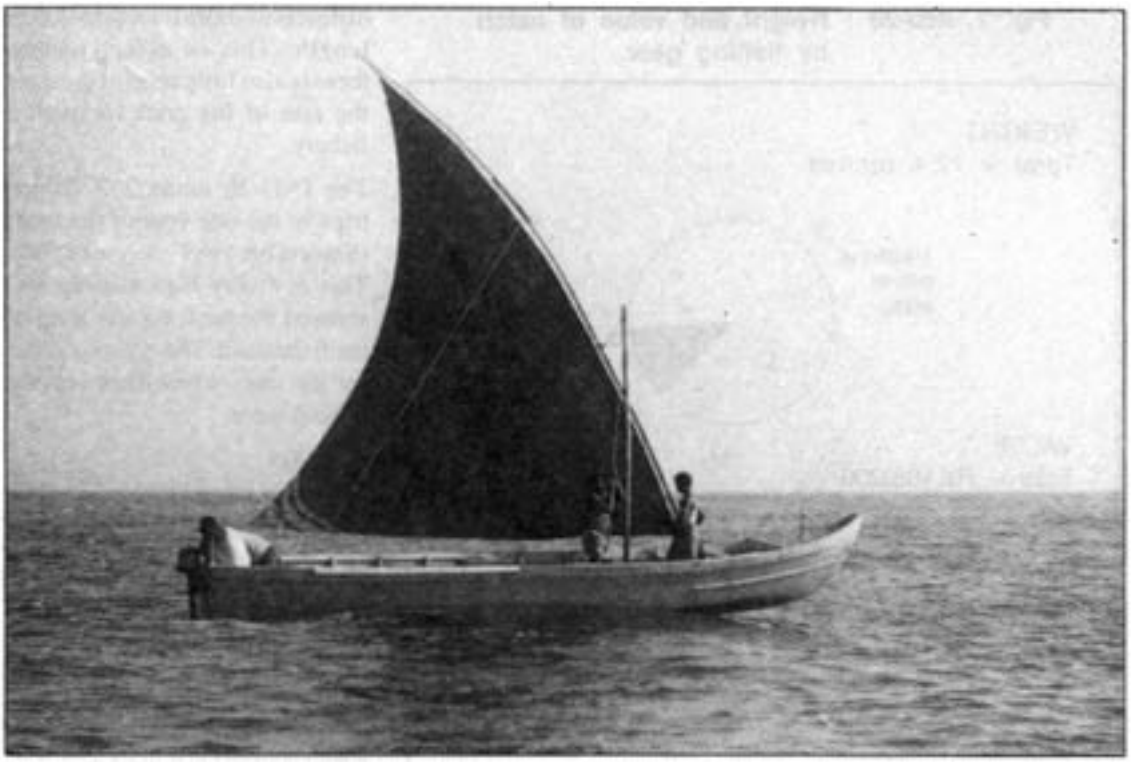


The IND-26. 8.5m with 7 hp outboard motor

5. *IND-26 : PLYWOOD CANOE, 8.5 m WITH 7 hp OUTBOARD MOTOR*

5.1 Fishing trials

The prototype IND-26 (Figure 9, see page 14) was transferred to a crew of three fishermen in Poonthura village in June 1989. The canoe was equipped with the following fishing gear:

Type of Fishing **Gear**

Twine size (denier)	*Stretched mesh size (mm)*	*Ilung length per piece (m)*	*Cost per piece (Rs)*	*Pieces (No)*	*Total length (m)*	*Total cost (Rs)*
Traditional driftnets						
210d3	62	140	3000	5	700	15,000
210d3	80	120	3500	2	240	7,000
210d9-12	90	140	4500	3	420	13,500
Trammelnet (disco)						
210d9	300					
210d2	20	135	2000	2	270	4,000
HOOK AND LINE *(Multi-hook trolling line and handline)*				2	100	500
				TOTAL COST (Rs)		40,000

Fishing with small mesh driftnets is generally carried out 10-15 nautical miles from the shore. The outboard powered canoes leave about 15.00-16.00 hours and return the next morning at about 07.00 hours. At a speed of 7 knots it takes upto two hours to reach the fishing area.

The fishermen constantly adopt different combinations of nets, but most commonly use four nets of 62 mm and two nets of 80 mm, a total length of 800 m. The reason for not using more nets, as stated by the fishermen, was the difficulty of supervising the end of the fleet of nets stretching further than 800-900 m from the boat; other boats could start hauling in the nets at that end and steal not only the fish but, sometimes, even the nets. There is, therefore, little advantage in Kerala in using small mesh

Fig. 7. IND-26 : Weight and value of catch by fishing gear

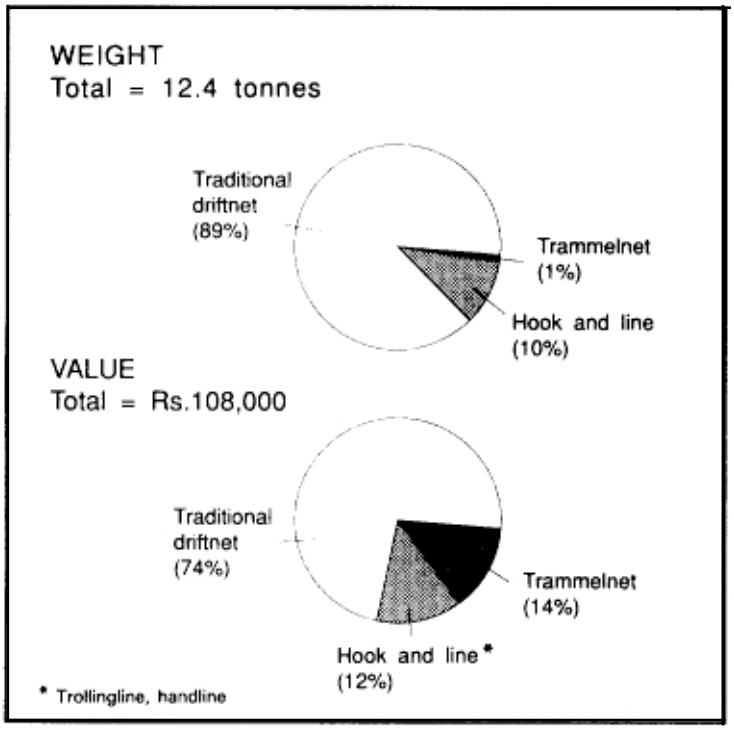
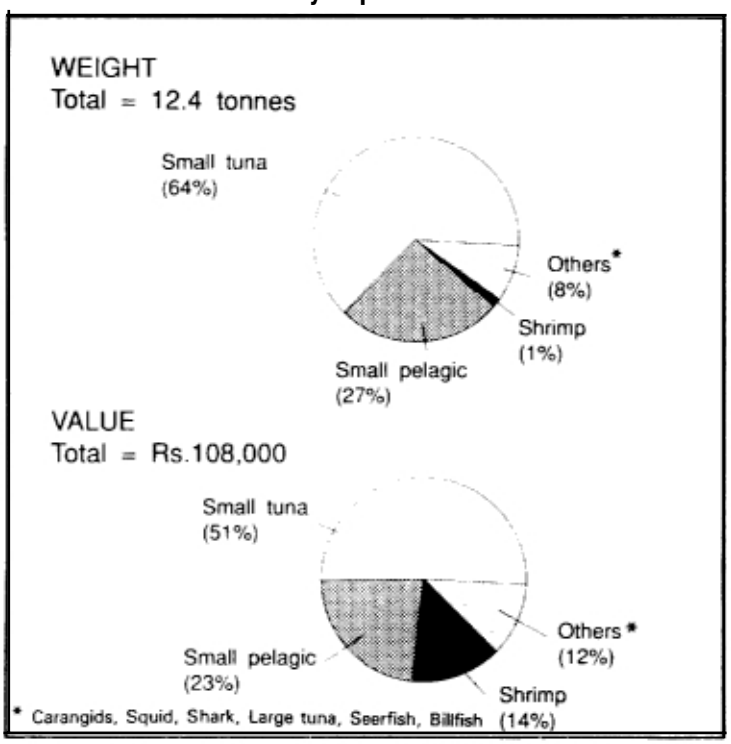


Fig. 8. IND-26 : Weight and value of catch by species



drift nets of more than 800 -900m in length. This in effect means. there is also little need to increase the size of the craft for such a fishery.

The IND-26 made 273 fishing trips in the one year of the trials (September 1989 - August 1990). This is a very high number and showed the prolessional level of the fishermen. The reasons given for the days when there was no fishing were:

Holidays	61
Engine problems	13
Rough weather	9
Mending of fishing gear	3
Other reasons	6
TOTAL NON-FISHING DAYS	92

The number ot days lost due to rough weather is remarkably few. This is. to a great extent, due to the prosimily of the harbour vvheie craft could operate from May to September.

5.2 *Catch data*

The total catch over the one year September 1989 - August 1990 was 12.4 tonnes. valued at Rs. 08.000. The average catch Per trip was 45 kg and valued at Rs 395 A detailed record is given in Table 1.

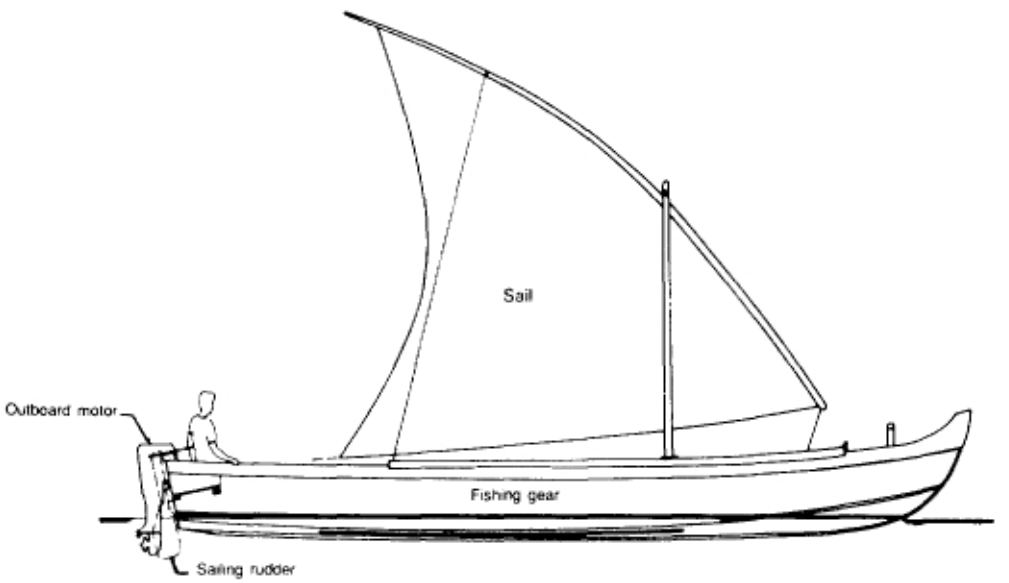
The traditional driftnett con— tributed 89 percent of the catch in weight and 75percent in value (Figure7. It is also of interest to note that the trammelnet for shrimp, used in June alone. caught only 1 percent in weight bL it accounted for 14 percent of the otal value. Further study, to investigate means of extending the fishing season for shrimp and improving the catching ability of the trammelnet seems well justified. This would inciease the access of the small—scale fisherman to the rich shrimpre sources of Kerala.

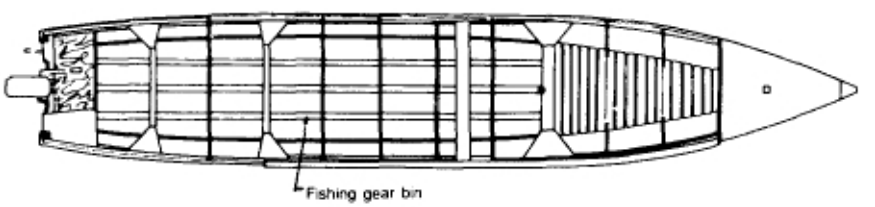
Small tuna and small pelagics constituted 91of the catch by weight and 74 percent by value (Figure8).

Table 1: IND-26 : Record of catch, earnings and expenses

Month/Year		SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	TOTAL
PART I														
1. **Fishing Time**														
No. of fishing days		21	23	21	23	20	23	26	20	24	25	23	24	273
No. of man-days		63	69	63	69	60	69	78	60	72	75	69	72	819
Hours at sea		296	311	293	345	306	355	384	301	323	312	313	226	3765
Hours fishing		171	202	184	169	172	214	264	207	205	199	190	127	2304
Sail time eng		95	98	92	169	127	141	117	90	118	113	123	99	1382
Engine + Sail		30	11	17				3	4					65
Sail					7	7								14
2. Gearwise catch and Earnings														
Drifmet	wgt. (kg)	1219	728	376	906	970	868	924	1456	1885	783	865	59	11039
(Traditional)	val. (Rs.)	8388	6609	2490	6114	5632	5969	6940	9469	11258	7804	8572	598	79843
Trammelnet	(kg)										145			145
	val. (Rs.)										15115			15115
Hook and Line (multi hook trolling and handlines	wgt. (kg.)		98	278	422	15	16						346	1175
	val. (Rs.)		4255	1602	2459	100	74						4458	12948
Total	wgt (kg)	1219	826	654	1328	985	884	924	1456	1885	928	865	405	12359
	val. (Rs.)	8388	10864	4092	8573	5732	6043	6940	9469	11258	22919	8572	5056	107906
PARTII														
3. **Specieswise** Catch and Earning														
Small tuna	wgt. (kg.)	1013	502	230	884	655	706	477	1233	910	783	498	59	7950
	val.(Rs.)	6884	3059	1225	5766	3794	4757	3557	8036	5146	7804	4946	598	55572
Small pelagics	wgt. (kg.)	161	31	404	293	20	120	447	223	975		312	346	3332
	val. (Rs.)	829	220	2421	1702	126	856	3383	1433	6112		3001	4458	2454 1
Prawn	wgt. (kg.)										145			145
	val. (Rs.)										15115			15115
*** Others**	wgt. (kg.)	45	293	20	151	310	58					55		932
	val. (Rs.)	675	7585	446	1105	1812	430					625		12678
TOTAL	wgt. (kg.)	1219	826	654	1328	985	884	924	1456	1885	928	865	405	12359
	val. (Rs.)	8388	10864	4092	8573	5732	6043	6940	9469	11258	22919	8572	5056	107906
PART III														
1. Total Sales Value (Rs.)		8388	10864	4092	8573	5732	6043	6940	9469	11258	22919	8572	5056	107966
2. Variable Operational Costs — Fuel (kerosene/petrol)		1910	1650	1860	3495	2785	2985	2615	2022	2533	2560	2746	2208	29369
Food		1260	1380	1260	1380	1200	1380	1560	1200	1440	1770	1380	1440	16650
TOTAL		3170	3030	3120	4875	3985	4365	4175	3222	3973	4330	4126	3648	46019
3. Cash flow before payment to crew and boat-owner (1 – 2)		5218	7834	972	3698	1747	1678	2765	6247	7285	18589	4446	1408	61887
4. Distribution of cash flow to : — Crew members (50% of 3)		2609	3917	486	1849	873	839	1382	3123	3642	9294	2223	704	30943
5. Gross cash flow to boat-owner (50% of 3)		2609	3917	486	1849	873	839	1382	3123	3642	9294	2223	704	30943
6. Repairs — craft		70										135		205
— Fishing Gear			25				260	115						400
— Engine			119	769	215	1760	360	145		210				3578
TOTAL		70	144	769	215	1760	620	260		210		135		4183
Net cash flow to boat-owner (5-6)		2539	3773	-283	1634	- 887	219	1122	3123	3432	9294	2088	704	26760

*** carangid. shark, largetuna, seer fish and bill** fish



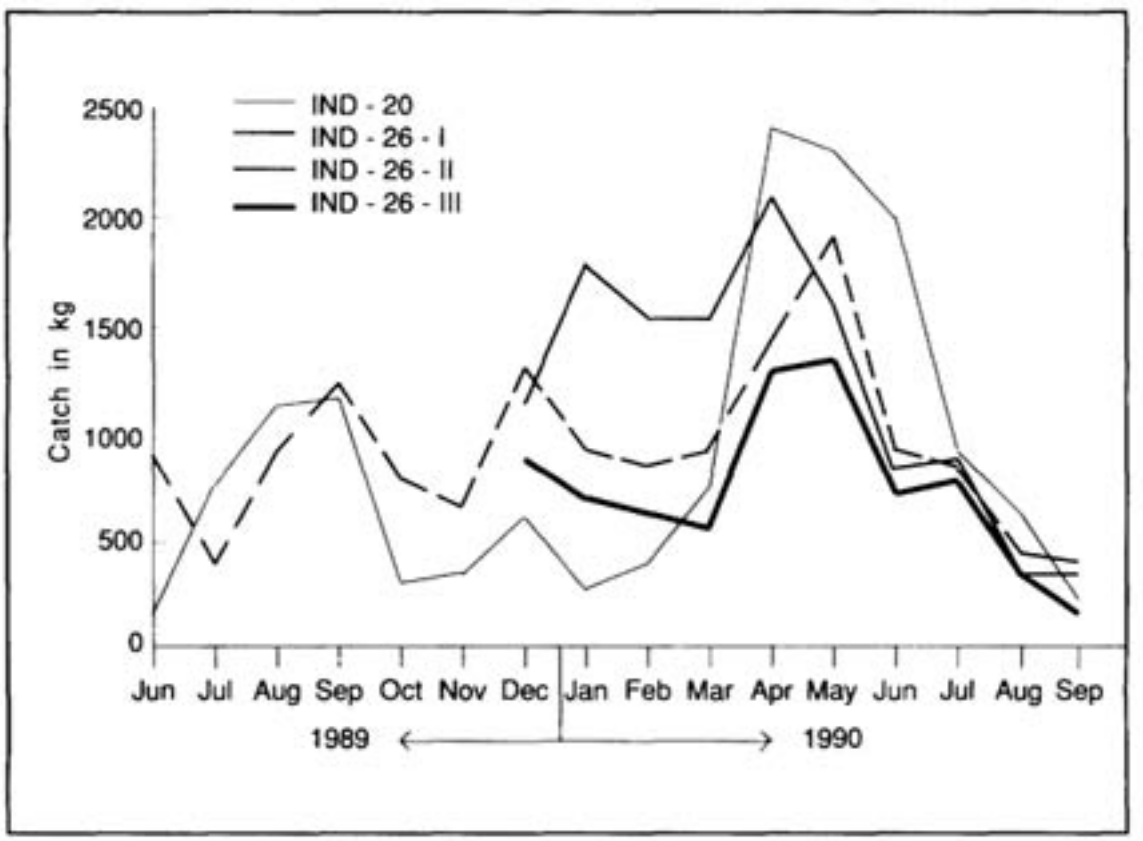


PARTICULARS

Length overall	LOA	: 8.5 m
Beam moulded	B	: 1.55 m
Depth moulded	D	: 0.78 m
Cu No	LOA x B x D	: 10.3m³
Outboard motor	Kerosene	: 7 hp
Sail	Lateen	: 15 m²

The good results obtained by the prototype encouraged MATSYAFED to order two more canoes of IND-26 design from a private boatyard. These canoes were handed over to fishermen in Poonthura in December 1989. The monthly catches of these two canoes, called IND-26 II and IND-26 III, show a pattern similar to that of the original IND-26 (Figure 10). The catch record of IND-20 is also given for comparison.

Fig. 10. Monthly catches by different craft



5.3 Design modifications

In order to determine the effect of some design changes on speed and seaworthiness, two canoes of modified IND-26 design were ordered by MATSYAFED from SIFFS boatyard at Veli, Trivandrum. IND-26A had sharper waterlines in the bow, but no changes aft, while IND-26B was 0.60 rn shorter in length and had a deck installed with a net bin midship.

Trials proved that IND-26A, although having better performance in a head sea, did lose some stability. The IND-26B did not have sufficient stability and was later converted to an open canoe. Overall, the original IND-26 was preferred. The conclusion of the trials with the IND-26 type was that the original version was very good and should be the one used in the future with only a few minor modifications. The prototype operated from Poonthura village for 16 months without any structural problems. The three owners of this type of craft were very satisfied with the sea-kindliness, stability and strength of the construction.

5.4 Engine and speed performance

All the IND-26 craft were fitted with 7 hp outboard motors of Japanese origin. These motors are manufactured by companies with long experience and large resources for research and development. The end product is, therefore, reliable and of relatively low cost. The problems with them lie in the use of kerosene as fuel. This creates high wear on the motor and leads to high repair costs and a short service life (of only about three years). Because spare parts are imported and carry a heavy duty, they are expensive. Another problem connected with the use of this fuel is shortage of kerosene at government rates. This forces the fisherman to buy most of his kerosene in the open market at a higher cost.

Despite these drawbacks, the kerosene outboard motors have become extremely popular in Kerala, with the number of motors increasing from nil in 1980 to an estimated 11,000 in 1990. The bulk of the outboard motors are the 7 hp Yamaha, but other makes, such as Suzuki and Mariner, have also been introduced. The main advantages of the outboard motor are the relatively low purchase price and its low weight and portability. The latter enable the motors to be easily taken to the workshops for repairs. There are many mechanics in Kerala experienced in the repair of outboard motors, and spare parts, although expensive, are freely available.

Calm water speed trials were performed in Vizhinjam harbour to measure the performance of the new IND-26 design. The speed was measured with an electronic STOWE trailing log. Two different loadings were tested:

Load	Speed
500 kg (8 men)	7.2 knots
750 kg (12 men)	6.8 knots

The new design is slightly faster than the comparable size of plywood vallams. Tests conducted in a choppy sea outside the harbour showed a considerable better performance by the IND-26 in a head sea compared with that of the existing design of plywood vallam, which slammed heavily due to the flat bottom in the forebody.

5.5 Construction materials and costs

The IND-26 was built of aini timber and marine plywood. A cost breakdown is shown in Table 2.

Table 2: IND-26 - Breakdown of construction costs

Item	Unit	Qty	Price/unit RS	Cost RS
Timber. Aini. sawn	Cub ft	20 80	23.5 00	4888 00
Marine plywood Y mm (8'x4')	Sheet	900	773 00	69.57 00
BWR plywood Y mm (8'x4')	Sheet	1 50	500 00	7.50 00
Epoxy resin, Araldite 103 + hardener	kg	300	445 00	133s 00
Epoxy resin. Araldite 106 + hardener	kg	6 24	320 00	1996 80
Polyester resin	kg	53 00	71 00	3763 00
Chopped strand mat 450 g/m2	kg	12 00	75 00	900 00
Woven roving 200 g/m2	kg	0 75	145 00	108 75
HDG nails 3.35 x 32 (10g x 1-1/4")	kg	700	20 00	140 00
Copper nails 4 x 51 (10g x 2")	kg	0 65	12s 00	81 25
Copper nails 4 x 63 (10g x 2-1/2")	kg	0 20	125 00	25 00
Copper nails 4 x 76 (8g x 3")	kg	0 35	125 00	4 3 75
Copper nails 4 x 89 (8g x 3-1/2")	kg	0 15	125 00	18 75
Copper nails 4 x 100 (8g x 4")	kg	0 05	125 00	6 25
Copper nails 4 x 152 (8g x 6")	kg	0 15	125 00	18 75
Carriage bolts HDG 5/16" x 3"	Nos.	11 00	3 00	33 00
Carriage bolts HDG 5/16" x 4"	Nos.	1 00	3 00	3 00
Carriage bolts HDG 5/16" x 6"	Nos.	600	3 00	18 00
Copper washers	kg	0 18	160 00	2x 80
Brass wood screws (9g x 30)	100pcs	0 24	85 00	20 40
Brass wood screws (12g x 60)	100pcs	2 37	161 00	381 57
Wood primer	litre	5 .70	45 00	256 50
Gloss paint	litre	8 00	80 00	640 00
Chalk powder	kg	1 50	5 00	7 so
		TOTAL MATERIAL COST		22421 07
Labour	Mandays	70 00	82 00	5740 00
Overheads & profit 10%				2816 11
			SELLING PRICE	30977 18

The selling price of the IND-26 was estimated at Rs 31 .000 in August 1990. This includes FRP covering of the lower parts upto just above the waterline.

The total investment cost of the final version of IND-26, including outboard motor and fishing gear. was as follows:

	Rs.
Hull	30,000
7 hp outboard motor	22,000
Sail rig	1000
Fishing gear	40,000
TOTAL INVESTMENT (no subsidy)	**93,000**

The cost of an IND-26 canoe in FRP may be estimated from the weight of the canoe and the material cost. The plywood version weighs 400 kg. The FRP version will be about 15 per cent lighter, that is, about 340 kg. Assuming 10 per cent wastage. the FRP material weight would be 375 kg. The cost of FRP materials in October 1990 was 7 1 Rs/kg for polyester resin, isothalic, 85 Rs/kg for chopped strand mat.

Assuming 72 per cent polyester resin and 28 per cent chopped strand mat, the cost of the FRP laminate will be 75 Rs/kg. The FRP material component in an IND-26 would, therefore, cost 375 kg x 75 Rs/kg = Rs.28,125/-. In addition, there are plywood tloorboards and various fittings costing about Rs.3000/-. The total material cost will therefore be about Rs.3 1,000/-.

The labour cost of the FRP canoe will be lower than of the plywood canoe, but the overhead costs would be higher because of the cost of the mould.

The comparative cost picture of the IND-26 in plywood and FRP would. therefore, he:

	Plywood Rs.	FRP Rs.
Materials	2 1,000	31,000
Labour	5000	3000
Overheads + Profit	4000	7000
SELLING PRICE	**30,000**	4 1,000

The price of the plywood canoe is based on a plywood cost of Rs.820 per sheet of 9 mm x 1.2 x 2.4 m. This cost has risen rapidly over the last few years, but the FRP prices are also going up. It is. therefore, difficult to predict future price levels. But at present it seems that a fisherman will not be willing to pay an additional 30 per cent to get an FRP canoe, although the question of status could be important in his decision. Saving on maintenance cost by using FRP would not be considerable, as the plywood canoe is in any case covered with FRP up to just above the waterline. Repairs of plywood canoes are more easily done at village level. Plywood canoes also permit a more decentralized construction. But the service life of a well-built FRP canoe is, probably. longer and, therefore, the depreciation per year will be lower than for the plywood canoe.

It must, however, be noted with concern that, since materials constitute the major portion of the cost in a FRP canoe, there is a temptation by the manufacturer to reduce the thickness of the FRP laminate. There is also a temptation to use inferior, cheaper grade of plywood to cut costs in the case of plywood canoes.

Any private company wanting to go into FRP construction should be encouraged. It is only in this way that fishermen will get a choice of construction material which they do not have at present.