BAY OF BENGAL PROGRAMME

DEVELOPMENT OF SMALL-SCALE FISHERIES

FISHING CRAFT DEVELOPMENT IN KERALA: EVALUATION REPORT

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BOB P/WP/25
(GCP/RAS/040/SWE)

FISHING CRAFT DEVELOPMENT IN KERALA: EVALUATION REPORT

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Executing Agency:

Food and Agriculture Organisation of the United Nations

Funding Agency:

Swedish International Development Authority

Development of Small-Scale Fisheries in the Bay of Bengal
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This paper results from a project to examine various development alternatives concerning fishing craft development in Kerala. The project, which was in operation from April 1981 to April 1983, was meant to provide the Kerala Government with information needed to make investment decisions concerning craft and engines.

Specifically, the project examined whether the performance of Thanguvala canoes can be improved by motorising them with locally made engines; whether a new type of sailcraft can be developed to replace traditional dugout canoes; whether motorisation can improve the efficiency of small-mesh gillnetters; and whether a new type of engine-cum sail beachcraft can be developed to operate large-mesh driftnets.

Fishing trials for project activities were held in co-operation with local fishermen and crew at villages near Quilon and Trivandrum. On behalf of BOBP. consultant Oyvind Guibrandsen provided technical assistance for executing the project. On behalf of the Government of Kerala, Mr V G Joseph, Co-ordination Officer in the Directorate of Fisheries, provided counterpart assistance.

The project was initially funded by the FAO/UNDP project RAS/77/044, “Small-Scale Fisheries Promotion in South East Asia”, and later by the FAO/SIDA project, GCP/RAS/040/SWE, “Development of Small-Scale Fisheries in the Bay of Bengal”.

The RAS/77/044 project, which terminated in 1981, undertook factual surveys and documentation on small-scale fisheries to help researchers, government planners and investors.

The GCP/RAS/040/SWE project aims at developing and demonstrating appropriate technologies and methodologies to improve the conditions of small-scale fisherfolk in five member-countries that border the Bay of Bengal—Bangladesh, India, Sri Lanka, Malaysia and Thailand.

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1. INTRODUCTION

1.1 About 70% of the annual fish catch in Kerala is landed by some 27,000 non-motorized canoes and kattumarams. The Kerala Government has, in its proposed fisheries schemes in the recent development plan, put special emphasis on the traditional sector to increase fish landings and improve the income of fisherfolk. In the current plan it is proposed to supply 800 engines for motorization of traditional craft and to introduce 1000 FRP canoes fitted with engines.

1.2 The main purpose of the Fishing Craft Development Project was to clarify the technical and economic implications of various development alternatives, thereby providing the Kerala Government with the information required for making investment decisions in the field of craft and engines. The project became operational in April 1981 and was terminated in April 1983.

2. OBJECTIVES OF THE PROJECT

2.1 Long-term objectives

A higher fish production and improved productivity and income of the marine small-scale fisheries.

2.2 Immediate objectives

In the short term, the project shall lead to a sounder technical basis for state-supported investment programmes in the fisheries sector, in particular through:

(a) demonstration of improved economic performance of the “thangu vala” canoe by motorization with an inboard diesel engine;

(b) development of a new type of sailing craft as a replacement for dugout canoes;

(c) fishing trials with motorized and non-motorized craft utilizing small-mesh gillnets; and

(d) development of a new type of motorized-cum-sailing beach-based craft for operating large-mesh driftnets.

3. MOTORIZATION OF “THANGU VALA” CANOE WITH INBOARD DIESEL ENGINE

3.1 The “thangu vala” is a lampara-type net of about 150 m length used to surround surface schools of sardine and mackerel. It is used in the area between Quilon and Cochin and operated from beachlanding canoes (“thangu vallams”) of length 15 m, beam 1.4 m, and depth 0.85 m. Previously the “thangu vallams” were made as dugout canoes, but all new ones are of planked construction, the planks being tied together with coir rope in combination with tencn and mortise joints. The crew consists of 12 oarsmen and 3 helmsmen/fishing leaders. In favourable winds a lateen sail of about 25 m^2 is utilized.

3.2 Trials with motorization of the “thangu vallam” were first made by the Indo-Norwegian Project in Neendakara around 1955. The conclusion from these trials was that the vibration of an inboard diesel engine caused leaking problems in the stitched canoes and that the high operating costs of a petrol outboard engine together with less reliability did not make motorization an attractive alternative.

3.3 In September 1980 new motorization trials were started by the Kerala Fishermen's Welfare Corporation in Purakkad near Alleppey. The following three alternatives were tried:

(a) Inboard diesel engine of 9 hp with Z-drive through the starboard side of the hull.

(b) Outboard diesel engine of 5 hp fitted to a bracket on the starboard side.

(c) Outboard kerosene engine of 7 hp fitted to a bracket on the starboard side.

3.4 Data were collected for the month of October 1980 comparing three motorized canoes with three non-motorized canoes. Each canoe carried the same crew of 15 men required for hauling the "thangu vala". The data from the trials were analyzed in the report prepared by the Programme for Community Organization Centre in Trivandrum—"Motorization of traditional canoes: the Purakkad experiment". The report shows that the motorized canoes caught on an average 70% more fish per trip than the non-motorized canoes; this was due to:

(a) their ability to search for fish schools over a larger area, and

(b) setting the "thangu vala" quicker around the school.

The motorized canoes also made more trips (20 versus 14); so the total value of the catch over one month was 128% higher with the motorized canoes than with the non-motorized canoes.

3.5 A trial period of one month is too short to draw definite conclusions but the spectacular increase in the catch proved the economic feasibility of motorization of the "thangu vala" units. The question was: which of the engine alternatives would be most suitable? There would be obvious economic advantages in using a diesel engine produced in India. In addition to the two "diesel alternatives" tried in Purakkad, the Project investigated the possibility of using the same type of installation as had been tested in beachlanding trials by the Bay of Bengal Small-Scale Fisheries Project. This power unit consisted of a 5 hp industrial air-cooled diesel engine installed in a watertight box and driving through a "power pole" shaft to the propeller without a neutral or reverse gear. The box is pivotable so that the propeller and rudder can be retracted into a hole in the bottom of the hull when landing on the beach. The advantage over the other "diesel alternatives" would be a reduction in cost.

3.6 To install the unit in the aft end of the canoe, two watertight bulkheads had to be bolted in place and a hole in the keel section cut for retracting the propeller and rudder. The fishermen objected to the keel being cut maintaining that the canoe would be weakened. They preferred the simpTer side installation of the outboard motor which did not require any structural changes. The fishing trials, however, proved that the main disadvantage of the installation was the risk of getting the "thangu vala" net fouled with the propeller during setting, especially when strong currents were experienced. Several times the net had to be cut loose from the propeller. A pipe fixed to the side with the purpose of leading the net further out during setting did not solve the problem. The conclusion, therefore, was that the centrally mounted engine and propeller was not acceptable because of the risk of getting the net into the propeller. This problem did not occur with the outboard engines mounted on the side opposite to the one from which the net was set and also further forward.

3.7 In spite of the advantages of the Indian-made diesel engines in fuel economy and spare part supply, it was the imported kerosene outboard engine that was eventually preferred by the fishermen. The diesel engines and the transmissions suffered from various defects and could not match the kerosene engines in reliability. The increase in catches with motorization was so great that the fishermen considered fuel economy of lesser importance. In a period of three years, the importer of the Japanese-made outboard engine has sold close to 2,000 engines, about 80% being 7 hp engines and the remaining 12 hp. The cost of the 7 hp engine is Rs. 11,200 and the 12 hp Rs. 15,600. Included in the price is 67% import duty and 8% sales tax. Spare parts are expensive, being charged with 200% import duty.

3.8 The importer in the initial stage provided credit to the fishermen for buying outboard engines but has now stopped this due to problems with loan recovery. The Kerala Fishermen's

Welfare Corporation now provides a subsidy of 25%, limited up to Rs. 3,000. For a 7 hp engine the finance scheme works out as follows:

Cost of engine & installation	.. ..	**Rs. 13,500**
Down payment by fishermen, 7½%		Rs. 1,012
Subsidy	.. ..	Rs. 3,000
Bank loan — 2 years repayment	..	Rs. 9,488
Total	..	Rs. 13,500

In 1982, 600 engines were issued under this scheme. For 1983, the number was reduced to 500 engines.

3.9 Some "thangu vallams" have recently been motorized with 12 hp kerosene outboard engines. The urge for more speed and the competition among the fishermen will always lead to an escalation in power without any economic justification. It has been proved that a 7 hp outboard engine gives satisfactory performance and the trend towards larger engines should be discouraged. Even the 5 hp outboard engine gave a higher speed than 12 men with oars.

4. IMPROVED SAILING CRAFT FOR SMALL-MESH GILLNETTING

4.1 Gillnetting for small pelagic species is done from dugout canoes, ptanked canoes and kattumarams. The kattumarams are utilized in the southern areas of Kerala and have a fairly good sailing performance partly due to the use of two centerboards to prevent side drift. The canoes do not use leeboard or centerboards and can therefore utilize the sail only with the wind from abeam and aft.

4.2 The project wanted to explore the possibility of introducing a non-motorized craft with a superior performance under sail compared with the canoes in order to reduce the need for rowing. Although the traditional canoes could be fitted with a leeboard, the narrow beam gives insufficient stability for sailing closer to the wind. A new craft (IND—17) was designed with the main emphasis on sailing performance. Its characteristics compared with those of an average-size traditional canoe are as follows:

		IND—17	Traditional canoe
Length overall (LOA)		7.8 **m**	**9.0 m**
Beam (B)		1.95 m	0.94 m
Depth (D)		0.69 m	0.52 m
Cubic number LOA x B x D		10.5 m^3	**4.4** m^3
Weight of hull		490 kg	440 kg
Sail:	Main sail	17.6 m^2	16 m^2
	Jib	6 m^2	
	Total	23.6 m^2	16 m^2
Crew		**5**	**4**

It can be noticed that the IND—17 was considerably larger in volume than the canoes, but, due to construction in 12 mm marine plywood, the weight was only slightly more. To give good windward sailing ability the IND—17 carried a leeboard that could be shifted from side to side when tacking. Steering was with a stern-mounted rudder rather than with a steering oar as used on the canoes. For surf crossing, a special steering oar was provided. The sailing rig was of the Gunter type which has the advantage of a short mast and yard which are relatively easy to erect and take down when converting between rowing and sailing. The mast is a teak pole, the yard and boom of bamboo, and the rigging of low stretch polyester rope. Figures 1 and 2 show the boat under sail and oars and Figure 3 a local canoe.

4.3 Two boats of the IND—17 type were built and fishing trials started from Tangassery village near Quilon in October 1981. A person from the village was appointed to collect data from the fishing of the two boats named FAO—3 and FAO—4 and from two local canoes. The fishing trial data sheet is shown in Appendix 1. The two FAO boats proved to have a superior sailing performance especially to windward compared with the local canoes. However, data collected over the first four months showed that although this should have been the best period of the year, suitable sailing winds were available only for about 50% of the time. Usually sail could be used going to the fishing ground in the evening, while the return during the night had to be made with oars. The use of oars became more important than anticipated and in this respect the FAO—3 and 4 were inferior to the canoes because of increased beam and freeboard.

4.4 From data collected over a full year one finds that the use of sail by the canoes was as low as 14% of the total travelling time, mainly because no sailing was done during the monsoon months from June to September. This figure is probably lower than the average yearly figure because of the abnormal wind conditions experienced during 1982. Possibly a more realistic average figure would be around 25% use of sail. In any case it clearly shows that an improved sailing craft can reduce the amount of rowing only to a limited extent. Improvement in sailing performance is certainly worthwhile, but it must not be done at the expense of rowing performance.

4.5 The catch data over four months showed an average increase of 24% in the gross income of the two non-motorized FAQ boats compared with the canoes. This increase is mainly due to the increase in the amount of fishing gear carried by the FAO boats. Lack of funds means that most canoes are not carrying sufficient nets.

4.6 The operation of the two FAO boats provided much valuable experience regarding the characteristics of a future non-motorized craft. Through discussions with the crew of the FAQ boats the following points emerged:

(a) Overall beam should bo reduced from 1.95 m to around 1.40 m and depth moulded reduced from 0.69 to 0.60 m.

(b) The reduction in beam and depth will make it easier to row the boat and also for handling it on the beach.

(c) The leeboard is essential for good sailing performance.

(d) The Gunter rig was well liked, but for a narrower craft,the sail area must be reduced; therefore, the local lateen rig should also be considered.

(e) The stern must be sufficiently narrow to permit a man paddling on both sides when crossing the surf.

(f) The decked area in the bow gives protection to the crew in rainy and windy weather, but is not essential.

(g) The cost should ideally not be higher than Rs. 15,000.

The BOBP-designed craft IND-17 under sail (Figure 1, right) and on a rowing trip (Figure 2, below). The craft weighs only silghtly more than a canoe, but its volume is considerably more than a canoe's.

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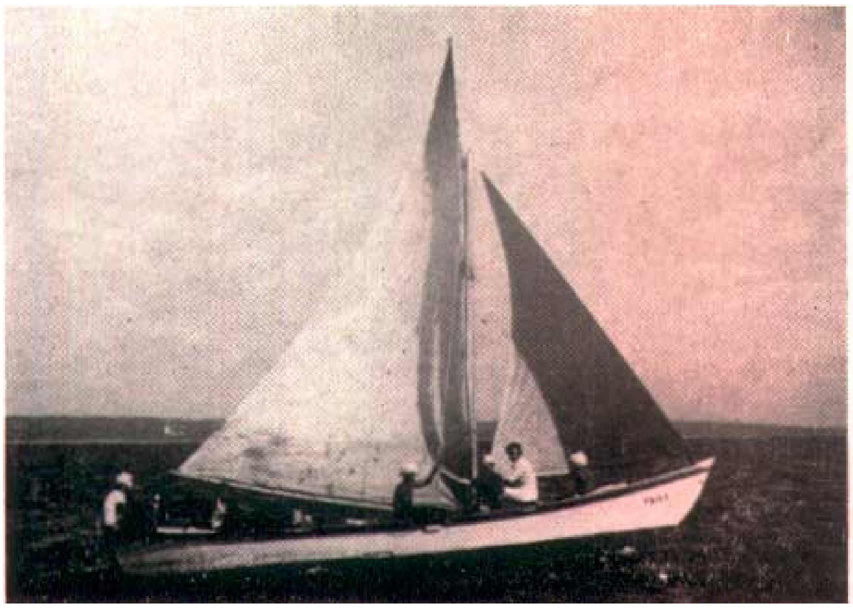
Above: Traditional Kerala canoes (Figure 3). Right: Installation of outboard engine on IND-17 (Figure 4). Be/ow; The IND-18, an engine-cam-sail beachlanding craft for large mesh gil/net fishing, designed by BOBP (Figure 5).



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any significant advantage. There is also no advantage in going far out from the shore because the oil sardine,lesser sardines and mackerel form surface schools within 10 km from the coast and are, therefore, generally within the reach of the rowing canoes. The motorized craft have the advantage of travelling further along the coast to areas with higher densities of schools. Because of higher speed the motorized boat can get back to the beach faster than the canoes and thereby obtain a higher price. This advantage would disappear as more motorized craft are introduced.

5.4 Figure 6 shows the yearly variations in the gross income per trip. The average gross income per trip is Rs. 182 for the motorized boats and Rs. 115 for the canoes. This is an increase of 58%. Assuming that the catch per length of net is constant, the income per trip can be assumed as follows:

	Gross income per trip
Non-motorized canoe with full complement of nets	Rs. 115
Non-motorized FAO boats with 14% increase in amount of nets compared with the canoes	Rs. 131
FAO boat with outboard motor	Rs. 182

The motorization represents an increased income per trip of Rs. 51 or about 39% compared with a non-motorized boat with the same amount of nets. From this added income must be subtracted the cost of motorization:

(a) Fuel cost per trip 4.3 litre/trip x Rs. 4.00/litre oil + kerosene	Rs. 17
(b) Depreciation of engine Rs. 12,000 over 3 years at 15% interest 200 trips per year	Rs. 25
(c) Repair costs Rs. 800 per year/200 trips	Rs. 4
Total cost per trip	Rs. 46

When the cost per trip is subtracted from the gross earnings of Rs. 182, the net earnings become Rs. 136 per trip which is only slightly more than what one would expect from a non-motorized craft carrying the same amount of nets (Rs. 131).

Motorization has not, therefore, increased the income per fisherman. The added return per trip goes to pay for the fuel and the depreciation of the engine. On the positive side one must, however, account for the much reduced toil and strain of rowing for 2 to 3 hours on every fishing trip. There is no doubt that reducing the fatigue of rowing makes motorization very attractive to the fisherman.

5.5 Why does the catch over the year for the motorized boats increase only by 30% while the catch per trip is increased by 58% compared with the canoes? The answer lies in the reduced number of fishing trips by the motorized boats. The motorized boats made 231 trips over one year while the canoes made 282 trips. The difference is 51 trips. The canoes sometimes made two trips a day when the motorized boats made only one. The main reason for the loss of fishing days was, however, lack of kerosene or breakdown of engine. Even though the motorized boats could go fishing by rowing in the same way as they had done before the engine was fitted,they did not do this. The loss of fishing days over the year was as follows:

	Motorized boats	Canoes
Holidays	63	63
Rough weather	38	31
Poor catch expectancy	25	20
Crewsickorabsent	15	18
Engine breakdown	8	
Lack of kerosene	12	
Total loss of days	161	132

5. MOTORIZATION OF CRAFT FOR SMALL-MESH GILLNETTING

5.1 After having concluded the sailing trials, the two FAQ boats in Tangassery were fitted with a 7 hp kerosene outboard engine of the type utilized by the "thangu vala" canoes. The engine is mounted in a well giving good protection in case of capsize. See Fig. 4. The sailing rig was kept unchanged to be utilized in favourable winds to save fuel. The trials started in April 1982 and carried on for one year until the end of March 1983.

5.2 The local canoes used for comparison were equipped with nets to their full carrying capacity. The type and the amount of the various small-mesh nets are shown below:

Type of net	Length of net in meshes			
	FAO—3	FAO—4	Canoe—1	Canoe—2
Oil Sardine Net				
Mesh size—38 mm Depth — 200 meshes	17,000	20,000	18,800	17,000
Sardine Net				
Mesh size—31 mm Depth — 300 meshes	21,000	22,900	14,000	18,500
Mackerel Net				
Mesh size—55 mm Depth — 200 meshes	12,300	9,400	11,000	11,200

The two FAQ boats carry on average 14% more nets than the canoes.

The fishermen on the motorized boats stated at the commencement of the trials that the amount of nets carried was near the limit of what they could handle. At the end of the trials, however, the crew maintained that they in fact could have carried more nets. They would have liked to have a mackerel net of 20,000 meshes length instead of the 9,400—12,300 meshes length actually used. Whether this wish is a result of a good mackerel season is difficult to say. Certainly the capacity of the motorized boats would have allowed a greater amount of nets to be carried. According to the fishermen, the limitations are more on the amount of nets that can be effectively maintained by the crew and the work involved in clearing the nets for fish after returning to the beach.

The motorized boats were also fitted out with a large-mesh driftnet costing Rs. 15,000. The fishing trials showed that the return on the fishing with this net was low in relation to the investment. The comparison between the motorized boats and the canoes has, therefore, been made on the basis of using small-mesh driftnets only. On the trips where the motorized boats used large-mesh driftnets it is assumed that their catch with small-mesh nets would have been the same as the average of the two canoes with a 14% increase for the larger amount of nets carried on the motorized boats. Likewise, since not all boats were fitted with prawn nets, the prawn catches have been omitted.

5.3 Appendix 2 shows the gross income over one year. The motorized boats have an average gross income of Rs. 42,200 compared with Rs. 32,400 for the canoes. The increase of 30% is partly due to the increased amount of nets carried and partly due to motorization. One will note that for small-mesh gillnetters, the catch increase due to motorization is considerably less than what was experienced with "thangu vala" canoes (30% versus 128%). This is due to the more passive nature of fishing with small-mesh gillnets where increased speed does not represent

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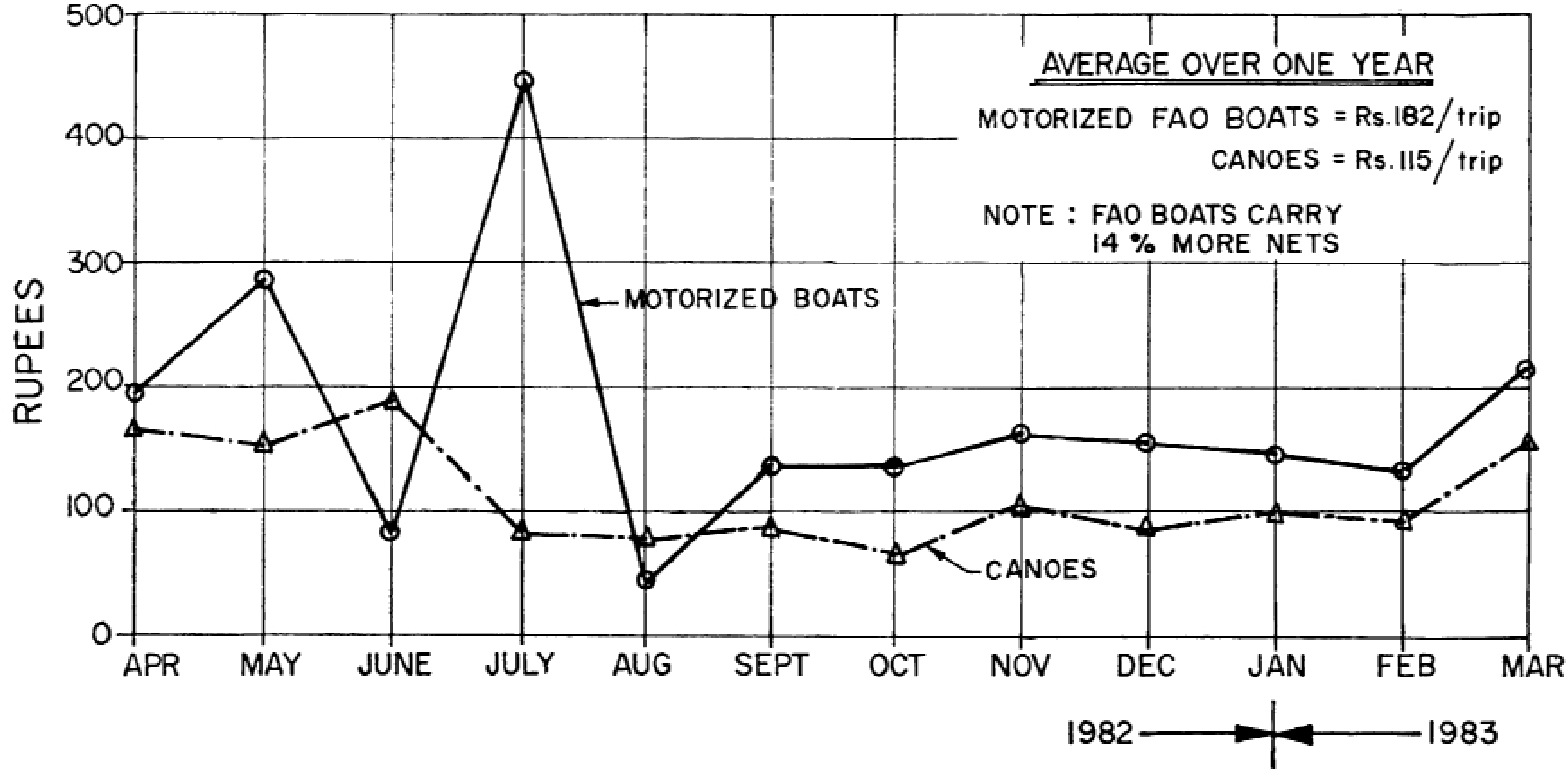
FIGURE - 6

GROSS INCOME PER TRIP

MOTORIZED FAO BOATS VERSUS CANOES
FISHING WITH SMALL MESH GILLNETS



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The motorized boats, therefore, lost 29 fishing days more than the canoes. The major part of this loss was due to engine breakdown and lack of kerosene. Kerosene is rationed and sold to the consumers at a subsidized rate of Rs. 2.00 per litre. A special permit was obtained from the Kerala Fishermen's Welfare Corporation to obtain 200 litres of kerosene per month for each engine at the rate of Rs. 2.00. However, owing to some disagreement between the local retailer and the Kerala Fishermen's Welfare Corporation, the retailer was not willing to sell kerosene to the fishermen. The fishermen, therefore, had to obtain kerosene on the open market where the price is Rs. 3.00 per litre, but often it could not be obtained even for this price. Also the motorized boats made fewer trips, because when the catch expectancy was low, they did not go fishing for fear that the income might not cover the fuel cost.

5.6 For the FAO boats utilization of sail to save fuel was 16% of the total travelling time taken over one year. Sail was not used at all during June and July. The saving in fuel is about Rs. 750 which justifies the investment in a sail rig, provided the installation cost is not above Rs. 2,500, assuming a depreciation over 5 years at 15% interest.

The canoes had a surprisingly low utilization of sail over one year – 14% of the total travelling time. The reason for the higher sail utilization of the FAQ boats was the greater stability and sea-worthiness and the ability to reef the sail in higher wind strengths.

5.7 Below is an economic evaluation of the motorized boats and the canoes based on the data collected from April 1982 to April 1983. According to the fishermen, the year 1982 was slightly above average in catch results and this is confirmed by the Central Marine Fisheries Research Institute.

	Motorized boats (Rupees)	Local canoes
I. *Investment*		
(a) Hull	17,000	12,000
(b) Sailing rig	1,600	800
(c) Engine and installation ..	12,000	
(d) Subtotal (a+b+c)	30,600	12,800
(e) Fishing gear		
– Oil sardine nets . ..	4,500	4,400
– Sardine nets	4,500	3,400
– Mackerel nets . ..	5,000	5,000
Subtotal – Fishing gear	14,000	12,800
(f) Total investment (d+e)	44,600	25,600
II. *Annual Fixed Costs*		
(a) Depreciation of hull (10 years)	1,700	1,200
(b) Depreciation of sailing rig (5 years)	300	200
(c) Depreciation of engine (3 years)	4,000	
Total fixed costs	6,000	1,400
III. *Annual Variable Costs*		
(a) Fuel and oil (950 x Rs. 4.00)	3,800	
(b) Engine repair ..	800	
(c) Hull repair ..	500	200
(d) Gear repair and replacement 20% of I (e)	2,800	2,600
(e) Other expenses ..	1,500	1,500

	Crew salary		
	Gross income	42,200	32,400
	— (a + e)	5,300	1,500
	= Net income	36,900	30,900
(f)	Crew salary = 60% of net income for motorized boats, 70% for canoes	22,100	21,600
(g)	Total variable costs	31,500	27,400
IV.	Total annual costs	37,500	29,800
V.	Total annual income	42,200	32,400
VI.	Net profit (V—IV)	4,700	2,600
VII.	Accounting Rate of Return VI/I (f) x 100%	11%	10%
	Number of crew	4*	4
	Yearly cash income per crew member	5,500	5,400
	Investment per crew member	11,500	6,400

* The FAQ boats had a crew of 5 when used without an engine.

Conclusion: Motorization has not increased the income per fisherman, bul eliminated the effort of rowing.

5.8 Motorization could lead to an increase in the income pet fisherman, provided:

(a) A locally manufactured kerosene outboard engine of maximum 4 hp is available. This would reduce the investment cost and the fuel cost without a corresponding reduction in catch. The present 7 hp engine is unnecessarily powerful for the size of the craft utilized for small-mesh gillnetting.

(b) A regular supply of kerosene can be assured at a cost of Rs. 2.00 per litre instead of the open market price of Rs. 3.00. The average price of Rs. 4.00 per litre used in the economic evaluation is due to the need for adding 3% oil to the kerosene besides the consumption of petrol for starting and slow running.

(c) The subsidy of 25% of the cost of the engine is maintained.

Regarding subsidy, it is a paradox that the fishermen who are using imported engines and imported fuel are subsidized while the rowing and sailing fishermen who spend no foreign exchange to catch the fish are not.

6. ENGINE-CUM-SAIL BEACHLANDING CRAFT FOR LARGE-MESH GILLNET FISHING

6.1 Large-mesh gillnetting is presently being done mainly by motorized craft operating from harbours. In Quilon the majority of the fleet consists of boats of 22 ft.—28 ft. length equipped with Norwegian-made engines of 8 and 16 hp built 20 years ago. In Cochin generally the gillnet boats are 25 ft.-28 ft. and fitted with 24 hp engines of Indian manufacture. The report "Economics of artisanal and mechanized fisheries in Kerala: a study on costs and earnings of fishing units" (Working Paper no. 34, Small—Scale Fisheries Promotion in South Asia, GCP/RAS/77/044, issued from Madras, July 1982) gives indications of the poor economic performance of the present type of mechanized large-mesh gillnetters. For the period April 1980 to March 1981, the survey showed a negative profit of – 17% of the total gross income. Probably the catches during the survey year were below average, but the age of the gillnet fleet and the fact that on new units are coming into this fishery show that the main conclusions are correct.

The reason for this might be:

(a) High investment in boats, engines and fishing gear. A new 28 ft. boat with a 24 hp engine costs about Rs. 100,000 and a complete set of large-mesh nets Rs. 35,000.

(b) High fuel cost due to most of the boats being fitted with 24 hp engines. The fuel cost represents 20—30% of the gross income.

6.2 There is little that can be done on the fishing gear side to improve the catches. The BOBP fishing gear specialist found that the large-mesh nets utilized in Kerala were of optimum twine and mesh size and well mounted. Emphasis must, therefore, be on reducing the cost of operation, and the only area where a significant reduction can be made is in the investment cost of the engine and the fuel cost. A new design of a beachable large-mesh gillnet boat with the designation IND—18 was, therefore, prepared with the following main characteristics:

Length overall (LOA)	.. .. ..	8.40 m
Beam (B)	.. .. ..	2.24 m
Depth (D)	.. .. ..	0.76 m
Cubic number (LOA x B x 0)	.. .. ..	14
Weight of hull ± engine	.. .. ..	1050 kg
Weight of fishing gear + 4 crew	.. .. ..	850 kg
Total displacement	.. .. ..	1900 kg
Engine	.. .. ..	5 hp air-cooled diesel
Sail: Mainsail: 17.6 m^2 Jib : 9.1 m^2	.. .. ..	26.7 m^2

The engine was mounted in a pivotable watertight box which permits retracting the propeller and rudder when landing on the beach. The sail rig was the same Gunter type utilized on the FAO boats operated from Tangassery with a leeboard fitted into a slot on the port side. The IND—18 under sail is shown in Fig. 5.

Each boat was equipped with large-mesh driftnets of the following specifications:

Length and depth (meshes)	Mesh size	Twine size
2700x125	90mm	5
3500x110	100mm	6
9700x97	110 mm	6and7
5000x80	125mm	6

Total weight of webbing is 270 kg.

6.3 Two boats of the IND—18 type designated FAO—1 and FAO—2 started operation from the beach of Cherizheekal north of Quilon in November 1981. The village and the crew were selected by the Fisheries Department. The results of the first four months showed that the crew were not familiarwith operating large-mesh gillnets and also indicate that it is not easy to convert small-mesh gillnet fishermen to fishing much further off-shore with large-mesh driftnets. The large-mesh gillnetters operating from Quilon are crewed by fishermen coming from south of Trivandrum where this fishery is done traditionally. In March 1982 the boats were, therefore, shifted to Sakthikulangara near Quilon and operated for the next seven months by experienced large-mesh gilinet fishermen. The purpose was to determine the catch result compared with the existing gillnet boats.

6.4 The gross incomes for the four boats are given in Appendix 3. The average income for the two FAO boats over the 7-month period was Rs. 31,400 versus Rs. 32,200 for the local boats. The average catch per trip was Rs. 274 for the FAO boats and Rs. 276 for the local boats. One can, therefore, conclude that the FAO boats have the same catching ability as the local boats with higher powered engines. It was also interesting to note that the FAO boats could fish during the monsoon months in spite of being fitted with an engine of only 5 hp.

6.5 None of the local large-mesh gillnet boats is fitted with sail. The utilization of sail by the two FAO boats was 10% of the total travelling time. The average travelling time per trip was 8.2 hours of which 7.4 hours were spent with engine and 0.8 hour with sail. The average consumption of diesel fuel per trip was 10 litres at a cost of Rs. 36 (Rs. 3.60 per litre). The local boats with old Norwegian engines of 8 – 10 hp had an average cost of fuel per trip of Rs. 50. The 24 hp engines fitted to the newer gillnet boats have a fuel cost per trip of around Rs. 80.

6.6 The yearly fuel saving due to the use of sail on the FAO boats would be about Rs. 900. assuming that sail is used on the average about 0.8 hour per trip, that the fuel consumption of the engine is 1.5 litres and that the boats make 200 trips per year: the yearly saving is Rs. 900. To justify this saving, the investment cost of the sail rig must be lower than Rs. 3,000, assuming that the sail rig is depreciated in 5 years at 15% interest. Since the large-mesh gitlnetters fish up to 20 nautical miles from the shore, sail should in any case be carried as a standby in case of engine breakdown.

6.7 The original 5 hp engine that had been fitted was not sufficiently reliable and it was replaced in December 1982 with an 8 hp Indian-made air-cooled diesel engine. The FAO boats were subsequently transferred to Pulluvila village south of Trivandrum for operation from the beach, fishing with hook and line at depths of 50—80 fathoms. Some initial problems were experienced with the new engines which limited the number of trips in January—March. The average income per trip was Rs. 482. However, as the trips lasted 36 hours, half as many trips could be made as with large-mesh gillnets resulting in a gross income per day of about the same as with large-mesh gillnets. The boats will be operated with large-mesh gillnets from Pulluvila from May to October 1983. Valuable experience will be gained as to the possibility of fishing operations with a motorized large-mesh gillnet boat from the beach during the monsoon period.

6.8 An economic evaluation of the FAO boats, compared with the most recent type of large-mesh gilloetter fitted with a 24 hp engine, is given below. The evaluation shows that the present type of gillnetter is not economically viable mainly because of too high engine power leading to high investment cost and fuel cost.

	FAO boat 8 hp engine	Local type boat 24 hp engine
I. *Investment*		
(a) Hull	28,000	40,000
(b) Sailing rig	2,000	
(c) Engine and installation	20,000	60,000
(d) Sub-total (a+b-J-c)	50,000	100,000
(e) Fishing gear:		
– Large-mesh driftnets	35,000	35,000
(f) Total investment	85,000	135,000

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II.	*AnnualFixed Costs*		
	(a) Depreciation of hull (10 years)	2,500	4,000
	(b) Depreciation of sailing rig (4 years)	500	
	(c) Depreciation of engine	4,000	10,000
	(d) Total fixed costs (a+b+c)	7,000	14,000
III.	*Annual Variable Costs*		
	(a) Fuel and oil	8,000	18,000
	(b) Engine repair	800	800
	(c) Hull repair	600	600
	(d) Gear repair and replacement: 20% of I (e)	7,000	7,000
	(e) Other expenses	1,500	1,500
	(f) Crew salary = 50% of net income Net income = Gross income (Rs. 55,000) – (a+e)	22,800	17,800
	(g) Total variable costs	40,700	45,700
IV.	Total annual costs (11+111)	47,700	59,700
V.	Total annual income*	55,000	55,000
VI.	Net Profit (V—IV)	7,300	—4,700
VII.	Accounting rate of return VI/I(f) x 100%	+8.6%	—3.5%
	No.of crew	4	4
	Yearly cash revenue per crew member..	5,700	4,500
	Investment per crew member	21,300	33,800

* Annual gross income is based on an average of Rs. 275 per trip and 200 trips per year.

7. CONSTRUCTION MATERIALS FOR BEACHLANDING BOATS

7.1 All traditional beachlanding craft in Kerala are made of wood. The service life of a planked wooden beachlanding canoe built of Aini is around 15 years. About the same life is expected from dugout canoes made of mango wood. Maintenance costs are low because the canoes, being beached most of the time, are not subjected to attacks by marine borers. Timber prices have, however, been rising rapidly over the last 10 years. Aini, which in 1970 cost Rs. 500 per m^3 in log form, costs today As. 3,500 per m^3. Even with this price increase, timber is still cheaper than any other alternative. The weight and material cost per square metre of the various materials in comparable thickness utilized in an 8.5 m beachboat are:

Material	Basic material cost	Thickness mm	Weight kg/sq.m	Cost Rs./sq.m
Aini	Rs. 35001m3in log;40% loss from log to planks	19	11.5	112
Marine plywood	Rs. 120/sq.m	12	9.0	120
Fibreglass	Rs. 55/kg	6	9.0	500
Aluminium	Rs. 40/kg	3	8.4	340

The cost of a completed hull does not show the same wide price difference because a wooden hull needs fastenings and paint and requires higher labour cost to build. It is, however, wrong to believe that mass production of FRP boats will lower the cost substantially since the largest portion of the cost of an FRP boat is in the materials.

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7.2 Because of the price advantage, wood is at present the most attractive alternative for a beachboat. One major advantage is the possibility of construction and repair work which can be carried out in the village by local carpenters. The prototype FAQ boats were made of pressure-impregnated marine plywood which combines low weight with strength. Not much service experience with plywood beachboats is available in India, but at Muttom in Kanyakumari district there is a plywood beachboat built 13 years ago and still in good condition. For a beachlanding boat no sheathing is required. However, if a plywood boat is to be used for prolonged periods from a harbour, an FRP sheathing is essential to protect it against marine borers. Experience shows that FRP will adhere to plywood, provided there is no oil in the wood and the surface is well roughened with a grinder. The sheathing of a wooden boat increases its cost and for harbour-based boatsthere is a stronger casefor using FRP oraluminium as construction material. Price development of timber in the future might also necessitate a shift to FRP or aluminium for beachboats.

7.3 Developmentwork for a new beachcraft built of FRP or aluminium will taketime. Prototypes should be built and subjected to long-term trials before any larger scale construction programme is envisaged. The most urgent task is to find alternatives for the dugout canoes presently made of mango. Over the last 3 or 4 years there has been a rapid price escalation of these canoes because of the difficulty of finding large enough trees to carve out a canoe. Development of new types of canoes made initially of planked wooden construction of marine plywood should start soonest. When the main characteristics have been determined, the use of alternative materials such as FRP and aluminium should be investigated.

8. SUMMARY AND CONCLUSIONS

8.1 Motorization of “thangu vala” canoes

Motorization of "thangu vala” canoes with locally manufactured diesel inboard and outboard engines has proven difficult because of problems regarding the reliability of the engines and transmissions. In the case of a central installation in the stern of the canoe tried by the project, the “thangu vala” net got caught in the propeller during setting. To avoid this problem the propeller must be on the starboard side and well forward of the net platform. It is hoped that Indian manufacturers will succeed in producing an engine acceptable to the fishermen as an alternative to the imported kerosene outboard engines. There seems to be little doubt, however, that even with the present type of kerosene outboard engine the motorization of the “thangu vala” canoes has increased the income per fisherman.

8.2 Improved sailing craft for small-mesh gillnetting

The project has tested two new sailing beachlanding craft of the IND-17 type fishing with small-mesh gillnets from Tangassery near Quilon from November 1981. The frequency of favourable winds has been lower than anticipated and the use of sail varies between zero and 50% of the travelling time depending on the period of the year. Improved sailing performance, therefore, can only to a limited extent reduce the amount of rowing, which averages 2.5 hours per fishing trip. For a non-motorized craft, rowing performance is of paramount importance— which means that the increase in beam and depth of a new craft compared with the canoes must be moderate.

8.3 Motorization of small-mesh gillnetters

After the initial period of five months’ operation as a sailing/rowing craft, the two FAQ boats at Tangassery were fitted with 7 hp kerosene outboard engines to obtain data regarding the effect of motorization. Data were collected over one year from April 1982. Compared with two non-motorized canoes the catch increase per trip due to motorization is close to 40%. However, because of increased cost of fuel, together with depreciation and repair of the engine, there is no substantial increase in the earnings of the crew. On the positive side, one must account for the elimination of the effort of strenuous rowing for 2 to 3 hours per day. The number of fishing trips per year of the motorized boats is 18% lower than for the canoes mainly because of lack of kerosene or engine breakdown. The experience indicates that the crew does not go fishing by rowing when the engine is out of order or kerosene is not available. One should avoid generalizing on the basis of data from two motorized craft in one locality, but the results indicate that one should proceed with caution in motorizing craft fishing with passive gear such as small-mesh driftnet within 10 km from the coast. When fishing for small pelagic species such as oil sardine, lesser sardine and mackerel schooling near the coast, there appears to be no advantage in a motorized boat going further offshore.

8.4 Engine and fuel supply

Motorization of small-mesh gilinetters could lead to an increased income per fisherman, provided:

(a) An Indian-made kerosene outboard engine of maximum 4 hp is available at a reduced investment cost compared with the presently imported 7 hp engine.
(b) A regular supply of kerosene can be assured at the subsidized rate.
(c) Sail is used whenever possible to save fuel.

8.5 Fishing gear

Most canoes do not carry small-mesh driftnet in sufficient quantity to utilize their full capacity. To improve the income of these fishermen, the first step should be to provide financial assistance to purchase additional nets. Subsidy should first of all go to the non-motorized fishermen who are now catching the fish without consuming foreign exchange.

8.6 Beachlanding craft for large-mesh gillnetting

A low-powered, sail-assisted beachlanding craft for large-mesh gilinetting has baen developed by the project. Two craft of the IND-18 type fitted with a 5 hp inboard diesel engine have operated together with two local craft with higher powered engines from Sakthikulangara near Quilon over a period of seven months including the monsoon. The data collected shows that there is no difference in catch with the lower powered engine but a significant saving in fuel and in investment cost. An economic evaluation based on the data from the seven months' operation at Sakthikulangara shows that the local types of large-mesh gillnetters fitted with 24 hp engines are not economically viable owing to high investment and fuel cost. Problems with the engine installation, which can be expected on a prototype, have delayed beachlanding trials. The boats have now been fitted with new engines of 8 hp and are fishing from Pulluvila village south of Trivandrurn. Continued monitoring of these two boats should be done by the Fisheries Department to obtain data on beach-based operation with a motorized large-mesh gillnetter. Further trials with the same type of craft should be done in the northern part of Kerala.

8.7 Replacement of dugout canoes

Traditional beachlanding canoes made of aini or mango wood have a service life of around 15 years with low maintenance cost. They are also considerably cheaper than alternatives in FRP and aluminium and have the advantage of being easy to repair by local craftsmen in case of damage sustained through capsize in the surf. The price of timber has, however, increased rapidly over the past 10 years and the large wild mango trees required for making dugout canoes are becoming scarce. There are some 10,000 dugout canoes in Kerala, and with a service life of 15 years, the replacement need is about 700 canoes per year. There is also a need to expand the canoe fleet in view of the increasing number of fishermen. Development of an alternative craft to replace the dugout canoe takes time. A project for the design, building and testing of the alternative craft made of planked construction, plywood, fibreglass or aluminium should be started as soon a3 possible. The new canoe type must have a good performance under oars and sail and be suitable for motorization at a later stage, should this prove economically viable.

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Appendix 1

Fishing Trials Data Sheet

Name of Village

Date

	FAO Boat No.		FAO Boat No.		Canoe 1 (Traditional)		Canoe 2	
No. of crew								
Fishing gear								
Departure time								
Arrival time								
Total hours								
Travelling time hours								
Used sail								
Used oars								
Depth of Fishing								
Income	Kg.	Rs	Kg.	Rs.	Kg.	Rs.	Kg.	Rs.
Oil sardines								
Sardines								
Mackerel								
Seer fish								
Others								
A. Total Income								
Expenses	Rs.		Rs.		Rs		Rs.	
Fuel and oil								
Net repair								
Others								
B. Total Expenses								
C. Wages								
Total cost: (B+C) C)								
Net Income: A—(B+C)								

Remarks:—Reason for not fishing: engine breakdown, weather, etc.

Appendix 2

Catch results—motorized and non-motorized small-mesh gillnetters based at Tangassery, Quilon

Month	*Motorized*				*Non-motorized*			
	FAO—3		FAO—4		Canoe—1		Canoe—2	
	Trips	Gross Income	Trips	Gross Income	Trips	Gross Income	Trips	Gross Income
April 1982	29	5885	29	5401	28	4078	25	4692
May	25	8447	24	5704	30	4654	31	4557
June	9	694	11	942	17	1892	16	4259
July	11	3510	11	6350	9	505	4	440
August	7	163	8	527	11	729	11	947
September	12	1375	13	2083	19	1705	22	1967
October	21	2485	19	2955	29	1733	25	1445
November	26	3871	24	4235	31	2794	33	3945
December	22	3715	20	2846	26	1782	25	2635
January1983	25	3634	18	2592	30	2684	24	2638
February	24	3182	25	3360	23	2667	29	2029
March	23	4792	26	5735	35	5032	31	5032
Total	234	41753	228	42730	288	30255	276	34586

Comparative performance in summary

	Motorized boats	Non-motorized canoes
Yearly gross income (Rs.)	42240	32420
Number of trips	231	282
Gross income per trip (Rs.)	182	115
Crew number	4	4
Yearly income per fisherman (Rs.)	5500	5400
Investment per crew member (Rs.)	11500	6400
Fuel cost per trip (Rs.)	17	Nil
Fuel consumed for one year (litre)	950	Nil
Average hours per trip	6.7	6.3
Average income per fisherman per hour (Rs.)	3.60	3.00

Appendix 3

Catch results — large-mesh gilinetters based at Sakthikulangara. Quilon:

FAO engirie-cum-sail boat compared with local type

Month	FAO-1		FAO—2		Boat 137		Boat Sabu	
	Trips	Gross Income	Trips	Gross Income	Trips	Gross Income	Trips	Gross Income
April1982	22	6942	24	6112	17	2805	23	3754
May	19	3162	13	2164	13	1631	19	2097
June	0	0*	0	o*	12	7221	19	4075
July	9	1470	11	4640	18	8658	13	2604
August	15	4728	21	4896	4	1697	16	2296
September	25	8143	26	9910	23	7795	26	6090
October	20	5509	19	5162	21	8136	21	5646
Total	110	29954	114	32884	108	37943	137	26567

* Engine breakdown.

Comparative performance in summary

	FAO boats	Local boats
Gross income (7 months) (Rs.)	31419	32252
Number of trips (7 months)	112	122
Gross income per trip (Rs.)	274	276
Crew number	4	4
Yearly income per fisherman (Rs.)	5700	4500
Investment per crew member (Rs.)	21300	33800
Fuel cost per trip (Rs.)	40	80*
Fuel consumed for one year (litre)	2200	5000*
Average hours per trip	15.6	15.0
Average income per hour and per fisherman (Rs.)	1.80	1.50

With 24 hp engine.

Publications of the Bay of Bengal Programme (BOBP)

Development of Small-Scale Fisheries (GCP/RAS/040/SWE)

Reports (BOBP/REP/....)

1. Report of the First Meeting of the Advisory Committee.
Colombo, Sri Lanka, 28—29 October 1976.
(Published as Appendix 1 of IOFC/DEV/78/44.1, FAO, Rome, 1978)

2. Report of the Second Meeting of the Advisory Committee.
Madras, India, 29—30 June '1977.
(Published as Appendix 2 of IOFC/DEV/78/44.1, FAO, Rome, 1978)

3. Report of the Third Meeting of the Advisory Committee.
Chittagong, Bangladesh, 1—10 November 1978. Colombo, Sri Lanka, 1978.
(Reissued Madras, India, September 1980)

4. Role of Women in Small-Scale Fisheries of the Bay of Bengal.
Madras, India, October 1980.

5. Report of the Workshop on Social Feasibility in Small-Scale Fisheries Development.
Madras, India, 3—8 September 1979. Madras, India, April 1980.

6. Report of the Workshop on Extension Service Requirements in Small-Scale Fisheries.
Colombo, Sri Lanka, 8—12 October 1979. Madras, India, June 1980.

7. Report of the Fourth Meeting of the Advisory Committee.
Phuket, Thailand, 27—30 November 1979. Madras, India, February 1980.

8. Pre-Feasibility Study of a Floating Fish Receiving and Distribution Unit for Dubla Char, Bangladesh. G. Eddie, M. T. Nathan. Madras, India, April 1980.

9. Report of the Training Course for Fish Marketing Personnel of Tamil Nadu.
Madras, India, 3—14 December 1979. Madras, India, September 1980.

10.1 Report of the Consultation on Stock Assessment for Small-Scale Fisheries in the Bay of Bengal. Chittagong, Bangladesh, 16—21 June 1980.
Volume 1: Proceedings. Madras, India, September 1980.

10.2 Report of the Consultation on Stock Assessment for Small-Scale Fisheries in the Bay of Bengal. Chittagong, Bangladesh, 16—21 June 1980.
Volume 2: Papers. Madras, India, October 1980.

11. Report of the Fifth Meeting of the Advisory Committee.
Penang, Malaysia, 4—7 November 1980. Madras, India, January 1981.

12. Report of the Training Course for Fish Marketing Personnel of Andhra Pradesh.
Hyderabad, India, 11—26 November 1980. Madras, India, September 1981.

13. Report of the Sixth Meeting of the Advisory Committee.
Colombo, Sri Lanka, 1—5 December 1981. Madras, India, February 1982.

14. Report of the First Phase of the "Aquaculture Demonstration for Small-Scale Fisheries Development Project" in Phang Nga Province, Thailand. Madras, India, March 1982.

15. Report of the Consultation-cum-Workshop on Development of Activities for Improvement of Coastal Fishing Families. Dacca, Bangladesh, October 27—November 6, 1981. Madras, India, May 1982.

16. Report of the Seventh Meeting of the Advisory Committee. New Delhi, India, January 17—21, 1983. Madras, India, March 1983.

17. Report of Investigations to Improve the Kattumaram of India's East Coast. (In preparation)

18. Motorization of Country Craft, Bangladesh. (In preparation)

19. Report of the Eighth Meeting of the Advisory Committee. Dhaka,Bangladesh. January 16—19, 1984. Madras, India, May 1984.

Working Papers (BOBP/WP/....)

1. Investment Reduction and Increase in Service Life of Kattumaram Logs. R. Balan. Madras, India, February 1980.

2. Inventory of Kattumarams and their Fishing Gear in Andhra Pradesh and Tamil Nadu. 1. R. Menon. Madras, India, October 1980.

3. Improvement of Large-Mesh Driftnets for Small-Scale Fisheries in Sri Lanka. G. Pajot. Madras, India, June 1980.

4. Inboard Motorisation of Small G.R.P. Boats in Sri Lanka. Madras, India, September 1980.

5. Improvement of Large-Mesh Driftnets for Small-Scale Fisheries in Bangladesh. G. Pajot. Madras, India, September 1980.

6. Fishing Trials with Bottom-Set Longlines in Sri Lanka. G. Pajot, K. 1. Weerasooriya. Madras, India, September 1980.

7. Technical Trials of Beachcraft Prototypes in India. ø Gulbrandsen, G. P. Gowing, A. Ravikumar. Madras, India, October 1980.

8. Current Knowledge of Fisheries Resources in the Shelf Area of the Bay of Bengal. B. T. Antony Raja. Madras, India, September 1980.

9. Boatbuilding Materials for Small-Scale Fisheries in India. Madras, India, October 1980.

10. Fishing Trials with High-Opening Bottom Trawls in Tamil Nadu, India. G. Pajot, John Crockett. Madras, India, October 1980.

11. The Possibilities for Technical Cooperation between Developing Countries (TCDC) in Fisheries. E. H. Nichols. Madras, India, August 1981.

12. Trials in Bangladesh of Large-Mesh Driftnets of Light Construction. G. Pajot,T. K. Das. Madras, India, October 1981.

13. Trials of Two-Boat Bottom Trawling in Bangladesh. G. Pajot, J. Crockett. Madras, India, October 1981.

14. Three Fishing Villages in Tamil Nadu. Edeltraud Drewes. Madras, India, February 1982.

15. Pilot Survey of Driftnet Fisheries in Bangladesh.

M. Bergstrom. Madras, India, May 1982.

16. Further Trials with Bottom Longlines in Sri Lanka. Madras, India, July 1982.

17. Exploration of the Possibilities of Coastal Aquaculture Development in Andhra Pradesh. Soleh Samsi, Sihar Siregar and Martono of the Directorate General of Fisheries, Jakarta, Indonesia. Madras, India, August 1982.

18. Review of Brackishwater Aquaculture Development in Tamil Nadu.
Kasemsant Chalayondeja and Anant Saraya of the Department of Fisheries, Thailand
Madras, India, September 1982.

19. Coastal Village Development in Four Fishing Communities of Adirampattinam, Tamil Nadu, India. FW Blase. Madras, India, December 1982.

20. Further Trials of Mechanized Trawling for Food Fish in Tamil Nadu.
G. Pajot, J. Crockett, S. Pandurangan, P. V. Ramamoorthy.
Madras, India, December 1982.

21. Improved Deck Machinery and Layout for Small Coastal Trawlers. G. Pajot, J. Crockett, S. Pandurangan and P. V. Ramamoorthy, Madras, India, June 1983.

22. The Impact of Management Training on the Performance of Marketing Officers in State Fisheries Corporations. U. Tietze. Madras, India, June 1983.

23. Review of Experiences with and Present Knowledge About Fish Aggregating Devices.

M. Bergstrom. Madras, India, November 1983.

24. Traditional Marine Fishing Craft and Gear of Orissa. P.Mohapatra. (Under preparation)

25. Fishing Craft Development in Kerala: Evaluation Report.
0. Gulbrandsen. Madras, India, June 1984

26. Commercial Evaluation of IND-13 Beachcraft at Uppada, India.
R. Ravikumar and U. Tietze. Madras, India, June 1984.

27. In preparation

28. Fishing Trials with Small-Mesh Driftnets in Bangladesh.
G. Pajot and 1. K. Das. Madras, India, March 1984.

Miscellaneous Papers (BOBP/MIS/....)

1. Fishermen's Cooperatives in Kerala: A Critique.
John Kurien. Madras, India, October 1980.

Newsletters (Bay of Bengal News):

January 1981, May1981, September 1981, December 1981.
March 1982, June 1982, September 1982, December 1982.
March 1983, July 1983, September 1983, December 1983.
March 1984, June 1984.

Information Documents: (BOBP/INF/....)

1. Women and Rural Development in the Bay of Bengal Region: Information Sources. Madras, India, February 1982.

2. Fish Aggregation Devices: Information Sources.
Madras, India, February 1982.

3. Marine Small-Scale Fisheries of India: A General Description. Madras, India, March 1983.

4. Marine Small-Scale Fisheries of Andhra Pradesh: A General Description, Madras, India, June 1983.

5. Marine Small-Scale Fisheries of Tamil Nadu: A General Description. Madras, India, December 1983.

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