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ECONOMICS OF ALTERNATIVE TECHNOLOGIES FOR HARVESTING AND PROCESSING MARINE FISH IN BANGLADESH[1]

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ABSTRACT

Marine fish is a relatively unexploited source for meeting the deficient protein supply problem in the country. An important consideration in this respect is the technology mix to be used. In this article relative economics of the alternative technologies currently in use for production and processing of marine fish have been analyzed. The trawler operation could not be completely analyzed because of poor accounts keeping by the relevant agencies which imply that the project is not being well managed. Mechanized and sail boats are respectively capital and labour intensive techniques and input-output ratios are the same for both type of boats but mechanized boat can produce much higher output per time unit. Most of the processing plants are heavily underutilized due to shortage of fish. It has been concluded that appropriate steps should be taken to economically operate the trawler project and expand the rate of boat mechanization for expanding fish production both for fresh sale and for better utilization of the processing plants.

I- INTRODUCTION

The minimum per capita per day protein requirement in Bangladesh has been estimated as 45.3 gm of which one third, i.e. 15 gm should be of animal origin. The present supply of animal protein is 5 gm and the contribution of terrestrial animals to the animal protein supply is 1.3 gm (25%) and the rest come from fish. This amount of fish protein comes from 22.4 gm of whole fish since 16.5 per cent of whole fish is protein (DU 1977). At this rate, current per capita annual intake of fish is about 8 kg. In view of the fact that farming of the cattle offers rather limited scope for expansion in near future, the share of fish in total protein should increase further. But estimated fish production has declined in recent years (Table 1) because a combination of factors, man-made and natural, have physically reduced the total inland water areas (Table 2) and also qualitatively degraded the physical environment of fish and other aquatic organisms. The

[1] This articles is based on part of a report "An Economic Study on Bangladesh Fisheries" prepared for the Planning Commission in June 1979. However, the authors alone are responsible for the views expressed in the article.

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Table 1: Estimates of fish output in Bangladesh

Year	Estimating Agency	Quantity	000 tons	
		Inland	Marine	Total
1962/63	Nutrition Survey, Dacca University	622	55	677
1967/68	Fishing Village Survey, BFDC	NA	99	NA
1972/73	First Five Year Plan, GOB	719	90	809
1973	Fisheries Directorate	713	87	800
	Private Consultant	800	50	850
1973/74	FAO DANIDA Report	729	85	804
	Fisheries Directorate	732	88	820
1974/75	FAO Country Perspective Study	550	99	649
	Fisheries Directorate	734	90	824
1975/76	FAO Yearbook	550	90	640
	Fisheries Directorate	732	89	821
1977/78	Fisheries Directorate	522	118	640

Source: Quoted in Karim 1978; Karim 1979; Perera 1977.

more important of these factors affecting open water fisheries are large scale shoaling in the rivers, obliteration of the river courses by water control structures, large scale reclamation of haor, beels, and other low lying areas for crop production, excessive removal of surface water for irrigation, construction of flood and tide control dykes, frequently indiscriminate use of agricultural pesticides, over exploitation of at least certain major fish species etc.

Decreased fish production not only aggravates the problems related to protein supply, it is also contributing to waste of scarce capital resources in the way of massive underutilization of the various export oriented fish processing plants established in the country. Fish production, therefore, has to be increased on a priority basis.

While efforts have to be made to preserve inland water bodies and expand fish production from inland sources, much of increased fish requirement has to come from the marine source which has very good unexploited potential. Various surveys indicate that the present output of 100,000 tons can be doubled provided appropriate technology mix is used (for summary of the surveyssee, Karim 1978, pp 13-19). The objectives of this article are to examine the alternative technologies for fish production & processing, their relative economics and potential for expanding fish production.

Information available from various published and unpublished sources will be used. Small surveys were also conducted in 1978/79 to supplement existing information.

Table 2: Inland water resources having fish production potential

Type of water	Water area in 000 hectares	
	Previous estimate	Current estimate
Perennial		
Rivers and tributaries	939(21.2)	830(30.4)
Estuaries	183(4.1)	183(6.7)
Beels and haors	293(6.6)	277(10.2)
Baors		16(0.6)
Ponds/lakes – Khas		24(0.9)
Private	76(1.7)	50(1.6)
Mini		40(1.5)
Irrigation Canal		6(0.2)
Keptai Lake	91(2.1)	91(3.3)
Total	1582(35.8)	1513(55.5)
Seasonal (Paddies)	2834(46.2)	1214(44.5)
Total	4416(100)	2727(100)

Figures in the parntheses are percentages
Source: Karim 1978; Karim 1979.

Detailed analysis are presented for 1976/77. In section II, alternative technologies and their economics are examined. Conclusion are presented in section III.

II. ECONOMICS OF ALTERNATIVE TECHNOLOGIES

Production Technologies

At present three types of crafts are engaged in marine fishing: trawlers, mechanized boats and sail boats. These are discussed below. Coastal aquaculture of shrimp is a different type of technique to harness marine resource and this will be discussed at the end of this section.

Trawler Fishing

Up to June 1977, the Bangladesh Fisheries Development Corporation (BFDC) owned a fleet of 14 trawlers the particulars of which along with some private and joint venture trawlers are presented in Table 3. The Bangladesh Jatia Matshajibi Samabaya Samity (BJMSS) trawlers have been lying inoperational for a long time. Since 1972 the government has sanctioned 33 trawlers (up to Novmber 1977) for operation in the Bay of Bengal by the joint venture and private sectors. Of these 8 were in operation in 1976/77. However, detailed information about these private and joint venture trawlers could not be collected. Further analysis is based on BFDC trawlers.

Table 3: Particulars of trawlers being used by various agencies, 1977

Agency/no. of trawler	Length of trawler (metre)	Freezer/ice	Fish hold		Year of	
			Capacity/trawler (tons)	Refrigerated/Insulated	Make	Arrival in Bangladesh
BFDC:						
5	54	Freezer[a]	150	Refrigerated[a]	1967	1972
2	44	Ice	60	Refrigerated[b]	1961	1972
3	27	Ice	40	Insulated	1971	1972
1	17.7	Ice	c	Insulated	1965	1968
2	18.3	Ice	20	Insulated	1973	1974
1	30.5	Ice	40	Insulated	1973	1974
BJMSS:						
1	20	Ice	20	Insulated	1962	1965
Private:						
3	10.7	Ice	c	Insulated	c	1975
1	c	Freezer	c	Refrigerated	c	c
Joint Venture:						
2d	43	Freezer	c	Refrigerated	c	1976
1e	28.3	Freezer	75	Cum	c	1976
1e	35	Freezer	234.64	Refrigerated Cum Refrigerated	1969	1976

a. All but one nonfunctional
b. Nonfunctional
c. Information not available
d. With public sector and a Japanese firm
e. With private and a Japanese firm

Source: Karim 1978, p. 67.

All but two 18.3 m trawlers of BFDC are multipurpose fishing trawlers. The remaining two although meant for shrimping, are being utilized for general fishing. In 1976/77, 13 of the 14 trawlers were used for fishing. These were operated under two projects of 10 and 4 trawlers.

A substantial time and effort was lost in trying to collect relevant information about the trawler operation, yet accurate and complete information were not available. See, for example, the two sets of information supplied by the BFDC Head office and the Chittagong Fish Harbour office (Table 4). This poor state of account keeping by a national organization spending huge amount of nation's resources should be a mater of concern to every body. There is reason to believe allegations that a conspiracy and large

scale misappropriation is going on through the trawler project (see, The Weekly Bichitra, 27 April and 18 May, 1979).

The largest 10 of the 14 BFDC trawlers were donated by the USSR government in 1972. The other 4 were purchased from the UK, Denmark and Holland. The large trawlers are capable of deep sea fishing throughout the year. Considering the rough weather of the Bay of Bengal for about 4 months, it is reasonable to assume that the large trawlers should be able to fish for 7-8 months and smaller ones for at least 6 months.

Table 4: Information on costs and returns of BFDC trawler operation in 1976/77 as supplied by two sources.

Particulars	10 Trawler Project		4 Trawler Project	
	Head Office	Harbour Office	Head Office	Harbour Office
Capital value of trawlers	NA	NA	NA	NA
Number of employees	NA	NA	NA	49
Depreciation (Mill. Taka)	7.85	NA	0.46	NA
Operational expenditure (Mill. Taka)	8.00	NA	2.38	1.97
Total cost (Mill. Taka)	15.85	NA	2.84	NA
Total catch (Tons)	1156	1170	200	208
Total sale proceeds (Mill. Taka)	3.03	1.87	0.76	0.40
Net Profit (Mill. Taka)	-12.82	NA	-2.08	NA

NA Not available
Source: BFDC Head office and BFDC Harbour at Chittagong

In 1976-77, only two trawlers were operated for 6 months and the remaining ones for 1-3 months (Table 5). BFDC could not satisfactorily explain this poor performance of the trawler operation both in terms of fishing duration and catch. One of the less mentioned but reasonable explanation is that operation of such trawlers need to be supported by large fish carrier ships/trawlers which BFDC does not own.

In 1978, four best performing trawlers were declared in operational and were sold to the private sector for 6.3 million Taka, If the annual depreciation figures shown in Table 4 are correct and if we assume a 15 year life for each trawler, then the market value of these four trawlers would be 35.6 million Taka. Obviously, the private sector would not be interested to buy the trawlers even at that low (18% of real value) price unless they were in a position to operate them profitably. The nation has lost 30 million Taka because of the inefficiency of the BFDC. That trawler operation is profitable is evident by the number of trawlers sanctioned by the government for the private sector and joint venture operators.

In March 1979, three best performing trawlers (Provati, Udayan and Chanda) have been declared in operational and quotations have been invited for sale. Three more trawlers (Santi, Mitali and Chandana) are also likely to be declared in operational and sold in a few months (Bichitra, 18 May 1979). The disinvestment drive indicates that

lack of carrier ship is not the real reason for inefficient operation of the trawlers. If it were, one or two earrier ship/trawler could easily be acquired.

Table 5: Fishing duration and catch of BFDC trawlers in 1976/77

Sl. No.	Name of trawler	Length (metre)	Fishing duration (days)	Catch		Catch Value	
				tons	%	000 Taka	%
1.	Chingri	44	-	-	0.0	-	-
2.	Usha	54	6	5.5	0.4	2	0.1
3.	Nabarun	54	23	44.3	3.2	34	1.5
4.	Suktara	54	41	96.6	7.0	180	7.9
	Total			146.4	10.6	216	9.5
5.	Chanda	44	68	225.5	16.4	384	16.9
6.	Pravati	54	79	268.5	19.5	368	16.2
7.	Udayan	54	89	297.7	21.6	521	23.0
	Total			791.7	57.5	1273	56.1
8.	Chanda	30	38	36.9	2.7	86	3.8
9.	Mitali	27	44	27.0	2.0	50	2.2
10.	Santi	27	49	61.7	4.5	107	4.7
	Total			125.6	9.2	243	10.7
11.	Mirsandhani	18	60	16.2	1.2	28	1.2
12.	Bagda	18	100	41.0	3.0	70	3.1
13.	Rupchanda	27	180	174.2	12.6	296	13.1
14.	Galda	18	190	82.6	6.0	140	6.2
	Total			314.0	22.8	534	23.6
Grand Total				1377.7	100	2266	100.0

Source: BFDC Harbour, Chittagong.

Mechanized Boats

Available information suggest that since 1961 up to June 1978 about 1800 engines have been distributed to motorise locally built boats for fishing. Of these, more than 1000 were distributed by the BJMSS, more than 250 by the BFDC, 100 by the CCDB, 22 by Caritas and the rest by the private sector. It is not, however, known for certain how many of these were fishing at any one time. A BJMSS survey in 1975 revealed that 1156 mechanized boats were used for fishing in marine and estuarine waters in 1974/75 (Karim 1978, pp. 64-66). The BJMSS believe that more than 1200 mechanized boats were used for fishing in 1976/77 but they are not sure about the exact number.

The other important capital item for fishing is gear. The 1975 BJMSS survey revealed that a total of 758,497 pieces of different kinds (Gill net, Seine net, set bag, cast net, long lines etc.) of gears were used in the marine sector (Karim 1978, p. 64). Number of nets used by sail boats, mechanized boats and trawlers are not shown separately. Since actual number of boats and nets in use in 1976/77 could not be established with certainty,

attempt was made to calculate economics of mechanized boat operation on the basis of information obtained from the BJMSS.

In 1976/77, the BJMSS provided on credit fully completed mechanized boats (boat, engine, gear) to 232 fishermen groups. The boats generally made of planked wood mostly range between 8-14 metres in length and the capacity of the engine vary from 6HP to 90HP, but 15-25 HP engines are more common. The credit extended to the groups was to be repaid in installments and by provisions of contrant, these boats were to regularly report fish catch to the BJMSS. Accordingly 103 mechanized boats reported total catch of 595 tons over a period of three month fishing or 5.8 tons per boat. The BJMSS considered these output as serious underreporting.

For purposes of calculating economics of using mechanized boat, 20 out of above mentioned 103 mechanized boats were purposively selected from Chittagong and Noakhali area and detailed information were collected from them. The length of the 20 sample boats ranged from 10-12 metres and 12 of them used 22 HP engine and 8 used 8 HP engine. Other relevant information are shown in Table 6. Actual output reported by the boats was slightly higher than those reported to the BJMSS yet it was considered underreporting. Therefore, the relevant ratios were calculated on the basis of potential output. The calculated labour/output ratio imply that a boat with 7-5 men needed a trip of 10-12 days including traveling time to catch one ton of fish. During peak fishing season a return tip was found possible even within 4-5 days. After Mid-March when the sea becomes rough a longer duration was necessary. Since information on actual fishing time in terms of hours and days were not available, labour days actually required for catching a ton of fish could not be shown.

Sail Boats

A large number of sail boats were damaged by the cyclone in 1970 and during the liberation war in 1971. A survey in 1975 revealed that 45,199 sail boats were used for fishing in marine and estuarine waters in 1974/75 (Karim 1978). Figures for later years were not available but the BJMSS believe that at least 45,000 boats were still fishing. Type-wise distribution of these boats were not available. Generally three types of boats are used: Dingi and Chandi types in estuarine waters and Balam in marine waters. Cost per boat differ significantly among these three types.

Like mechanized boats, the BJMSS provided 285 sail boats on credit to fishermen groups who were also supposed to repay credit in installments and report catch regularly. These were either dingi or chandi type boats. Eighteen percent of the boats were about 12 metres long, 48 percent about 9 metres long and 34 percent about 7 metres long. During 1976/77, these 285 boats reported total catch of 85 tons or 0.29 tons per boat over a period of 4 month fishing. The BJMSS considered this as serious underreporting and the fishermen were found to unreasonably delay or even avoid repayment of credit.

To collect detailed information, 30 of these 285 boats were selected purposively from Chittagong-Noakhali area. Size distribution of these 30 boats is more or less same

as the distribution of the 285 boats. Detailed technical and economic information of the sample boats are given in Table 7. Here also reported actual output was more than double than that reported to the BJMSS and still it was considered as under reporting. Relevant calculations were therefore made on the basis of potential output.

Table 6: Capital, labour, output and related ratios for mechanized boats used in marine fishing, 1976/77.

Items	Engine Power		
	22 HP	16 HP	All
Number of boats	12	8	20
Capital value per boat (Tk)			
Boat hull	427,720	32,000	38,432
Engine	54,000	47,744	51,498
Gear	10,086	9,040	9,668
Total	106,805	88,784	99,598
Fishermen per boat	7.8	7.2	7.6
Input value per boat (Tk.)			
Capital services	19,165	15,997	17,898
Labour services	28,320	26,880	27,744
Oil, fuel, repair	15,240	12,832	14,277
Others	12,78	1,956	2,101
Total	64,903	57,695	62,020
Output per boat			
Actual (tons)	7.5	6.8	7.0
Potential (tons)	11	9	10.2
Value of Potential output (Tks.)	88,000	72,00	81,000
Ratios			
Capital/output	1.21	1.23	1.22
Capital/labour	13,693	12,331	13,105
Labour days/ton output	85	96	89
Labour cost/Taka output	0.32	0.37	0.34
Input/output	0.74	0.80	0.76

Source: Field survey.

Table 7: Capital, labour, output and related ratios for sail boats used in Marine fishing, 1976/77

Items	Size of boat			
	±12m	+9m	±7m	All sizes
Number of boats	5	15	10	30
Capital value per boat (Tk)				
Boats	8,000	6,100	4,600	5,916
Net	7,080	4,040	4,040	4,546
Total	15,080	10,140	8,640	10,462
Fishermen per boat	7	5	3	4.6
Input value per boat (Tk.)				
Capital services	4,055	2,709	2,333	2,809
Labour services	20,200	15,100	8,800	13,850
Oil, fuel, repair	1,450	970	825	952
Others	1,392	1,084	793	1,038
Total	27,097	19,863	12,751	18,649
Output per boat				
Actual (tons)	0.83	0.68	0.52	0.65
Potential (tons)	4	3	2	2.8
Value of Potential output (Tk.)	32,000	24,000	16,000	22,400
Ratios				
Capital/output	0.47	0.42	0.54	0.47
Capital/labour	2,154	2,028	2,880	2,274
Labour days/ton output	252	257	216	244
Labour cost/Taka output	0.63	0.63	0.55	0.62
Input/output	0.85	0.83	0.80	0.83

Source: Field survey.

Shrimp Culture

Shrimp culture is a relatively new phenomena in the fisheries sector. Export demand for shrimp registers a continuous upward trend. A number of processing plants have been established to process shrimp for export (discussed in detail in next section). But supply of shrimp from natural sources has decreased. The Bay of Bengal has a good stock of shrimp (West 1973). But there has not been appreciable progress in harvesting this resource. Two BFDC trawlers meant for shrimping are used for general fishing. Even now, supply from natural sources is not adequate to run the existing processing plants on full capacities. As an alternative source, the Government is encouraging coastal aquaculture of shrimp particularly in the Cox's Bazar Sub-Division. A few people have

started culturing shrimp long before the Government initiative. Exactly how many farms were culturing shrimp in the dyked tidal flats, salt beds, paddy fields and in and around WDB's polders in 1976/77 or now are not known with certainty. Those who mention larger numbers also include miniature farms of 0.5-1 acre size.

Information were collected from 4 private farms, 3 of them operating on their own and one leasing land from the Government under the special shrimp culture programme. The three private farms have been culturing shrimp since 1970. Relevant information for these farms are shown in Table 8.

Capital investment include digging, enclosing the area with bamboo and wood, building of sluice gates etc. Three of the farms supplied seeds in addition to those coming naturally from the sea. Of the total output, 60 percent was shrimp and 40 percent mixed small fishes, but shrimp accounted for 77 percent of total value of fish. Of the total shrimp output, one third each was 'Bagda', 'white' and 'Laylla' Shrimp. Price per kg was the following: Bagda 108.10 white Taka 57.32 Laylla, Taka 39.38, mixed small fishes Taka 15.00; all shrimp Taka 60.91, all fishes Taka 47.98.

Fish Processing Technologies

Available fish processing technologies may be discussed under the following heads: (1) Canning plant (2) Drying plant (3) Fishmeal and Sharkliver oil plant (4) Freezing plant. The only modern drying kiln in the country situated at Cox's Bazar is run by the BFDC. It has a capacity to handle 2 tons of raw fish per 24 hours. Detailed information about this plant could not be collected. Chittagon fish harbour complex has a canning plant with a capacity to produce 100 cans of finished product per 24 hours. The machineries for the plant were received from Japan in 1968 but the plant has hardly been used. No canning was done in 1976/77.

Fishmeal Plant

The harbour complex has established a fish meal plant in 1976. Another BFDC operated fishmeal plant is located at Cox's Bazar. Detailed information about these two plants are shown in Table 9. The Cox's Bazar plant was originally established by the Fisheries Department in 1967 and was later handed over to BFDC.

Unavailability of fish was reported to be the major reason for very low capacity utilization. The fishmeal plants are supposed to use only trash fish. Other fishes may be used only if that fish cannot be disposed in normal ways, i.e. fresh sale and freezing. The plant at the harbour gets its supply from trawler catches. BFDC informed that trawler catches contain very little trash fish. Moreover, whatever small amount is found can be easily sold in the local market at reasonable price. In that case, there is very little justitication for processing those trash fishes. In 1976/77, the Chittagong plant processed 27 tons of raw fish which accounted for only 2.0 percent of the total trawler

catch of 1378 tons. Even if it is assumed that 10 percent of trawler catch constitute trash fish (unreasonable under the present circumstances), then to utilize the full capacity of

Table 8: Capital, output and related ratios for shrimp culture farms near Cox's Bazar sea Belt, 1976/77

Item	Value
Average size of farm (hectares)	26.68
Capital investment per farm (Taka)	74,700
Capital investment per hectare (Taka)	2,798
Workers per farm	10
Input values per farm (Taka)	
Capital services	21,550
Labour services	32,000
Seeds	6,200
Feeds	3,449
Others	2,176
Total	65,375
Input value per hectare (Taka)	2,450
Output per farm	
Quantity (tons)	4.69
Value (Taka)	225,220
Output per hectare (Kg.)	175.76
Ratios	
Capital/output	0.33
Capital/labour	7,470
Man-units/ton output	2.13
Labour cost/Taka output	0.14
Input/output	0.29

Source: Field Survey.

4800 tons of the fishmeal plant, a total of 48,000 tons of trawler catch will be necessary. This is 35 times greater than the 1976/77 trawler catch and seems practically unattainable during next several years. The slightly better performance of the Cox's Bazar plant is due to its buying of trash fish from the open market.

Freezing Plant

In 1976/77, 12 plants in the country had facilities for dressing, packaging and freezing shrimps, froglegs and finned fish. Of these plants, 5 were under the public sector, 2 under the cooperative sector, and 5 under the private sector. Description of these plants are shown in Table 10. Five more plants – 4 in private and one in public sector – have started operating after 1977. All these plants are export-oriented.

Table 9: Capital, output and related ratios for fishmeal plants, 1976/77

Items	Chittagong Plant	Cox's Bazar Plant
Capital values (Tk.)		
Building	1200,000	-
Machineries	3500,000	-
Total	4700,000	-
Number of Workders	9	5
Capacity for handling raw fish (tons)		
Per 24 hrs.	24	1.5
Per year of 200 days	4800	300
Raw fish processed in 1976/77 (tons)	27.00	73.46
Output-Quantity (tons)	4.30	20.30
Value (Taka)	30,000	142,100
Input values (Taka)		
Capital services	709,000	-
Labour services	15,300	17,000
Raw material	27,000	74,784
Oil and fuel	23,000	2,300
Others	2,250	7,700
Total	776,500	-
Ratios		
Capacity utilized (%)	0.56	24.5
Fishmeal/raw fish	0.16	0.27
Capital/output	156.67	-
Capital/labour	522,222	-
Man-units/ton output	2.09	0.25
Input/output	25.88	-

- Not available

Source: BFDC

Attempts were made to collect detailed information from all 8 Chittagong based plants assuming that these would be enough to represent the industry. However,

Table 10: Freezing plants in operation in 1976/77

Sector/Name of Plant	Location	Year Established	Capacity (tons)	
			Per 24 hours	Per year of 300 days
Public Sector				
Bay Fishing Ltd.	Chittagong	1964	5	1500
Eastern Fisheries	Chittagong	1964	4	1200
Amin Agencies (1947) Ltd.	Chittagong	1964	3	900
Bangladesh Cold Storage Ltd.	Khulna	-	4	1200
Fish Export Ltd.	Khulna	-	2.5	750
Cooperative Sector				
Chittagong Old Freezing plant	Chittagong	1966	0.5	150
Chittagong New Freezing Plant	Chittagong	1976	1.5	450
Private Sector				
Bangladesh Foods Ltd.	Chittagong	1968	8	2400
Frozen Foods Ltd.	Chittagong	1968	2	600
Chowdhury and Co.,	Chittagong	-	-	-
Eastern Sea Food Ltd.	Khulna	-	-	-
Labonchora Fish Processing Factory	Khulna	-	-	-

- Not available

Source: Karim 1978; BSFIC

information were available from 5 plants – one in the public sector, 2 in the cooperative sector and 2 in the private sector. Other plants promised, when the authors visited them in December 1978, that they would send information afterwards. They did not do so even after repeated reminders. In April they were again contacted personally. This time the two public sector plants declined to provide information and suggested to collect the same from the BSFIC Head Quarters. That was a clean departure from what they had promised in December. Under the circumstances, information received from the 5 plants are presented in Table 11. The figures in the Table should be interpreted keeping in mind the following: (1) The plants were established in the late sixties. Current book values were reported by the plants but the real current values might not have been reported. (2) Number of workers does not include management staff the cost of which is included in operation and maintenance cost. The public sector plants appeared to have more managerial staff compared to other plants. (3) Break-up of operation and maintenance cost was not available. (4) Raw material cost as a proportion of output value was lower in case of Bangladesh Foods because this plant made a very big margin on processed

frogleg. (5) Price per unit of raw fish and processed fish varied substantially among the plants (Table 12).

Table 11: Capital, output and related ratios for some freezing plants, 1976/77

Items	Name of the plant				All Plants
	Eastern fisheries	Coopera tives	Bangladesh Foods	Frozen Foods	
Capital (000 Tk.)					
Building	876	499	1,500	100	2,975
Machineries	1,439	1,059	15,000	1,000	18,498
Total	2,315	1,558	16,500	1,100	21,473
Number of workers	115	51	77	92	335
Annual capacity (tons)	1,200	600	2,400	600	4,800
Amount processed (tons)	1,116	220	206	330	1,872
Input values (000 Tk.)					
Capital services	275	179	1,980	102	2,536
Operation & maintenance	3,370	720	820	-	-
Raw material	28,755	11,692	7,845	15,259	63,551
Total	32,400	12,591	10,645	-	-
Raw material cost as % of output value	93.0	94.2	73.3	93.9	90.2
Output					
Quantity (tons)	1,029	198	175	306	1,708
Value (000 Tk.)	30,903	12,412	10,803	16,247	70,445
Ratios					
Capacity utilized (%)	93	36.7	8.6	55.0	39
Capital/output	0.07	0.13	1.54	0.07	0.30
Capital/labour	20,127	30,551	214,286	11,959	64,098
Man-units/ton output	0.11	0.26	0.44	0.30	0.20
Input/output	1.05	1.01	0.99	-	-

- Not available
Source: Offices of the Plants.

Table 12: Composition and prices of products processed by various freezing plants, 1976/77

Items	Name of Plant				All Plants
	Eastern Fisheries	Cooperatives	Bangladesh Foods	Frozen Foods	
Quantity of Fish Processed (tons)					
Shrimp	807	-	65	230	-
Frogleg	156	-	141	53	-
White fish	153	-	+	47	-
Total	1,116	220	206	330	1,872
Output (tons)					
Shrimp	766	-	62	219	-
White fish	138	-	+	44	-
Frogleg	125	-	113	43	-
Total	1,029	198	175	306	1,708
Raw material price per kg. (Tk.)					
Shrimp	32.41	-	88.40	59.62	
Frogleg	8.80	-	14.60	11.88	
White fish	8.13	-	+	19.49	
All fish	25.78	53.14	38.04	46.27	33.94
Output price per kg (Tk.)					
Shrimp	36.15	-	99.37	65.91	
Frogleg	14.00	-	39.27	19.78	
White fish	10.59	-	+	21.95	
All fish	30.04	62.68	61,23	53.16	41.23

- Not available + Not applicable

IV- CONCLUSIONS

Decline of inland fishery resources has contributed to decreased national output of fish. While output from inland sources have to be increased to meet increased requirement of fish protein, one of the immediate source of increased output has to be the Bay of Bengal where there are very good unexploited resources. With appropriate technology, the present catch of 100,000 tons can be doubled. At present trawlers, mechanized boats and sail boats are used for fishing. Trawlers are managed by the BFDC; private and cooperative sectors are involved in the other two. Because of poor account keeping by the BFDC, the relative economics of fishing by trawler and mechanized boats could not be established. In fact, the economics should not be looked at this way. Deep sea fishing will necessarily require trawler. Otherwise foreign trawlers will exploit our resources. The question is whether trawler fishing should be promoted through public or private sector. The present poor performance of BFDC trawler operation is more apparent then real. There is reason to believe that a conspiracy is going on. The present performance of BFDC trawler project should be subjected to public

enquiry and steps should be taken to run it efficiently. It has to work because national resource must be tapped by a national organization. The private sector should definitely play its role but it should not be allowed to exploit the nation because of the inefficiency of a national organization. If there is valid reason for abandoning the trawler operation as already started by BFDC, then the question of abolishing BFDC as an organization should also be considered seriously. Other activities and establishments currently under BFDC should not justify its existence. Those establishments may well be handed over to other relevant organizations, e.g. boat mechanization programme may be handled by the BJMSS, processing plants may be handed over to BSFIC etc.

Mechanized boats are capital intensive and sail boats are labour intensive operations but their input/output ratios are not very different. But sail boats have two major problems: they cannot operate in deep sea and their operation is time consuming. Therefore, the programme for mechanizing fishing boats should be expanded rather rapidly for expanding fish production. The BJMSS should play a major role in this because it already has a network of local organizations and contact that cannot be easily created. However, the credit programme of BMSS in this respect should be subjected to serious scrutiny and review before further expansion. The present repayment discipline is rather poor. Currently the machines are distributed mostly to fishermen groups. But there are allegations that in the age old pattern, real fishermen do not really get these machines. Rich fishermen form fictitious groups and catch hold of these machines.

Two BFDC trawlers were earmarked specially for catching shrimps but these are being used for multipurpose fishing. On the otherhand, the fish processing plants cannot utilize about 70 percent of their capacity because of shortage of fish. In view of this and the expanding export demand for shrimps, steps should be taken to catch more shrimps. Otherwise the nation will lose in three ways: marine shrimps will remain untapped or will be caught by foreign trawlers, the highly capital intensive processing plants will remain idle and potential export earning will be lost. In the meantime there should be a temporary moratorium on sanctioning new processing plants because too many plants have already been sanctioned without taking concomitant measures to expand production. In this connection, it should be mentioned that the performance of the shrimp culture programme in salt bed near Cox's Bazar is not yet very encouraging. The programme has a tremendous future provided it is properly handled. Allegations are there that a number of people obtained large amount of credit under this programme but invested that money somewhere else. The proper utilization of other processing plants also depend on increased marine output.

Fish carrier transport and landing facilities need immediate expansion. The effective fishing season is rather short. A significant part of this is lost by the fishing boats in traveling to and from the fishing grounds. Special purpose fish carrier transport may help save this time. Landing facilities are needed for proper and quick handling of fish and also for maintaining proper records.

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