

Economics Of Fishing Operations By Trawling Vessels In Nigeria

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Abstract

The study examined the determinants of catch per vessel and profitability of trawling operations in Nigeria. Data for the study were collected from a broad spectrum of different classes of 60 randomly selected trawling vessels. Determinants of catch per vessel was analyzed using multiple regression analysis while profitability analysis of trawling operations was facilitated using the following parameters: Net Cash Flow, Net Cash Flow less Corporate Tax, Economic Performance (Ep) and Return on Investment (ROI). Result of the multiple regression analysis showed that Size of Vessel, Age of Vessel and Educational Qualification of captain statistically and significantly influenced catch per vessel and which in turn affected the revenue of trawling vessels. Analysis of operational cost components reveal that the cost of Automotive Gas Oil (diesel) used by trawlers constitute about 46.5 per cent of total operational cost due to the fact that AGO is mainly imported. Net Cash Flow of trawling vessels is N45,772,171.4, Net Cash Flow less 30 per cent corporate tax is N32,040,519.98 showing that trawling is a profitable venture. The economic performance index was 0.43 showing that trawling vessels retain 43 per cent of their total earnings as profit. Index of Return on Investment was 0.35 showing that the reproductive capacity of funds invested in trawling is 35.6 per cent. From these indices, trawling operations in Nigeria can be adjudged a worthwhile venture. The study recommends the need to set up a cabotage fund to enable indigenous investors buy new and large vessels equipped with modern fish capture technology at minimal interest rates. Maritime training institutions should be established within the country to train highly skilled manpower for the industrial fishery sub sector. Modalities for refining petroleum products within Nigeria should be undertaken to curb importation and hence curtail high prices of AGO. Trawler operators should be given tax waiver on 30 per cent corporate tax to attract more investors.

Keywords: Trawling Vessels, Industrial fishery, Net Cash Flow, Economic Performance, Financial Performance

Introduction

The emergence of trawling as a technologically efficient method in the exploitation of marine fishery resources is well recognized and has helped in no small way in increasing domestic fish production in Nigeria. However Nigeria is still unable to produce enough fish to meet domestic fish demand which at the present stands at 3.97 metric tonnes. The shortfall in domestic fish production is augmented through importation. As at 2015, Nigeria imported 806,000 metric

tonnes of fish valued at \$1,126,428,414.41 (FDF, 2016). Massive importation of fish places Nigeria in an unfavourable balance of payment position. Massive investment in trawling vessels can go a long way in boosting domestic fish supplies by reducing reliance on fish imports thereby saving hard earned foreign exchange which can be used to develop other critical sectors of the economy.

Trawling as a business is set up to make profit. The extent to which a trawling vessel is able to make profit is critical to the survival of the industrial fishery sub-sector (Effiong et al,2016a). Profits of a trawling vessel is determined by the revenue generated relative to its costs. The sale of quantities of fishery products at various prices constitute the revenue of trawling vessels. The catch per vessel which is influenced by some factors together with prices of the fishery products landed by a vessel determine its revenue. Revenues of trawling vessels depend on species and quantities of fishery products and prices obtained which again depend on marketing channels, market, seasonal fluctuations and other factors (FAO, 2000 and Tietze ,2005). The revenue of a trawling vessel relative to its operational cost is a major determinant of profitability. To operate profitably, it is expected that revenues of trawling vessels should be higher than their operational cost within some reasonable limits. This is because profitability is a major index of viability of a trawling vessel which could attract or scare away investors in the industrial fishery sub-sector (Effiong et al,2016b). Trimming down operational costs to the barest minimum will enable trawling vessels make more profit, meet its operational cost obligations and remain in business. This study examines the factors that determine catch per vessel as well as analyze the profitability of trawling operations. A study of this nature will provide baseline data and insight on how trawling vessels can scale-up quantities of fishery products landed to improve their revenue base. It will also highlight measures that can be adopted to improve the profitability of trawling vessels.

Methodology

All licensed trawling vessels operating in Nigeria, both Nigerian and foreign flagged registered vessels were involved in this study. The list of licensed vessels operating in Nigeria was obtained from Federal Department of Fisheries (FDF) from which 60 trawling vessels were randomly selected. A total of 60 copies of questionnaire were administered to the captains of these vessels. Hence n=60. Data used in this study are broad averages obtained from small vessels, large vessels, fishing, shrimping, Nigerian and foreign owned vessels.

Measurement of Variables

- (i) Age of vessel is measured in number of years since the purchase of a new vessel.
- (ii) Size of vessel or Length Overall (LOA) is measured in metres.
- (iii) Size of crew is measured by the number of people on board a vessel.

- (iv) Educational qualification of captain is measured by the number of years spent in school.
- (v) Captains experience in trawling is measured by number of years spent on the job.
- (vii) Catch per vessel/Quantity of fish is measured per metric tonne (1000kg).
- (viii) Cost/Revenue/Price/Net cash flow/Total earning/Net profit is measured in Naira.

Method of Data Analysis and Models

Data collected was subjected to thorough analysis and relied essentially on the quantification of explicitly defined variables.

Multiple regression analysis was used to test the relationship between the characteristics of vessels such as size of vessel (SOV), Age of vessel (AOV), captain’s experience in trawling (CEX)). Educational qualification of captain (EQC), size of crew (SOC), and average catch per vessel (CPV). The above functional relationship can be stated as follows:

$$CPV=f(SOV, AOV, CEX, EQC, SOV, ei).....1$$

Where

CPV = Average catch per vessel

SOV = Size of vessel

AOV = Age of Vessel

CEX = Captain’s experience in trawling

EQC = Educational qualification of captain

SOC = Size of crew

ei = Error term

A multiple regression model with average catch per vessel as dependent variable and size of vessel, age of vessel, captain's experience, educational qualification of captain and size of crew as independent variables was estimated. Data was fitted with four functional forms of the regression model, namely linear, exponential, semi-log and double log. The one that gave the best fit in terms of standard error, value of co-efficient of multiple determination, number of significant variables and other econometric criteria was chosen as the lead equation. The functional forms are given as:

$$\text{Linear: } CPV = \beta_0 + \beta_1 SOV + \beta_2 AOV + \beta_3 CEX + \beta_4 EQC + \beta_5 SOC + e_i \dots\dots\dots 2$$

$$\text{Exponential: } \log CPV = \beta_0 + \beta_1 SOV + \beta_2 AOV + \beta_3 CEX + \beta_4 EQC + \beta_5 SOC + e_i \dots\dots\dots 3$$

$$\text{Semi-log: } CPV = \beta_0 + \beta_1 \log SOV + \beta_2 \log AOV + \beta_3 \log CEX + \beta_4 \log EQC + \beta_5 \log SOC + e_i \dots\dots\dots 4$$

$$\text{Double Log: } \log CPV = \beta_0 + \beta_1 \log SOV + \beta_2 \log AOV + \beta_3 \log CEX + \beta_4 \log EQC + \beta_5 \log SOC + e_i \dots\dots\dots 5$$

To assess the economic and financial performance of fishing vessels, two indicators were used following Tietze and Lasch (2008). The economic performance was measured by the net cash flow (NCF), which is equal to the net profit. This was calculated as the value of landings minus all costs including the costs of depreciation and imputed interest. The NCF or net profit can be seen as the reward for entrepreneurship and expresses the absolute income of the entrepreneur or owner of the vessel. Another closely related indicator of economic performance is the NCF/total earnings (TE) ratio, which expresses the NCF or net profit as a percentage of TE. A ratio of more than 10 per cent can be considered good.

The financial performance was measured by the NCF/investment ratio, also referred to as rate of return on investment (ROI). A level of 10 per cent is generally considered to be a good result. The NCF or net profit expressed as a percentage of the invested capital indicates the profitability of the investment in relation to other alternative investments. The book value of fishing vessel based on the replacement value of the vessel has been used as a measure for the invested capital. In a number of cases, the insured value of a vessel has been taken as an indicator for the invested capital.

- (i) Net Cash Flow (NCF)= Total Earnings less Operational Costs
- (ii) Profit After Tax (PAT)= Net Cash Flow less 30 per cent Corporate tax

(iii) Economic Performance (Ep)= $\frac{\text{Net Cash Flow (NCF)}}{\text{Average Annual Total Earnings}}$

(iv) Financial Performance by Return on Investment (ROI)

$$\text{ROI} = \left[\frac{\text{Profit After Tax}}{\text{Average Investment Outlay}} \right]$$

Results and Discussion

Determinants of Catch per Vessel: Out of the four functional forms fitted with the data, result of the exponential form gave the best output in terms of economic, statistical and econometric criteria and was chosen as the lead equation. The result is presented in Table 1'

Table 1: Estimated Determinants of Catch per Vessel

Parameter	Coefficient	T-ratio	Significant
Constant term	1,280	18.571	.000
SOV	.654	12.372**	.000
AOV	-.147	-3.737**	.000
CEX	.068	1.607	.114
EQC	.284	5.468**	.000
SOC	.013	.312	.756
R2	.927		
R2 Adjusted	.920		
F-statistic	136.398		
Durbin Watson	1.908		

Source: Computed from survey data 2020

Note: **= Significant at 5% level of probability

The results show that 92.7 per cent of the variation in the dependent variable (catch per vessel) is accounted for by the independent variables i.e. size of vessel, age of vessel, captain's experience, educational qualification of captain and size of crew showing that the R² is highly significant.

The results indicated that all the predictors (size of vessel, age of vessel, educational qualification of captain, captain's experience in trawling and size of crew) had the expected sign a priori. However, three of the predictors (SOV, AOV and EQC) were statistically significant at the 5% level of probability. This implies that these explanatory variables are indeed the major factors determining catch per vessels operating in Nigeria.

Size of vessel with a beta coefficient of .654 had a positive and significant effect on catch per vessel. This implies that the larger the vessel the more the catch. This could be attributed to the fact that larger vessels by their capacity have higher fishing power relative to smaller trawling vessels. Effiong et al, (2017) linked higher fishing power to larger trawling vessels. It is expected that bigger trawling vessels are fitted with bigger fishing gears and storage holds relative to smaller vessels *ceteris paribus*. The corollary of this result is that with a higher volume of catch, larger vessels will generate more revenue and hence profit. The finding agrees with Chifamba (1995), Sumaila et al,(2002) on small versus large scale fishing operations and Effiong, et al, (2017) on financial performance of some classes of trawling vessels.

Age of vessel had an inverse relationship with catch per vessel and was statistically significant at the 5 per cent level. This finding shows that vessels catch less fish/shrimps as they get older. Effiong et al, (2016c) reported that old vessels are known to attract higher repair and maintenance costs and may not be used for long fishing journeys as they break down more often at sea.

This finding strongly suggests the need to establish a fund to help Nigerians buy new trawling vessels at minimal interest rates to replace aging vessels. This will help to eliminate drop in catch per vessel and as well serve to keep vessel operators in business.

Educational qualification of captain had a positive influence on catch per vessel and was statistically significant. This implies that Captain's with higher academic and professional qualifications were able to catch more fish than their less educated counterparts. Education has the propensity to improve the intellectual capacity of an individual and equip him with skill to enhance performance. This calls for the establishment of maritime institutions within Nigeria for training of highly skilled manpower in the industrial fishery sub-sector. Essien (1982) reported that the level of fish landing in a vessel depends on the quality of the Captain and Engineer which can be attributed to the type of education acquired. This is the type of education which increases the productivity of the individual receiving it by making him acquire new skills and techniques. According to Kasika (2015) the higher the education level, the more are the effect of education and skill on job performance. As such people's ability to understand and use advanced technology is determined by the level of their education. Educated workers tend to be more responsive in receiving instructions and doing new tasks and easily adopt new technology which increases their ability to innovate and improve job performance.

Captain’s experience had a positive effect on catch per vessel but was not statistically significant at 5% level. This implies that the more experience a captain acquires on the job, the more it places him in a vantage position to catch more fish. According to Effiong (1998), the number of years an individual had spent in a job gives an indication of the practical knowledge and skill acquired over the years and which makes it possible to observe an improvement in performance. Although experience may not count in terms of risk taking, it may have some considerable influence on efficiency.

Size of Crew also had a positive influence on catch per vessel but not statistically significant at the 5% level of probability. This implies that more hands are required in a trawling vessel that catches more fish. But the mere engagement of more crew members in a vessel cannot necessarily bring about an increase in the volume of catch per vessel as it is influenced by other factors.

The F-value of the model is statistically significant at the 5 per cent level and suggests that the joint influence of all the explanatory variables on the catch per vessel is strong.

Profitability Analysis of Trawling Operations

Table 2 : Average Annual Operational Cost of Trawling Vessels

Annual Running Costs

S/N	Item	Cost
i.	Fuel (Automatic Gas Oil)	N27,800,000
ii.	Lubricants	N20,000
iii.	Food Supplies to crew	N550,000
iv.	Miscellaneous Expenses	N2,500,000
	TOTAL	N30,870,000

Annual Vessel Costs

S/N	Item	Cost
i	Interest on loan(9% of N120,000,000)	N10,800,000
ii	Vessel insurance (5% of N120,000,000)	N6,000,000
iii	Vessel repair and maintenance	N400,000
iv	Gear repair and maintenance	N70,000
v	Annual depreciation on vessel	N3,466666.5
vi	Renewal of Annual Fishing Licence	N100,000
vii	Cabotage Ship registration	N150,000
	TOTAL	N20,761,666

Annual Labour Costs

S/N	Item	Cost
i	Captain’s wages	N3,000,000
ii	Engineer’s Wages	N2,160,000
iii	Wages for 10 crew members	N3,000,000
	TOTAL	N8,160,000

S/N	Operational Cost	Cost
i	Running Cost	N30,870,000
ii	Vessel Cost	N20,761,666
iii	Labour Cost	N8,160,000
	TOTAL OPERATIONAL COST	N59,791,666

Source: Survey Data, 2020

Table 3: Profitability Analysis of Trawling Operations

Average Annual Earnings of Trawling Vessels

Average Annual landing per vessel 210.02 metric tonnes

Average value of landings (fish/shrimp) per tonne N502,637.07

Average Annual total earnings per vessel N105,563,837.4

Average Annual Operational Cost of vessels N59,791,666

Net Cash Flow (NCF)= Average Annual Total Earnings less Average Annual Operational Costs

NCF= N105,563,837.4-N59,791,666

NCF= N45,772,171.4

Economic Performance (Ep)= $\frac{\text{Net Cash Flow (NCF)}}{\text{Average Annual Total Earnings}}$

Average Annual Total Earnings

Ep= $\frac{N45,772,171.4}{N105,563,837.4}$

Ep = 0.43

Profit after Tax (PAT) = Net Cash Flow less 30% corporate tax

$$PAT = N45,772,171.4 - N13,731,651.42$$

$$\text{Profit after Tax} = N32,040,519.98$$

Financial Performance

$$\text{Return on Investment (ROI)} = \left[\frac{\text{Profit After Tax}}{\text{Average Investment Outlay}} \right] \text{ Expressed as a percentage}$$

$$\text{Average Investment Outlay} = \frac{N120,000,000 + N59,791,666}{2} = N179,791,666$$

$$\text{Average Investment Outlay} = N89,895,833$$

$$ROI = \frac{N32,040,519.98}{N89,895,833} = 0.356$$

$$ROI = 0.356$$

Source: Survey Data, 2020

Table 2 shows the average annual operational cost of trawling vessels in Nigeria. Operators of trawling vessels in Nigeria incur high operational costs with average annual operational cost of N59,791,666. This could be attributed to the following factors: (i) the high rate of inflation in Nigeria. The current rate of inflation in Nigeria according to NBS, (2021) is 18.9%. This accounts for volatility in the prices of goods and services (ii) Exchange rate of the Nigerian Naira relative to the dollar and other currencies. The current exchange rate of the Naira to the dollar as reported by is N489 in the parallel market.

Furthermore, running cost constitutes about 51.6% of total operational cost. This shows that running cost is the highest cost item incurred by operators of trawling vessels. Similarly the cost of fuel (Automotive Gas Oil) popularly called diesel constitutes about 46.5% of total operational cost. The price of fuel (AGO) is mostly affected by the exchange rate of the naira as all petroleum products in Nigeria are imported despite the fact that Nigeria is a net exporter of crude oil. Instead of refining its oil, Nigeria prefers to import refined petroleum products. It is believed that if crude oil is refined in Nigeria, fuel used by trawling vessels could have been much cheaper by trimming down the fuel component of operational cost.

It can be observed in Table 3 that Net cash Flow of trawling vessels is N45,772,171.4. This shows that trawling vessels in Nigeria record a positive net cash flow in their operations. This represents net profit before tax. Furthermore, profit after tax which is net cash flow less 30 per cent corporate tax is N32,040,519.98. This represents absolute income or reward to the owner of the trawler. To curtail huge foreign exchange spent on fish imports, there is need to attract more

investors in marine capture fisheries by granting tax waivers to trawler operators. According to FDF, (2016) fish imports in Nigeria stands at 806,000 metric tonnes. This gap in fish demand can be bridged by attracting more investors to the industrial fishery sub-sector

Similarly economic performance expressed as a ratio of net cash flow to annual total earnings is 0.43. This implies that trawling vessels operating in Nigeria are able to retain 43 per cent of their total earnings as net profit. This means that the remaining 57 per cent is taken up as operational costs. From the rule of thumb a 43 per cent economic performance is considered good enough. However, trawling vessels can earn more of their total earnings as net profit if diesel fuel (AGO) used by trawling vessels is refined within Nigeria and supplied more cheaply to operators of trawling vessels. The current system of importing all diesel used by trawling vessels with its attendant high cost should be discontinued in view of the weak exchange rate of the naira relative to the dollar. High cost of AGO is capable of inducing a negative effect on the profitability of trawlers and could scare away investors.

Financial performance as can be observed from the table is 0.356. This result shows that trawling vessels are able to regenerate 35.6 per cent of invested funds for re-investment. This means that the reproductive capacity of their investment funds is 35.6 per cent. From this result, any capital investment in trawling vessels will *ceteris paribus* bring about 35.6 per cent in returns as average profit (Profit after tax). The corollary is that the remaining 64.4 per cent is taken up by cash outflows in subsequent investment outlay. From the rule of thumb the financial performance of trawling vessels is worthwhile. This work is in tandem with Tietze and Lasch (2008) who discovered that out of the 94 types of fishing vessels covered in their study, all had a positive gross cash flow and fully recovered their operating costs with no loss. When also considering capital costs i.e. the costs of depreciation and interest, 88 of the 94 types of vessels or 94 per cent showed a net profit after deducting the cost of depreciation and interest.

Conclusion

Catch per trawling vessel operating in Nigeria's territorial waters was influenced by size of vessel, age of vessel and educational qualification of captain. Since fish is a major source of animal protein, there is need to boost local fish production from the marine capture fishery sub sector to domestic meet fish demand. This will go a long way to reduce fish imports which as at 2015 the stood at 806,000 metric tonnes valued at \$1126428414.41 (FDF, 2016). There is an urgent need to set up a special fund to enable indigenous investors to acquire new and large trawling vessels equipped with modern fish capture technology at minimal interest rates. Maritime training institutions should be established within Nigeria for training of highly skilled manpower for the industrial fishery sub-sector. Modalities for refining petroleum products within Nigeria should be set up to stop importation of fuel at very exorbitant rates. This will go a long way to make AGO cheap and affordable to operators of trawling vessels. Trawler operators should be exempted from paying corporate tax as means of attracting more investors.

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