



# ECONOMICS OF GILLNET FISHING IN WEST BENGAL

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## INTRODUCTION

The economic motive of the fishermen is to maximise net returns which is mainly guided by monetary return out of the catch and cost of production i. e. fishing costs.

The purpose of this paper is to assess the productivity of gillnet fishing units in West Bengal. Broadly, this paper deals with the following aspects:

- Costs and returns of different gillnet units;
- Sharing system in the units;
- Annual income of the crew and the unit owners;
- Productivity of resources and lastly to judge the comparative efficiency between mechanised and non-mechanised gillnet units.

These informations are important for planning and development purposes of capture fisheries. It can help fishing units in the efficient use of resources to achieve their goals.

**Materials and methods:** The field research

was carried out during May 1983 to April 1984. The selection of the centres was done purposively rather than randomly. In the entire state fishing is carried out almost throughout the year (with a very low key from March to May) only in two centres, viz., Digha and Frasergunj. In order to know the cost and earning as well as returns from the investment, it is essential to choose those two centres purposively rather than randomly.

The unit is defined, one boat - mechanised or non-mechanised and a number of gillnet pieces stiched together to form a unit.

Twenty sample units were taken randomly both mechanised and non-mechanised units in each centre for our study. Both mechanised and non-mechanised boats operate gillnets throughout the year at Digha. At Frasergunj, only mechanised boats operate gillnets from June to October. Fishing days for the landing centres defined, those days even if a single unit operates. The non fishing days area mostly due to unfavourable weather condition. It may be observed from the table that average number of fishing days in a month for the sampling units at Frasergunj

Table 1. Number of fishing days for gillnetters in different months at Digha and Frasergunj 1983-84.

Effort	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual	Monthly
Number of Fishing days												
Digha	20	20	20	25	26	26	28	29	20	15	228	22.8
Frasergunj	10	21	22	25	24						102	20.4
Average Number of Fishing Days for the Selected Units												
Digha (Mech.)	9	11	12	13	13	15	15	12	10	7	117	11.7
Digha (Non-Mech.)	5	9	10	9	10	15	15	10	7	3	93	9.3
Frasergunj	8	15	16	21	24						84	16.8

(16.8) is more than that of Digha (11.7) although the fishing days of Frasergunj (20.4) is less than that of Digha (22.8) (Table 1). The reasons may be attributed to the facts, that (a) the fishermen at Frasergunj are local inhabitants whereas, at Digha most of the fishermen come from far off inland districts thereby loosing fishing days during their sojourn to their home; (b) for fishermen at Frasergunj fishing is a principle source of livelihood whereas, for the same at Digha, it is a subsidiaries income.

**Catches and earnings:** Average catch per fishing trip for 10 months both for mechanised and non-mechanised units in Digha and 5 months in case of Frasergunj is shown in Table 2. Catch per trip ranged from 70 to 250 kg in case of mechanised gillnet at Digha and 33 to 44 kg in case of mechanised gillnet at Fraserganj, catches from the non-mechanised gillnets at Digha varied from 60 to 131 kg. The average annual gillnet catch in mechanised sector at Digha and Frasergunj

comes about 183 & 40 kg respectivley. Whereas annual average non-mechanised gillnet catch is about 93.5 kg.

The contribution of *Hilsa-ilisha*, pomfret and catfish in the total catch were found to be 17%, 30% and 20%, respectively in cases of Digha whereas at Frasergunj the percentage contribution of those species are 43%, 32% and 5%, respectively. In Table 3, we have given the catches per trip in each stratum of the year at Digha and Frasergunj. It may be seen that the catches per trip was maximum during the first stratum at Digha both for mechanised (212.4 kg) and non-mechanised gillnetters (101 kg) followed by second (173.2 kg, 92.5 kg) and third stratum (170 kg, 60 kg). The contribution of *Hilsa* during first, second and third stratum was 18%, 16% and 11%, respectively in the catch. Pomfrets contributed 25%, 34% and 47%. Cat fish contributed 25%, 14%, 31% and the contribution of other species was 32%, 36% and 11%, respectively.

Table 2. Average catch per trip (kg) of gillnetters in different months at Digha and Frasergunj 1983-84.

Centres	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual Total	Monthly Average
Digha (Mech.)	125	208	210	212	237	250	194	178	71	70	1826	182.6
Digha (Non-Mech.)	90	98	107	109	101	131	92	85	62	60	935	93.5
Frasergunj (Mech.)	33	37	41	43	45						199	39.8

**Table 3.** Catch per trip (kg) of gillnetters in each stratum at Digha and Frasergunj 1983-84.

Centers	Mech./Non-mech.	Stratum I	Stratum II	Stratum III
Digha	Mechanised	212.4	173.2	70
	Non-Mechanised	101.0	92.5	60
Frasergunj	Mechanised	39.8	Nil	Nil

The percentage contribution of those species from non-mechanised gillnetters are 12%, 14% and 16%, respectively.

Fishing days and trips are same in each month for all units, because each unit operates one trip in a day. At Digha out of 228 fishing days (June 83 to March 84) in 1983-84 we covered 120 days both for mechanised and non-mechanised units and out of 102 fishing days at Frasergunj we covered 50 days as days observed.

Fishing days or trips for the selected units varied from unit to unit. In case of mechanised gillnetters at Digha its range is 52-93 days (61.58) out of 120 observed days; whereas at Frasergunj its range is 30-47 (41.2) out of 50 days observation. In case of non-mechanised gillnetters fishing days varied from 31-61 (48.95) days out of 120 days.

The mechanised gillnetters fished 51% of those selected days on an average at Digha and 82% at Frasergunj. Non-mechanised gillnetter fished 40.79% of those selected days. Reasons for non-fishing can be given as engine/bcat/gear trouble, sickness; crew charges, festivals and local beliefs in 'Bad Luck'. 'Bad-Luck' is a common word used by fishermen when despite their efforts, good weather and adequate gear, they catch less than other fishermen who exert the same amount of effort.

At Digha gross earning per trip for the mechanised unit was maximum during October (Rs. 2110/-) and from January onwards the

earning was going down gradually. It was Rs. 860/- at January, Rs. 614/- during February and Rs. 405/- during March 84. The contribution of *Hilsa* in total earning was maximum (57%) during October whereas the maximum earning for the mechanised unit was Rs. 358/- during August.

At Frasergunj the maximum earning for the mechanised unit was Rs. 295/- (per trip) during October and minimum was Rs. 252/- during July. Earning per trip of a mechanised unit was Rs. 269.73 during 1983-84 at Frasergunj).

The variation in earnings from month to month can be explained partially by the availability of species, especially in terms of *Hilsa-ilisha* Pomfret, catfish etc.

Per trip earning for mechanised unit was maximum during first strata (Rs. 405/-) followed by second (Rs. 1801/-) and third strata (Rs. 405/-) and 299/-, 233/- and Rs. 228/- for the non-mechanised unit at Digha. Average gross earning of a mechanised unit (per trip) during 1983-84 was Rs. 1355.53 and for the non-mechanised unit it was Rs. 209.43.

#### **Investment costs:**

The average investment cost for a 11.9 m craft with old 67-72 H. P. engine comes about Rs. 50/- thousand at Digha whereas 10m craft along with 6-15 H. P. old engine comes about Rs. 10 thousand at Frasergunj. The average cost for a set of decron gillnet is about Rs. 15 thousand in Digha and Rs. 5 thousand at Frasergunj. The same for chord

net at Digha is about Rs. 20 thousand. The investment in moderately higher at Digha.

52% of our respondents at Digha used 72 H. P. engine; 25% used 68 H. P. and 23% used 65 H. P. at Frasersgunj 37% used 15 H. P., 33% used 8 H. P. and 30% used 10 H. P. engine.

For working out the depreciation we took into the account the expenditure the present owner actually incurred to acquire the asset.

The life expectance has been taken to the ten years for a craft, 5 years for the engine and 3 years for a set of gears.

On the basis of the above method the average total annual depreciation cost per gillnet fishing units was about Rs. 13/- to 14 thousand in Digha and Rs. 3 thousand in Frasersgunj.

The ratio of depreciation to gross earnings is a measure of how much amount must be reserved for eventual replacement of fishing assets. The ratio is 0.08 at Digha and .12 at Frasersgunj. Apart from those costs there are some other fixed cost items like for construction of shed association fee etc. Those are about Rs. 5 thousand and Rs. 1.5 thousand, respectively. At Frasersgunj those costs are not arises.

### **Operating costs**

Operating costs are fuel, repair and maintenance of craft and gear, food for the crew, packing, transport, unloading, wages for the crew and some other miscellaneous expenses. At Digha some of the gillnetters engage labourers on monthly wage basis but sharing system also exists both at Digha and Frasersgunj which has been discussed later.

On the basis of total operating cost during 1983-84, 49% was spent on fuel at Digha and 83% at Frasersgunj. For repairing

and maintenance it is 7.5% and 9% in the respective centres. For mechanised boat at Digha the expenditure towards ice, food, unloading, packing, transport and miscellaneous expenses works out to 9%, 15%, 7%, 5.5%, 5% and 2% of the total operating cost.

In the mechanised sector operating cost is 39% of the gross earnings at Digha and at Frasersgunj it is 23%, whereas in the non-mechanised sector it is 30% of the gross earnings.

In the non-mechanised gillnetters repair and maintenance of craft and gear are major cost item in total operational cost.

### **Sharing system:**

Operating costs are deducted from the total value of the catch before sharing between owners and labourers at Frasersgunj. At Digha both wage and sharing system exist. In wage system, labourers are paid on monthly basis. Engine drivers and Sukhanis (Majhi) are paid more than the general crew. In sharing system boat owners and gear owners share the net income (gross income-operating cost) in the ratio 45:55. The general crew are paid 32% of the net income by the gear owners. "Sukhanis" and Engine Drivers are paid on monthly basis by the gear owners and boat owner, respectively.

At Frasersgunj there are six shares - one for the engine, one for the craft, one for gear and rest three for five crew members. The crew shares are regarded as the return for labour whereas the share for craft, engine and gear are the returns on capital. If the owner works as a crew member he is entitled for share as a crew member. The owner of gillnetters at Frasersgunj always prefer sharing system rather than wage system, because fishing is a risk venture and in sharing system, the crew will put their best effort and also the risk of the owner gets shared. The owners

of gillnetters at Digha mostly operates on wage system and bear the whole risk because the return is more sure owing to better catch, better contribution of the priced fish and better transport facilities leading to higher value realised lastly most of the units comes from the inferior inland areas, so that for them it is very difficult to make sharing arrangement.

In 50% of our observed units, craft and gear were owned by a single owner, whereas in other cases craft and gear were owned by different persons. In the case of a single ownership of craft and gear, the payment of labourers are on the monthly basis. The average remuneration of the crew per fishing month at Digha for mechanised unit were Rs. 350/- in wage system. The share for the crew is Rs. 103.40 and Rs. 271/- per fishing day at Frasersgunj and Digha, respectively. In the case of non-mechanised unit at Digha the share for the crew per fishing days was Rs. 114/-. Under the wage system the net revenue of a mechanised unit per fishing day at Digha was Rs. 821/- (including wage of crew) whereas under sharing system it was Rs. 850/- out of which Rs. 383/- goes to the craft owner, Rs. 196/- to the gear owners and rest Rs. 271/- for the ten crew members for their share.

At Frasersgunj the net revenue per fishing day for a mechanised gillnetters were Rs. 206.78, out of which Rs. 103.40 goes to the craft-gear owners and the rest goes to the five crew members.

#### **Annual income for the owners and labourers:**

At Digha, the average annual earning for a crew in mechanised unit was Rs. 3500/- wage system and Rs. 3171/- in sharing system whereas for a non-mechanised unit it was Rs. 1674/-.

At Frasersgunj the annual (five months) average earning for a crew from a mechanised gillnetters was Rs. 1737/-. In the non-mechanised sector, after deducting the operating cost the net income is divided equally, whereas at mechanised Sector the distribution to the crew is only 32% of the net revenue at Digha and 50% at Frasersgunj. Compared between the mechanised sectors, the annual income for a crew at Frasersgunj is lower than at Digha. It may be mentioned here that the annual income at Frasersgunj has been taken to be the income of five months and that at Digha to income for ten months.

The calculation of costs and returns for the fishing units is a complex structure because of various sharing arrangement in different centres, moreover in order to know the motivation of artisanal fishing units behind their investment it is essential to know the returns to owners (capital) and crew (labour). The annual earning for a craft gear owner at Digha were Rs. 96057/- and Rs. 8685/- at Frasersgunj. The annual income of a craft owner at Digha were Rs. 44811/- and Rs. 22932/- for the gear owners.

To know the annual residual return to owner's capital, labour and management, wages for the crew, fixed costs, yearly maintenance and repairing cost, which were not covered before sharing were deducted. In tables 4 & 5, we have given the annual returns to capital for a gillnetter at Digha and Frasersgunj. The gillnet owners, both the Digha & Frasersgunj on an average earning pure profit. At Digha the owner of craft and gear by investing 65 thousand earned a pure profit of Rs. 16 thousand, whereas the craft owner who invested 50 thousand only earned Rs. 13 thousand and gear owners (cordnet owners) by investing Rs. 20 thousand realised Rs. 7.5 thousand pure profit. At Frasersgunj the owners of gillnet units got a pure profit of Rs. 3 thousand by investing Rs. 15 thousand.

Table 4. Annual returns from capital (under single ownership) from a mechanised gillnetter at Digha and Frasergunj 1983-84.

Items	Digha	Frasergunj
No. of fishing days from selected units for the year 1983-84	117	84
Revenue per fishing days	821	103.40
Annual revenue of the owner	96057	8686
Annual cost of owner :		
(i) Fixed costs :		
Construction of shed	5175	3117
Depreciation	13000	3117
Association fee	1500	3117
(ii) Variable costs :		
Yearly repair and maintenance (including replacement)	3700	745
Wage bill for the crew <sup>1</sup>	44500	
Contribution to festival	600	75
Total variable costs	48800	820
Total fixed & variable costs	68475	3937
Residual return to owner's capital	27582	4748
Less opportunity costs of investment capital <sup>2</sup> of own labour <sup>3</sup>	7800	1800
Total opportunity costs	3500	-
Owner's pure profit (loss)	11300	1800
	16282	2948
1. Wages for 10 Crew (a) Rs. 350/- per month x 10 months =		Rs. 3500
wage for Engine Driver (a) Rs. 450/- x 10 months =		Rs. 4500
Wage for Sukhani (Maghi) at Rs. 500/- x 10 months =		Rs. 5000
	Total wage bill	13000
2. Based on 12% annual rate of interest.		
3. On the basis of monthly wages @ Rs. 350/- per month x 10 months =		Rs. 3500

But this does not arise at Frasergunj because the owner work as a crew so we have not added that share in his annual income as well as we have not subtracted it from opportunity cost of own labour.

The rate of return of a gillnetter (who own both craft and gear) was 37% at Digha and 32% at Frasergunj. It has been observed that the rate of return on investment is higher than the opportunity cost of capital, which means the owner is making the best use of his investment. In case of gillnetters the opportunity cost of the owner's capital is that amount which he could have earned 12% annual interest. Both at Digha and Frasergunj, the rate of return (37% and 32%) is higher than 12% market rate of interest.

In case of non-mechanised unit at Digha, the owners earned pure profit of Rs. 4 thousand by investing 12 thousand rupees (Table 6). It has been observed that both revenue per fishing day (Rs. 144/-) as well as pure profit (Rs. 4229/-) at Digha is higher than that at Frasergunj for a mechanised unit. The earning of a mechanised unit at Frasergunj is Rs. 103.40 and pure profit is Rs. 2948/-. Moreover in terms of pure profit the non-mechanised units which were operated at Digha is much more efficient than that of a



**Table 5.** Annual returns to capital (in Rs.) (under joint ownership) at Digha and Frasersgunj 1983-84 from a mechanised gillnetter.

(Sharing on 45 : 23 : 32: basis of gross earning)

Items	Craft Owner	Gear Owner
No. of fishing days for the selected units for the year 1983-84	117	117
Daily (share) revenue per fishing days	383	196
Annual revenue of the onwer's	44811	22932
<b>Annual costs</b>		
(i) Fixed costs		
Construction of shed	5175	-
Associate Fee	1300	200
Depreciation	8000	6667
Total fixed costs :	14475	6867
(ii) Variable costs :		
Yearly repairing & Maintenance (including replacement)	2700	1000
Wages for Engine Driver/Sukhan; (Majhi)	4500	5000
Contribution to festival	500	100
Total variable costs	7700	6100
Total fixed + Variable costs	22175	12967
Residual returns to owner's capital		
Less opportunity costs of investment capital <sup>1</sup> .	6600	2400
Of own labour <sup>2</sup>	3500	-
Total opportunity costs	9500	2400
Owner's pure profit (loss)	13196	7565

2. Based on 12% annual rate of interest.

3. On the basis of montly wages @ Rs. 350/- per month x 10 months = Rs. 3500/-

mechanised unit. But this type of comparison is sometimes misleading, because area of operation in both the cases is different. Moreover size of boat and nets are different in both the centres.

From the above analysis, it can be informed that by investing one rupee during 1983-84, a mechanised gill netter earns 25 paise at Digha and 19 paise at Frasersgunj as pure profit, whereas a non-mechanised unit earns 35 paise as pure profit. So interms of pure profit, non-mechanised unit is much more efficient than that of mechanised units both at Digha and Frasersgunj. To compare the efficiency of manpower between mecha-

nised and non-mechanised fishing units and within the mechanised units (between low H. P. and high H. P. craft in the case of Frasersgunj and Digha) the catch per man hour of fishing has been calculated.

The man-hours of a fishing units is the produce of number of crew in a unit and the actual fishing hours. It can be seen that catch/ man-hour of non-mechanised units (2.90 kg) is higher than mechanised unit (1.76 kg) at Digha and within the mechanised sector it is higher at Frasersgunj (2.67 kg) than at Digha.

The catch per trip for mechanised unit at Digha is higher than that of a non-

Table 6. Annual returns to capital (in Rs.) at Digha 1983-84 from a non-mechanised gillnetter.

Items		
	No. of fishing days for the selected units	93
	Revenue per fishing day	144
	Annual revenue	13392
Annual costs :		
i)	Fixed costs :	
	Construction of shed	1023
	Association fee	400
	Depreciation for nets <sup>1</sup>	4000
	Yearly rent for the boat	1500
	Total fixed costs	6923
ii)	Variable costs :	
	Yearly repairing & maintenance costs of nets	500
	Contribution to festival	300
	Total variable costs	800
	Total fixed + Variable costs	7723
	Residual returns	5669
	Less opportunity costs of investment capital <sup>2</sup>	1440
	Pure profit (loss)	4229

1. The total acquisition costs of a set of (decron) nets for non-mechanised unit is about Rs. 12000/- and expected life is 3 years. So depreciation is Rs. 4000/-.
2. Based on 12% annual rate of interest.

mechanised units as well as the units at Frasergunj. But since less man-power is employed in non-mechanised unit as well as mechanised unit at Frasergunj, the catch per man-hour by unit is higher resulting in higher earning (Table 7).

The catch or gross earnings per man-hour of effort or per trip show the efficiency or productivity of the fishing unit when it is in actual operation. But this information will not tell us how productive the craft-gear combination was over the entire year-which is affected both by seasonal pattern of utilisation and by the intensity of utilisation during the operating season.

To achieve a given level of production, it is essential to know the productivity of labour and capital, because these two are

commonly used in any production process. Here productivity of labour is expressed as the yearly catch or gross earnings per fisherman and productivity of capital is the yearly catch or gross earnings per unit of capital invested. The relationship between capital intensity and labour productivity of the gillnet fishing during our study shows that there is a trend of increasing gross earnings per crew with increasing investment per crew member. Even though the correlation coefficient ( $r = 0.3358, 0.1360$ ) is not very strong in both the cases of mechanised gillnetters at Digha and Frasergunj. This is mainly because fishing is an uncertain event. There is no guarantee that higher investment means higher return. It has been observed during our study, even though the investment of some units are lower, the earnings of those, units are higher. So within



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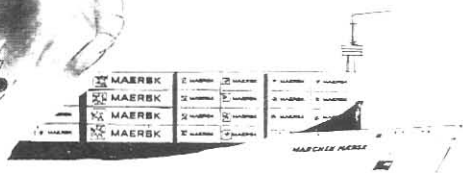
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