

# Analysis of Capital Investments, Costs and Profits of Trawling Fishing Business in Goa

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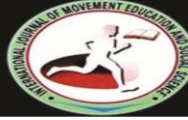
## ABSTRACT

*The objective of the present study is to examine the capital investment, operating costs, fixed costs, and profits of trawl fishing business across small size 32-36 feet, medium size 38-45 feet and large sized 46-60 feet trawlers in Goa. This study explores the capital investments, costs and profits of 78 trawler owners in the two districts of Goa using primary data for the entire fishing season August 2016 to May 2017. The statistical tool, one way ANOVA and post hoc test was used to compare the means of the three groups of small, medium and large sized trawlers regarding the capital investments, costs, earnings and profits. The findings of study using ANOVA test revealed that there is variation in capital investments, costs, earnings and profits made by the owners of small, medium and large sized trawlers in Goa. The study reveals that medium and large sized trawlers owners which undertake multi-day deep sea fishing, earned more gross revenue, gross and net profit per trip as compared to small trawlers. The trawl fishing business is capable of creating additional employment, through government support, enhancing income to improve the standard of living of the fishermen in Goa.*

**Key words:** Capital investment, Gross revenue, Net profit, Subsidy, Trawlers

## 1. INTRODUCTION

The coastline of Goa is 104 km which is (1.28% of Indian coast line of 8117 km) with numerous bays and headlands facilitating the production of fish on a large scale. The state of Goa's coastline although small, has significantly helped the people living in the coastal areas in undertaking fishing activity as a source of livelihood. Fish is an important constituent of staple food for 90% of the population of Goa. According to CMFRI, (2016), Goa is the tenth largest fish producing state among the nine marine states in India. As per the CMFRI Marine Census (2010) fisheries population in Goa was 30,225 and active population was 11,944. The



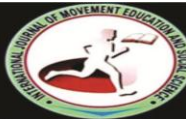
marine production of Goa was 1,20,430 tonnes in 2017 as compared to 1,01,053 tonnes in 2016 whereas the inland production was 5,532 tonnes in 2017 as compared to 4,403 tonnes in 2016. The share of fisheries sector to the State Gross Domestic Product was 2.0 % in the year 2015-2016, declined to 0.70% in 2016-17 (Economic survey, Goa, 2017-2018). According to the Fisheries Department, Government of Goa, the traditional sector includes motorized and non-motorized canoes and the mechanized sector includes trawlers and purse-seine vessels. The Government of Goa permits the fishermen to build or purchase the trawlers and purse-seine vessels from 32 feet up to 75 feet with horsepower motor engines ranging from 37 to 300 horsepower. In the recent years most of the traditional fishermen in Goa have shifted from non-motorized and motorized fishing canoes to mechanized fishing business. The mechanized sector contributes 76% and traditional sector contributes 24% to the fishing industry of Goa (Goa Fish Trails, 2015). The fishing ban of 61 days from 1st June to July 31<sup>st</sup> is applicable for the mechanised sector as per the regulations of the Government of Goa. The main aim of the monsoon fishing ban is to allow the fish to breed as well as safety of fishermen at sea.

Trawlers are mechanized fishing vessels and were first developed by the British in the 17th century. The introduction of trawl nets in the fifties helped to change the fishing pattern and production trends in India. Trawling started in India, during the early sixties, with the Indo-Norwegian project at Kerala, Cochin and later it spread to other parts of the country. The trawl net is an active fishing gear and the mechanized boat pulls the trawl net, therefore it is called trawling. Trawling is an effective method to catch different species of fish and sizes at the same time (Dineshbabu et al., 2013). Trawl net is an important marine fishing gear and nearly 20% marine fish landed in the world is caught by the trawl gear (Sawant & Mohite, 2016).

There were several studies conducted in India and abroad on the economic as well as commercial aspects of motorized fishing activity.

## 2. REVIEW OF LITERATURE AND RESEARCH GAP

Central Marine Fisheries Research Institute of India (CMFRI) is a database for all annual fish landings in all the 9 maritime states and 2 union territories in India and publishes annual reports of the same. The economic sustainability of trawlers in Gujarat was studied by Sehara (1998) using ANOVA technique and exponential growth function. Xavier (2014) in her study using multiple linear regression models finds that the economic performance of trawlers in Kerala depends on the profit they earn. The study used independent sample *t*-test and one way ANOVA test to study total fixed costs, variable costs and earnings, season-wise for small, medium and large vessels. The study concludes that trawl fishing units with positive gross profits and negative net profits are undergoing temporary problems and simply living off their capital. The study also summarizes that higher quantity of catch and revenue was available in post-monsoon season. A study by Sehara, Kanakkan, & Salini (1994) on Goa's coast in 1994, examined the economics of trawling, by using variables such as investment, cost, and income. They used the profit and loss analysis and find that trawlers were running in profit in Goa during 1991-1992. Another study by (Gaonkar, Rodrigues, & Patil, 2008) analyse the fixed costs, variable costs, gross revenue and gross profit of trawlers in Goa for the year 2004. All the above studies reveal that trawling as a mechanism for improved fishing has got established in all the maritime states of India. The above literature reviews reveal that no research has been conducted on the costs, earnings and profits of mechanized fishing vessels (trawlers) in Goa since 2004. The present study is an attempt to fill this research gap.



### 3. OBJECTIVES AND SIGNIFICANCE OF THE STUDY

The present study focuses on analyzing the capital investments, costs, earnings, and profits of small, medium and large sized trawlers in Goa. The objective of this study is to examine the variation in costs, earnings and profits of motorized canoes in the two districts of Goa for the year 2016-17. The research question involved was to investigate whether there is a variation in capital investments, costs and profits among the small, medium and large sized trawlers operational in Goa. Keeping this in mind, in the present study, the profitability will be examined only by studying the costs and earnings of the trawlers operated by the trawler owners in Goa. The findings of this investigation would provide better insights to the fishermen for making investment decisions and for the government to formulate policy decisions for the welfare of fishermen.

### 4. RESEARCH METHODOLOGY

The methodology section includes population, sample size, sources of data, variables and statistical tools used in the study. The details are as follows;

#### 4.1. Population and sample

In Goa, the total population of operational registered trawlers was 464 for the year 2016-17 in the five jetties of Goa namely Malim, Chapora, situated in North Goa, Vasco, Cutbona, and Talpona situated in South Goa. Talpona jetty has only two operational trawlers, hence was not considered for the study. However, four jetties, Malim, Chapora, and Vasco, Cutbona were considered for the purpose of data collection in the study.

#### 4.2 Data sources and sample size

The study uses cross sectional primary data collected through simple random sampling method using a pre-tested structured interview schedule administered to 78 trawler owners in the four jetties of Goa. The sample size comprises of 40 trawler owners in North and 38 trawler owners in South Goa. The researcher used Priscilla Salant and Don A. Dillman method given in equation 1 to determine the sample size for the study (Salant & Dillman, 2007).

$$N_s = \frac{(N_p) (p) (1-p)}{(N_p-1)(B/C)^2 + (p) (1-p)} \dots\dots\dots \text{(Equation 1)}$$

Where:  $N_s$  = completed sample size needed (notation often used is  $n$ )

$N_p$  = size of population (notation often used is  $N$ )

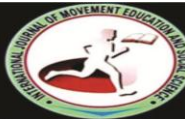
$p$  = proportion expected to answer a certain way (50% or 0.5 is most conservative)

$B$  = acceptable level of sampling error (0.05 =  $\pm 5\%$ ; 0.03 =  $\pm 3\%$ )

$C$  = Z statistic associate with confidence interval (1.645 = 90% confidence level; 1.960 = 95% confidence level; 2.576 = 99% confidence level)

#### 4.3 Characteristics of Sample of Mechanized trawlers

The following classification given in Table No. 1, regarding fishing operations of small, medium and large sized trawlers operational in Goa is used for the present study. In the sample, the researcher could find



**Table 1. Technical and Operational Characteristics of Trawlers**

Size of mechanized fishing vessels (Trawlers)	Size in feet	Overall Length in meters	No of Cylinders	Horsepower of engine	Number of vessels surveyed	Average Number of Fishing days	Number of Labourers employed
Small	32-36	9.8-11m	3	37-45	13	1	3-5
Medium	38-45	11.7-13.8m	4	45-70	22	1-6	6-7
Large	46-60 and above	14-18.4m	6	90-300	43	4-15	8-10

**Source:** Researchers compilation from the Primary survey

trawlers of overall length (OAL) varying from 32 feet to 60 feet fitted with inboard engines varying from 37 to 300 horsepower which is legally allowed by the Fisheries Department, Government of Goa. These trawlers are fitted with inboard engines and use the trawl and gillnet for trawl operations. Small trawlers venture for single day, and medium and large size trawlers venture for multi-day deep sea fishing in Goa.

#### **4.4 Variables and Statistical tools used in the study**

This section elaborates the variables and statistical tools which are used to forward the study from data towards inferences. The variables used in the study are capital investments, operating costs, fixed costs, total costs, total fish catch, earnings, gross profit and net profit from trawl fishing business. Descriptive Statistics has been used to find the mean of all the variables used in the study. Shapiro Wilk test has been used to test the normality of the data. The parametric tests namely one way ANOVA and post hoc test was conducted to find the statistical relationship between the means of small, medium and large sized trawlers towards capital investment, costs and profits of trawl fishing business.

#### **4.5 Hypothesis of the study**

*a. Across small, medium and large sized trawlers there is no significant difference between the average capital investments in fixed assets made on trawlers.*

*b. Across small, medium and large sized trawlers there is no significant difference between the average costs incurred and profits earned per trip from trawling business.*

### **5. RESULTS AND DISCUSSION**

The economic performance of trawlers in Goa can be examined through the analysis of capital investments, costs, earnings and profits from trawl fishing business.

#### **5.1 Capital Investments in Fixed Assets of Trawlers**

Investment in fixed assets of trawlers is very important for the respondents to carry out the fishing business activities. In the study area, the total fixed capital investment incurred for acquisition of a trawl fishing vessel is



the sum of the price of the hull, engine, the amount spent to modify vessel, reconditioning, cost of fishing gear (trawl and gillnet), fish holds, safety equipment and other communication devices used for fishing. The null hypothesis proposed is “Across small, medium and large sized trawlers there is no significant difference between the average capital investments in fixed assets made on trawlers”. The dependent variable is capital investment in fixed assets, and the independent variable is the size of the trawlers.

The Table 2 presents the results of one way ANOVA test of capital investments of small, medium and large size trawlers. It is evident from Table 2, that 37% to 47.62% of the total investment in fixed assets is spent on the hull itself. The ANOVA test results conducted has revealed that a statistically significant relation was found between the variable hull of the trawler against the size of the trawler ( $F = 16.14$ , d. f. = (2, 75),  $p < 0.05$ ), and hence the null hypothesis is rejected. However, when the life of the trawler is considered, frequent repair and maintenance is a necessity for all sizes of trawlers. The investment on reconditioning on trawlers is substantial and ranges between 26.96 % to 40.26%. It is higher for small size vessels, which are aged, compared to large sized trawlers. Moreover, there is a significant statistical relation in the investment on the reconditioning when the size of the vessel is cross-tabulated ( $F=10.85$ , d.f.=(2,75),  $p < 0.05$ ). As per respondent's views, reconditioning of the trawlers is done approximately between 10-15 years to increase the life of the vessel. The reasons for these differences of investment in fixed assets depends on the size of the trawler, horsepower of the engine, type of fishing gears and other equipment used. The results in Table 2 reveal that cost of hull and the costs of reconditioning were the major items contributing to the total capital cost. The investment required in all other components is directly proportional to the investment required for the hull of the vessel.

**Table 2: Results of ANOVA test of the Average Cost of Capital Investment in Fixed Assets against the Size of the Trawlers**

Variables(Capital investment in fixed assets )	Size of vessel categories			ANOVA	
	Small Vessel	Medium Vessel	Large Vessel		
	Mean (Rs)	Mean (Rs)	Mean (Rs)	F-statistics	Sig.
Hull of trawler	340808 <sub>a</sub> (37.00)	661591 <sub>a</sub> (43.38)	1266209 <sub>b</sub> (47.62)	16.14	0.00**
Engine of trawler	110865 <sub>a</sub> (12.04)	202841 <sub>a</sub> (13.30)	394942 <sub>b</sub> (14.85)	15.28	0.00**
Amount to modify the vessel	53807 <sub>a</sub> (5.85)	94148 <sub>a</sub> (6.17)	160981 <sub>b</sub> (6.05)	11.18	0.00**
Reconditioning of vessel	370833 <sub>a</sub> (40.26)	480556 <sub>a</sub> (31.51)	663929 <sub>b</sub> (24.96)	10.85	0.00**
Cost of fishing gear(nets)	35769 <sub>a</sub> (3.88)	75364 <sub>b</sub> (4.94)	158128 <sub>c</sub> (5.94)	16.1	0.00**
Safety and other equipment	8906 <sub>a</sub> (0.97)	10648 <sub>a</sub> (0.70)	14831 <sub>a</sub> (0.56)	2.53	0.08

<b>Total of mean of fixed asset</b>	920988 <b>(100.00)</b>	1525148 <b>(100.00)</b>	2659020 <b>(100.00)</b>		
<b>Total average investment in fixed asset</b>	<b>1242265<sub>a</sub></b>	<b>1830538<sub>a,b</sub></b>	<b>2103272<sub>b</sub></b>	<b>3.94</b>	<b>0.02<sup>**</sup></b>

**Note:** \*\*Variables significant at 5%, subscript a, b, c represents no significant difference and a,a,b and a, b,c means there is a significant difference, Figures in (parenthesis) represents the proportion of mean percentage to the total of mean of fixed asset, **Source:** Researchers compilation from the data analysis based on Primary survey.

There is no subsidy given by the government for the trawler owners to construct/purchase hull, engine, amount to modify vessel, reconditioning, and cost of fishing gear. The respondents have to incur a substantial amount on investments towards hull and reconditioning of the vessels. Majority of the respondents needed subsidy to purchase trawlers, nets, other accessories and also for reconditioning. The Government can intervene and implement policies in providing subsidies for fishers for the purchase and reconditioning of vessels as well as to purchase fishing gears.

## 5.2 Analysis of Costs and Profit of Trawl Fishing Business

The economic performance of trawlers in fishery industry depends on the costs they incur, earnings and profits made by them from fishing business. Hence, an investigation of costs, earnings and profits would give us a clear picture of the trawl fishing business in Goa. The economic indicators namely operating costs, fixed costs, total costs and gross revenue are used to examine whether there is a significant difference between the costs, earnings and profits of small, medium and large sized trawl fishing business in Goa. Parametric statistical test, ANOVA was conducted to find the statistical relationship between the variables size of the vessel towards costs, earnings and profit per trip.

The null hypothesis proposed is that “Across small, medium and large sized trawlers there is no significant difference between the average costs incurred and profits earned per trip from trawling fishing business”.

The dependent variable is costs, catch, earnings and profits and independent variable is the size of trawlers. The formulae for computation of gross revenue, gross profit, and net profit, are given in equation 2, 3, and 4. According to (Panayotou & Jetanavanich, 1987) gross revenue is calculated from the species composition of the catch and the price of species of fish given in equation No. 2:

$$GR = \sum_{i=1}^n q_i x p_i \dots \dots \dots (\text{Equation } 2)$$

Where,  $q^i$  is the quantity of catch in kgs of the  $i^{\text{th}}$  variety,  $p^i$  is the price per kg of fish of the  $i^{\text{th}}$  variety.

Gross profit=Gross Revenue (earnings)- Total operating cost.....(Equation 3)





Net profit= Gross Profit – Fixed cost.....(Equation4)

Operating costs are incurred for operating the trawlers and is used to find gross profit. Operating costs in the study area, includes “Fuel costs, wages to labour, food and “batta” (commission to labour), cost of ice, repair and maintenance of trawlers, mending of nets, marketing, and miscellaneous expenses”. Fixed costs are incurred in the fishing business even when the trawlers are not in operation and are used to find net profit. In the study area, fixed costs include depreciation on the hull, engine, amount to modify the vessel, reconditioning, fishing gear, and safety equipment. Fixed cost also includes license fee, contribution to fishermen association and interest on loan. The total costs are the sum of operating and fixed costs. The total costs are computed by taking the total costs dividing by number of trips. The catch per trip is computed by taking the total catch (in kgs) divided by the number of fishing trips. Gross revenue (earnings) per trip is estimated by taking the total earnings and dividing by the total number of trips.

**Table 3: Key Economic Indicators of Costs and Profit of trawlers as per Size of Vessel for Entire Season (August-May)**

Variables	Size of vessel categories			ANOVA	
	Small Vessel	Medium Vessel	Large Vessel		
	Mean	Mean	Mean	F-value	Sig
Operating cost per trip (Rs)	14492 <sub>a</sub>	31043 <sub>a</sub>	71988 <sub>b</sub>	30.36	0.00**
Total fixed cost per trip (Rs)	646 <sub>a</sub>	1686 <sub>a</sub>	4669 <sub>b</sub>	21.53	0.00**
Total costs per trip (Rs)	15138 <sub>a</sub>	32729 <sub>a</sub>	76657 <sub>b</sub>	31.1	0.00**
Total catch (in kgs)	17532 <sub>a</sub>	22394 <sub>a</sub>	38518 <sub>b</sub>	15.96	0.00**
Catch per trip (in kgs)	122 <sub>a</sub>	317 <sub>a</sub>	956 <sub>b</sub>	31.4	0.00**
Earnings/ Gross Revenue per trip (Rs)	13290 <sub>a</sub>	36361 <sub>a</sub>	107279 <sub>b</sub>	54.67	0.00**
Gross profit per trip (Rs)	4312 <sub>a</sub>	9279 <sub>a</sub>	22807 <sub>b</sub>	22.02	0.00**
Net profit per trip (Rs)	3666 <sub>a</sub>	7593 <sub>a</sub>	18138 <sub>b</sub>	16.93	0.00**

**Note:** \*\* Variable significant at 5% significance level, subscript “a,a,” means no significant difference and “a,b” means there is significant difference. Total costs per trip represents sum of operating and fixed costs per trip **Source:** Researchers compilation from the data analysis based on Primary survey.

The one way ANOVA tests results of economic indicators of trawlers given in Table 3, reveals that costs, catch and profits per trip are significant across size of trawlers, rejecting the null hypothesis. The medium and large vessels which undertake multi day and deep sea fishing, get more catch, earned more gross revenue, gross and net profit per trip and performed better than small vessels. The net profit per trip of large vessels is almost six times that of the small vessels. Due to these factors, large vessels are sustainable in the long run as compared to small and medium vessels. Medium vessels performance is average but small vessels earn low gross profit and net profit per trip and find it difficult to sustain as major portion of their earnings is spent on fuel and other



operating expenses. The respondents expressed that high priced fish and exportable quality of fish such as prawns and other fish fetches them high income. The gross revenue (earnings) depends on the catch composition and the price prevailing in the market, which further depends on the demand and supply of fish. The price is decided by the agents at the fishing jetties depending on the demand and supply situation with regard to different species of fish. Earnings depend on the quality of catch where the species decides the quality. As per respondent's views, earnings are more in the peak season i.e the post monsoon season during (August to November) as compared to winter and pre-monsoon season from December to May. In the study area trawlers make fewer days of voyage, save on fuel cost, during post- monsoon season when shoals of fish is available in the near vicinity, but spend more amount on fuel from December to May, in searching shoals of fish. The fishermen receive Value Added Tax (VAT) reimbursement subsidies on fuel for operating trawlers from the government for every fishing season. Trawlers fitted with engine of 3 cylinders get maximum 15,000 Lts, 4 cylinders get 20,000 Lts, and 6-8 cylinders get 30,000 Lts get fuel reimbursement subsidy on VAT from the government depending on the actual fuel consumption.

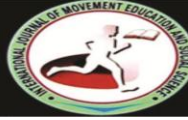
## 6. FINDINGS OF THE STUDY

The analysis of cost and earnings using ANOVA test revealed that there is variation in capital investments, costs, earnings and profits made by the respondents across small, medium and large sized trawlers in Goa. It is evident from the study that the respondents invest more amount of the total cost of capital investments ranging from 37% to 47.62% on the hull of the trawler. However, reconditioning is also a major capital cost for small and medium aged vessels. The results of ANOVA test revealed that there was a significant difference for the variables hull, engine, reconditioning, fishing gear, amount to modify the vessel among the small, medium and large sized trawlers in Goa. Depreciation is a major element of fixed costs for all the sizes of trawlers. The one way ANOVA tests results shows that total costs, catch, gross profit and net profit per trip of trawlers is significant across size of vessels in Goa. The findings of study also reveals that fuel costs is major component of the total operating costs ranging between 40-50% for all sizes of vessels followed by wages of labour. The results of the study are in line with another study conducted by (Shanis, Salim, Shridhar, & Pillai, 2014) in Kerala on the economic efficiency of deep sea shrimp fishery operations who finds that fuel constituted 55% of the total operating cost.

## 7. CONCLUSION

The respondents expressed that 100% VAT reimbursement subsidy on fuel from the government was inadequate, due to the continuous increasing prices of cost of fuel. In this regard, it is suggested that Government has to retain 100 % VAT reimbursement fuel subsidy for trawlers. There is further scope for the respondents of small and medium trawlers to enhance the revenue earned by them if they replace small vessels and medium vessels with large size vessels. The respondents owning small, medium and large sized vessels generate reasonable revenue to cover fixed and variable costs. However, the high percentage of operating costs is compensated by the trawlers only due to continuing increase in the fish prices of quality species of fishes. The government can motivate the small and medium trawlers to invest in large sized trawlers to gain from trawl





fishing business by providing additional financial assistance in the form of subsidy so that the fishermen can earn their livelihood. The economic indicators reveal that earnings from fishing are economically rewarding and profitable for the trawler owners of large size vessels as they get more catch compared to small and medium size vessels in Goa. The trawl fishing business is capable of creating additional employment, through government support, augmenting income and improving the standard of living of the fishermen in Goa. The study could be further extended by studying season wise analysis of trawlers comparing Goa and other maritime states in India.

## 8. ACKNOWLEDGEMENTS

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