Symposium on Harvest and Post Harvest Technology of Fish held during 24- 27 November 1982 at Cochin,310-315,

Mechanisation of Traditional Fishing Vessels in the South West Coast of India

S. AYYAPPAN PILLAI

Central Institute of Fisheries Technology, Cochin-682 029

The paper describes the various stages of development in the mechanisation of traditional fishing vessels in the south-west coast of India. Both imported out-board motors using petrol-kerosene engine and indigenously developed inboard-outboard drive units using diesel power, have been tried to mechanise the traditional craft.

India has a vast coast line of over 5,500 km with over 21,000 fishing villages scattered all over it. The current annual marine fish landing in India is nearly 1.4 million t. The marine fishing industry in India depends largely on the indigenous fishing vessels which contribute to as much as 60% of the total catch of the country. These indigenous craft will continue to play an important role for a long time on account of their large number estimated to be around 1,00,000 and several million people depend on these craft for their livelihood. It is desirable to improve the standard of living of the small scale fishermen for which it is necessary to improve fish production. By mechanising the craft, the labour involved in rowing the craft can be reduced and fishermen can go further offshore and catch more fish. They can even go for more voyages so that it is possible to increase the per capita catch and income.

Progress of mechanisation

Many attempts have been made by FAO and local government agencies to mechanise traditional fishing vessels as early as 1953. The first outboard motor (imported) was fitted in Jaleswar at Suaurashtra coast of Gujarat State (Traung, 1969). The result of the operation attracted many fishermen and there were over 300 craft fitted with outboard motors in 1969. Now the number may be over 1,000 and all the reputed outboard motors, namely, Johnson, Evinrude and Yamaha operate quite successfully in the Gujarat coast. However, these engines have proved economical only in the Gujarat area. Even though some attempts were made to mechanise the traditional craft in the south the results were not encouraging. The increasing price of petrol, together with higher rate of fuel consumption, were detrimental to the popularisation of mechanisation through the outboard motors. Mechanisation of such craft using diesel power could not be carried out for want of light engines and due to other disadvantages such as high capital cost, costly maintenance and difficulty in installing on small craft.

The Central Institute of Fisheries Technology, Cochin has taken up studies to develop mechanisation of small craft using indigenously available light weight diesel engines and developed an inboard-outboard drive (Fig.1) (CIFT Special Bulletin, 1979). The drive consists of a chain drive system fitted with a 3 blade gunmetal propeller of size 250 × 200 mm. The drive shaft was designed in such a way that the drive unit along with the propeller and a rudder can be lifted so that the propeller can be brought above the water surface for easy starting of the engine. This provision also ensures safety to the propeller and rudder during beaching of the craft. The drive unit coupled with the diesel engine model Greaves-Lombardini-523 developing 5 HP at 1800 r.p.m. was installed on a row boat of 4.27 m OAL (Fig. 2.) and extensive trials were carried out. The propeller speed was maintained at 900 r.p.m. corresponding to the engine r.p.m. at 1800. The vessel attained a speed of 5 knots with 8 people on board. With less number of people the speed attained was 6 knots As any innovation developed by the Institute has to be commercially exploited through the National Research and Development Corporation of India, the innovation was got published through that organisation and it appeared in the April 1978 issue of Invention Intelligence.

Subsequently some indigenous manufactuers showed interest in the innovation and with the inspiration and guidance of the Institute, two firms came out successful in developing the modified version of the drive unit. One of them has developed the Z type drive unit by replacing the chain drive system of CIFT design with bevel gears and with provision to lift the propeller unit on the side for easy starting and to safeguard it during beaching of the craft. The drive unit named stern drive model GT 4018, basically comprised of two bevel gear boxes (Fig. 3). The top gear box is driven by the diesel engine through a clutch. The top and bottom gear boxes are connected by a vertical intermediate shaft and housing. The propeller is mounted at the output shaft on the bottom gear box.

There is provision in the top gear box to change the gears. With the help of these it is possible to obtain either forward or reverse rotations of the propeller including the neutral position. The engine used is

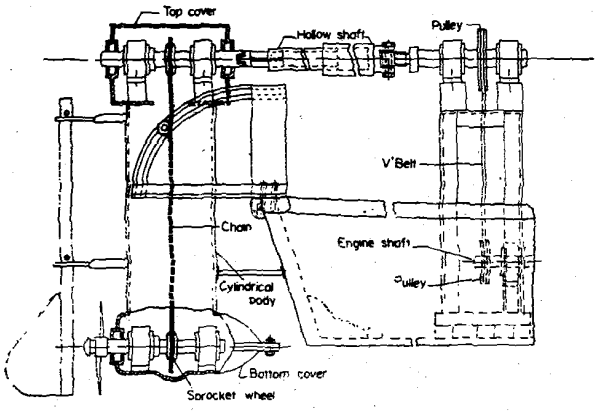

Fig. 1. Inboard-outboard drive

Greaves Lombardini diesel engine LDA–510 developing 9.5 HP at 3000 r.p.m. The drive unit was installed on craft such as inspection launch, pleasure craft, rescue

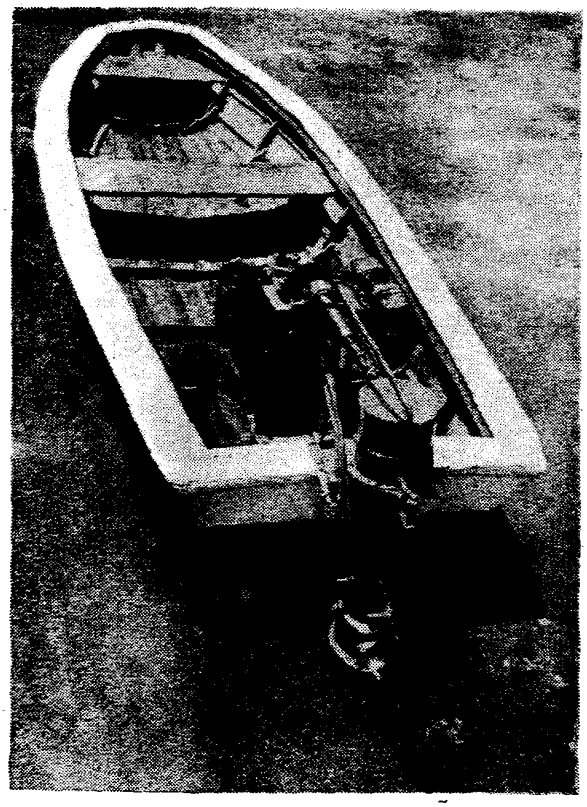

Fig. 2. Outboard fitted to a row boat.

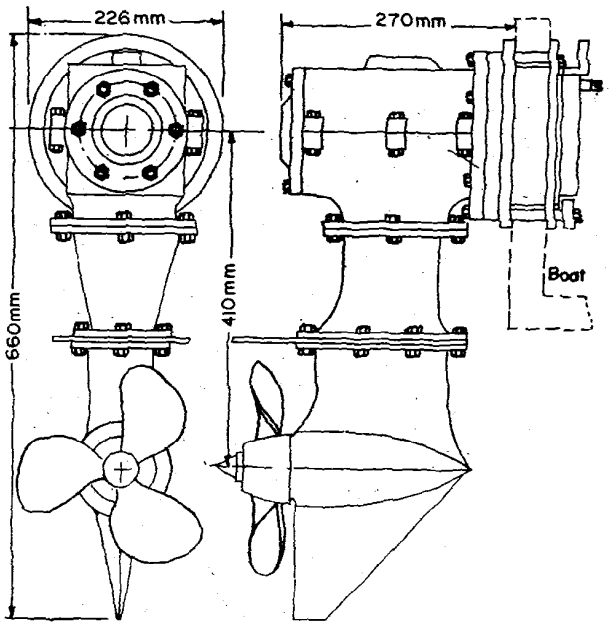

Fig. 3. Stern drive

Table 1. *Data on trial operation*

Period of operation	:	February to May 1979
Place of operation	:	Kundapur near Udipi of Mangalore coast
Name of craft	:	Janatha-I-Sarathi
Type and size of craft	:	Dugout canoe of 10.37 m OAL
Application	:	as carrier boat for purse seinec atch
Total load and type of fish, t	:	2.5 (sardine and mackerel)
Powered with	:	Greaves Lambardini diseel engine LDA 510–9.5 h.p. at 3000 r.p.m. with stern drive model GT 4018
Total no. of days operated	:	71
Total hours operated	:	568
Total fuel consumed, l	:	852
Average fuel consumption, l h^{-1}	:	1.5
Average operation h day^{-1}	:	8

launch (all the fibre glass construction and on traditional fishing craft of 10.37 m OAL. The fishing craft was used as a carrier vessel on Mangalore coast. The results were encouraging and the speed of the vessels attained was ranging from 5 to 6 knots and the fuel consumption was found to be around 1.5 l/h. However, this method of installation of the drive unit, did not create the desired response from

Table 2. *Data on trial operation*

Period of operation	January 1980
Place of operation	Chellanam
Type and size of craft	*Thanguvallam* of 17.08 m OAL
Application	Fishing operation with *Koruvala* (single boat seine)
Powered with	Greaves Lombardini diesel engine LDA 510–9.5 hp at 3000 r.p.m. coupled with stern drive model GT 4018
Total no of days operated	12
Total no. of hours operated	72
Total catch and type of fish	160 baskets (8000 kg) of sardine and mackerel
Total price realised, Rs.	4300/–
Total fuel consumed, *l*	64.5
Fuel consumption, lh^{-1}	0.9
Average operation h day^{-1}	6

Table 3. *Data on trial operation*

Period of operation	September 1980
Place of operation	Chellanam
Name of craft	Velankanni
Type and size of craft	*Thanguvallam* of 17.08 m OAL
Application	Fishing operation with *Koruvala* (single boat seine)
Powered with	Yamaha outboard motor E 15AK, 12 hp at 5500 r.p.m.
Total no. of days operated	13
Total no. of hours operated	59.5
Total catch and type of fish	9.7 t (sardine, mackerel, mullet and white bait)
Total price realised, Rs.	5920/–
Total fuel consumed, *l*	30 (petrol) 299 (kerosene)
Fuel consumption, lh^{-1}	Petrol 0.5; Kerosene 5
Average operating h day^{-1}	4½

Table 4. *Comparative studies on mechanised and non-mechanised vessels*

Period of operation	October 1980
Place of operation	Purakkad of Alleppey District
Type and size of boat	Thanguvallam of 10.37 m
Application	Fishing with *koruvala* (single boat seine)
Type of fish	Sardine and mackerel

	Mechanised			*Non-mechanised*		
	with GT 4018	with outboard diesel drive 750D	Yamaha OBM E 8 BK			
Total days operated	15	15	14	11	11	11
Total hours operated	81	90.75	58	65.75	69.25	72
Total catch, kg	4300	3680	2570	1210	1285	1385
Total price, Rs.	7375	6290	4200	2100	2300	2485
Total fuel consumed, l	Diesel 71.25	Diesel 75	Petrol 15.5 + kersoene 106	—	—	—
Total cost of fuel *	209.5	220.50	513.13			
Average operating cost, Rs. day^{-1}	13.97	14.70	36.65	—	—	—
Average earning, Rs day^{-1}	491.67	419.33	300.00	190.90	209.09	225.91
Average net earning, Rs day^{-1}	477.70	404.63	263.35	190.90	209.09	225.91

* Diesel @ Rs. 2.94; Petrol @ 5.75 and Kerosene @ Rs. 4.00 (as on 1982)

the fishermen owing to the fact that they were not willing to modify the vessel by cutting the stern of the vessel. Hence the next method of installing such drive unit contemplated, was to cut a small hole on the side near the stern so that the fishermen's objection to the major modification of the vessel could be avoided. A fishing village named Punnappura of Alleppey District about 80 km south of Cochin was selected to conduct the trials. The unit was installed on a 11.6 m OAL Malabar *Vallam* locally known as '*Kettuvallam*' (Fig.4). Fishing operations were conducted with the traditional '*Koruvala*' (single boat seine) and '*Neetuvala*' (gillnet) involving 9 fishermen and weight of fish catch varying from 200 to 900 kg. The fishing operation could be made more efficient compared to the non-mechanised craft due to the fact that the mechanised craft could encircle the fish faster so that the escape of fish is avoided. Moreover, fishermen could go for fishing again after the first trip as there was a lot of saving in time and labour. Trials were also conducted in Chellanam, a fishing village adopted by CIFT to carry out the Institute's Lab-to Land Programme in imparting technical training in craft and gear technology to the traditional fishermen. Here a larger vessel of 17.08 m OAL locally known as '*Thanguvallam*', was selected for the trial purpose. The number of fishermen on board was 15 and the performance was quite satisfactory.

The same drive unit with some modifications (GT 2018) coupled with another engine namely SEACUB No. ND–7 developing 8.8 HP at 2500 r.p.m. was also put on the field and trials were conducted.

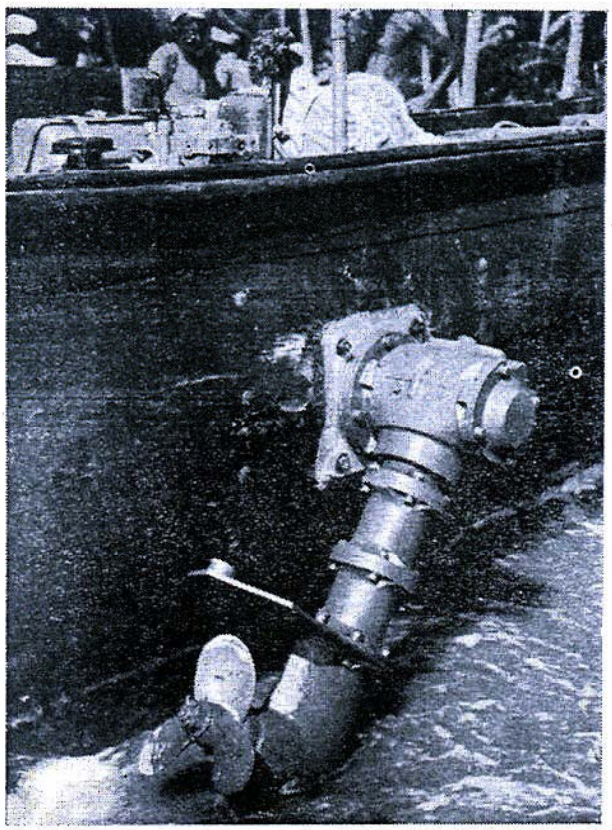

Fig. 4. Out board drive fitted to a Malabar canoe

Table 5. *Cost comparison*

	OBM E8BK 7 hp	OBM E15AK 12 hp	Diesel engine Greaves Lombardini LDA 510 9.5 hp with stern drive GT 4018	Diesel engine Greaves Lombardini 522 7.5 hp with outboard drive 750 D
Cost of fuel				
*Fuel consumption, h^{-1}	0.3	0.5	—	—
Petrol	3.5	5.0	—	—
Diesel	—	—	1.0	0.75
Fuel cost Rs h^{-1}	1.73 | 15.73 14.00 |	2.88 | 22.88 20.00 |	2.94	2.205
Running time, yr^{-1} (assuming 300 days at 5 h day^{-1})	1500	1500	1500	1500
Fuel cost, Rs. yr^{-1}	23,587.5	34,312.5	4410	3030.75
Capital cost				
Initial cost of engine and drive unit Rs.	8000	12000	18000	12000
Life of engine years	3	3	5	5
**Annuity factor (12%)	0.416	0.416	0.277	0.277
Capital cost Rs. yr^{-1}	3328	4992	4986	3324
Yearly cost of engine and drive	13861	20622	9081	6395.25

* Petrol at Rs. 5.441 l^{-1}; Kerosene at Rs. 1.54 l^{-1} and diesel at Rs. 2.73 l^{-1} prevailing in Cochin during October 1982

** Annuity factor gives the fraction of the initial cost representing depreciation and interest of equal yearly amounts over the life time of the investment

Meanwhile another firm came forward with a drive unit named zinga outboard drive model 750 D coupled with a vertical shaft diesel engine of Greaves Lombardini model 522 develcping 7.5 HP at 3600 r.p.m.T his drive unit also was installed on craft of similar size mentioned above at Purakkad and Kattoor, both of Alleppey District, and at Chellanam near Cochin. In this case there is the advantage that no hole need be made on the body of the vessel as in the case of the z type drive described above. The total weight of the unit also is reduced. However, the full weight is overhung on the side of the vessel so that the fishermen will have to be a bit more careful in balancing the vessel especially when crossing a surf. However, the trials carried out show that this is not serious and the fishermen manage very well with the drive and the operations are found successful.

The imported Yamaha outboard motor and Johnson outboard motor have also come to the field and the trials have started with these engines also in the fishing villages in Alleppey District and Chellanam near Cochin. The two models of Yamaha petrol start, kerosene running outboard motors under trial are model No. 8 BK developing 7 HP at 5500 r.p.m. and model No. E15 AK developing 12 HP at 5500 r.p.m. The trials are in progress and the operations are found successful.

Mechanisation using power pole was tried in early sixties, however, this system did not find any significant impact on the Indian coasts. Recently one firm has come forward with a power pole drive unit using two models of diesel engines. They are SEACUB model SC 5 developing 5 HP at 2200 r.p.m. and SC 9 developing 9 HP at 2500 r.p.m. Even though demonstration of this simple system was successfully carried out on backwaters by installing on *Kettumarams* and on some small country craft, no further progress could be achieved, in actual fishing operation.

Operational efficiency and economy

In the west coast where the surf is not so severe as in the east coast, the trials clearly demonstrate that mechanisation of the traditional craft ranging from 10.37 m to 17.08 m OAL, is possible with any of the types of drives mentioned in this paper. Tables 1 to 3 give the results of some trials carried out on actual fishing operations using the various types of drives. Table 4 gives the comparative trial results conducted on mechanised and non-mechanised craft in one of the fishing villages. It has been observed that operation-wise, all the types are suitable for mechanisation without modifying the craft except in the case of the Z type drive for which a small hole will have to be made near the stern of the craft. However, in this case there is the advantage that the engine is installed inside the craft so that the weight overhanging on the side is considerably reduced. In the case of the imported outboard motor and the indigenous outboard diesel engine drive the full unit is hung on one side so that the fishermen will have to be careful in counter balancing the overhung weight. This is more predominant in the case of the indigenous diesel engine drive as it is much heavier than the imported outboard motor. However, it has been observed that the fishermen understand the drawback very well and they adjust themselves so that practically no hazard has been felt due to this either during beaching or fishing operations. Considering the low initial cost and less weight thereby enabling easy handling and manoeuvrability, the imported outboard motors appear to be the ideal choice for the mechanisation of the traditional craft in the west coast. However, the high cost of petrol and scarcity of kerosene together with higher fuel consumption rate of the outboard motor, make it costlier compared to the indigenous desiel engine drive units which consume much less fuel and that too the cheaper diesel. The difference in economic performance of the different drive units thus depends on the costs related to the drive units, that is, the cost of capital, fuel and maintenance/repair (CIFT Special Bulletin, 1979). The comparison of costs is given in Table 5 assuming that the costs of maintenance and repair are equal in all cases which may not be absolutely correct.

Conclusions and recommendations

Mechanisation of the traditional fishing craft is essential to improve the standard of living of the small scale fishermen for, my mechanisation, they are in a poistion to reach the fishing ground very fast. They can cast the net rapidly and encircle the shoal faster due to higher speed of the craft so that practically the shoal dispersal does not take place. Onec the fishing operation is over, they can reach the shore much faster so that the spoilage of catch is reduced and better price is realised for the catch. As mannual labour is considerably reduced they can go for fishing for more trips so that ultimately their income is increased.

The trials carried out show that technically all the drive units described in the paper are acceptable to the fishermen in the west coast. However, considering the overall cost including capital cost and the operating cost, it is seen that the indigenous diesel engine driven drive units work out to be cheaper in the long run (Table 5). The cost calculated for kerosene is based on the control price. However even for the trial runs, kerosene has to be purchased at Rs. 4/- litre from the open market. Even though the overall cost of the diesel engine drive units will be economical in the long run, their high initial cost compared to the imported outboard motor stands in the way of their acceptability. The fishermen are happy as long as the trial runs are concerned as the cost of the trial are met by the manufacturers. It is beyond the capacity of small scale fishermen to raise the cost of the drive units which are costing more than the cost of the craft

themselves (the cost of the craft vary from Rs. 10,000 to 15,000). This is more predominant in the case of the Z type drive unit and in this case a hole also will have to be made on the side to install the unit. So it is imperative that some sort of subsidy is to be provided by the local authoritites, to help fishermen to own such units. The manufacturers also will have to take measures to reduce the cost of the units as well as to improve their quality by marinising the engine and by streamlining the drive units for better efficient operation.

References

Anon (1980) *Inboard Motorisation of Small G.R.P. Boats in Sri Lanka.* BOBP/WP/4, Madras

CIFT Special Belletin–7 (1979) *Catalogue of Implements/machinery for Fish Harvest and Post-harvest Technology (Inboard-outboard drive)*

Traung, J.O. (1969) *Mechanisation of Small Fishing Craft.* Fishing News (Books) Ltd., London