

Chandi boat motorization projects in Bhola, Bangladesh — and their impacts



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The Hilsa is the main marine fish captured in Bangladesh. and the Meghna River is the centre of this fishery. Bhola Island. off the east shore of the Meghna, is the home of thousands of fisherfolk who rely on Hilsa for their survival. They mainly use chandi boats in this fishery.

This report describes the evolution of the motorization of the chandi boat, in Bhola. between 1980 and 1993. It includes information on the project sponsored by the Danish International Development Agency (**DANIDA**) and developments in the private sector. The Bay of Bengal Programme's (BOBP) involvement during this period, supporting project implementation and monitoring the project, permits a technosocioeconomic analysis. which is also part of the report.

The Bay of Bengal Programme (BOBP) is a multiagency regional fisheries programme which covers seven countries around the Bay of Bengal — Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka and Thailand. The Programme plays a catalytic and consultative role: it develops, demonstrates and promotes new technologies, methodologies and ideas to help improve the conditions of small-scale fisherfolk communities in member countries. The BOBP is sponsored by the governments of Denmark, Sweden and the United Kingdom, and also by UNDP (United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

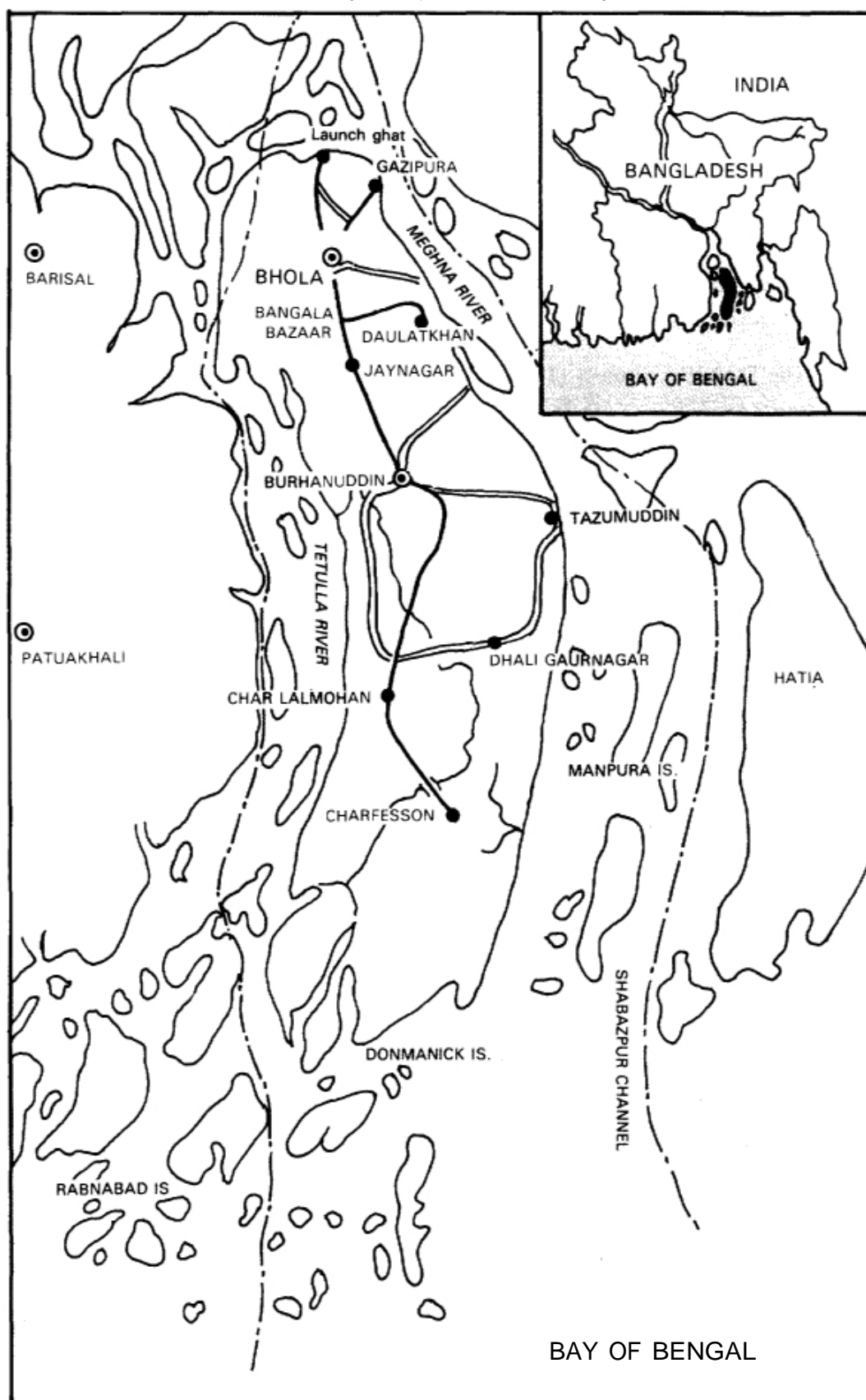
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Fig 1. Map of Bhola Island, Bangladesh



1. BACKGROUND

1.1 *The project*

The 3rd Advisory Committee meeting of the Bay of Bengal Programme (BOBF), held at Chittagong in November 1978, marked the beginning of the implementation phase of the Programme. In that meeting, the Bangladesh representative indicated a priority interest in the motorization of country fishing boats. It was felt that the catalytic effect needed to raise the living standards of fisherfolk could only be accomplished by motorizing indigenous craft; the introduction of new craft would not meet this objective, as it would be severely limited by financial and logistic constraints. In the spirit of technical cooperation between developing countries (TCDC), Thailand offered to share its expertise in this area.

Consequently, in December 1979, the Chief of the Fishing Vessel Section of the Department of Fisheries, Thailand, and BOBP's Naval Architect surveyed the country craft of Bangladesh to identify the most appropriate craft for motorization. While numerous vessel technology projects had been initiated in the Chittagong/Cox's Bazar areas, very little had been done in the area around Bhola Island, a centre for the most important marine fishery in Bangladesh, *i.e.* the *Hilsa* fishery, except for a few boats being motorized, with expensive marine engines installed inboard, by an NGO (Swedish Free Mission), for experimental trawling. It was an experiment which did not prove successful.



Hilsa - Bangladesh's most important marine psn

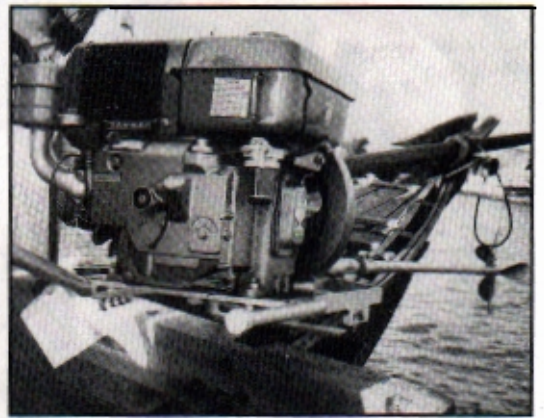


A chandi boat beached at a creek landing centre

The survey recommended that the *chandi* boat was suitable for motorization. It is the larger of two traditional types of craft employed in the fishery. It is a round bilge, open boat with high sheer, particularly aft. For the motorization, a lightweight, aircooled diesel engine with longtail arrangement was recommended. These retractable longtails could be side-mounted in combination with a large steering oar at the rear to make up for the lack of keel (lateral plane area). Inboard engine installation was ruled out, as most of the boats had to be 'beached' on the river banks and also because it would need major structural modifications to the craft.

1.2 Pilot phase (1980-'83)

In December 1980, four 11 m-long *chandi* boats were selected for trials. Two were fitted with longtail engines (a Deutz FIL 208, 8.2 hp in one and a Yanmar TS 105 c, 9 hp in the other) and it was intended to compare their performance with that of the two nonmotorized craft. All four were issued 130 pieces of nylon gillnet so as to standardize the fishing gear used. While BOBP provided engines, gear and supervised installation, the Bangladesh Fisheries Development Corporation (BFDC) provided the services of a mechanic as field supervisor. The craft were monitored for 14 months and their fishing results analyzed.



The first longtail installation by BOBP in 1980

The results of the fishing trials were clear. The catch of the motorized *chandis* was double that of the nonmotorized craft. While price received for the fish (almost exclusively *Hilsa*) was the same for all craft, the increased revenue obtained by the motorized *chandis* resulted in a 60 per cent increase in crew wages. The motorized craft had been able to tap resources out of reach of the nonmotorized *chandis*. Crew fatigue in the motorized craft was also minimal on arrival at the 'fishing grounds. But while the results aroused much interest from the fishing community, credit



Chandis anchored in the Meghna

The split bamboo deck and cooking utensils aboard a chandi boat.



Close-up of the sheltering woven-roof of a chandi boat



was not available for motorization. Nevertheless, as commercial viability had been demonstrated, the two participating boat-owners purchased the longtail engines after they had been used for more than a year. Their positive attitude led to test marketing of four more engines in 1982-'83 and these were easily sold at full cost (further details in BOBP/REP/18).

1.3 Proposal for 250 engines (1982-86)

In order to motorize chandis on a larger scale the BFDC drafted a proposal in 1982 to motorize 250 craft with low-powered, longtail marine diesel engines.

The Tk 21,00,000^{*} proposal, to be sponsored by the Ministry of Fisheries and Livestock (MFL) and fully executed by the BFDC, comprised of two phases. In Phase I, engines were to be installed in 100 chandi boats during 1982-83 and fishing gear distributed to their operators. During Phase II, 150 chandis were to benefit in 1983-84. The United Nations Capital Development Fund (UNCDF) was approached with a request to fund the Tk 12,575,000 foreign exchange component. They showed interest and BOBP prepared a comprehensive project report for UNCDF in late 1982. After several years of negotiations between UNCDF and BFDC, the former withdrew their offer to consider funding the project as they were not convinced that the institutional arrangements proposed by the BFDC would suffice for successful project implementation.

In the meantime, as part of the Government's efforts to improve rice production, several thousand diesel engines had been imported for agricultural purposes and offered to farmers at a subsidized cost. These engines were needed for pumpsets only during the four-month dry season and many an enterprising farmer rented his engine to a fisherman to motorize his boat. The ready availability of engines and spares, together with the successful results from BOBP's pilot project spurred motorization in the private sector among well-to-do fishermen. However, motorization was still beyond the reach of many who had no access to low-cost credit.

1.4 Proposal for 50 engines (1987-'89)

A new project proposal was drafted by BOBP in 1987 to motorize just 50 chandis. Unlike the UNCDF project, this project was to be channelled through the Department of Fisheries, with administration, coordination and monitoring carried out under the supervision of the BOBP office in Dhaka through regular field visits by BOBP-engaged field staff. Local fishery officers would assist in monitoring. The Swedish Free Mission, an NGO with experience of fisheries and motorization and in Bhola since 1978, was to be contracted to assist in beneficiary selection, installation and servicing of engines, provide training courses in engine maintenance and repairs, and coordinate the monitoring. The Bangladesh Krishi Bank was to assist with disbursement and repayment. The \$ 200,000 proposal was sent to a limited number of potential donors in mid-1987.

1.5 BOBP's catalytic subproject (1987-'89)

While the new motorization project awaited donor acceptance and Government clearance, BOBP decided to fund a catalytic interim subproject to gain experience in fisherfolk credit and demonstrate the feasibility of motorization on a larger scale. In June 1987 it was agreed between BOBP and MFL that ten chandis would be motorized utilizing the same project structure as suggested in the pending 50-engine project. This, it was expected, would have a catalytic effect on the release of institutional credit for motorization. With this resolve, the interim subproject got underway.

The District Fishery Office (DFO) and the Swedish Free Mission (SFM) made the preliminary beneficiary identification. By October, ten 10.5 hp Kubota engines with longtail arrangements were purchased by the subproject at a 17 per cent discounted price of Tk 36,500 per unit. In December 1987 the Daulatkha Beneficiary Selection Committee was convened by the Department of Fish-

^{*}US\$ 1 = Tk 28 (appx.) (1982)

cries. The Committee consisted of the DFO (chairman), the *Thana* Fishery Officer (TFO) (formerly Upazilla Fisheries Officer) as secretary, two representatives of the National Fishermen's Association — Jatiya Matsyajibi' Samiti (JMS) — Bhola branch and a representative of the Krishi Bank. Ten beneficiaries for the engines and gear were selected. By late January 1988, the first batch of ten engines were installed under BOBP supervision and repair and maintenance training given by the BOBP field staff. In February 1988, fishing gear was distributed on 50 per cent down payment being made. Fishing operations and monitoring commenced thereafter.



'FAO 10, which was motorized with a longtail in 1988. The Kubota engine was later (in 1990) used as an inboard system as trends changed.

Meanwhile, BOBP had, already decided in January 1988, with the concurrence of the MFL, that the first batch of engines should be followed by a second batch of ten. This, it was felt, would have an even greater catalytic effect on funds being released by hanks. So, in early 1988, an additional ten Kubota engines were purchased at Tk 27,000 each. By May 1988, the second batch of ten beneficiaries were selected from 46 applicants who had been screened by the DFO and BOBP field staff during on-site visits.

The JMS now raised allegations that several beneficiaries did not fulfil the set criteria of being a full-time fisherman of Daulatkhan, owning at least one — and preferably no more than one — nonmotorized *chandi* of 9-12 m size. In June, a public enquiry was held in Daulatkhan in the presence of the TFO, JMS, BOBP and 49 local residents. All ten beneficiaries were cleared of the charges. However, it was found that

the Committee's secretary had not announced a closing date for applications;

Committee members had not been furnished with lists of candidates;

— not all members of the Committee had been involved in the screening; and

the recently transferred *Thana* Fishery Officer (TFO) and recently terminated Assistant Fishery Officer (AFO), as well as local touts, were guilty of extortion.

Having selected the ten beneficiaries, the second hatch of engines were distributed to them in June 1988 along with fishing gear. Four others were given fishing gear only for comparison.

During the rest of 1988 and all of 1989 BOBP monitored catch data, collected instalments and provided technical backstopping. Collected data showed a tripling of income for motorized units. No major technical problems were encountered. Repayments, however, were only at 80 per cent by mid- 1989, as many beneficiaries were delinquent in their payments. More effort was then put into recovery and, by November 1989, recovery was 90 per cent. The loans were fully repaid by November 1991 a year later than schedule.

During the time frame of this project, there were some interesting developments in the private sector. Motorization gained momentum and, by 1988, thirty boats were motorized with longtails. Around this time, heavy erosion in Daulatkhan thana changed the topography of the shoreline. Mudflat river banks vanished, while new creeks and channels were formed near fishing villages. The boats had to be anchored, not beached, and overcrowding created a problem on account of the side-mounted longtail engines. River piracy had also increased and the longtail was an easy target due to its portability. It was only to be expected that this type of engine installation would have to give way to the more conventional inboard installation despite increased costs of stern gear and structural modifications to the boat. Motorization, however, continued at a rapid pace, and, by 1989, nearly 100 motorized boats were operating in Daulatkhan thana. Engines of Chinese make, cheaper than the earlier Japanese versions, had begun making an entry into the market in a big way. And several local workshops had sprung up, making available expertise at engine installation.

2. THE DANIDA PROJECT (1990-1993)

Shortly after BOBP submitted the project proposal for SO engines, the Danish International Development Agency (DANIDA) expressed an interest in it and undertook to sponsor it. However, the implementation was delayed due to bureaucratic snags in the GOB machinery. The design of the project is described and the history of the project narrated in the following pages.

2.1 Project design

The original project document, which laid the foundation of the project design, is presented below in edited form.

OBJECTIVE

The development objective was to improve the standard of living of small-scale marine fisherfolk in Bangladesh.

The immediate objective was to increase the income of small-scale marine fishermen in Bhola District, through increased productivity, by motorizing traditional chandi boats.

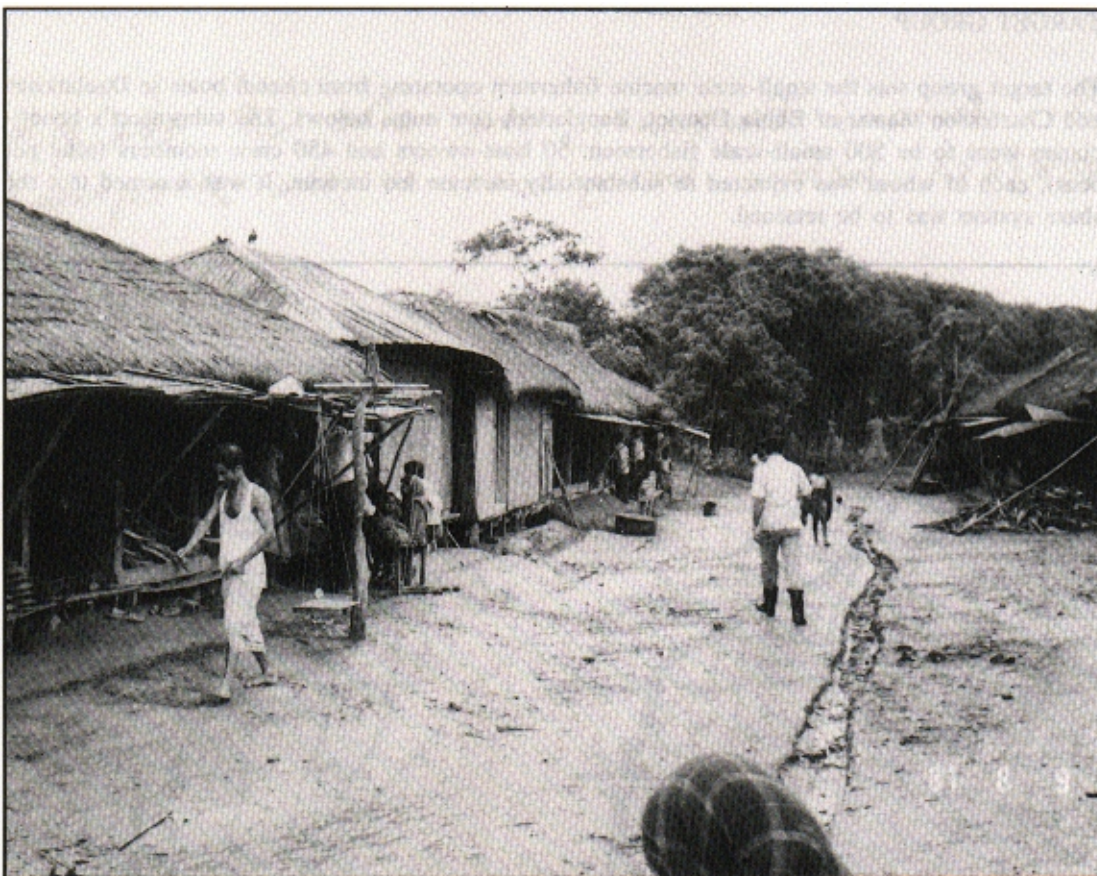
OUTPUTS

The outputs of the project included:

Fifty motorized and equipped chandi boats

Crew members trained in maintenance and repair of engines

Higher productivity and earnings for 500 small-scale fishermen.



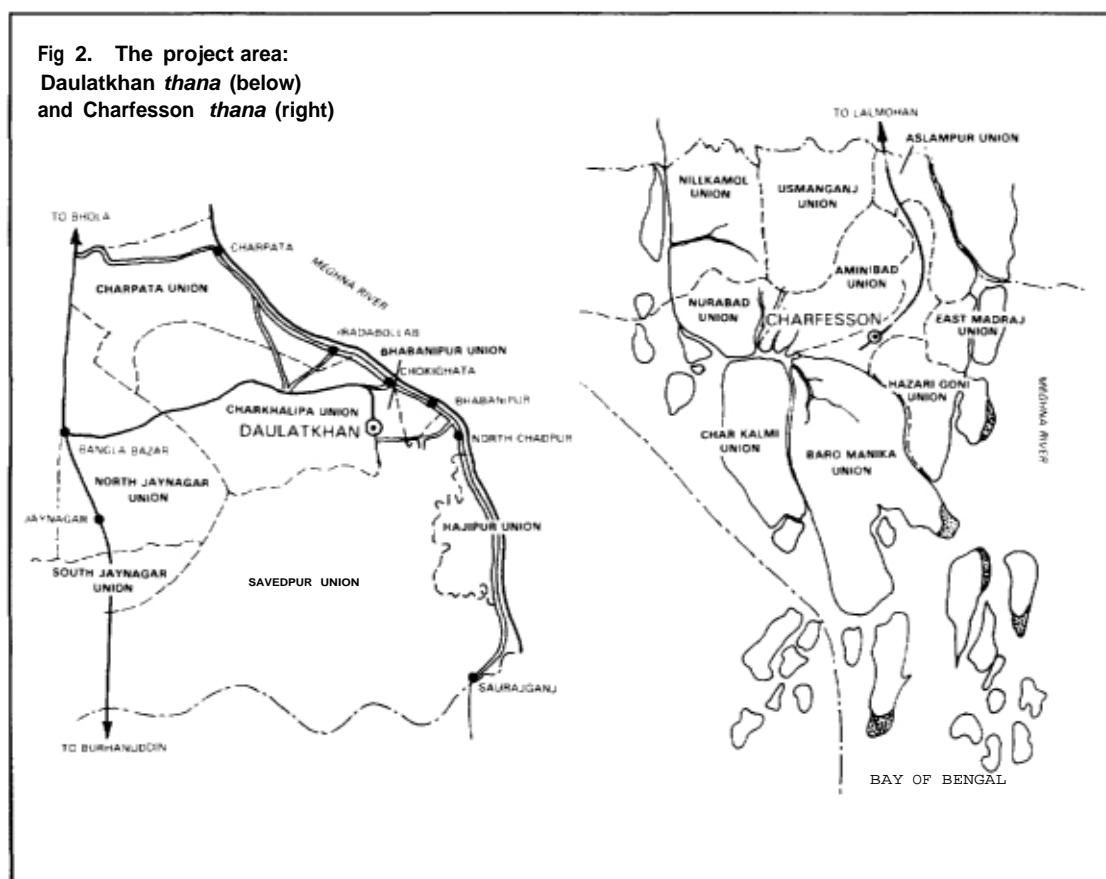
Amani Bazar, the site of the pilot project, before it was lost through erosion to the Meghna.



Net repairing in subproject fishing village in Daulatkhan thana

TARGET GROUP

The target group was the small-scale marine fishermen operating from *chandi* boats in Daulatkhan and Charfesson *thanas* of Bhola District, Bangladesh (see maps below). The subproject's beneficiaries were to be 500 small-scale fishermen: 50 boat-owners and 450 crew members (nine per boat), each of whom was expected to substantially increase his income. It was assumed that the share system was to be retained.



DURATION

The project was designed to be completed in two years from the date of transfer of funds by DANIDA.

WORK PLAN

The work plan consisted of the following elements:

Identification of beneficiaries: The basic criteria for selecting the beneficiaries to be provided with engines and fishing gear were that each boat-owner should:

Be a permanent resident of Daulatkhan or Charfesson *thanas* of Bhola District.

Be an owner of a *chandi* boat of 9-12 m size range.

Be a full time fisherman.

Have, preferably, only one *chandi* boat.

Selection of beneficiaries: The beneficiaries were to be selected by a Committee specially constituted for the purpose at the thana level (then upasilla) on 1.11.89 and which was to include:

Chairman	—	The District Fishery Officer
Member		The local representative of the Krishi Bank (BKB)
Member	—	Two local representatives of the Jatiya Matsyajibi Samiti (JMS)
Member Secretary	—	The Thana Fishery Officer
Member	—	A Representative of BOBP

In February 1990, a representative from DANIDA was coopted as a member of the Selection Committee.

The Thana Fishery Officers of Daulatkhan and Charfesson, as secretaries of the respective committees, were to receive applications in response to the official notice.

The members of the Beneficiary Selection Committee were to undertake field investigations independently and present their report to the Committee for the final selection to be made.

Procurement of equipment: Engines (10.5 hp) were to be procured from the local assembler-cum-manufacturer of Kubota, an engine that had already been used and accepted by Bangladesh fishermen. Clutch and gear box were to be provided with the engine. as requested by the local fishermen. Fishing nets (nylon) and polyethylene ropes were to be procured from the local market through quotations.

Training of fishermen: Two crew members from each selected unit were to be trained in five batches of 20 to operate and maintain the engines. The four days' training for each batch was to be held at Daulatkhan/Bhola Sadar and the trainees were to be provided a training allowance of 100 Tk/day.

Engine installation: The engines were to be installed during the training programme under the supervision of BOBP mechanics-cum-field supervisors. As mentioned earlier, the preference was for inboard installation over the longtail, as most boats were based in creeks or channels in Daulatkhan thana.

Service programme: Regular engine service, twice a year, was to be provided during the initial two-year period of operation through the BOBP mechanic and the manufacturer's field service mechanic (once a year) working with local workshops. The service was to include a general check-up and adjustment of the engine, change of lubricating oil, change of oil and fuel filter and cleaning of fuel tank. The service was to be provided at some of the landing centres.

Monitoring: Of the 50 motorized units, six units in each thana, together with a few nonmotorized boats, were to be continuously monitored through field visits by BOBP mechanics and thana staff. Fishing trip data on location of fishing ground, number of fishing days in the month, number of pieces of net, catch, catch value, operating costs etc. were to be collected. The economic performance of the motorized craft was then to be assessed in relation to that of the nonmotorized craft.

Loan recovery: Engines and fishing gear were to be provided to the beneficiaries on a loan that was to be repaid in monthly instalments. The Beneficiary Selection Committee had been empowered to decide on the amount of down payment to be made by the beneficiaries when delivering the engines and fishing gear. The balance loan was to be repaid in 16 equal monthly instalments for engine and eight equal instalments for the fishing gear. If any beneficiary failed to repay an instalment in time, a penalty of 10 per cent would be levied on the instalments of the defaulting month(s). In case of default for three consecutive months, the loan would be cancelled and engine and fishing gear seized and allotted to another person.

The field staff of BOBP and the TFOs of Daulatkhan and Charfesson were to be responsible for realization of the instalments. Beneficiary Selection Committee members, particularly the representatives of the JMS of Bhola, were to motivate and pursue the boat holders to repay the loans.

The recovered loan was to be deposited in a separate bank account to be opened by BOBP and the manner of utilization of the accumulating fund was to be decided in consultation with MFL and DANIDA.

Quarterly review meetings: The DFO, TFOs and BOBP field staff were to send monthly reports to the BOBP office in Dhaka and quarterly progress reports were to be prepared, incorporating fishing data, fishermen's problems, loan recovery, expenditure statement etc. The District Fishery Officer, Bhola, was to convene quarterly review meetings to discuss the reports, matters related to the progress of the programme, bottlenecks in implementing the activity, fishermen's problems, loan recovery status etc. The meetings were, generally, to be held in Bhola and Beneficiary Selection Committee members were expected to participate together with representatives from DOF headquarters, the BOBP regional office (Madras) and DANIDA.

Final report/evaluation: When the project came to an end, a final report, incorporating a summary of physical and financial outcome, experiences from the training and service programme and the socioeconomic benefit to boat holders, was to be prepared.

Workshop: A workshop was to be held to review the final report, draw conclusions and recommend follow-up actions.

Organization and management: The project was to be operated through the Department of Fisheries, and the District Fishery Officer was to be responsible for supervision and coordination of the activities. BOBP, through its Dhaka office, would be responsible for implementing the project ordering of equipment, training of fishermen, installation of engines, recruitment of field staff, monitoring, reporting etc. Appropriate nongovernmental organizations were, if necessary, to be contracted by BOBP to provide training, engine servicing facilities or to prepare the final report/evaluation.

2.2 Project history

The revised version of the 1987 project proposal became a reality in January 1990 with DANIDA funding it and Government of Bangladesh clearing the proposal. As Daulatkhan had already been the sole target area of the BOBP project, it was decided that the DANIDA project could be extended to cover Charfesson *thana* also, as envisaged in the project design. While Daulatkhan had relatively good infrastructure, Charfesson, still growing physically (with erosion deposits) and demographically (with new settlers), was much less developed and more isolated.

Fifty Kuhota 'Marine Powermates' (a Kubota ER 900 N Diesel engine of 10.5 hp, with belt-driven clutch gear, three-bladed bronze propeller, 1.8 m stainless steel shaft and stern tube, universal coupling and other fittings) were ordered that same January at TK 50,000* each. The 5 per cent discount given was used to buy an additional three engines. The cost of the propulsion unit with the new specifications was 92 per cent more than during the BOBP interim project, not to mention the added cost of inboard installation which, fortunately, was covered by project funds. Perhaps savings could have been made, if low-cost Chinese engines — that had by then flooded the market — had been purchased; however, a decision had been taken on the Kubota engine. In February 1990, applications were solicited from the fisherfolk communities in Daulatkhan and Charfesson, for allotment of the Kubota propulsion system. There were 55 and 92 responses respectively. The list of candidates was circulated in March, mechanics were hired and office-cum-godowns were rented in both Daulatkhan and Charfesson in April-May to facilitate engine installations and impart training before the fishing season commenced.

* US \$1 = Tk 35 (appx.) (1990)

In May 1990, the Beneficiary Selection Committee selected fifty beneficiaries and put 15 on a waiting list. The Committee decided on a Tk 5,200 down payment and repayment of the balance in 16 equal monthly instalments after a two-month grace period. The Committee further decided, in consultation with the fishermen, on what nets and ropes to purchase. Tk 8,080 and Tk 7,050 respectively were to be the down payments for nets and ropes and both were to be repaid in eight equal monthly instalments after a two-month grace period: Unfortunately, the DANIDA funds initially transferred to the project did not cover the costs of net and rope and this additional funding required Government approval, resulting in further delay. The selected beneficiaries were understandably concerned that, without the required gear, they would not be able to meet the repayment schedule. Their only means of procuring the gear was through the money lenders/fish traders who would then demand they be given all catch at below market prices. Only seven beneficiaries took receipt of their engines by July. Another six took possession during July and three more during the next few months, making a total of 16 engines distributed in 1990. Despite the unfortunate turn of events, 100 fishermen were trained in engine repair and maintenance in June and July by the project's field staff.

To overcome this impasse, the BOBP Programme Director, at a meeting of beneficiaries in Daulatkhan in October 1990, agreed to the fishermen's request for cash credit to deserving fish-



High level officials, including the Director of Fisheries and Director of the Fisheries Research Institute, listen to fisherfolk's views.

ermen. This would enable them to avoid indebtedness to fish traders, something the fisherfolk considered a major barrier in their upliftment. A set of nine criteria was thereafter spelt out to stipulate the framework of the BOBP-funded cash credit scheme. they were:

Loan amount to be decided on verification of funds required.

- Loans to be provided to *chandi* boat operators having one *chandi* boat and at least 80 *kachi* gillnets. Preference to be given to the *chandi* boat units participating in BOBP's motorization projects.



BOBP beneficiaries gather at Daulatkhan thana assembly hall to discuss the progress made

- *Chandi* boat fishermen should be permanent residents of the Daulatkhan and Charfesson thanas of Bhola District.
- Selected boat holders to repay the loan in eight equal instalments.
- Each boat holder to deposit monthly, in a savings account opened individually, money equal to Tk 150 per *pon* (80 pcs of *Hilsa*) of their total monthly landings.
- Money saved to be refunded after receiving the last instalment.

Failure to deposit both loan and saving instalments to render immediate cancellation of the loan.

- All transactions to be made through the designated bank.
- Units selected for the loan programme to execute an agreement including the above terms and conditions and specifying that the programme authorities (BOBP and DOF) were authorised to confiscate the boat and nets of any defaulting unit.

The cash credit programme was implemented by BOBP staff in 1991 but was not replicated.

As the 1991 fishing season approached, only two new engines were installed prior to the cyclone and tidal bore of April 29th which struck Bhola. Sporadic installation of engines continued from the very next day until September, by when 16 engines had been taken possession of. In all, thus, only 32 had been distributed and 21 still remained.

In March 1992, as the peak season once again neared, the Beneficiary Selection Committee met to select additional candidates. The Committee chose another 21 names, but, again, only eight took

immediate possession. They were later joined by four more. The Committee again convened in April, determined to distribute the engines prior to the start of the season. This time, the MFL, on the request of the JMS, who offered to stand as guarantor for its members living in two other thanas — Tajmuddin and Monpura, a group of small islands in the middle of the Meghna River — approved the inclusion of these two localities. Of the eight JMS members proposed and selected, five beneficiaries eventually took possession of engines and gear, making a total of 17 beneficiaries for 1992. Only three new engines allocated to JMS members plus one slightly used, returned engine remained to be sold off. In early 1993, one engine was sold on a cash basis in Charfesson to a fisherman for Tk 25,000 and the other three were sold to an NGO in Bhola (Jatio Bandhujan Parishad) at the same price in order to liquidate the remaining stock.

It is important to explain this lukewarm response despite the proven benefits of motorization.

The reason for the reluctance to take possession of the engines after the first selections in 1990 was initially attributed to the absence of the promised fishing gear. But after December 1990, fishing gear was available on credit from the project. It soon became clear that the two basic reasons for the poor response by the selected fishermen were:

- Some selected individuals did not own *chandis* but were representing absentee owners and had yet to work out an agreement for sharing the earnings.
- Some owners did not want to take possession of the engines as their craft were in disrepair and they lacked necessary funds for immediate fishing operations and down payment. It was later found that money-lenders/fish traders did not want to lend to project participants.

In retrospect, it appears that the screening of beneficiaries with reference to their assets was not thorough.

The monitoring envisioned throughout the project was postponed repeatedly and only began in May 1992 and continued to April 1993, resulting in only one complete year of data on 15 craft.

It became evident by mid-1992 that several beneficiaries had wilfully defaulted and fines for late payments had not been levied. The Committee then decided to repossess assets from 15 engine beneficiaries and seven cash credit beneficiaries and auction them to offset a portion, or all, of their debt. Action to be carried out by the Committee chairman (DFO) was delayed until November/December 1992, then legal action was initiated in four cases. By early 1993 legal costs forced this line of action to be abandoned. Repossession and immediate redistribution by DFO and project staff at a discounted price proved more effective.

In January 1993, a three-day workshop was held to discuss the results of the project. The workshop, held in Bhola town, was attended by high-ranking government officials, NGOs, banks, fishermen societies and fishermen. The summary of the workshop is documented in the *Bay of Bengal News* (Issue No 48).

3. ANALYSIS OF CHANDI BOAT MOTORIZATION

From the pilot phase in 1980 to the present, BOBP has been involved with the evolution of *chandi* boat motorization in Bhola. Trial records, observations by field staff, visits by project staff to Bhola, analysis by an NGO (CODEC) and earlier working documents and reports make it possible for a techno-socioeconomic analysis to be attempted.

3.1 Technical aspects

The traditional *chandi* boat has no keel. It is basically a riverine craft, though it is used in the bay during the calm season. The average size range (9-12 m), with a full complement of fishing gear



Field discussions on the Meghna's shore during the National Workshop, January 1993.



*Workshop participants
formulate their
recommendations, which
were published in the
BOBN Issue No. 48
(1993).*

and crew, would need an engine developing 10-15 hp. The majority of boats motorized to date have 10.5 hp engines.

The simplest and most practical solution to motorization of *chandi* boats in 1980 was to install longtail or 'power pole' engines, very common in Thailand. This system requires no structural modifications to the hull. The longtail is normally used to steer the boat, but for the installation in the *chandi* boat, it was felt that it would be safer to mount the engine on the side and continue to use the steering oar. In practice, this system worked well.

By 1989, the longtail was no longer an acceptable solution for reasons mentioned earlier (creeks versus mud flats). An inboard installation of the same engine required engine bearers and a short keel to be fitted. Negotiating crowded channels also required a clutch to disengage the propeller. All this added to the cost of the propulsion unit. The interesting point to note is that engines imported for agricultural purposes turned out to be ideally suited for *chandi* boats. Initially, the Government imported Japanese engines — Yanmar and Kubota — but, by 1988, cheaper Chinese engines entered the market.

For reasons of scale, as the number of Chinese engines increased the cost of the propulsion units reduced! (See Figure 3.) While the Japanese engines were more reliable, they were also more expensive to buy and maintain. The Chinese engines, on the other hand, were within reach of a larger section of boat-owners. This is evident from the increased share of the market for Chinese engines since 1985 (see Figure 4).

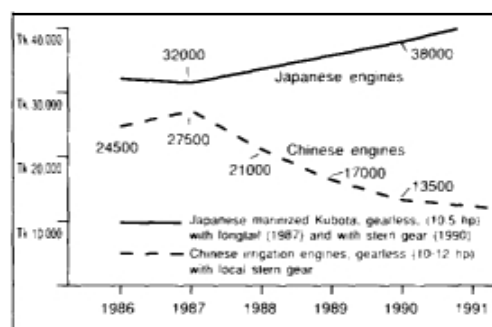
The increasing number of motorized boats in Bhola also resulted in increased availability of engineering services. Training of fishermen and local mechanics was an integral part of all the motorization projects. While over 100 fishermen received training from BOBP field staff, the situation today is that nearly all motorized boat fishermen have some working knowledge of engine maintenance and repair.

3.2 Economics

FINANCIAL ANALYSIS

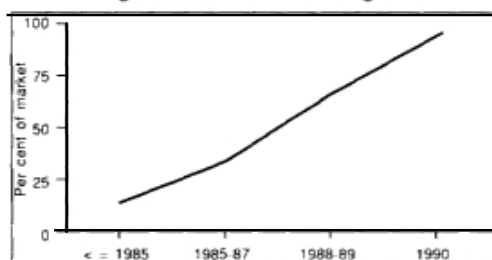
To determine the viability of motorization with new input costs, 15 *chandis* were selected in Daulatkhan and Charfesson thanas to be monitored for one year. Data was collected in May 1992 - April 1993 from 92 fishing trips made by six nonmotorized *chandis* six BOBP-motorized (Japanese engines) and three independently motorized *chandis* (Chinese engines and local stern gear). While the nonmotorized craft were given nets on credit, as were the BOBP motorized craft, the Chinese-engined craft monitored were not supplied any fishing gear. Identical numbers of nets would have been preferable for craft comparison, but each boat-owner decided on gear investment independently. The Chinese-motorized craft came as an additional component of the monitoring exercise, as it was felt that availability comparison with these craft was necessary to get a complete picture.

Fig 3. Average cost of engines



Source: Sharif (interviews) and KVAM 1991

Fig 4. Sales of Chinese engines



Source: KVAM (1991)

The initial capital costs of the three categories are quite different, the nonmotorized being the cheapest and the BOBP craft the most expensive (see table alongside).

The common hull cost is that of a medium-sized low-cost hull. Hull prices vary greatly, depending on size and the type of timber used for construction. While the Chinese engines are inexpensive, their useful life is quite short, and, in comparison, they have a higher annual depreciation than the Japanese engines if stem gear and installation is included. In the calculations, conservative figures have been given for engine life, as poor maintenance is widespread. Data about the longevity of various parts of the locally-manufactured stern gear with aluminium propeller are not available, so it is not known if some part could be salvaged. Working capital for roughly one trip has been budgeted (see table above right).

The cash flows have been generated with the average data in each category and further compared with the actual data of specific chandi units to verify the range of normal profitability (see tables alongside and on facing page).

The number of trips have been assumed as nine, except in the case of Chinese-motorized chandis, which made slightly shorter but more trips (assumed as ten). It has also been assumed that 33 per cent of the total value of nets is purchased during each fishing season on all craft to make up for gillnet losses at sea. Salvage value has been simplified

Capital costs (assumed) for craft categories (in 1992 Taka)

	<i>Non-motorized</i>	<i>Japanese engine</i>	<i>Chinese engine</i>	<i>Average life</i>	<i>Annual depreciation</i>
Hull	65,000	65,000	65,000	7	9,286
Engine/Stem gear (Jap)		50,000		5	10,000
Engine (Chi)			14,000	2	7,000
Stem gear (Local)			8,000	2	4,000
Fishing gear*	28,558	36,172	24,790	3	9,947 **
Working Capital	3,000	5,000	5,000	.	.
Total	96,558	156,172	116,790		
Depreciation***	18,805	31,343	28,549		

* Based on average number of nets used by category of craft

** Average of three categories

*** Annual depreciation for a complete unit

Average trip data, actual annual operating costs and revenue

<i>Item/category of craft</i>	<i>Non-motorized</i>	<i>Japanese engine**</i>	<i>Chinese engine***</i>
Fishing data			
Nets (PCS)	143	181	124
Crew size (No)	9	11	10
Trips/Year	9	9	10
Days/Trip	19	20	19
Kg/Trip	479	814	740
Kg/Net/F. hour	0.030	0.038	0.054

Operating cost (In Taka)

Diesel	0	15,949	15,738
Oil/Lub.	0	1,499	980
Engine repair	0	2,269	2,648
Net repair	4,144	1,544	2,188
Hull repair	1,311	466	450
Food	16,938	23,705	7,330
Crew share	36,325	50,165	62,576
Total	58,718	95,597	91,910

Revenue (in Taka)

Fish (kg/yr)	4,307	7,322	7,403
Fish sold	95,730	148,091	151,939
Salvage value*	3,000	35,000	16,000

* 7-yr projection, engine working capital only

** Chandi motorized by project with Japanese marinized inboard engine with clutch gear

*** Chandi motorized by private sector with Chinese all-purpose engine and local gearless inboard installation

fied to account for only engine value and working capital. Average life estimates have been based on the experience of fishermen interviewed.

Economics of motorization

Category/type	Nonmotorized				Motorized (Japanese)				Motorized (Chinese)		
Chandi No (#)	Average*	#39	#75	#76	Average *	#31	#65	#72	Average *	#101	#102
Thana/Centre	-	Daul.	Char.	Char.	-	Daul.	Char.	Char.	-	Daul.	Daul.
Capital cost (in Taka) **	96,558	96,558	96,558	96,558	156,172	156,172	156,172	156,172	116,790	116,790	6,790
Operating cost (in Taka)	58,718	32,219	70,784	70,493	95,597	71,430	67,025	38,073	91,910	83,895	87,108
Revenue (in Taka)	95,730	51,769	115,594	110,642	148,091	120,017	110,625	51,765	151,939	141,315	141,706
IRR	21%	-6%	31%	25%	16%	32%	8%	-35%	34%	32%	29%
NPV (at 16%) (in Taka)	15,919	-54,601	46,604	28,590	-519	89,662	-36,435	-157,222	65,911	55,376	43,979

* Calculated from average trip data for Category times Avg. No. Trips (NM: Japanese engine = 9 trips/yr: Chinese-engine = 10 trips/yr)

** Assumed investment as in table on page 6 top (including 33% of nets replaced yearly)

*** Revenue in Year 7 includes salvage value of engine and working capital

Daul. - Daulatkhan *thana* Bhola District

Char. - Charfesson *ihana*, Bhola District

The nonmotorized craft show a profitability range from -6 to 31 per cent in internal rate of return (IRR) and an average of 21 per cent. The BOBP motorized craft show an even wider range, from -35 to 32 per cent in IRR. The average trip data for all six craft in the category give an IRR of nearly 16 per cent. The Chinese-motorized craft fared best, there being NO negative results and only a small range in IRR: 29 - 34 per cent. The average of the trip data generated a higher IRR of 34 per cent due to the third craft, not shown in the table above, making fewer but heavier landings than Boat No. 101, thus raising the group average.

The Chinese-motorized craft show consistently healthy profitability. Nonmotorized craft and motorized craft with Japanese engines appear less profitable in general, yet still acceptable. Their range of profitability suggests that factors other than propulsion systems affect results.

MARKETING

Fishermen often complain of the market situation, as they feel they lack leverage in bargaining with fish traders. It was mistakenly thought that motorization would help fishermen return to the land-based market quicker and improve sales value.

The fallacy here is that fish is not sold on land but, most of the time, to carrier boats (Choudhury, 1975). As *chandis* neither carry ice boxes nor ice and trips are normally more than two weeks, fish must be sold at sea, daily. Ironically, the nonmotorized craft are closest to land-based markets and are in a position to sell on land more often. If at all there is any slight price differential, it is in favour of the nonmotorized craft.

Prices of Hilsa have shown greater seasonal variations in recent years, reflecting the change in landings (see 3.5 Fishery resources). Prices in 1981 varied, but within a limited range: today, the range is much greater (see Figure 5, facing page), prices being extremely high during the lean season when *Hilsa* is very scarce. If the current prices are converted into constant prices, using an average annual GDP deflator of 10.6 per cent (World Bank 1991), the picture changes (see Figure 6, facing page). While the current lean season prices have remained higher than in the past, peak season prices have actually fallen drastically. An average of the monthly prices shows the 11.50 Tk/kg of 1981 as just Tk 12.54 more than a decade later. The good years in the late Eighties had an average annual price of around 9 Tk/kg. These averages are, however, misleading, as the bulk of catch is landed in a few months. Fishermen today are most affected by October prices, not February, when they do not go fishing. October prices in 1981 were 8.47 Tk/kg, 5.07 Tk/kg in 1988 and 5.35 Tk/kg in 1992. Real prices for fishermen have fallen to 63 per cent of 1981 levels.

3.3 Socioeconomics

Motorization was expected to bring higher incomes to BOBP beneficiaries. CODEC, an NGO based in Chittagong, made an impact assessment in November 1992, focusing on income changes. Beneficiaries are, of course, boat-owners and earn incomes above poverty level. The result showed at least a 10 per cent annual improvement on household income (see table below). The cash credit beneficiaries were shown to earn annual incomes below the poverty line and income growth after BOBP intervention was 4 per cent per annum

Change in real income after motorization

	Group A		<i>Group B</i>		<i>Group c</i>		<i>Group D</i>		<i>Group E</i>	
	1987	1992	1989	1992	1990	1992	1991	1992	1990	1992
Nominal household income	23 520	46,554	25,200	40,350	28,200	37,470	30,000	42,460	21,000	25,200
Real household income*	5.180	7.759	4.94	6.725	5.222	6.245	5.263	7.010	3.889	4,200
Real change (in %)		49.8		36.1		19.6		33.2		7.9
Real change/annum (in %)		10		12		10		3.3		4

* converted to 1973-74 Taka by CPI

Group A = engines issued 1988 B = 1990, C = 1991, D = 1992 E = Cash credit disbursed 1991

Source CODEC, 1993 based on 15 interviews with beneficiaries

Crew incomes from their share of catch were not very impressive. Crews of BOBP motorized craft may earn 500-1000 Tk/annum more than their counterparts in the nonmotorized chandis, but the improvement is not always assured (see table below)

Crew share per annum 1992-93

Category	Non-motorized				Motorized(Jap)				Motorized(Chn)		
Boat Number	Avg*	# 39	# 75	# 76	Avg*	# 31	# 65	# 72	Avg*	# 191	# 102
Annual share/crew	3082	2475	3391	3380	2753	4826	3007	427	5856	5742	5970
Annual household income from fishing	8198	6584	9070	8991	7324	12837	7999	1136	15577	15274	15880

* Based on assumption of a 100:266 dependency ratio and 6.4 members per household

If a family had 2.66 wage earners (CODEC, 1989) who worked as chandi crew members, household income from fishing would be in the range of 6500-17,700 Tk/annum. The high end figure from a Chinese-motorized boat is slightly more than half the income needed to reach the poverty line. Poverty line income is a location-specific figure that allows for clothing, shelter and food (2235 Cal/person/day). The actual figure for the poverty line is around 29,000 Tk/year/household.

Fig 5. Nominal price of *Hilsa* over the years
(Average Taka/kg sold by Bhola *chandis*)

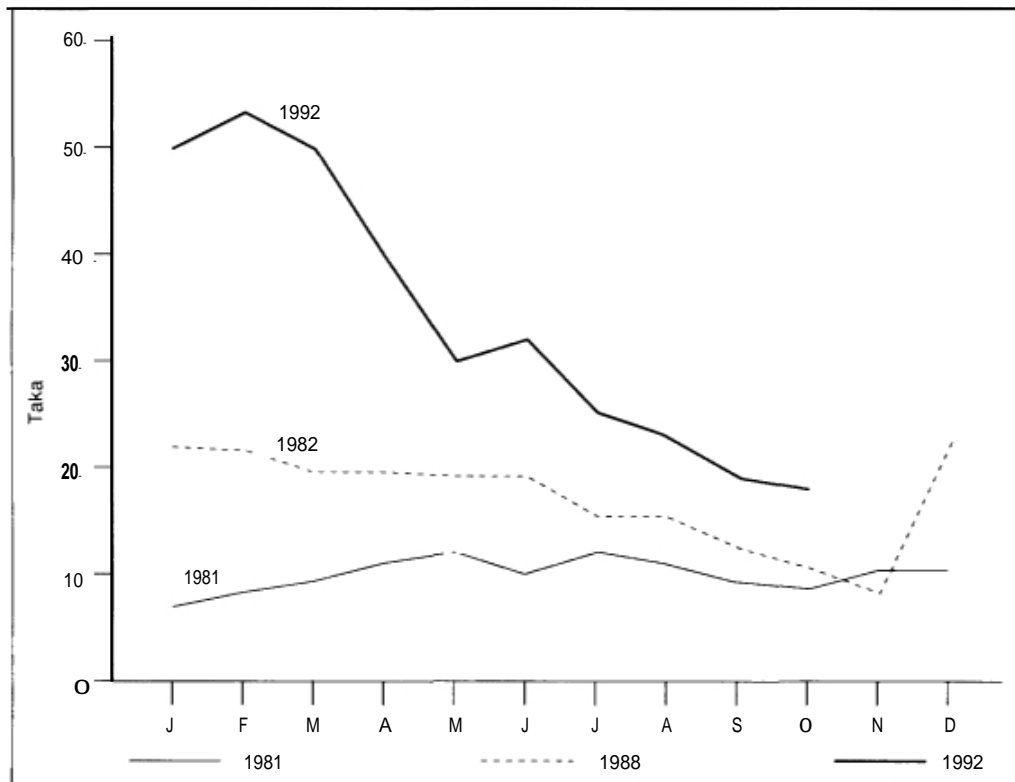
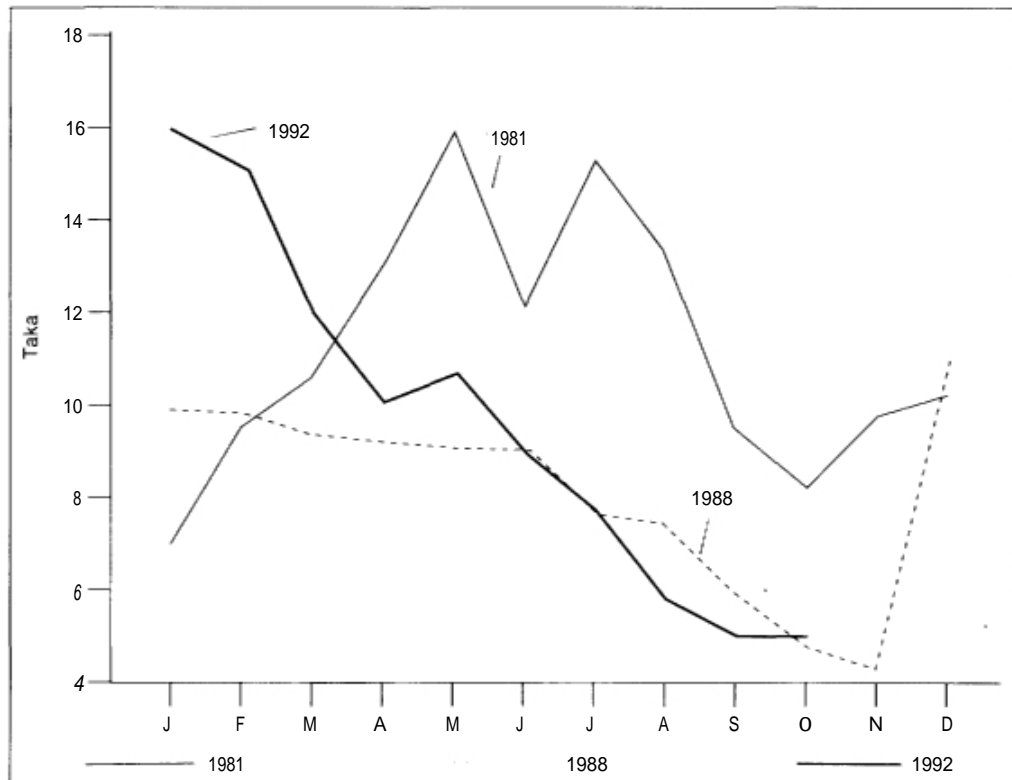


Fig 6. *Hilsa* prices in constant 1981 Takas
(Bhola landing prices deflated)



The crew must, and certainly do, find other income sources — in agriculture and trading — during the lean season. The crew also receive food while onboard, where they spend a major portion of their time. But many crew households are forced to live with incomes far below what is estimated as necessary for minimum basic requirements.

More than 90 per cent of Bhola fisherfolk are Muslim. They are farmers, or children of farmers, who have lost their land due to erosion or economic misfortune (CODEC, 1989). Their housing previously consisted almost exclusively of thatched huts. The number of project beneficiaries interviewed who had some tin sheeting on their houses had increased from 6 (30%) to 15 (65%) during the project. But the CODEC evaluation team points out that this improvement may be more due to BOBP-facilitated cyclone relief than to the benefits of motorization. Similarly, the numbers using only tubewell water for drinking rose from 18 (78%) to 21 (91%) and the numbers using open latrines dropped from 15 (65%) to 5 (22%). Improvements in hygiene, such as water sealed or hygienic pit latrines, have, very likely, not been initiated by the beneficiaries themselves but by Government and NGO programmes. Land ownership by the relatively well-off boat-owners did not change significantly. Indebtedness had been found to effect nearly 90 per cent of Bhola fishermen in 1975 (Choudhury, 1975). In 1989, CODEC found 54-64 per cent of the households indebted. The small sample CODEC made in 1992 showed indebtedness unchanged 23 households (100%) prior to and 23 (100%) after the project. The difference was source. The 1975 survey found that 80 per cent of respondents borrowed from money lenders at 120-300 per cent interest p.a., while 9 per cent borrowed from friends and relatives at 0-120 per cent interest p.a. In 1992, CODEC found that 19 (83%) of those interviewed had previously taken *dadon* from a money-lender and four (17%) from friends/relatives. After the project, the borrowing pattern had moved away from the moneylenders — now only four households (17%) — and towards friends/relatives, land mortgage or just BOBP. In fact, BOBP had competed with the moneylenders, and the moneylenders had, in turn, not wanted to lend to BOBP participants as there was conflict over rights to buy fish at low rates, etc. It should also be noted that all cash credit participants and some motorization participants have come into contact with formal credit institutions through the project and many have active savings accounts now, thanks partly to the project.

3.4 Credit

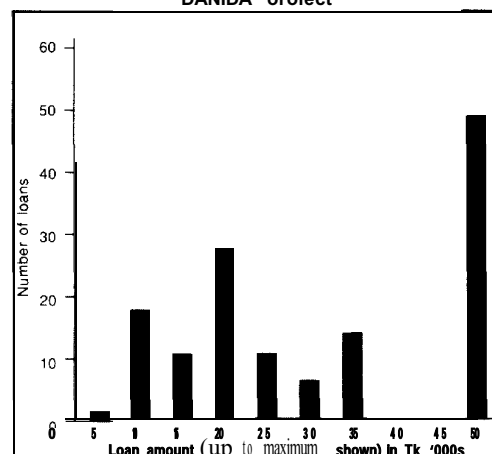
BOBP's idea was not to implement motorization of *chandis en masse*, but to help demonstrate to the local banks the feasibility of a credit scheme for motorization. Motorization, at the same time, was to be promoted among fishermen and, hence, their productivity would improve and, in the long-run, an improved standard of living would follow. The idea of demonstrating credit feasibility was clearly stated in the BOBP interim subproject document. Both the 1988-89 and 1990-93 projects sought the active participation of the local Krishi Bank in implementation and all local banks were invited to the final workshop in January 1993.

CREDIT DISTRIBUTED

During the BOBP interim subproject, Tk 535,000 in engine credit and Tk 230,400 in fishing gear credit were distributed to 20 units for motorization and to four units that were to be nonmotorized controls. All credit was interest-free and to be repaid in 17 monthly instalments after a grace period of one month. Of the total Tk 765,400 distributed to beneficiaries in Daulatkhan thana, Tk 251,000, or one-third, was received immediately as down-payment.

The DANIDA project went on to disburse 141 loans ranging from Rs 1515 to Rs 50,000 and totalling Tk 4,180,045 (see Figure 7).

Fig 7. Size and number of loans disbursed by DANIDA orioiect



600,000	150,393.50	58,588	340,450	321,500	1,470,931.50
(12)	(5)	(3)	(22)	(21)	(63)

While over one-third of the loans were for engine purchase. credit was given for fishing gear and BOBP cash loans. The total amount of credit and number of loans by categories. i.e. engines and stern gear for motorization. nets and ropes, cash credit. are shown in the table below. The motorized units programme consisted of both motorization and fishing gear components for which two separate loans were given. In addition, credit for fishing gear was given to some nonmotorized units in order to ensure comparability and their cooperation and make possible monitoring of nonmotorized control craft.

DANIDA project credit disbursement (in Tk.)

Thana	Motorized units					Thana total
	Engine	Fishing gear	F.gear to controls	Nets & ropes	Cash credit (BOBP)	
Daulatkhan	600,000 (12)	150,393.50 (5)	58,588 (3)	340,450 (22)	321,500 (21)	1,470,931.50 (63)
Charfesson	1,600,000 (32)	301,600.50 (13)	79,120 (4)	195,337 (11)	168,500 (9)	2,344,557.50 (69)
Tajmuddin	100,000 (2)	61,235 (2)	0 (0)	0 (0)	0 (0)	161,235 (4)
Monpura	150,000 (3)	53,321 (2)	0 (0)	0 (0)	0 (0)	203,321 (5)
Total	2,450,000 (49)	566,550 (22)	137,708 (7)	535,787 (33)	490,000 (30)	4,180,045 (141)

() = No of loans

RECOVERY

In the case of the loans disbursed under the DANIDA project, the schedule of repayments and the amount per instalment as envisaged did not consider real time cash flow. With extremes in disposable income over the fishing year, it turned out that the debtor could pay five instalments per year, with the amount per instalment increasing during the peak season to nearly eight times that during the lean season. However, the total loan amount was repaid by a majority within the specified period of 16 months.

The DANIDA project Beneficiary Selection Committee's persistence with the specified schedule of repayment, while ignoring seasonal changes in disposable incomes, may have been the reason for defaults in some cases, affecting overall recovery figures. It is to be hoped that, in future, credit programmes, especially by banks, will take note of the importance of tailoring repayment schedules.

The mechanism for loan recovery is also another important feature of any credit programme. Under the DANIDA project, quarterly meetings of beneficiaries with project staff, local DOF officials and JMS representatives provided a good forum for repayment follow-up and communication. Project staff and Thana Fishery Officers, in association with JMS representatives, were able to make house-to-house visits to collect instalments. In this way, the project had more resources than a commercial bank in recovery follow-up. On the other hand, the project had the stigma of being a government-related programme. Further, BOBP was associated with cyclone relief. There had also been some irregularities in selection of relief beneficiaries. These factors weighed against the project achieving full recovery. but they are factors, which would not affect a commercial bank.

No clear spatial variation can be seen, though, interestingly, the long presence in Daulatkhan thana did not give field staff better social control over loan defaulters nor had repayment discipline been

developed despite the fact that the cash credit programme had been requested by the borrowers themselves. Overall, the recovery here was a respectable 98 per cent. This can be attributed to:

Loans less than the borrowers' seasonal income were more in proportion.

Repayment period was shorter.

Selection was a cooperative effort between BOBP staff, the borrower and his peers. The borrower could choose how the loan was used but had to account in detail at a public meeting how the funds would be used. The advantages of this method were twofold: direct disbursement without any bias in selection of beneficiary and the leeway to circumvent the traditional high-cost money-lending *dadon* system.

Loan recovery was worst where the disbursement was for fishing gear given to nonmotorized units used as controls in Daulatkhan *thana* (see table alongside). The explanation could be that the boat-owner felt that they had made their contribution to data collection. The nets received would be of little value if repossessed by the project and the borrowers may not have believed that the project would repossess their boats as stipulated in the contract. The control craft in Charfesson were able to repay an impressive 100 per cent in comparison.

If the loans are analyzed (see table alongside) as a distribution of recovery percentages, it will be seen that 75 per cent of the borrowers managed 100 per cent repayment. Excepting the 6 per cent who repaid only 40-49 per cent, the distribution of recovery levels of defaulters is evenly spread from 100 per cent repayment up to full repayment

Despite the high proportion of loans recovered, it cannot be concluded that the project demonstrated the feasibility of institutional credit to small-scale fisherfolk for motorization. Even with BOBP and the DOF having a significant field presence that banks do not have recovery was not 100 per cent. The project however, demonstrated that small, short-term loans could be a possibility for banks to compete with the traditional system.

It is important to note that despite the weaker financial status of the cash credit borrowers, recovery was quite acceptable. This is perhaps the reason why small, short-term loans, at very high interest rates and assured repayment, are already an established feature in the villages.

DANIDA project loan recovery rate (in %)

Thana	<i>Motorized units</i>				
	<i>Engine</i>	<i>Fishing gear</i>	<i>F. gear to controls</i>	<i>Nets & ropes</i>	<i>Cash credit</i>
Daulatkhan	78	86	38	98	99
Charfesson	79	94	100	83	96
Tajmuddin	50	96	—	—	—
Monpura	59	80	—	—	—
Total	76	91	74	92	98

Distribution of recovery rates

<i>Recovery</i>	<i>No. of loans</i>	<i>in category</i>
Up to 10%	0	0
20%	5	4
30%	3	2
40%	8	6
50%	6	4
60%	2	1
70%	4	3
80%	3	2
90%	4	3
100%	106	75
Total	141	100

3.5 Fishery resources

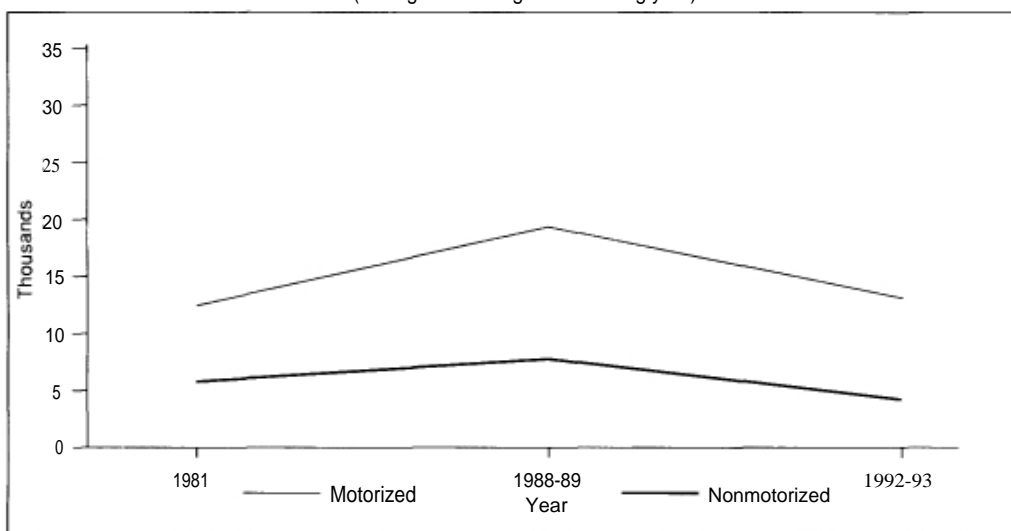
While the project itself may not have directly affected the resource base in a significant way, the project assisted in the motorization process which has certainly made an impact on the *Hilsa* stocks of the Meghna River and its estuary, the main fishing grounds of the national fish of Bangladesh. It is still unclear if there are more than two species of *Hilsa* in Bangladesh, which means exploitation of one may not directly affect production at another location, such as farupstream or in the open sea. Investigations on the *Hilsa* stocks in 1985-86 led to the conclusion that "although there is no clear evidence that the *Hilsa* fishery is being over-exploited, it might be prudent not to

encourage an increase in fishing pressure beyond the present level, because catch rate may decline with higher fishing effort" (BOBP/REP/36).

Since 1985-86, the near total motorization of large and medium size *chandi* boats has taken place. These motorized craft are landing 68 per cent more *Hilsa* than the few comparable-sized nonmotorized (*hanths* remaining; 98.85 per cent of all landings are *Hilsa* (project data). In other words, fishing effort on the Meghna has increased, but at the same time become more extensive, as motorized craft fish further downstream.

The initial result was positive for both motorized and nonmotorized. As motorized craft ventured further south, to virgin territory, they found new rich fishing grounds at the mouth of the Meghna. This push south may have relieved pressure upstream and improved catches in the waters near the Bhola landing centres. The situation, however, appears not to have been sustained, as recent annual landings have fallen, and, for the nonmotorized, fallen below the levels of the premotorization period (see Figure 8).

Fig 8. Annual *chandi* landings of *Hilsa*
(Change in average catch in kg/year)

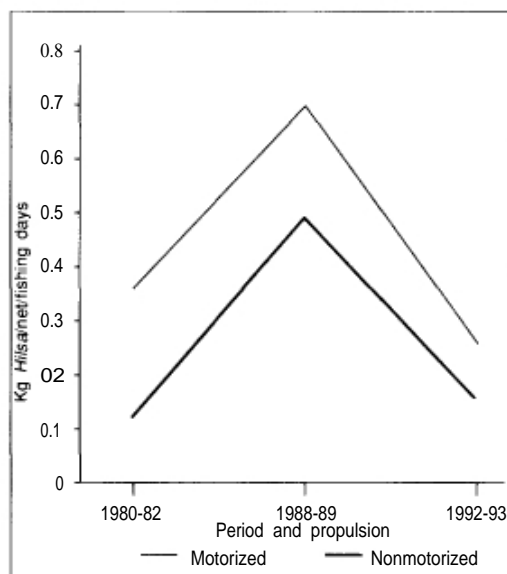


The increase in sea robbery has totally halted all night fishing during the past few years. Night fishing had previously been the more productive of the two fishing times (night and morning). This too is an important factor to be considered.

If the CPUE for the first years of motorization are compared, the result shows that the 1992-93 CPUE (measured in kgJnet/fishing day) of motorized *chandis* has actually fallen from 1981 as well as 1988.

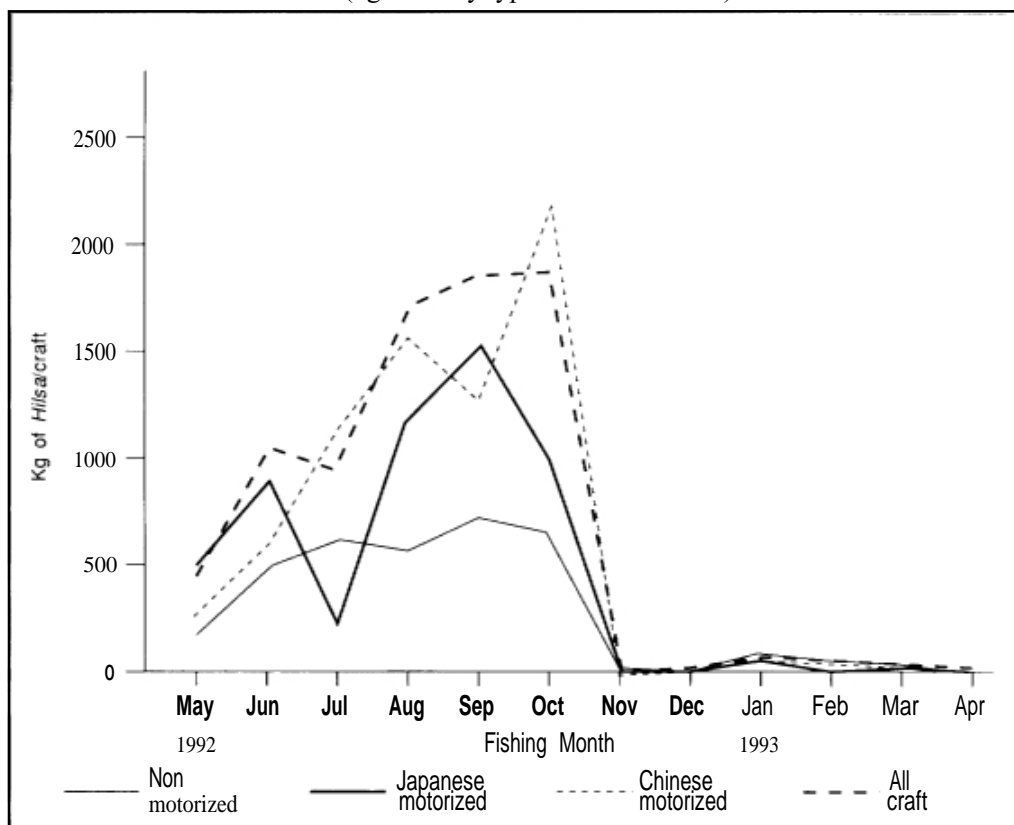
Interestingly, the nonmotorized CPUE has improved slightly (see Figure 9). While it can be criticized that the 1980-82 monitoring sample was too small, the trend is confirmed in qualitative field interviews. The apparent conflict between the falling annual landings, especially for nonmotorized craft, and a slightly improved CPUE for the same craft points to another major change, the shift in the *Hilsa* fishing season.

Fig 9. Catch per unit of effort (CPUE)
(Average catch rates of surveyed craft)



The average landings of Hilsa regardless of the type of chandi followed a common pattern in 1992-93 (see Figure 10). The season opens in May and increases in June. July is known for a slight drop as it bridges the early Hilsa run and the later run. The later run picks up in August and peaks in end-September or early October. By November, fishing has halted, with little effort made prior to the season starting in May.

Fig 10. Average landings 1992-93 in Bhola
(kg Hilsa by type chandi & month)



4. CONCLUSIONS

- While the project did not introduce the inboard diesel system to Bhola, it supervised the installation of 53 engines in Bhola chandis between 1990 and 1992, setting an example for improved quality inboard installations by local mechanics and creating an awareness among fishermen on the importance, in the long run, of the quality of propulsion system. Motorization is firmly established and the basic technical knowhow has been widely distributed on Bhola Island.
- The motorized ehandi has been shown to be adequately profitable, even after additional capital costs. The nonmotorized boats are also viable economic units, assisted partly by dilution of fishing effort in the riverine area since motorization. Motorized craft boast higher catch rates and heavier landings, partly due to newly tapped fishing grounds near the mouth of the Meghna River. Landing price, soaking time of Hilsa gillnets, number of shoots are not noticeably affected by motorization, as they are determined by socioeconomic and biological factors, not technological ones. Indigenous motorization with Chinese irrigation engines has been shown to be more cost-effective and, thus, more profitable. It will, therefore, continue to play the leading role in motorization of the artisanal fishing fleet.

The stable Hilsa prices of the early 1980s has changed to a highly variable price. While lean season prices today are higher than in 1981, peak season prices in real terms (subtracting inflation) are less than 1981. While fishermen are paying higher prices for imported petroleum products, engines and nets, their product, *Hilsa*, is losing its purchasing power.

Beneficiaries of BOBP motorization projects were found to have significantly improved their income. An impact survey by CODEC suggested an average income improvement for boat owners (who are often the skippers as well) of at least 10 per cent/annum. This has meant some improvements in the standard of living of boat-owner families, particularly in the areas of housing, sanitation and water supply, but exact percentages are not possible, as BOBP-administered cyclone relief, government programmer and NGOs have also contributed to this improvement.

Motorization has meant relief from the drudgery of propulsion by oars and towing from the embankments, but crew incomes have not significantly increased from the levels that nonmotorized units pay. Regarding annual household income (with 2.66 wage earners for every 6.3 family members), crews of both nonmotorized and motorized chandis are only able to generate an income equivalent to one-third the poverty-level income. Their incomes must be supplemented by, for example, agricultural wage labour in the lean fishing season, or they will be subjected to extreme deprivation. Even the most profitable craft motorized with cheaper Chinese engines showed a crew income reaching only a level of around half the poverty line annual income.

Credit to the tune of over 4 million takas has been distributed in the form of 141 loans during the DANIDA-funded project. The project retained a repayment schedule with monthly instalments, despite the interim project showing that it is not practical. Recovery rates of the different programmer vary, with smaller loans for cash credit, net and ropes having the best rates. The cash credit programme, an expressed wish of the participants, was most successful with 98 per cent repayment. These particular participants were in general, from poorer sections of the fishing community. They not only received credit to avoid the moneylenders, but they proved their credit-worthiness. Moreover, these cash credit participants all have been introduced to institutional credit and, now, have savings accounts.

The engine programme and the nets to the nonmotorized control units in Daulatkhan thana have had lower rates of recovery. The overall recovery rate was 83 per cent. While this figure is respectable for a government-related credit programme, significant effort by project staff and by members of the office of the DFO was required. This effort is not feasible for commercial banks, and, thus, the project has not been able to convince commercial banks of the viability, of loans to small-scale fishing communities. Institutional credit will remain inaccessible for the foreseeable future, with informal credit from friends and relatives, moneylenders and fish traders and, to a lesser degree, NGOs as the main sources of funds for the self-development of the fisherfolk.

Catch rates for *Hilsa* seem to be falling after initial increases in the early days of motorization (late 1980s). The seasonal variation of landings has become extreme, with almost no landings during six months of the year. This is in glaring contrast to the stable catch year-round in the early 1980s. Motorization has increased pressure on the resource base at the same time as other fisheries, i.e. set bagnet. Fishermen have not significantly increased the number of nets or fishing days nor decreased mesh size but there are complaints of dwindling catch.

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PUBLICATIONS OF THE BAY OF BENGAL PROGRAMME (BOBP)

The BOBP brings out the following types of publications:

Reports (BOBP/REP/...) which, describe and analyze completed activities such as seminars, annual meetings of BOBP's Advisory Committee, and subprojects in member-countries for which BOBP inputs have ended.

Working Papers (BOBP/WP/...) which are progress reports that discuss the findings of ongoing work.

Manuals and **Guides** (BOBP/MAG/...) which are instructional documents for specific audiences.

Information Documents (BOBP/INF/...) which are bibliographies and descriptive documents on the fisheries of member-countries in the region.

Newsletters (*Bay of Bengal News*) which are issued quarterly and which contain illustrated articles and features in nontechnical style on BOBP work and related subjects.

Other publications which include books and other miscellaneous reports.

Those marked with an asterisk (*) are Out of stock but photocopies can be supplied.

Reports (BOBP/REP/...)

- 32.* *Bank Credit for Artisaal Marine Fisherfolk of Orissa, India.* U. Tietze. (Madras, 1987.)
33. *Nonformal Primary Education for Children of Marine Fisherfolk in Orissa, India.* U. Tietze, N. Ray. (Madras, 1987.)
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35. *Brackishwater Shrimp Culture Demonstration in Bangladesh.* M. Karim. (Madras, 1986.)
36. *Hilsa Investigations in Bangladesh.* (Colombo, 1987.)
37. *High-Opening Bottom Trawling in Tamil Nadu, Gujarat and Orissa, India : A Summary of Effort and Impact.* (Madras, 1987.)
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39. *Investigations on the Mackerel and Scad Resources of the Malacca Straits.* (Colombo, 1987.)
40. *Tuna in the Andaman Sea.* (Colombo, 1987.)
41. *Studies of the Tuna Resource in the EEZs of Sri Lanka and Maldives.* (Colombo, 1988.)
42. *Report of the Twelfth Meeting of the Advisory Committee.* Bhubaneswar, India, 12-15 January 1988. (Madras, 1988.)
43. *Report of the Thirteenth Meeting of the Advisory Committee.* Penang, Malaysia, 26-28 January 1988. (Madras, 1989.)
44. *Report of the Fourteenth Meeting of the Advisory Committee.* Medan, Indonesia, 22-25 January, 1990. (Madras, 1990.)
45. *Gracilaria Production and Utilization in the Bay of Bengal Region: Report of a seminar held in Songkhla, Thailand, 23-27 October 1989.* (Madras, 1990.)
46. *Exploratory Fishing for Large Pelagic Species in the Maldives.* R.C.Anderson, A.Waheed, (Madras, 1990.)
47. *Exploratory Fishing for Large Pelagic Species in Sri Lanka.* R Maldeniya, S. L. Suraweera. (Madras, 1991.)
48. *Report of the Fifteenth Meeting of the Advisory Committee.* Colombo, Sri Lanka, 28-30 January 1991. (Madras, 1991.)
49. *Introduction of New Small Fishing Craft in Kerala, India.* O. Gulbrandsen and M. R. Anderson. (Madras, 1992.)
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51. *Report of the Seminar on the Mud Crab Culture and Trade in the Bay of Bengal Region,* November 5-8, Surat Thani, Thailand. Ed by C.A. Angell. (Madras, 1992.)
52. *Feeds for Artisanal Shrimp Culture in India — Their development and evaluation.* J F Wood *et al.* (Madras, 1992.)
53. *A Radio Programme for Fisherfolk in Sri Lanka.* R N Roy. (Madras, 1992.)
54. *Developing and Introducing a Beachlanding Craft on the East Coast of India.* V L C Pietersz. (Madras, 1993.)
55. *A Sri Lanka Credit Project to Provide Banking Services to Fisherfolk.* C. Fernando, D. Attanayake. (Madras, 1992.)
56. *A Study on Dolphin Catches in Sri Lanka.* L. Joseph. (Madras, 1993.)
57. *Introduction of New Outrigger Canoes in Indonesia.* G Pajot, O Gulbrandsen. (Madras, 1993.)
58. *Report of the Seventeenth Meeting of the Advisory Committee.* Dhaka, Bangladesh, 6-8 April 1993. (Madras, 1993.)
59. *Report on Development of Canoes in Sri Lanka.* G Pajot, O Gulbrandsen. (Madras, 1993.)
60. *Improving Fisherfolk Incomes through Group Formation and Enterprise Development in Indonesia.* R N Roy. (Madras, 1993.)
61. *Small Offshore Fishing Boats in Sri Lanka.* G Pajot. (Madras, 1993.)
62. *Fisheries Extension Services in the Maldives.* A M H Heelas. (Madras, 1994.)
63. *Small-scale Oyster Culture on the West Coast of Peninsular Malaysia.* D Nair, R Hall, C Angell. (Madras, 1993.)
64. *Chandi Boat Motorization Projects and Their Impacts.* R Hall, A Kashem. (Madras, 1994.)
65. *Learning by Doing in Bangladesh: Extension Systems Development for Coastal and Estuarine Fisherfolk Communities.* R N Roy. (Madras, 1994.)
66. *Promotion of Small-sale Shrimp and Prawn Hatcheries in India and Bangladesh.* C Angell. (Madras, 1994.)
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53. *Atlas of Deep Water Demersal Fishery Resources in the Bay of Bengal.* T. Nishida, K. Sivasubramaniam. (Colombo, 1986.)
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57. *Identifying Extension Activities for Fisherwomen in Vishakhapatnam District, Andhra Pradesh, India.* D. Tempelman. (Madras, 1987.)
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5. *Bay of Bengal Fisheries Information System (BOBFINS): User's Manual.* (Colombo, 1987.)
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8. *Extension Approaches to Coastal Fisherfolk Development in Bangladesh: Guidelines for Trainers and Field Level Fishery Extension Workers.* Department of Fisheries, Ministry of Fisheries and Livestock, Government of Bangladesh and Bay of Bengal Programme. (In Bangla). (Bangladesh, 1992.)
9. *Guidelines on Fisheries Extension in the Bay of Bengal Region.* I Jungeling. (Madras, 1993.)
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20. *Life on Our Reefs - A colouring book.* Ministry of Fisheries and Agriculture, Male, Republic of Maldives and the Bay of Bengal Programme. (Madras, 1993.)

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Quarterly, from 1981

Other Publications

1. *Helping Fisherfolk to Help Themselves : A Study in People's Participation,* (Madras, 1990.).
2. *The Shark Fisheries of the Maldives.* R C Andersen, H Ahmed. Ministry of Fisheries and Agriculture, Maldives. (Madras, 1993).

NOTE: Apart from these publications, the BOBP has brought out several folders, leaflets, posters etc., as part of its extension activities. These include Post-Harvest Fisheries folders in English and in some South Indian languages on anchovy drying, insulated fish boxes, fish containers, ice boxes, the use of ice etc. Several unpublished reports connected with BOBP's activities over the years are also available in its Library.

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