice model using Multinomial Logit Regression.
- To investigate the determinants of the revenue of cultured fish marketers in the study area. This was achieved with the use of Multiple Regression.

Methodology

Sampling procedure

A multistage random sampling was used to select 320 respondents from three states (Ogun, Osun, and Oyo), South West, Nigeria. Purposive sampling was used to select three states, simple random sampling was used to select two local governments from each state, while stratified random sampling was used to select respondents from each local government [1]. The final selection was 76 farmers, 73 wholesalers, 79 retailers, and 92 processors. The selection was based on the number of registered cultured fish farmers and marketers in the ADP. Twenty questionnaires were discarded because they were not well filled out.

Market outlet choice model

A multinomial logit (MNL) model was applied to explain inter-household variation in the choice of a specific marketing outlet. This study assumed that a cultured fish marketer's decision was generated based on its utility maximisation. This implies that each alternative marketing outlet choice entails different private costs and benefits, and hence different utility, to a household decision maker. The analytical model was constructed as follows. Suppose that the utility to a household of alternative j is U_{ij} , where $j = 0, 1, 2, \dots$. From the decision maker's perspective, the best alternative is simply the one that maximises net private benefit at the margin. In other words, household i will choose marketing outlet j if and only if $U_{ij} > U_{ik}$. It is important to note that a household's utility cannot be observed in practice. What a researcher observes are the factors influencing the household's utility, such as household and personal characteristics and attributes of the choice set experienced by the household [28,29]. Based on McFadden [30], a household's utility function from using alternative j can then be expressed as follows:

$$U(\text{Choice of } j \text{ for household } i) = U_{ij} = V_{ij} + \epsilon_{ij}$$

where,



Uij is the overall utility,
 Vij is an indirect utility function and
 εij is a random error term.

The probability that household i selects alternative j can be specified as: $P_{ij} = \Pr (V_{ij} + \epsilon_{ij} > V_{ik} + \epsilon_{ik})$

$$P_{ij} = \Pr (\epsilon_{ik} < \epsilon_{ij} + V_{ij} - V_{ik} ,)$$

Assuming that the error terms are identically and independently distributed with a type I extreme value distribution, the probability that a household chooses alternative j can be explained by a multinomial logit model [21,31] as follows:

$$P_{ij} = \frac{\exp(\beta_j X_{ij})}{\sum_{j=0}^J \exp(\beta_j X_{ij})}$$

where,

Xij is a vector of household of the ith respondent facing alternative j

βj is a vector of regression parameter estimates associated with alternative j.

Following the equation above, we can adapt the MNL model fitting to this study as follows:

$$P(CHOICE_{ij} = j) = \frac{\exp(\beta_j X_{ij})}{\sum_{j=0}^J \exp(\beta_j X_{ij})}$$

where,

i represents the ith cultured fish marketer household, and I = 1,2,3,...,300.

j represents different marketing outlets, j = 0 for sale to wholesalers, j = 1 for sale to processors, j = 2 for sale to retailers, and j=3 for sale to consumers

P represents the probability of cultured fish marketing outlet j to be chosen by cultured fish marketer i;

CHOICE_{ij} = j means that cultured fish marketing outlet j is chosen by cultured fish marketer i;

Xi is an independent variable [1,32].

It is a common practice in econometric specification of the MNL model to normalise the equation by one of the response categories such that βj = 0. In this regard, the MNL model can alternatively be specified as follows:

$$P_{ij} = \frac{\exp(\beta_j X_{ij})}{\sum_{j=1}^{J-1} \exp(\beta_j X_{ij})}$$

The coefficients of explanatory variables on the omitted or base category are assumed to be zero. The probability that a base category will be chosen can be calculated as follows:

$$P_{ij} = \frac{1}{1 + \sum_{j=1}^{J-1} \exp(\beta_j X_{ij})}$$

The marginal effects of the attributes on the probability of choice are determined by differentiating equation (11):

$$\delta_j = \frac{\partial P_j}{\partial X_j} = P_j \left[\beta_j - \sum_{j=0}^J (P_j)(\beta_j) \right]$$

for j= 1, 2....J

where,

Pj is the probability that farmers choose market outlet j

βj is a vector of regression parameter estimates associated with alternative j.

Independent variables:

These include all variables that are associated with factors that determine the outlet choice decisions of the cultured fish marketers [33].

Descriptions, Measurement, and Expected Signs of Variables for Multinomial Logit Regression Analysis on Outlet Choice Decisions.

Y 0 - Wholesalers

1 – Processors = Dependent Variables

2 – Retailers

3 – Consumers

Sex	-	dummy	1 - male	+/-
			0 - female	+
Age	-		In years	+
Education	-		In years	+
Ownership of transport facilities	-	dummy	1-available 0- not available	+
Cost of fish sold	-		In naira	+
Quantity of fish for sale	-		In kg	+
Marketing experience	-		In years	+
Family size	-		In number	+/-
Credit access	-	dummy	1-access	+/-
			0-no access	
Access to market information	-	dummy	1-access	+/-
			0-noaccess	

Results and discussion

Multinomial Logit Regression (MLR) of market outlets of the actors in the market chain

Table 1 presents the results of the Multinomial logit model used to investigate outlet choice decisions in the cultured fish market chain. Four different market choices were used as the outcome, and these are wholesalers, processors, retailers, and consumers. Wholesalers are used as the reference group. A total of 10 explanatory variables were considered in the econometric model, from which 4 were found to be statistically significant at various levels under the processors and retailers

**Table 1:** Multinomial Logit Regression of Market Outlets of the Actors in the Market Chain.

Variables	Processors			Retailers			Consumers		
	Coefficient	Z	P> z	Coefficient	Z	P> z	Coefficient	Z	P> z
Gender	-2.4351*** (0.8225)	-2.96	0.003	-1.9603*** (0.7372)	-2.66	0.008	-3.2753*** (0.7654)	-4.28	0.000
Age	0.0158 (0.0345)	0.46	0.647	-0.0081 (0.0301)	-0.27	0.788	0.0249 (0.0337)	0.74	0.460
Education years	0.1159 (0.0763)	1.52	0.129	0.0890 (0.0671)	1.33	0.185	0.0557 (0.0824)	0.68	0.499
Own transport	-0.3425 (0.5485)	-0.62	0.53	-0.3677 (0.4987)	-0.74	0.461	-0.3997 (0.5149)	-0.78	0.438
Cost of fish sold	0.0071* (0.0042)	1.70	0.089	0.0120*** (0.0040)	2.98	0.003	0.0148*** (0.0046)	3.21	0.001
Quantity of fish for sale	-0.0003*** (0.0001)	-2.84	0.004	-0.0003*** (0.0001)	-3.65	0.000	-0.0008 (0.0012)	-0.65	0.516
Market experience years	-0.0113 (0.0618)	-0.18	0.855	0.0400 (0.0535)	0.75	0.455	-0.0759 (0.0609)	-1.25	0.213
Family size	0.0508 (0.1725)	0.29	0.769	0.0346 (0.1633)	0.21	0.832	0.0859 (0.1836)	0.47	0.640
Access to credit	-0.2488 (0.5765)	-0.43	0.666	0.0990 (0.4884)	0.20	0.839	-0.0968 (0.5183)	-0.19	0.852
Access to market info	-12.9742*** (1.0982)	-11.81	0.000	-10.9403*** (0.9276)	-11.79	0.000	-12.4268*** (0.9360)	-13.28	0.000
Constant	7.3670 (4.2915)	1.72	0.086	2.7676 (4.1778)	0.66	0.508	2.2819 (4.7026)	0.49	0.628

Note: ***, ** and * represent the level of significance at 1%, 5% and 10% respectively. Obs = 300; Wald chi² (30) = 499.90; Prob> chi² = 0.0000; Log pseudo-likelihood = -267.81136; Pseudo R² = 0.2979

market outlet, while 3 were statistically significant under the consumers' outlet. The significant variables are the gender of the respondent, the cost of fish sold, the quantity of fish for sale, and access to market information. The Wald chi-square (W_T) ratio of 499.90 with a p -value of 0.0000 reveals that the model as a whole is statistically significant. The model has a log likelihood of -267.81136.

Processors market outlet relative to wholesalers

According to Table 1, gender was negative and statistically significant at a 1 percent level of significance. The result showed that the probability of males relative to females decreased by 2.4351 for choosing processors as market outlet relative to wholesalers while holding all other variables in the model constant. The cost of fish sold was positive and statistically significant at a 10% level of significance. This result explains that for a naira increase in the cost of fish sold, the probability of choosing a processor's market outlet relative to wholesalers increased by 0.0071, given all other variables are held constant. The output price of fish serves as a motivation for marketers as well as to determine the choice of marketing channels. This finding is also consistent with that of Zivenge and Karavina [34], S Edoge [35], and Ololade, et al. [1]. The quantity of fish for sale is negative and statistically significant at the 1 per cent level of significance. This explains that an increase in the quantity of fish sold by one kilogram reduced the likelihood of choosing a processor's market outlet relative to wholesalers by 0.0003 while other variables are held constant. Access to market information is negative but statistically significant at the 1 per cent level of significance. The result showed that the probability of fish marketers who had access to market information was 12.9741 lower for choosing a processor's market outlet relative to wholesalers, giving all other variables constant. According to Edoge [35], access to information measured in terms of ownership of cell phone, radio, or

television was a significant positive determinant of channel choice at 1% significance level. Farmers with these facilities have better access to market information. A one per cent increase in the number of fish farmers with access to market information increases the probability of deciding on channel choice. This finding is consistent with the report of Zivenge and Karavina [34].

Retailers market outlet relative to wholesalers

According to Table 1, gender was negative and statistically significant at a 1 percent level of significance. The result explains that the probability of males relative to females was 1.9603 lower for choosing retailers relative to wholesalers as market outlet while holding all other variables in the model constant. The cost of fish sold was positive and statistically significant at a 1 per cent level of significance. The result shows that for a naira increase in the cost of fish sold, the likelihood of choosing retailers' market outlet relative to wholesalers increased by 0.0120, given all other variables in the model constant. Marketers are more responsive to market price relative to the transaction cost. The output price of fish serves as a motivation for marketers to determine the choice of marketing channel. This finding is also consistent with that of Zivenge and Karavina [34]; Edoge [35], and Ololade, et al. [1]. The quantity of fish for sale is negative and statistically significant at the 1 per cent level of significance. The result explained that an increase in the quantity of fish sold by one kilogram will reduce the probability of choosing retailers relative to wholesalers as market outlet by 0.0003 while other variables are held constant. Access to market information is negative but statistically significant at the 1 per cent level of significance. The result showed that the probability of fish marketers who had access to market information relative to those who do not have access is 10.9403 lower for choosing retailers' market outlet relative to wholesalers, while holding



all other variables in the model constant. According to Edoje [35], access to information measured in terms of ownership of cell phone, radio, or television was a significant positive determinant of channel choice at 1% significance level. Farmers with these facilities have better access to market information. A one per cent increase in the number of fish farmers with access to market information increases the probability of deciding on channel choice. This finding is consistent with those of Zivenge and Karavina [34] and Amaya and Alwayng 2011.

Consumers market outlet relative to wholesalers

According to Table 1, gender was negative and statistically significant at a 1 percent level of significance. This showed that the likelihood for males relative to females is 3.2753 lower for choosing consumers as market outlet relative to wholesalers while holding all other variables constant. This is contrary to the findings of Umoinyang 2014. that there are more males in the fish marketing in Akwa-Ibom state, Nigeria. The cost of fish sold was positive and statistically significant at a 10 per cent level of significance. The result showed that for a naira increase in the cost of fish sold, the probability of choosing consumers relative to wholesalers as market outlet increased by 0.0148 while holding all other variables constant. The output price of fish serves as a motivation for marketers as well as to determine the choice of marketing channels. This finding is also consistent with that of Zivenge and Karavina [34] and Edoje [35]. Access to market information was negative but statistically significant at the 1 per cent level of significance. This explained that the probability of fish marketers who had access to market information relative to those who do not have access was 12.4268 lower for choosing consumers' market outlet relative to wholesalers, while holding all other variables in the model constant.

MaOriginal effect from multinomial logit on the choice of marketing outlets

It is important to note that the marginal effect from the multinomial logit on the choice of marketing outlets explains the change in the predicted probability of choosing a specific market outlet for a one-unit change in an independent variable.

Processors market outlet relative to wholesalers

As shown in Table 2, the cost of fish sold was negative and statistically significant at the 5 per cent level of significance. This showed that for a naira decrease in the cost of fish sold, the probability of choosing a processor market outlet relative to wholesalers decreased by 0.003045, holding all other variables in the model constant. This is contrary to the findings of FAO [36]. Fish prices are therefore influenced by demand in those areas, which enables them to meet their transport costs and production costs.

Access to market information is negative but statistically significant at the 1 per cent level of significance. The result explained that the probability of fish marketers who had no access to market information relative to those who had access was 0.3301764 lower for choosing a processor market outlet relative to wholesalers, while holding all other variables in the model constant. This, in terms, goes with the findings of Geoffrey [37] that 36%, 65% and 75% of the market participants who sold at the farm gate, local market and urban market, respectively, had access to price information, which implies that the majority of market participants who sold at the urban market had access to price information. Again, business decisions are based on dynamic information such as consumer needs and market trends [38]. According to Edoje [35], access to information measured in terms of ownership of a cell phone, radio, or television was a significant positive determinant of channel choice at 1% significance level. Farmers with these facilities have better access to market information. A one percent increase in the number of fish farmers with access to market information increases the probability of deciding on a one percent increase in the number of fish farmers with access to market information increases the probability of deciding on channel choice. This finding is consistent with those of Zivenge and Karavina [34] and Amaya and Alwayng 2011.

Retailers market outlet relative to wholesalers

According to Table 2, sex was positive and statistically significant at a 10 per cent level of significance. This implies that the probability for males relative to females is 0.1046578 higher

Table 2: Marginal Effect from Multinomial Logit of the Choice of Marketing Outlets of the Actors in the Market Chain.

Variables	Processors			Retailers			Consumers		
	dy/dx	Z	P> z	dy/dx	Z	P> z	dy/dx	Z	P> z
Sex	-0.0351317	-0.98	0.328	0.1046578	1.70	0.089*	-0.2160306	-3.85	0.000***
Age	0.0008881	0.41	0.681	-0.0052026	-1.45	0.146	0.0045246	1.34	0.179
Education years	0.005056	0.86	0.392	0.006342	0.89	0.371	-0.0054816	-0.69	0.492
Own transport	-0.0034645	-0.09	0.927	-0.0107142	-0.18	0.860	-0.0093009	-0.18	0.858
Cost of fish sold	-0.003045	-2.29	0.022**	0.0003009	1.28	0.201	0.0007115	2.26	0.024**
Quantity of fish for sale	6.09e-06	0.16	0.869	0.0000544	0.35	0.723	-0.0000847	-0.43	0.669
Market experience years	-0.0000505	-0.01	0.990	0.0174782	2.77	0.006***	-0.0168259	-2.76	0.006***
Family size	0.0004017	0.04	0.972	-0.0055585	-0.28	0.778	0.008135	0.43	0.669
Access to credit	-0.0224341	-0.59	0.553	0.0404606	0.71	0.477	-0.0197505	-0.39	0.696
Access to market info	-0.3301764	-3.59	0.000***	-0.1498607	-0.75	0.453	-0.2740537	-1.71	0.087*

Note: ***, ** and * represent the level of significance at 1%, 5% and 10% respectively. Obs = 300; Wald chi2 (30) = 499.90; Prob> chi2 = 0.0000; Log pseudo-likelihood = -267.81136; Pseudo R2 = 0.2979.

for choosing retailers as market outlets relative to wholesalers while holding all other variables in the model constant. This is contrary to the findings of Umoinyang 2014. that there are more males in the fish marketing in Akwa-Ibom state, Nigeria. Marketing experience was positive and statistically significant at a 10 per cent level of significance. This implies that the probability of fish marketers who have more years of marketing experience is 0.006 higher for choosing retailers as market outlets relative to wholesalers, while holding all other variables in the model constant.

Consumers market outlet relative to wholesalers

Sex was negative and statistically significant at a 10 per cent level of significance. This implies that the probability for males relative to females is -0.2160306 lower for choosing consumers as market outlet relative to wholesalers while holding all other variables in the model constant (Table 2). The cost of fish sold was positive and statistically significant at the 5 per cent level of significance. This gives the implication that for a naira increase in the cost of fish sold, the probability of choosing a processor market outlet relative to wholesalers is expected to increase by 0.007115, given all other variables in the model are held constant. Marketers are more responsive to market price relative to the transaction cost. The output price of fish serves as a motivation for marketers to determine the choice of marketing channel. This finding is also consistent with that of Zivenge and Karavina [34]; Edoge [35]. Marketing experience was negative and statistically significant at a 1 per cent level of significance. This implies that the probability of fish marketers who have fewer years of marketing experience is -0.0168259 lower for choosing consumers as market outlet relative to wholesalers while holding all other variables in the model constant. This implies that as marketing experience and education increase, net income also increases. This result corroborates the findings of Offor and Nse-Nelson [39], who opined that marketing experience has a significant influence on net income and marketing efficiency.

Determinants of revenue of the marketers in the fish market chain in the study area

Determinants of revenue of the marketers in the fish market chain in the study area are presented in Table 3.

Multiple regression coefficients of catfish marketing are summarised and also presented in Table 3. The exponential functional form was chosen as the lead equation based on the statistical and econometric consideration of the R^2 (coefficient of determination) value, which shows the explanatory power of the independent variables; the F-ratio, which shows the goodness of fit of the specified model and the conformity of the significant variables with *a priori* expectation. The R^2 value of 0.5293 was obtained, which implies that 52.93% of the total variation in the dependent variable was accounted for by variation in the independent variables. The F-ratio was significant at 1% probability level. This indicates the goodness of fit of the model and the relevance of the variables to the model. The significant variables include sex, years of education, total market cost and distance to the market.

Sex: Sex was significant at 1% and is positively related to the revenue of the marketers. A plausible explanation for this is that male marketer tends to take risks, thus they are capable of searching markets in distant and competitive places for their produce. Conversely, female tends to be confined at home by household chores, hence hindering them from attending the marketplaces (Table 3). The finding concurs with that of Morrison, et al. 2007, who found that female farmers are faced with gender specific constraints like a time burden that limits them from accessing the best market for their output, which will definitely increase their income.

Years of education: Years of education were significant at 5% and were positively related to marketers' revenue. This, therefore, explains that improving the quality of education or individual years of education will positively influence the revenue of marketers (Table 3). This is supported by the findings of Palla, et al. [40], who discovered in their findings that formal education is a significant variable for the marketer's margins, an obvious indication that formal education enhances the performance of business practitioners. In addition, a possible explanation for the positive and significant nature of the years of education variable may be that education is significant in the life of an individual; it helps to shape attitudes, values and behaviour, promoting inquisitiveness and innovations in the process. It grooms the mind and makes it receptive to technological innovation and managerial skills [41].

Table 3: Multiple Regressions of the Determinants of Revenue of the Actors in the Fish Market Chain in the Study Area.

Variable	Linear	Exponential	P> t	Semi log	Double log
Sex	186515.45	.57843507***	0.0000	-332176.24	.11379845
Age	-4814.2365	.01250219	0.113	-1202483.7**	-.04193068
Edu(yrs)	-29746.325	.04381545**	0.021	-1096852.1	.21782552
Qty of fish	199.62094	.00002561	0.724	783712.51***	68613436***
Mkt exp(yrs)	-32664.289	-.02157326	0.193	434552.48*	.11707556
Total mkt cost	7.7766432	8.667e-06***	0.0000	291909.38***	.15619783***
Dis to mkt(km)	4854.6755	.01869118***	0.0000	-175950.64	.0169253
Memb coop	41138.144	.31458274	0.117	-234295.84	.0627776
Acc to credit	-252242.71	-.23194533	0.244	132977.01	.06730769
Acc to mkt inf	176.17842	.01276538	0.924	11739.839	.02550212
Sec occup	226866.8**	-.04771966	0.751	444274.92**	-.00529086
-cons	1057935.1	10611373***	0.0000	1204434.2	6.2486775***



Total market cost: Total market cost was high at 1% and is positively related to marketers' revenue. The market cost comprises the transport cost, labour cost and the cost of marketing equipment (Table 3). This implies that an increase in the cost of transportation decreases the revenue of the marketers. Kumar, et al. [42] also observed that fish marketers at the landing site were more or less fishermen who do not transport or store their produce but sell to marketers coming from the environs. They also observed a negative and significant coefficient in the transportation of fish marketers. Also, as the cost of labour of the cultured fish marketers increases, their revenue reduces. Cost of labour is a very important factor in revenue determination because if the cost of labour incurred in a marketing system by a marketer is high, it will have a negative and significant effect on his/her revenue.

Distance to the market: Distance to the market was significant at 1% and was positively related to the revenue of marketers. Considering the distance to market by a marketer is a very important factor because as the distance to market increases, the cost of transportation will definitely increase, and this will reduce the quantity of fish available for sale, thereby reducing the marketer's revenue (Table 3). This is related to the result by Gurmis and Melese [43] on analysing the factors that influence market participation among avocado producers in the Kaffa Zone of South-Western Ethiopia [44,45].

Conclusion

The Multinomial Logit Regression (MLR) model revealed that negative but significant relationships existed between sex, quantity of fish for sale, access to market information and processors' market outlet relative to wholesalers, while a positive but significant relationship existed between cost of fish sold and processors' market outlet relative to wholesalers. The MLR model also revealed that negative but significant relationships existed between sex, quantity of fish for sale, access to market information and processors' market outlet relative to wholesalers, while a positive but significant relationship existed between cost of fish sold and processors' market outlet relative to wholesalers. The MLR model further showed negative but significant relationships between sex, access to market information and processors' market outlet relative to wholesalers, while a positive but significant relationship between costs of fish sold and processors' market outlet relative to wholesalers. Sex, years of education, total market cost and distance to the market had a positive and significant relationship with the revenue of the cultured fish marketers in the study area. Therefore, due to the significant relationship between some demographic characteristics of the marketers (sex, years of education, total market cost, distance to the market) and the revenue of marketers in the study area, the null hypothesis was rejected and the alternative accepted. It is recommended that the Nigerian government should pay special attention to market access facilities, especially good roads, to enhance the maximum profitability of the cultured fish business in the study area. Credit should also be made available for cultured fish producers to encourage them to increase their production, since marketing starts from the

producers. It is also suggested that government extension workers should encourage more cultured fish youth producers, marketers and processors to register under ADP, so as to be beneficiaries of different incentives or programs that may be organised by the government, since marketers need to be educated on how to maximise their profit.

Data availability statement

Data supporting the findings of this study are available within the article.

Authors contribution

RAO: Conceptualisation, Design, Data collection, Analysis, Writing of manuscript.

FIO: Data collection, Analysis, and Writing of the manuscript.

TJA: Data collection, Analysis, and Writing of the manuscript.

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