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AN ECONOMIC EVALUATION OF PURSE SEINE FISHERY ALONG GOA COAST

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Purse seining on an experimental basis was carried out first in Goa in 1957. However, it was successfully commercialised in 1964, with only two purse seiners under operation. By 1969 the number of purse seiners in Goa increased to 42 and recently the number has been considerably increased with the result that about 225 purse seiners are under operation along Goa coast.

The total marine fish landings of Goa in 1992 was estimated at about 96,000 tonnes, of which the purse seine contribution was about 70%. In this State traditional way of marine fishing has almost disappeared. About 96% of the total marine fish catch of the State was accounted for mechanised fishing comprising purse seiners and trawlers. About 3% of the catch was through motorised country craft and only 1% by non-motorised traditional sector. Hence, the marine fishing is becoming very much capital intensive. Fish is no more a gift of the sea. As in any other production process the fishing also involves a substantial production cost and with the increased tempo of mechanisation the unit cost of effort is continuously increasing. An economic evaluation is needed to find out whether this increase in fishing cost is compensated by increase in revenue either due to higher price or better catch.

Since the marine fishery of Goa is very much dominated by purse seine fishery and in view of its high catching efficiency and increasing tempo of its expansion the CMFRI has taken up

a study on the economic performance of purse seiners along Goa coast.

Data base

The data on economics of operation of purse seiners and socio-economic aspects have been collected through special surveys organised by CMFRI during 1991 and 1992. Catch and effort and other relevant data utilised for this study have been obtained from the data centre of CMFRI.

Trend in marine fish landings viz-a-viz purse seine landings in the state

Marine fish landings in Goa during the period 1990-'92 showed an increasing trend with marginal yearly fluctuations. The catch varied between 24,500 tonnes in 1980 and 1,20,000 tonnes in 1989. From 1987 onwards the level of total landings of the State was maintained above 65,000 tonnes. The average annual landing during the period 1988-'92 was about 90,000 tonnes which indicates a 3 fold increase from the average catch of 33,800 during 1980-'84 period (Table1).

In 1980 the contribution of purse seiners in the total marine fish landings along Goa coast was only about 25%. The marine fish production of Goa recorded a continuous increase from 1980 except a few cases of slight fluctuations, reaching the level of about 96,000 tonnes in 1992. In between an all time record catch of 1.2 lakh tonnes was achieved in 1989 which was mainly

TABLE 1. Catch, effort and total landings of purse seine units in Goa

| Year | Total catch in tonnes (all gears) | Purse seine catch in tonnes | Effort No. of unit days in operation for P.S. | Purse seine (CPUE kg) |
|------|-----------------------------------|-----------------------------|---|-----------------------|
| 1980 | 24490 | 6217 | 4184 | 1486 (25) |
| 1981 | 34498 | 14113 | 12977 | 1088 (41) |
| 1982 | 34041 | 7611 | 7333 | 1038 (22) |
| 1983 | 37688 | 3568 | 5821 | 613 (09) |
| 1984 | 38505 | 7322 | 7311 | 1002 (19) |
| 1985 | 48850 | 13363 | 9721 | 1375 (27) |
| 1986 | 54401 | 5950 | 8542 | 697 (11) |
| 1987 | 65677 | 25192 | 28305 | 890 (38) |
| 1988 | 91168 | 56335 | 24548 | 2295 (62) |
| 1989 | 119866 | 98989 | 39859 | 2483 (83) |
| 1990 | 66505 | 54305 | 36134 | 1503 (82) |
| 1991 | 75623 | 55944 | 34699 | 1612 (74) |
| 1992 | 96333 | 69614 | 35677 | 1950 (72) |

Note :- Figures given in brackets are percentages to the total catch

due to the huge landings of oil sardine and mackerel throughout the west coast. The increase in marine fish landings of Goa was mainly due to the increase in purse seine landings which was estimated at about 6,000 tonnes in 1980, increased to 69,000 in 1992 and during this period its contribution to the total landings of Goa increased from 25 to 72%.

In 1980 the total effort by purse seiners was estimated at about 4000 unit days which increased to about 36,000 unit days in 1992.

The catch per unit per day of operation was 1.5 tonnes in 1980 and recorded about 2 tonnes in 1992 with wide fluctuations during this decade. In 1983 it was 0.6 tonnes, in 1986 about 0.7 tonnes and the highest at 2.5 tonnes was recorded in 1989, the year of all time record landings of the State. More than 95% of the purse-seine catch is contributed by clupeids, carangids, mackerel and tuna which used to be caught in traditional gears (Table 2).

Fishing cost

The average investment for a purse seine unit was estimated at about Rs. 7.5 lakhs. Eventhough the period of study was 1991-'92, the level of investment was calculated on the basis of average net asset value of a purse seine

TABLE 2. Specieswise marine fish landings along Goa coast by purse seiners

| Catch | 1991 | 1992 |
|---------------|--------------|--------------|
| | (tonnes) | |
| Cat fish | 495 | — |
| Clupeids | 30935 | 25891 |
| Perches | — | 8 |
| Croakers | 21 | 221 |
| Ribon fish | — | 7 |
| Carangids | 18348 | 31784 |
| Pomfrets | 94 | 122 |
| Mackerel | 2925 | 7673 |
| Seerfish | 73 | 128 |
| Tunnies | 1624 | 2721 |
| Crustaceans | 1081 | 534 |
| Miscellaneous | 348 | 525 |
| Total | 55944 | 69614 |

unit. Most of the craft are 46 footers and the engines are mostly with 125 HP.

For the purpose of analysing the fishing cost the costs incurred during 1991 and '92 have been separately calculated and the entire costs have been given under two classifications viz. the annual average operating cost and annual average fixed cost per unit under operation.

The annual average operating cost per unit worked out at about Rs. 5-6 lakhs of which the major components are expenditure on fuel and wages. Other cost items are repairing and maintenance, bata, food and ice. Unlike in other major purse seine operating states, in Goa, the carrier boat is not used for landing the fish. Wage system in Goa is also different from Karnataka and Kerala. In Goa, payment is made on monthly basis whereas in other states it is certain percentage of the total revenue after deducting the fuel expenditure for fishing and auction charges of the catch.

Interest, depreciation and insurance premium are included in fixed cost estimation. Interest is calculated at the rate of 18% and depreciation on the basis of the life span of the capital asset i.e. 10 years for craft and engine, 5 years for gear and one year for other accessories. The total fixed cost worked out at Rs. 2.68 lakhs. Hence, annual total cost of fishing operation of a purse seine unit has been

calculated at about Rs. 7.73 lakhs for 1991 and Rs. 8.71 lakhs for 1992 (Table 3).

TABLE 3. Costs and earnings of a purse seine unit operating along Goa coast

| | 1991 (Rs) | 1992 (Rs) |
|---|-----------------|-----------------|
| A. Initial investment | | |
| Craft | 4,50,000 | 4,50,000 |
| Net | 2,80,000 | 2,80,000 |
| Other accessories | 20,000 | 20,000 |
| Total | <u>7,50,000</u> | <u>7,50,000</u> |
| B. Catch (tonnes) | 320 | 360 |
| C. Revenue | 8,48,000 | 9,90,000 |
| D. Operating cost | | |
| — Fuel | 1,50,000 | 2,10,000 |
| — Wages | 1,40,000 | 1,68,000 |
| — Bata | 75,000 | 75,000 |
| — Food | 25,000 | 25,000 |
| — Ice | 40,000 | 50,000 |
| — Repairing, maintenance and other miscellaneous | 75,000 | 75,000 |
| Total operating cost | <u>5,05,000</u> | <u>6,03,000</u> |
| E. Fixed costs | | |
| — Interest @ 18% | 1,35,000 | 1,35,000 |
| Depreciation | | |
| a) Craft | 45,000 | 45,000 |
| b) Gear | 56,000 | 56,000 |
| c) Other accessories | 20,000 | 20,000 |
| Total depreciation (a+b+c) | <u>1,21,000</u> | <u>1,21,000</u> |
| — Insurance | 12,000 | 12,000 |
| Total fixed cost | <u>2,68,000</u> | <u>2,68,000</u> |
| F. Total costs (D+E) | 7,73,000 | 8,71,000 |
| G. Gross profit (C-D) | 3,43,000 | 3,87,000 |
| H. Net profit (G-E) | 75,000 | 1,19,000 |
| I. Rate of return (%) | 28 | 34 |

Fishing income

The average catch and fishing income per unit have been given for the years 1991 and 1992 in Table 3. Average annual catch per unit worked out at 320 tonnes in 1991 and 360 tonnes in 1992 with the average annual revenue of about Rs. 8.5 lakhs and 9.9 lakhs respectively. During 1991, the gross profit (income after deducting the operating cost) per unit worked out at Rs. 3.4

lakhs and the net profit at Rs. 75,000 (income after deducting the entire cost). During 1992, gross profit increased to Rs. 3.9 lakhs and net profit to Rs. 1.2 lakhs due to the increase in quantity landed per unit and also in price. The rate of return was 28% in 1991 which increased to 34% in 1992.

The total revenue through purse seine catch in Goa is estimated at about Rs. 210 million, which is earned by about 200 purse seiners. The total investment on purse-seine units came to about Rs. 150 million.

Value added income

Out of revenue of Rs. 210 million by purse seine landings an amount of about Rs. 42 million is incurred as fuel expenditure and the balance of Rs.168 million has come back to different people as remuneration for the services they contributed for the fish production. Hence, about 80% of the total income created through purse seine catch is the value added to the national income which indicates its high social benefit.

Cost and earnings per trip

Usually purse seiners in Goa go only one trip per day for fishing. Average fuel costs per day amounted to Rs. 750 during 1991 and Rs.1,050 during 1992. Average wages paid per day for all workers in a unit worked out at Rs. 750 in 1991 and Rs. 840 in 1992. Besides this an amount of Rs. 375 is paid as bata and Rs.125 as food expenditure, so that the total wage bill per day of operation per unit worked out at Rs. 1,200 in 1991 which increased to Rs. 1,340 in 1992.

The catch per unit per day of operation amounted to 1.6 tonnes in 1991 and 1.8 tonnes in 1992 (Table 4). The corresponding gross earnings worked out at Rs. 4,240 and Rs. 4,950 respectively. This amount is less as compared to purse seiners in Karnataka and Kerala. However, the annual income per unit is higher for purse seiners in Goa than those of Karnataka and Kerala. It is mainly because of more number of annual fishing days in Goa. Purse seiners in Goa operate about 200 days in a year as compared to 100-150 days in Karnataka and Kerala. So also annual net profit per unit in Goa is comparatively higher because of more number of fishing days as well as lesser cost as compared to other two states. Labour cost is fixed in Goa and wages are paid on monthly basis, where as in Karnataka and Kerala, it is based on percentage (mostly

TABLE 4. Costs and earnings of a purse seine unit per day of operation along Goa coast

| | 1991 (Rs) | 1992 (Rs) |
|--|--------------|--------------|
| A. Catch (tonnes) | 1.6 | 1.8 |
| B. value | 4240 | 4950 |
| Price realised per kg of fish | 2.65 | 2.75 |
| Average number of days fished per year | 200 | 200 |
| C. Operating cost | | |
| — Fuel | 750 | 1,050 |
| — Wages | 700 | 840 |
| — Bata | 375 | 375 |
| — Food | 125 | 125 |
| — Ice | 200 | 250 |
| — Repairing and maintenance | 375 | 375 |
| Total operating cost | 2,525 | 3,015 |
| D. Fixed costs | | |
| — Interest @ 18% | 675 | 675 |
| Depreciation | | |
| a) Craft | 225 | 225 |
| b) Gear | 280 | 280 |
| c) Other accessories | 100 | 100 |
| Total depreciation (a+b+c) | 605 | 605 |
| — Insurance | 60 | 60 |
| Total fixed cost | 1,340 | 1,340 |
| E. Total cost (C+D) | 3,865 | 4,355 |
| F. Gross profit (B—C) | 1,715 | 1,935 |
| G. Net profit (F—D) | 375 | 595 |

25%) of the gross revenue after deducting the fuel cost and auction charges. Hence workers of purse seiners in Kerala and Karnataka get better wages than those of Goa.

Seasonality

About 80% of the Goa marine fish is landed in the first and the last quarter of the year. More than 80% of the purse seine catch is landed in the last quarter and about 85% of the trawl catch is in the first and the second quarter. Hence for any owner it is more economic to use the vessel for purse seining during September to December and for trawling during January to May. This will be more remunerative for the boat owner without affecting the total landings of the States (Tables 5 & 6).

TABLE 5. Month wise marine fish catch (in tonnes) and effort (unit days) in Goa during 1991 by purse seiners and trawlers and quarterly total landings

| Month | Purse seiner | | Trawler | | Total catch (tonnes) (Quarterwise) |
|-----------|--------------|--------|---------|--------|------------------------------------|
| | Catch | Effort | Catch | Effort | |
| January | 2274 | 3875 | 2099 | 6030 | |
| February | 997 | 2205 | 3188 | 6825 | 12583 (I) |
| March | 413 | 1000 | 2631 | 8022 | |
| April | 1237 | 1613 | 1565 | 5588 | |
| May | 300 | 1085 | 1935 | 6805 | 5697 (II) |
| June | — | — | 40 | 1050 | |
| July | 36 | 277 | 43 | 1080 | |
| August | 2344 | 3860 | 283 | 3752 | 8062 (III) |
| September | 3107 | 2880 | 798 | 4140 | |
| October | 8606 | 5853 | 310 | 1872 | |
| November | 29186 | 7767 | 318 | 2700 | 49281 (IV) |
| December | 7444 | 4284 | 606 | 2747 | |
| Total | 55944 | 34699 | 13816 | 50611 | 75623 |

TABLE 6. Month wise marine fish catch (in tonnes) and effort (unit days) in Goa during 1992 by purse seiners and trawlers and quarterly total landings

| Month | Purse seiner | | Trawler | | Total catch (tonnes) (Quarterwise) |
|-----------|--------------|--------|---------|--------|------------------------------------|
| | Catch | Effort | Catch | Effort | |
| January | 1951 | 1674 | 3042 | 2821 | |
| February | 1451 | 1717 | 2925 | 3834 | 11220 (I) |
| March | 101 | 391 | 1270 | 3323 | |
| April | 142 | 915 | 3688 | 6345 | |
| May | 3 | 223 | 2007 | 7136 | 6184 (II) |
| June | — | — | 117 | 2026 | |
| July | 8 | 517 | 99 | 1681 | |
| August | 5481 | 5851 | 1410 | 6572 | 12952 (III) |
| September | 4418 | 2340 | 385 | 4770 | |
| October | 7685 | 3798 | 245 | 1302 | |
| November | 37311 | 12375 | 225 | 1080 | 65977 (IV) |
| December | 11063 | 5876 | 1105 | 4768 | |
| Total | 69614 | 35677 | 16518 | 45658 | 96333 |

Optimum level of operation

On the basis of the existing operational level i. e. 200 units operating for about 200 days, assuming a reasonable level of profit and with expected level of average fish price of Rs. 3 per kg, each unit should get 1.5 tonnes per day of

operation. Hence, the total purse seine catch should be about 60,000 tonnes. The present level of operation can be increased without effecting economic viability only if there is either an increase in catch or price. Even if there is a reduction in catch, it will be compensated by an increase in price, so that the present level of effort can be maintained.

Impact of purse seine operation on traditional fishery

'Rampani', 'Yendi' (shore seine) and gillnet were the prominent traditional gears operated in Goa. These gears put together contributed about 60% of the marine fish landings of Goa in 1975, which reduced to about 10% in 1984. During 1992, 96% of the total landings was contributed by motorised units and the rest by the traditional gears without any type of mechanisation. This indicates the almost total disappearance of the traditional fishing units like 'Rampani', 'Yendi' etc. from Goa shore due to the large scale introduction of purse seining which is highly competitive to the traditional units. However, because of the continuous increase in purse seine effort the total catch also has been increased which coupled with the increasing trend in fish prices resulted in not only higher fishing income, but also helped to establish a number of fishery allied activities. Thus, the loss in the employment potential in traditional sector due to the onslaught of purse seining has been compensated by such newly created employment opportunities. But, as in the case of Karnataka State, these new opportunities have mainly helped the urban fishing centres and not the fishermen of remote rural centres. Besides this, the huge investment requirement of purse seiner has deprived the

traditional fishermen in owning the means of production and most of them especially younger generation have become fishing workers in purse seine units. The recent introduction of motorisation of country craft may help the traditional fishermen revive the village based fishing operation. In Karnataka, motorisation has started reducing the dominance of purse-seining by introducing small mini purse seines, such as *ranivala*, *mattubala* and ring seine operating with motorised country craft. This can be introduced in Goa also so that the village based fishing activities can be revived without affecting the level of exploitation.

Conclusion

During 1991-'92 about 75% of the marine fish landings was by purse seiners. The average profit per unit during 1992 worked out at Rs. 1.19 lakhs and the rate of return was 34%. At present about 200 purse seiners are under operation in the State. At the present level of exploitation, the effort is almost at the optimum level. Since there is every possibility of considerable increase in fishing cost along with the increase in price of fish, unless there is a substantial increasing trend in fish landing during the coming years, it is better to have the effort to be stabilised at the present level of near about 40,000 boat days with 200 existing number of units under operation.

It is more profitable to any boat owner in Goa to operate purse seines during September-December and trawl nets from January-May with the same craft.

As in Karnataka and Kerala the introduction of ring seine operation in Goa can help revive the village based fishing activities as a joint venture.