

# Comparative Efficiencies of Mechanized Fishing Crafts introduced in India

By

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## Introduction

India has a vast continental shelf of 121,000 square miles which amounts to one-tenth of the area of the entire country. Hence the marine products are as important as other foods like corn or grain. It is also a highly valuable export commodity.

Fisheries have always been a popular avocation of the people along the coastal line. With primitive tools and crude techniques, catch per man hour was low. Frequently the effort put in was unrewarding.

India started mechanization of fishing crafts in early 1950. The traditional craft were subjected to technical scrutiny and some of them were mechanized with good results. However, due to limitations inherent in traditional craft, it was found necessary to develop new series of craft suitable for the operation of modern fishing gears and in areas, hitherto unexplored. The impetus given to the development of infrastructure like freezing, canning and ice plants and quickly expanding export market, increased the demand for marine products. Hence craft for immediate, as well as long-term needs, had to be introduced.

## Craft Designs

During the initial stages, it was felt that a smaller mechanized boat for in shore waters will be ideal because—

- (a) There was lack of experienced crew to man mechanized vessels.
- (b) To involve more traditional fishermen through co-operative sector by a loan/subsidy scheme of supplying the small craft.
- (c) To study the problems and prospects involved in large-scale operations in inshore area.
- (d) To knock off the initial resistance to mechanization from the traditional fishermen communities.

Initially, two designs were introduced viz. 7.62 M and 9.14 M open wooden vessels with 10 HP and 20 HP respectively. These were general purpose vessels and were engaged in gillnetting and trawling operations. The successful fishing accomplished with these boats resulted in a demand for bigger craft with more facilities to extend operations further.

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Craft design units were set up to go into the development of future craft to be introduced. It was necessary to study and choose carefully those designs, features and construction practices which were consistent with modern trends. Hence investigations were required on—

Choice of size and type of vessels.

Acceptable general arrangement plan incorporating essential features for safe and comfortable fishing operation.

Choice of propulsion machinery.

Choice of construction material and methods of construction.

Structural design and determination of scantlings.

Standards for speed power relationship, stability etc., requirement of electronic/mechanical equipment.

A number of basic designs (see Table I) in wood and steel between 9 and 18 M length were prepared. All these craft were equipped with winch and other equipments driven off the main engine. Electronic fishing aids and insulated fish holds were provided as desired. Crafts above 10 M were provided with adequate accommodation and other living facilities.

The designs in GRP (fibreglass) has been introduced with the help of British collaborators.

There are now more than 10,000 mechanized fishing craft in India. Almost all of them are built in India with indigenous materials and equipments.

#### Feed-Back Information

Changes in designs by way of improvements were attempted based on the information received from actual users. The problems were analysed and acceptable solutions found out. The following studies were also undertaken—

Model tests of prototype crafts.

Full-scale trials for determining the craft pull and efficiency of propulsion.

Studies to determine minimum scantlings.

Studies on economics of the designs over several years.

Studies on layouts of boat building yards.

#### Designs of Distant Water Vessels

Various studies were undertaken to assess the impact of mechanization programme in fishing industry. Organisations were formed to watch the development of marine expert and suggest ways and means of increasing production. Economic evaluations for respective designs were made by independent institutions representing research and technology and trade before considering financial assistance. National banks recognised these studies more often than individual entrepreneurial projections.

#### Productivity Studies

However very little work is done on assessing objectively a comparison between various sizes/types of crafts now existing in the Indian fishing industry. The present paper is to highlight the importance of productivity studies in aiding to assess the comparative economic viability of various sizes of boats engaged in the present fishing method, viz. bottom trawling.

### Income and Expenditure

Table II gives an idea of the costs involved in acquiring and running the vessels under study. The running charges do not include maintenance. The total of expenses is shown in Table III which relates to the economic values involved in the present assessment.

The income from catches are based on the following :—

- (1) The composition of fish/prawns in the catches and depending on the quality and quantity of each variety and their respective prices.
- (2) The quantity is assumed on the basis of net catch per hour of fishing.
- (3) Average hours of fishing done per day.
- (4) Number of days fished in a year (average).
- (5) The quality of the catch e.g. catches on 57' and 72' vessels taken as a little better than the smaller vessels because the vessels are equipped with cold storage facilities.

### Economic Values

Table III gives the total expenses including maintenance and in case of bigger steel vessels, the overhead expenses. It is assumed that smaller vessels are owner operated and overhead expenses are kept a minimum. The profits are worked out before taxation and hence reflects gross profits.

It may be noted that GRP vessels outshines the other inshore vessels as far as profits are concerned. Naturally profits of 57' and 72' steel vessels are higher because of the operational latitude, range, experienced crew and professional management.

### Production Cost

However when computing the cost of producing one kilogram of the catch, the GRP vessels are the most economical where as wooden boats are more expensive. This obviously reflects the cost of maintenance, loss of fishing days and generally lower productivity of the wooden boats.

### Productivity

Profit, that too the gross value, itself is not a measure of efficiency or success. It should be rubbed with the touch stone of productivity. The three bases of productivity used in this assessment are shown in Table V. In each base, output and profits are separately shown divided by the respective values of the base unit.

### Conclusions

The important view that emerges is that the smaller the craft, the more productive it becomes. This may be a reflection on the way the bigger vessels (57' and 72") are being operated in India now. The investment needed and the running and maintenance costs of these bigger vessels are so high, the productivity has come down (see B—Table V). With regard to the productivity based on time and labour and oriented to output, the bigger vessels are able to account for themselves. But output oriented productivity may not be as attractive as the profit oriented one when an operator is concerned with his economic viability. It is clear that it is wiser to invest on more number of smaller crafts than a few of the bigger sizes examined in this study. However, the present working of 57' and 72' fishery vessels in India are not all that satisfactory. There is enough scope of improving and increasing productivity by reducing maintenance and running expenses, increasing number of fishing days, reducing cost of investment by employing standardised boat building and exploring new areas hitherto uncoursed. The GRP craft answer creditably to the higher investment required in them compared to wooden craft.

The material used in this analysis are gathered a couple of years ago. Though the author has tried to update the information, it is unavoidable to keep out all possible errors with regard to the computation of total catch values and certain type of expenses like fish sales expenses, crew incentives variation in overhead expenditure etc. If the analysis helps as a pointer to the general direction in which future development could be planned this study would have served its usefulness. It is imperative that Productivity Studies are considered in comparing efficiencies of types and sizes of fishing craft already existing.

## REFERENCE

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TABLE I

Designs Prepared in India

*A. Wooden Vessels (MARINE)*

1. 7.62 M Open Fishing Vessel
2. 7.62 M Pole and Line Fishing Vessel
3. 9.14 M Trawler, Pole and Line Fishing Vessel
4. 9.75 M Trawler and Gill Netter
5. 10.97 M Trawler
6. 11.58 M Trawler and Training Vessels
7. 12.19 M Combination Vessel
8. 12.80 M Combination Vessel
9. 13.72 M Trawler/Purse Seiner
10. 14.93 M Drifter Trawler
11. 15.24 M Combination Vessel
12. 15.50 M Trawler
13. 17.10 M Trawler
14. 18.32 M Trawler/Fish Carrier

*B. Steel Vessels (MARINE)*

15. 12.19 M Trawler
16. 17.50 M Trawler
17. 23.5 M Purse Seiner
18. 28.4 M Fishery Training Vessel
19. 23.5 M Fishery Training Vessel
20. 49.5 M Exploratory Fishing Vessel

*C. GRP Fishing Vessels (MARINE)*

- \*1. 9.29 M Trawler/Gill Netter/Pole and Line Fishing Vessel
- \*2. 9.9 M Trawler/Purse Seiner/Gill Netter/Combination
- \*3. 11.58 M Gill Netter/Trawler/Pole and Line Fishing Purse Seiner
4. 4.5 M Gill Netter

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\*Under collaboration with M/s. Water Craft, U.K.

TABLE II

Particulars	Values in Lakhs of Rupees					
	32 Ft. OAL G.R.P.	36 Ft. Wood	38 Ft. G.R.P.	43.5 Ft. Wood	57 Ft. Steel	72 Ft. Steel
<i>Capital Costs</i>						
(a) Hull and Accessories	1.50	1.50	2.10	1.50	10.00	22.00
(d) Engine and Accessories	0.75	0.85	0.90	1.20	3.00	8.00
(c) Fishing Gear	0.50	0.15	0.20	0.20	0.50	1.00
Total..	2.40	2.50	3.20	2.95	13.50	31.00
<i>Running Costs</i>						
Crew Wages	0.32	0.38	0.45	0.48	1.30	1.60
Running Charges	0.38	0.50	0.52	0.72	1.80	2.75
Total..	0.70	0.88	0.97	1.18	3.10	4.35
<i>Catches</i>						
Catch/Day (Tons)	0.50	0.50	0.60	0.75	2.20	2.86
Fishing Days	220	220	250	250	270	300
Catch/Year (Tons)	110	110	150	190	594	858
Value of Catch/Year (Lakhs)	1.60	1.60	2.25	2.85	9.50	13.73

TABLE III

Economic Values	32" GRP	36" Wood	38" GRP	43.6" Wood	57" Steel	72" Steel
Fishing Effort Man Days	880	880	1,000	1,500	2,160	2,400
Expenses (Total)	0.72	1.10	1.20	1.88	5.16	7.96
*Labour Wages	0.32	0.38	0.45	0.48	1.30	1.60
*Total Investment	2.4	2.5	3.2	2.95	13.5	31.00
*Output	1.60	1.60	2.25	3.55	9.50	13.73
*Profits	0.88	0.50	0.60	0.49	1.24	1.42

\*Value in Lakhs of Rupees.

TABLE IV

Particulars	32" GRP	36" Wood	38" GRP	43.6" Wood	57" Steel	72" Steel
Total Expenses Lakhs (Rs.)	1.04	1.48	1.65	2.36	6.46	9.56
Catch (Tons)	110	110	150	190	594	858
Production Cost per Kg. (Rs.)	0.95	1.35	1.10	1.24	1.08	1.11

TABLE V  
Productivity

Productivity Basis	Value in Rupees					
	32" GRP	36" Wood	38" GRP	43.5" Wood	57" Steel	72" Steel
A. Based on Time : Output/M. Days	181.8	181.8	225	236.7	439.8	572
Profit/M. Days	100	56.8	60	32.7	57.4	59.2
B. Based on Investment : Output/Investment (Rs.)	0.67	0.64	0.70	1.2	0.70	0.44
Profit/Investment (Rs.)	0.37	0.20	0.19	0.17	0.09	0.05
C. Based on Labour : Output/Wages (Rs.)	5.0	4.2	5.0	7.4	7.3	8.6
Profit/Wages (Rs.)	2.75	1.32	1.33	1.02	0.95	0.88

## DISCUSSION

- Mr. Livera I wish to know how successful been purse seining has been.
- Mr. K. Vijayan Unni The 43.5' vessel can use a net of 300 fathom long and 25 fathom deep. Value of catch is around 2.5 to 3 lakh/annum. Species like sardines and mackeral can be fished. When 4 to 5 vessels land their catch at the same point having inadequate distribution facilities, earnings will drop due to price reduction. Normally purse seine is done only for 4 to 5 months in a year.
- Mr. Godwin Fernando Is the Indian Government giving special incentives to investors ?
- Mr. Unni Concessions are given to investors. But there are restrictions in regard to fishing distances. Bigger vessels are not allowed to fish in areas where smaller vessels can operate. There is a subsidy available for diesel. In certain cases the price difference between the imported and indigenous craft is met, by Government.
- Mr. Pietersz There are subsidies available in Sri Lanka depending on the class of vessel.
- Mr. Wijepala What is the engine horse power (h.p.) of boats mentioned in the paper ?
- What kinds of model testing is done on these boats ?
- Mr. Unni The modern trend is to go in for higher horse power engines. The idea is to increase catch/hour, and to make the boat flexible for different methods of fishing. Following table shows the changes :—

Boat length in feet	Original or started h.p.	Present h.p.
32	42	60
36	60	100
38	88	120
*43.5	100	120
57	220	300
72	300	375

Hull, size and diameter of propeller, pitch of propeller, stability criteria, type of fishing, r.p.m. utilization of power produced, efficiency, displacement etc., are the factors considered during model testing.

Mr. Laus Rodrigo

Fish hold capacity of the 38' boat is insufficient and it is difficult to carry sufficient ice in the hold. Therefore precautions should be taken to prevent spoilage of fish.

Mr. Unni

2.5 to 3-ton hold capacity was introduced originally but now 4-ton capacity hold is incorporated. It is not practicable to do freezing in this boat. It is possible to fix a refrigerating unit, even then ice is needed to maintain the required low temperature. Another possibility is to have a chill brine tank. External appearance of fish may be affected by keeping fish in chill brine. White fish authority recommends 4" thick insulation. Since we are near the equator 4" thick insulation is reasonable. Adequate quantity of ice should be taken at the beginning to meet the loss of ice and to keep the fish sufficiently cool. It is possible to land about 2 tons of quality fish using these boats.

Mr. Bertram Perera

Fishermen were not consulted before constructing this 38' boat. Now after purchasing alterations have been done. Therefore fishermen's view should be obtained hereafter.

Mr. Pietersz

This is a very good point. Communication during the past was insufficient.

Mr. Gomez

Is it practical to do pole and line fishing in 38' boat ?

M . R. A. de Silva

Pole and line fishing can be done seasonally as a subsidiary fishery. Addition of live bait tank occupies a portion of the limited space available in the boat.