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ECONOMIC ANALYSIS OF OPERATION OF ARTISANAL FISHERFOLKS AND FISH MARKETERS ASSOCIATED WITH THREE CREEKS IN LAGOS, NIGERIA

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Abstract
Disturbance in aquatic habitats via several human activities is a potential menace to the fishing business and aquatic biodiversity. This study was conducted to document some socioeconomic characteristics and profitability of fisher folks and fish marketers that are operating within Badagry, Makoko, and Ologe creeks in Lagos State. Primary data were collected with the aid of well-structured questionnaires from 90 fisher- folks and 90 fish-marketers randomly selected across the three fishing communities. Budgetary and descriptive analysis was used to analyse the data collected. Fisher folks and fish-marketers were dominated by males and females respectively while difficulty in accessing credit and high costs of fishing equipment were common challenges they had. The calculated Net Return on Investment (NROI) for the fisher folks in Badagry (0.09) Makoko (0.08) and Ologe (0.08) indicated returns of N9, N8, and N8 respectively for every naira invested in the business. However, the NROI for the fish marketers in Badagry, Makoko, and Ologe was 0.27, 0.35, and 0.22 implying a return of N27, N35, and N22 respectively for a Naira invested in the business. The benefit-cost ratio (BCR) for fisher folks and fish marketers across the fishing communities was greater than 1 and this means that artisanal fishing and marketing is profitable. In conclusion, fish marketing in Makoko was the most profitable while the fishing business was most profitable at Badagry.

Keywords: *Artisanal, Community, Constraints, Fisher folks, Profitability*

INTRODUCTION

The artisanal fishery subsector is indirectly employed by the production of fishing inputs and suppliers such as fishing vessels, dugout canoes, sinkers, fish feed mills, floats, nets,

and restaurant owners etc while one of the main obstacles to the growth of small-scale fisheries is how to increase its size and ensuring a sustainable level of fisheries resources (FAO,2020). Ifabiyi *et al*. (2023) define artisanal fishing as the process of capturing fish from the natural water with less technology and traditional fishing crafts and gears. Usually, artisanal fishing is labour intensive and involves very low capital investment. Over the years, one of the mundane challenges is that neither the fishers nor the fishing communities have the capacity to improve their mode of operation due to numerous factors which include inadequate catch, lack of storage facilities, marketing issues, lack of access to credit as well as environmental degradation caused by irregular and unregulated anthropogenic activities (Boro and Agbugba, 2022). Often time, most fishing settlements are highly scattered in remote and inaccessible road networks which makes evacuation, distribution and marketing of their fish rather difficult (FAO, 2020).

Studies have shown that Nigeria is blessed with fish resources whose distribution and value must be kept sustained to bridge the gap between the supply and demand of fish (Anetekhai *et al*., 2022). To build a healthy nation, increased fish production quantitatively and qualitatively cannot be undermined (Folorunso *et al.*, 2021). However, despite the critical commitment of artisanal fishers and marketers to fish generation in Nigeria, few research works have economically analyse artisanal fish production in various parts of the country. Therefore, this study aims to estimate the cost and returns from artisanal fishers and marketers that operate in and within Badagry, Ologe, and Makoko communities, to determine the viability of artisanal fishing and marketing in these communities as well as identify their common challenges.

MATERIALS AND METHODS

Study area

Badagry, Makoko, and Ologe fishing communities were selected for this study as shown in Figure 1.Badagry is one of the coastal towns of Lagos State, located 57km from Lagos on Latitude 6.411566^{o}N, and Longitude 2.882037^{o}E.The fishing community of Makoko lies within the jurisdiction of the Lagos Mainland Local Government, in central Lagos State on latitude 6º25'44"N, and longitude 3º27'19"E.It is a water front community situated along Lagos Lagoon. The community of Ologe Lagoon is between latitude 6°28'14"N and longitude 3°4'59"E.

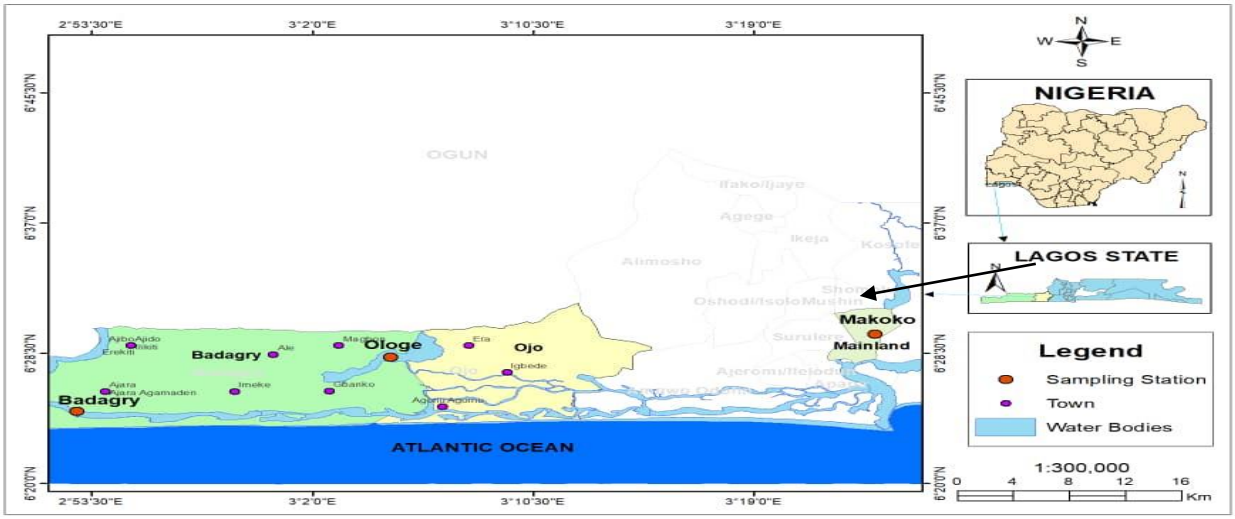

Figure 1: Map showing the location of the selected aquatic communities (Badagry, Ologe and Makoko) in Lagos State, Nigeria.

Collection of Data

A purposive sampling technique based on its intensity of fishing activities, was used to select Badagry, Ologe, and Makoko fishing communities among several fishing villages of Lagos State.Sixty respondents were selected randomly from each community, which consists of thirty fisher folks and thirty fish marketers from each selected fishing community. The data were obtained using a questionnaire. The questionnaire was divided into two sections based on the objectives of the study: information on the cost and returns of artisanal fisher folks and marketers and the constraint limiting the development of fishing and marketing in the three selected fishing communities.

Analytical procedures

Descriptive statistics such as frequencies and percentages were used to describe data on the socio-economic characteristics and challenges of the respondents while the following equations described by Abasilim *et al*. (2020) were used to determine the costs and return of fish production and marketing.

$GM = \sum TR - \sum TVC$ Eqn1

$NM = GM - TFC$ ..... Eqn 2

$NROI = NM/TC$ ..... Eqn 3

$BCR = TR/TC$ ..... Eqn 4

Where NM is the net margin, GM is the gross margin income, TVC is the total variable cost, TFC is a total fixed cost, NROI is the net return on investment, TC is the total cost, TR is total revenue and BCR is benefit-cost ratio.

RESULTS

Some Socio-economic features of artisanal fisherfolks and fish marketers within Badagry, Makoko, and Ologe fishing communities.

As shown in Table 1, Badagry had 6.7%, Ologe had 0% while Makoko had 13.3% of fisher folks within the age of 20-30 years. However, 20.3%, 13.3%, and 40.0% of fisherfolks are between the age of 31-40 years in Badagry, Ologe, and Makoko

respectively. A total of 53.3%, 66.7%, and 33.3% of fisherfolks in Badagry, Ologe, and Makoko respectively are within the age of 41-50 years while 20.0%, 20.0%, and 13.3% respectively are within the age of 51-60 years. In terms of years of experience, 13.2%, 20.0%, and 6.7% of fisherfolks in Badagry, Ologe, and Makoko respectively had 1-10 years of experience while on the other hand, 20.0%, 26.7% and 20.0% fisherfolks in Badagry, Ologe, and Makoko respectively had 31-40 years of experience in the business. As presented in Table 2, Badagry and Ologe communities did not have fish marketers whose ages are between 20-30 years. Makoko had 20% of fish marketers within that age, while 26.7%. 13.3% and 33.3% are between the ages of 31 and 40 years in Badagry, Ologe, and Makoko respectively. For the age group of 51-60 years, 20.0%, 26.7%, and 13.3% of fish marketers in Badagry, Ologe, and Makoko respectively fall within this age. Table 2 also showed that 13.3%, 26.7% and 33.3% of fish marketers in Badagry, Ologe, and Makoko respectively had 1-10 years of experience, while 26.7%, 20.0%, and 13.3% of them in Badagry, Ologe, and Makoko respectively had 31- 40 years of experience. On the gender of respondents, while 100% of fisherfolks interviewed across the fishing community were male, 100% of fish marketers were female.

Table 1: Socioeconomic characteristics of artisanal fisherfolks in Badagry, Ologe, and Makoko Fishing Communities

Age (Years)	**Badagry**		**Ologe**		**Makoko**	
	Frequency	%	Frequency	%	Frequency	%
20-30	2	6.7	0	0	4	13.3
31-40	6	20.0	4	13.3	12	40.0
41-50	16	53.3	20	66.7	10	33.3
51-60	6	20.0	6	20.0	4	13.3
Year of Experience						
1-10	4	13.3	6	20.0	2	6.7
11-20	6	20.0	6	20.0	10	33.3
21-30	14	46.7	10	33.3	12	40.0
31-40	6	20.0	8	26.7	6	20.0
Gender						
Male	30	100	30	100	30	100
Female	0	0	0	0	0	0

Table 2: Socioeconomic characteristics of artisanal fish marketers in Badagry, Ologe, and Makoko Community

Age	**Badagry**		**Ologe**		**Makoko**	
	Frequency	**%**	**Frequency**	**%**	**Frequency**	**%**
20-30	0	0	0	0	6	20.0
31-40	8	26.7	4	13.3	10	33.3

41-50	16	53.3	18	60.0	10	33.3
51-60	6	20.0	8	26.7	4	13.3
Year of Experience						
1-10	4	13.3	8	26.7	10	33.3
11-20	8	26.7	4	13.3	6	20.0
21-30	10	33.3	12	40.0	10	33.3
31-40	8	26.7	6	20.0	4	13.3
Gender						
Male	0	0	0	0	0	0
Female	30	100	30	100	30	100

Constraints Limiting the Performance of Artisanal Fisher Folks and Fish Marketers in Badagry, Ologe, and Makoko Communities

Table 3 presents the factors inhibiting the performance of artisanal fisher folks and fish marketers in Badagry, Ologe, and Makoko communities. The results showed that the fisher folks (100%) in the three studied communities had challenges with drought and flood/ erosion and inadequate storage facilities to preserve their excess catch. On the other hand, (100%) of fisher folks from Ologe Lagoon reported that vegetation invasion had made fishing grounds inaccessible for them. During fishing activities, vegetation like water hyacinths causes the canoe to topple, thereby causing serious injury to fisherfolks while those in Badagry and Makoko do not have complaints on water hyacinths. About 66.7% of the fisher folks had a high cost of equipment as a problem in Badagry,33.3% in Ologe, and 80.0% in Makoko. All fisherfolks (100%) had inadequate finance and credit facilities across the three communities which hamper the adoption of fishing technologies and innovations, while fisher folks (100%) across the studied communities do not have access to cooperative societies as well as lack of government intervention.

All (100%) fish marketers in Badagry, Ologe, and Makoko had problems with prices offered by consumers. Fish marketers in Badagry have poor transportation networks (100%), fish marketers in Ologe do not have such problems while those in Makoko (53.3%) had transportation network challenges. Also, fish marketers across the three communities have complaints of harassment by local government officials, specifically 73.3% of fish marketers in Badagry were affected by the hike in the price of fish, 66.7%were affected in Ologe and 80.0% were affected in Makoko. 60.0% of fish marketers in Badagry had problemswith storage facilities while all (100%) at Ologe and Makoko were affected.

Table 3: Constraint limiting the performance of artisanal fisher folks in Badagry, Ologe and Makoko

Constraints	**Badagry**		**Ologe**		**Makoko**	
Fisherfolks	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Inadequate storage facilities	30	100	30	100	30	100
Non membership to cooperative	30	100	30	100	30	100

society						
Lack of government intervention	30	100	30	100	30	100
High cost of fishing gears	20	66.7	10	33.3	24	80.0
Infestation by water hyacinth	0	0	30	100	10	33.3
Climate change	30	100	30	100	30	100
Lack of improved technology	20	66.7	24	80.0	20	66.7
Lack of finance	30	100	30	100	30	100
Fish marketers						
Low prices offered by consumer	30	100	30	100	18	60.0
Poor transportation network	30	100	0	0	16	53.3
Harrasment by local government official	30	100	30	100	30	100
Hike in price of fish	22	73.3	20	66.7	24	80.0
Coming back empty handed	14	46.7	16	53.3	16	53.3
Poor storage facilities	18	60.0	30	100	30	100

The cost and return of artisanal fisher folks in Badagry, Ologe and Makoko communities

The cost and return structure of the Fisher folks as shown in Table 4 revealed that the fishermen in Badagry had an average estimated total fixed cost of N959,733.4, those in Ologe had a fixed cost of N861,466.7 while those in Makoko had a fixed cost of N877,866.6. The mean total variable cost for fishermen in Badagry, Ologe and Makoko, are N160,606.7, N154,019.9 and N171,378 respectively. The fixed costs constitute the majority (78.7%) of the total cost of artisanal fish production in Badagry, (84.8%) in Ologe and (83.7%) in Makoko. The gross margin estimated for Badagry, Ologe and Makoko were N1,059,393.3, N945,980.1 and N957,954.5 respectively. The net profit was N99,659.9, N84,513.4 and N80,087.9 for Badagry, Ologe and Makoko respectively while net margin for fishermen at Badagry, Ologe and Makoko communities were N99,659.9, N84,513.4 and N80,087.9 respectively. From the analysis of profitability

indicators, the NROI for the fishermen was 0.08, 0.06 and 0.07 at Badagry, Ologe and Makoko communities respectively with the Benefit Cost Ratio (BCR) of 1.08, 1.08 and 1.07 respectively.

Table 4: Cost and return analysis of artisanal fisherfolks from Badagry, Ologe and Makoko Communities

Variable cost	Badagry	Stdev	%	Ologe	Stdev	%	Makoko	Stdev	%
Fuel	111,600.0	20059.9		109,600.0	9045.9		122,000.0	15191.1	
Miscellaneous	28,000.0	8684.9		23613.3	3381.0		28285.7	7599.9	
Floater	6166.7	645.5		6133.3	1187.2		6357.1	1008.2	
Sinker	14066.7	2016.6		13800.0	1373.2		13857.1	2178.9	
Lamp	773.3	310.5		873.3	361.5		878.6	340.1	
TVC	160,606.7			154,019.9			171,378.5		
Fixed cost									
Outboard engine	620,000	108232.6	55.3	580,000	108232.6	57.11	526,666.7	88371.5	50
Crayfish net	83,333.3	13451.9		65,333.3	9154.8		89333.3	24630.6	
Fishing net	116,666.7	16329.9		90,666.7	8837.2		119333.3	23441.9	
Canoe	97,333.3	22189.7		92,000.0	6761.2		102000.0	10141.9	
Paddle	6,466.7	1597.6		5,466.7	1125.5		5666.7	1397.3	
Rope	30,666.7	7988.1		22,666.7	7988.1		29333.3	9611.5	
Live jacket	5266.7	883.7		5,333.3	816.5		5533.3	1355.8	
TFC	959,733.4		78.7	861,466.7		84.8	877,866.6`		83
Total cost	1,120,340.1			1,015,486.6			1,049,245.1		
Total revenue	1,220,000.0	56061.2		1,100,000.0	239045.7		1,129,333.0	175802.9	
Gross margin	1,059,393.3			945,980.1			957,954.5		
Profit	99,659.9			84,513.4			80,087.9		
NFI	99,659.9			84,513.4			80,087.9		
NROR	0.09			0.08			0.08		
BCR	1.08			1.08			1.07		

The cost and return of artisanal fish marketers in Badagry, Ologe and Makoko

The costs and return of artisanal fish marketers in Badagry, Ologe and Makoko communities is presented in Table 5. The Table revealed that a total cost of N47,536.3 was incurred by the fish marketers in Badagry, N45,186.0 in Ologe and N64,933.3 in Makoko. The variable costs constitute most of the total cost of artisanal fish marketing across all the sampling communities, which was64.33% in Badagry, 63.88% in Ologe and 65.49% in Makoko. The fixed cost accounted for 35.66% of total cost of operation in Badagry,36.12% in Ologe and 34.51% in Makoko communities. The result of the cost and return analysis also revealed a total return of N60,533.7 in Badagry, N55,333.3 in Ologe and N64,933.3 in Makoko. The gross margin estimates for Badagry, Ologe and Makoko were N29,950.3, N26,467.3 and N33,449.9 respectively. From the analysis of profitability indicators, the NROI for the fish marketers, in Badagry, Ologe and Makoko was 0.27, 0.22 and 0.35 with BCR of 1.27, 1.22 and 1.35 respectively.

Table 5: Cost and return analysis of artisanal fish marketers in Badagry, Ologe and Makoko

Variable cost	Badagry	Stdev	%	Ologe	Stdev	%	Makoko	Stdev	%
Weaved basket	700.0	200		593.3	225.1		626.7	148.6	
Weaved tray	480.0	126.49		540.0	195.7		433.3	104.7	
Sieve	446.7	172.7		486.7	213.4		466.7	238.0	
Packaging	2390.0	236.5		2306.7	305.8		2390.0	236.5	
Ice block	3546.7	83.4		3613.3	155.2		3306.7	478.8	
Sack	100.0	0.00		100.0	100.0		100.0	100.0	
Miscellaneous	22,920	2355.3	48.21	21,226	8604.9	46.97	24,160.0	2559.2	50.25
TVC	30,583.4		64.33	28,866		63.88	31,483.4		65.49
Fixed cost									
scale	12,166.7	3472.7		11,333.3	2193.06		11600.0	20697.6	
knife	613.3	274.8		740.0	294.7		906.7	347.3	
bowl	1040.0	252.9		1020.0	251.3		960.0	364.1	
chopping	1353.3	425.7		1466.7	361.9		1426.0	599.4	
Stainless tray	1780.0	312.1		1760.0	250.1		1700.0	302.4	
TFC	16,953.3		35.66	16,320.0		36.12	16,592.7		34.51
Total cost	47,536.3			45,186.0			48,076.1		
Total revenue	60,533.7	19529.7		55,333.3	27996.6		64,933.3	20408.2	
Gross margine	29,950.3			26,467.3			33,449.9		
Profit	12,997.0			10,147.3			16,000.0		
NFI	12,997			10,147.3			16,857.2		
NROR	0.27			0.22			0.35		
BCR	1.27			1.22			1.35		

Discussion of Findings

The significance of economic analysis of artisanal fisheries cannot be over-emphasised. This study has shown that the age of most fisher folks and fish marketers falls between 31-50 years which implies that the respondents are within the economic and productive active age and, therefore are better positioned to contribute immensely towards improving the livelihood of their families. A similar active age group of artisanal operators has been reported by Aderinola *et al.* (2021) at Ganyinbo, Badagry. Also, the report by Mohammed *et al.* (2023) among fisherfolks in Borgu Local Government Area, Niger State where the most frequent age was 36-45 years, agreed with the age bracket of most respondents in this present study. In this study, most fisher folks had more than ten years of experience in fishing, and this indicates that most of them had virtually indubitable fishing experience. The findings of Agbebi *et al*. (2020) who observed that the average fishing experience of 12 years among fisherfolks in Ilaje coastal communities of Ondo State, accounted for their immense profitability in the business, also corroborated with the findings in this study.

Although the present study showed that the fish marketers in the three fishing communities are well experienced in marketing, those in Badagry have more experience than those in Ologe and Makoko. This study further revealed that artisanal fishing is gender sensitive with males dominating the fisherfolks while fish marketers were dominated by females. The work of Ogunremi *et al.* (2023), divulged artisanal fisher folks in Lower River Niger, Kogi State to be predominantly male, while the females engaged mainly in preservation, marketing, and processing activities and their findings conformed with the present study.

The gross margin estimates for fisherfolks and fish marketers from Badagry, Ologe, and Makoko indicated that artisanal fishing and marketing across these communities is still profitable. This was also buttressed by the profitability indicators- Net Return on Investment (NROI) values. Both the gross margin estimates and NROI reported by Abasilim *et al.* (2020) as well as Boro and Agbugba (2022) were lower than those recorded for the fish marketers and fisher folks in this study. Similarly, the gross margin estimated for fisher folks and fish marketers by Agbebi *et al*. (2020) was lower than that obtained in this study. Higher gross margin estimates and NROI in Badagry, Ologe, and Makoko indicated that the more the amount invested in the business, the greater their net revenue. The values of BCR documented by Okeowo *et al*.(2015) among fisherfolks and fish marketers in Epe and Badagry were lower than the values of BCR recorded in this study and this means that fisherfolks and fish marketer in this study make a greater profit in their business.Moreover, BCR for all fisher folks and fish marketers in this study being greater than 1 implied that the business is profitable.The NROI for the fishermen at Badagry, Ologe, and Makoko communities which were 0.08, 0.06, and 0.07 respectively indicated that for every Naira invested in the business,there is a return of N8.00, N6.00, and N7.00 respectively.On the other hand, NROI for the fish marketers in Badagry, Ologe, and Makoko was 0.27, 0.22, and 0.35 respectively implying that for every Naira invested in the business, there is a return of N27.00, N22.00, and N35.00 respectively. This further showed that fish marketers make more profit than fisher folks. Also, the

outcome of this study showed that fisher folks in Badagry and fish marketers in Makoko make greater profits than their counterparts from other studied communities. As revealed in this study, fish marketers `across the three communities have problems with prices offered by consumers, some had poor transportation networks which may restrict their ability to a wider consumer base, potentially reducing their overall sales and income. Lack of good storage facilities is one of the problems facing artisanal fish marketers across the communities and thus reduces the shelf life of fish products.The problems of fisherfolks such as the high rate of post-harvest loss, lack of funds, high cost of fishing inputs, high cost of transportation, and pollution of water bodies reported by Omitoyin and Aderanti (2020) in selected fishing communities along Kanji Dam, New Bussa, Niger State and by Mohammed *et al.* (2023) in Borgu Local Government Area, Niger State, did not differ from challenges of fisherfolks in this study and this could suggest that problems of artisanal fisherfolks in Nigeria have not been fully solved.

CONCLUSION

Artisanal fish marketing and fishing activities were gender specific with mature adults participating in the business. The main obstacles that the fisher folks and marketers had to deal with were inadequate storage facilities and a lack of credit facilities to grow their businesses, though some of them did not consider the lack of participation in a cooperative society to be a limitation. Artisanal fishing and marketing business is profitable in Badagry, Ologe, and Makoko communities, although the margin of cost and return indicated that the fish marketers in Makoko were the most profitable while the economic analysis for fisher folks showed that Badagry fisher folks were the most profitable. The fish marketers and fisher folks in the three fishing communities had a benefit-cost ratio (BCR) greater than 1.0 which implies that each activity delivered was profitable.

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