REPORT ON BASIC DESIGN FOR MOTORISATION PROJECT OF FISHING BOATS IN BANGLADESH

AUGUST, 1979

JAPAN INTERNATIONAL COOPERATION AGENCY

Preface

In response to a request of the Government of the Peoples Republic of Bangladesh, the Government of Japan has decided to conduct a basic design survey in connection with the requested donation of fishing boats and their engines, and the Japan International Cooperation Agency (JICA) conducted the survey.

The JICA dispatched to Bangladesh a 4-man survey team, headed by Mr. Zennosuke Takagi, ex-FAO expert from June 28th to July 14th, 1979 to hold discussions with the Bangladesh Government officials concerned and to collect necessary information for the basic design survey. The team has now completed its survey report for submission to the Government of the Peoples Republic of Bangladesh.

I hope that this report will prove to be useful for the progress of this project and contribute to the friendship and goodwill between our two countries.

I would like to express my heartfelt appreciation to the Bangladesh Authorities concerned for their cooperation and hospitality extended to the survey team.

August, 1979

Shinsaku HOGEN
President
Japan International
Cooperation Agency

CONTENTS

Summary

1. Survey Background

Bangladesh, acting principally through the BFDC, has developed a "Plan for the Motorization of 2,000 Ocean-going Fishing Vessels".

Requests were made to Japan on the following aspects of this program:

1) a grant of 500 marine diesel engines
2) a grant of 500 wooden vessels
3) the dispatch of experts on engine operation and repair.

This survey, based on the above requests, was designed to study the technical and economic feasibility of the fishing vessel motorization plan, evaluate the program, including the impact of the grants, and to develop an optimum plan for carrying out this grant program.

The Survey Team left Japan on June 28, 1979 and returned home on July 14, 1979. The field survey was carried out in Khulna, Mongla, Barisal and Chittagong via discussions with various related agencies of the Bangladesh Government, the Embassy of Japan in Bangladesh, and personnel at the Dacca office of JICA.

Following its arrival in Bangladesh, the Survey Team, in the course of consultations with the Bangladesh authorities, was verbally asked by the Secretary of the Ministry of Fisheries and Livestock to modify the contents of the request so as to switch "vessels" over to "engines". After the return of the Survey Team to Japan, this request was to be formalized through Embassy channels.

2. Backgroud of the Program

Bangladesh has an extremely high population density. Its entire

territory is in the estuary area of the Ganges River, with one-third of the total land area inundated each year. Under such rigorous natural conditions, there is a perpetual food shortage. As a consequence, the expansion of food supply is a major item in the planning of the Bangladesh Government.

The people of Bangladesh rely on fish for almost their entire supply of animal proteins. However, there is a steadily widening gap between the supply and demand for fishery products. But, as a tropical region, the country is endowed with a wide continental shelf, a plenty of nutrition salt, and productive fishing grounds. In this light, the ratio of marine to inland water catches is relatively low. The main reason for this is that the fishing fleet remains mired in a pre-mechanization stage. Fishermen direct most of their effort during the dry season, from October to March, at species taken mainly by traditional fishing vessels, called Dingi, Chandi, and Balam, employing mainly set bag nets and drifting gill nets. The bulk of these fishermen are living in indigent socio-economic circumstances.

For this reason, the Bangladesh Government is planning to promote a plan for the mechanization of coastal fishing vessels as a key policy for developing the coastal fisheries.

3. Conditions in Wooden Ship Construction

The wooden boat building industry of Bangladesh has not yet taken the shape of a modern industry. Its development has been haphazard and unplanned. The boat building yards are convenient for launching and located along river banks with relatively easy access to boat timber. They are generally close to sawmills and timber pond areas.

There are no facilities or equipment for berths, sheds, launching platforms, or rails. Nor are there any official figures on either

the number of boat-building yards or the number of craftsmen employed therein. Thus, the situation is such that we could not obtain a complete profile of the wooden boat building industry.

With respect to wooden boat construction, contractors build the vessels entirely on the basis of their experience and feel, without benefit of overall plans, layouts, construction plans, or design (architectural) plans. The technological level cannot be considered satisfactory. Basic timber materials for building the boats are of good marine grade and can be obtained at relatively low cost. But sawing technology and equipment are not satisfactory. Wooden boat construction uses only crude hand tools and is vastly inferior to the techniques used for building wooden boats in Japan and Western Europe.

4. Review of Survey Findings

Under the present conditions in the Bangladesh wooden boat-building industry, if we look at matters solely from the standpoint of increasing catch, it would be most effective to build the boats in Japan for shipment to Bangladesh. But, if this is done, the boats will be relatively costly and considering BFDC's character as a self-sufficient organization, by the time ocean freight, import duties, sales tax, and other costs are added on, would be well beyond the purchasing power of small-scale fishermen.

If, on the other hand, a Japanese company were to build the vessels locally, it would be virtually impossible for such a company to take on a contract for the direction and supervision of the construction in Bangladesh owing to the fact that--

1) with the industry having developed so haphazardly, it is impossible to grasp its present status; and
2) there are no industry standards or specifications, reflecting the fact that construction is based on experience and feel, without benefit of project plans.

Furthermore, it would be technologically difficult to install engines on existing boats which lack standardization and uniform specifications. If we go on the basis of past consumption of engines, it would appear that the country's annual absorptive capacity is in the order of 500 units per year.

The main fishing techniques being set bag nets and drifting gill nets, high engine horsepowers are not needed, nor is speed a critical factor. Also, duty rates for engines over 25 horsepower are quite high. Thus, we feel that 20-24 horsepower engines would be appropriate.

We present below, on the basis of the survey findings, the following proposal which we consider an optimum approach for implementing the subject program.

5. Proposed Implementation Plan

1) The Government of Japan will make grants of the following items to the Bangladesh Government:

a) Engines (including shafting, propeller and spare parts) (20-24 HP) 500 units

b) Equipment and materials for Engine Workshop and Boat Yard 1 location

c) Materials for fishing gear 1 rig per vessel

2) The Bangladesh Government will provide the necessary site at Barisal and will construct Engine Workshop and Boat Yard using the grant materials from Japan.

3) BFDC will use the Boat Yard to be constructed under this plan to construct boats of an average length of 40 feet, with engines of 20-24 horsepower, each equipped with fishing gear.

4) The boats to be built will be sold to fishermen selected by a selection committee. In this connection, BFDC will arrange for the fishermen to receive financing through the Bangladesh Kirishi Bank.

5) BFDC, in cooperation with engine manufacturers, will provide on-the-job instruction and training in installation and maintenance methods.

6) BFDC will give field instruction to the fishermen on the handling, maintenance, and care of vessels, engines, and fishing gear.

7) The estimated budget for this plan will be as follows:

1) Engines (500 units)	¥ 350 million
2) Equipment for Engine Workshop and Boat Yard (1 location)	150
3) Materials for fishing gear (1 set per vessel)	200
Total Budget	¥ 700 million

(For a detailed breakdown, cf. Section 3)

Section 1 The environment for fishing boat construction in Bangladesh.

1 — 1 The fishing boat industry

1-1-1 Wooden Vessels Construction

In Bangladesh, with the exception of the boat yard connected with the DANIDA Project, wooden vessel construction is not yet modernized. The industry has developed in a haphazard, unplanned fashion, and all one can say is that there are individuals who make a living out of building wooden boats.

The vessel owner placing a construction order makes a contract on the basis of discussion of vessel size and engine horsepower with the contractor. The contract, in almost all cases, is for labor only and is based on supply of the engine, propeller and shaft. The owner provides either new timber or, on occasion, may himself tear down the boat he has previously used and deliver the old timber to the contractor. The contractor assembles the necessary carpenters and other labor and sets to work.

1-1-2 Building Yards for Wooden Vessels

Construction sites are convenient for launching and have easy access to boat timber-- in short, they are located on river banks, chosen with respect to proximity to sawmills and timber storage ponds.

While the construction sites may be termed "boat yards", there are no facilities or equipment for berths, sheds, launching ramps, or rails. They are nothing more than simple open spaces. At many sites, there is about a one-meter height differential between water surface and ground level.

Launching methods involve digging out from around the vessel and letting in water from the river to float the vessel. The launching channel is then filled in again for use as a boat building site. Thus, sites that have been used many times in the past have become swamps which can turn into stagnant ponds after just a small rainfall. As a result, yard craftmen must work under conditions of very unstable footing.

At a boat yard we inspected in Chittagong, the site was in the midst of a banana plantation inside a cluster of trees of some 30 centimeter diameter, facing a 10-meter wide river. At the time of launching, we were told, trees on the river bank are chopped down for this procedure.

At a boat yard we inspected at Brisal, a boat of 50 gross tons was under construction. This vessel had been launched with the hull only half-finished, and the deck and upper structure were being constructed afloat. Perhaps owing to low productivity, it seemed that a considerable period of time had elapsed after launching.

1-1-3 Productive Capacity

We were told by an influential contractor that he was capable of constructing 10 vessels per year.

In view of the conditions described above, there are no official statistics anywhere on the number of boatyards, the number of contractors, the number of boat carpenters, or the annual production of vessels. It was thus impossible to develop an overall profile of the boat-building industry, at least in respect to wooden vessels.

Even in the source materials, the only descriptions we came across were of a ferro-cement boat yard being built by BJMSS in Chittagong with Canadian aid funds and of a "Boat Building

and Mechanization Scheme", also at Chittagong, based on aid funds from Denmark. As a result, our understanding of the "boat-building industry" in Bangladesh had to be based on a projection of the conditions at the sample of boat yards we actually visited.

There are no educational or training institutions in the wooden boat-building field.

1-2 Boat building techniques

1-2-1 Design Blueprints

In the case of wooden vessel construction, the contractor listens to the owner's requirements and, based on consideration of the timber and engine supplied by the owner, proceeds to contract the boat on the basis of his own experience and feel, totally without benefit of overall plans, layout charts, construction plans, or design (architectural) plans.

Dissemination and exchange of technical information are poor. Techniques tend to remain with the individual and are not generally passed on to others. In Bangladesh, there is clearly an infinite variety of wooden vessel types, depending on the particular boat yard and contractor.

The timber, which is the basic raw material of the wooden vessel, is unfortunately inadequate from the standpoint of sawing equipment and technology. A few yards are equipped with band saws with which short pieces are sawn. However, these saws are all beyond their useful lives; saw teeth are blunted; and since they run on very low horse-power motors, they cannot take wide bands. Thus the accuracy of the lumber is very poor.

Long pieces are procured from specialty sawmills but even this material fails to meet specifications, and the products tend to have irregular thicknesses. Only highly uneven sections are adjusted by hand planers; it is not feasible, using a hand planer, to obtain a standardized thickness over the whole section.

Other than at the DANIDA yard, we saw no evidence of any equipment such as hand planers, automatic surface planers, or saw bench.

1-2-3 Boat Building Techniques

The hull plankings of European-style vessels, generally speakings, as in the case of Japanese European-style boats, have planks applied in both the front and back directions and are attached from the keel section to the ship's bottom, the freeboard, and the bulwark.

In the case of local canoe-shaped boats, the hull is tightly planked and the sawn frame then mounted and fixed relative to the hull planking. For small-size boats, the bow and stern are like a "double ender", squeezed together at the upper edge of the stem. Since the sheer line has high tension and good strength, good construction is possible even with a small number of frames.

The hull plankings are turned simply with a band saw. Misfits resulting from the application of the plank are not planed unless there is a major unevenness. Thus, the sides are polygonal, made to resemble a curved boat shape.

The joining lines of the individual planks are often separated from the contact points and caulked with jute. Only in a very few instances are the "overlaps" at the joints of the hull planking, deck, etc.

The frame of western-style boats is totally irregular. The hull plankings are faithful to the strength of the growth rings. Because the frame bends lengthwise toward the outer side of the hull planking, there are gaps of 20-30 mm between the frame and inside planking. As a result, the planking is forcibly driven into the frame with spikes.

In the keels of western-type vessels, although a single piece of 30-40 feet is used, because of the clumsy sawing techniques, undulations develop, and the construction proceeds without any corrective treatment. As a result, it is not unheard of for the port and starboard to be asymmetrical.

Occasionally, boats were seen where even the stem was off center, leaning to one or the other side.

On the decks as well, as with the hull planking, gutters develope in various places, and corrective waterproofing is then required.

The interval between frames is disproportionately wide vis-a-vis plank thickness. As a result, if something moves on deck, acute bending occurs.

There is absolutely no waterproofing done on the upper structure or hatch-cover.

1-2-4 Materials

To plank the hulls of small-size boats, "clamp" type soft-iron nails are used measuring about 3-4 mm wide by 30-35 mm by 1.5 mm. For medium or larger boats, the nails are apparently selected on the basis of the thickness of the hull planking. Steel tacks with square body and semi-rounded heads are used, measuring at the base of the neck 7-8 mm square by 70 mm long, with about a 20 mm diameter.

Depending on the price of the boat, if the owner so wishes, ordinary construction nails of about 10 cm. are often used.

As to bolt types, in a very small portion of the frame only a limited number of low-precision screw threads (with a ø of about 12.5 mm) are used-- so few that they can be counted on the fingers of one hand. Bolts and nails are of ordinary steel; no electro-plating is done. It appears that anti-rust treatment is not even considered.

For caulking materials, 3-4 mm jute is knitted into the twine and tapped in. But this, as with so-called caulking cotton, lacks flexibility and, since only the tapped down rear surface absorbs moisture and expands, the water is not stopped, and reliability is understood to be poor.

Glues are not used at all in joints of important sections [i.e., in critical joints]. As a result, the boats lack strength and anti-corrosive properties, with the result that their normal useful lives are believed cut in half.

Finishing is by means of coating with coal tar both inside and out, with no paint used. Coal tar and coal dust are kneaded together and used in lieu of compounds to complete the form.

There is little interest either in quality control.

With regard to sawing, the normal procedure would be to cut the wood in as straight a grain as possible without the core. But in Bangladesh the sawing is done carelessly. Where a curved section is called for along a section of the boat, the cutting is reversed, forming a so-called "grain saw".

Even the caulking materials absorb water after launching. Although they are supposed to help prevent leakage, the

jute is placed as is on the very moist earth. If something already containing sufficient moisture is plugged in, when the weather turns dry, there is a danger of its dropping off from an overly wide seam.

Generally speaking, the only tool outfits in evidence were so-called "basic" carpenters' tools such as hand planers, hand saws, and hammers. But the number of such tools was inadequate.

The difference between the level of boat-building techniques in Bangladesh vs. those of Japan or Western Europe is obvious. In most respects, even the lowest conceivable technical requirements of Japanese or West European construction are not satisfied. However, the above evaluation results from viewing matters from the perspective of Japanese or West European technical standards. These boats are not lacking in ability to float on water-- the minimum requirement for a "boat". Thus, it is very necessary to give careful thought as to the initial target levels to be set for technology transfer in the wooden boat field.

1 — 3 Boat building materials

1-3-1 Procurement of Timber

There are, we believe, relatively few problems associated with the procurement of boat-grade timber. Relatively good quality timber, such as Jarul and Garjan for hull planks, and Champa and Karai for structural purposes, are produced in the Chittagong Hill Tract District and the hilly areas of the Chittagong District. And Sundari, Pashur, Kawra, and Pitraj are produced from the Sunderburn area of Khulna, Barisal, and Patmakhali Districts.

The timber is of large size and much material runs about 1 meter in diameter and 15 meters in length at eye level (i.e., at 1.5 meters from ground level).

Tree quality seems to run to the mahogany family. The types belong to the Tangile family, with quality comparable to Apitong, but the resin content is not as great as in Apitong.

Timber ownership is vested in the Forestry Department. If BFDC files a request, we believe that cutting permission will readily be granted. So long as one does not think of taking in a huge supply at one time, there are no problems connected with timber procurement.

1-3-2 Timber Management

There are, however, many problems with respect to the management of the timber brought in. Storage to prevent cracks in the wood is no problem, since there is ample water and area. But the problems develop after the timber is sawn.

Humidity in Bangladesh is quite high, particularly during the monsoon season (cf. Table 1)

TABLE 1

AVERAGE HUMIDITY AT CHITTAGONG (%)

(1951-1960)

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
79	77	79	82	85	89	89	91	89	89	85	83

Despite the above, timber is stored in the open, and boats are built in the open.

The standard moisture content for boat building is said to be about 14%. Even allowing for the excellence of the construction materials, it is desirable that this be held to no more than 50%.

1-3-3 Wood Prices

Timber prices are about 30% those of Japan -- i.e., approximately:

Logs	55 Taka/cu.ft.	¥ 30,000/m^3
Sawing costs	5.5 "	3,000 "
Transport	10 "	5,500 "
Total Cost	70.5 Taka	¥ 38,500 "

(Source: DANIDA)

At present, prices in the Japanese domestic market are about ¥ 130,000 per/m^3.

1 — 4 Related facilities

1-4-1 Boat Yard

As previously discussed, wooden boat construction has not yet taken the shape of an industry and is still at a stage of unplanned, haphazard growth. Thus, we were hardly satisfied with the related facilities. Among the yards building small vessels, only BJMSS' ferro-cement yard in Chittagong and the BFDC yard for the DANIDA Project have permanent facilities.

1-4-2 Engine Work Shops

According to public reference materials, of the six engine workshops in the fishery sector, three belong to BFDC, the rest to BJMSS, Caritas Bangladesh (a Christian charity organization) and CCDB (Christian Commission for Development Program).

The BFDC workshops are mainly repair facilities for outboard engines. They are located in Cox's Bazar, Rangamati, and Kaptai. However, we understand that the Kaptai facility has not been operative since 1966, for reasons that have not been established.

The BJMSS and Caritas workshops are in Chittagong and are facilities for inboard engines. CCDB's workshop is in Cox's Bazar.

As to private facilities, the lack of official statistics prevented us from getting a grasp of the situation during this study. However, there appear to be a considerable number of boat yards and engine workshops, though practically none of the facilities or equipment can be considered satisfactory.

Based on this study, there was at least evidence of a minimally acceptable level of technology and technicians at the engine workshops in Barisal, Khulna, and Chittagong.

Section 2 Review of the survey findings

2 — 1 Appraisal of the BFDC operating plan

2-1-1 Nature of the Plan

The plan for the "Motorization of 2,000 Coastal Fishing Vessels" was reportedly included in the 2-Year Plan 1979-80, as released in March, 1978. But, in point of fact, no progress whatever has been made with local funds toward the building of a boat yard and engine shop, as planned in the first stage. This is not only because of a reliance on foreign assistance for the major parts of this program. It is also due to the fact that the operational plan submitted to the Japanese Government was not finalized so that operating costs have not been appropriated.

With respect to program implementation, it has been explained that this is the kind of matter that has to be modified in the light of treaties with the countries concerned. However, we understand that it will not be too long before BFDC obtains the implementing budget, through consultation with the Planning Commission, based on international treaties.

2-1-2 The Character of the BFDC

The BFDC is an autonomous governmental body, with independent fiscal responsibility.In view of its fiscal independence, even, for example, in the case of external aid, goods must be sold to the final user inclusive of import duty (15% on finished products), sales tax (25%), and BFDC's commission on top of the CIF import price. Thus, to be able to sell the boats to the fisherman user at the lowest possible price, there is a strong feeling that, rather than importing the finished product, the boats should be made locally to eliminate import

duty and reduce the sales tax.

Furthermore, even on imported items, given the special character of the BFDC, there is a strong desire to import, insofar as possible, large quantities of items with low unit value subject to low duties. The BFDC "Motorization Plan for 2,000 Coastal Fishing Vessels" has been evaluated on the above premise.

2-1-3 The Significance of Motorizing 2,000 Vessels

Most of the population is under-nourished and dependent on fishery products for the bulk of its animal protein supply. Thus, there can be no argument as to the importance of developing the nation's fishing industry. There is vast significance in promoting the motorization fishing vessels whose development has lagged far behind the times.

Based on the present plan, under which 2,000 motorized vessels are expected to catch 4 maunds (about 149 kilograms) of fish per day, while operating 135 days per year, the total annual fish catch of the 2,000 boats would come to 40,230 tons. This would correspond to 4.9% of the total Bangladesh fish catch in 1974/75, including inland water fishing. When one considers that close to 90% of the total catch is made up of inland water landings, the contribution of this incremental catch to the overall expansion of the coastal catch will be considerable.

On the other hand, the shortfall expected in 1980 between estimated fish catch and estimated demand has been put at 38,300 tons. The catch of these 2,000 vessels would cover only about 10% of this deficiency.

As seen from the perspective of the nation's needs, as discussed above, the figure of 2,000 vessels for the fishing

motorization program can hardly be considered large. In fact, even the 7,000 vessel target for motorization set by the BFDC for 1985 in its long-term planning is hardly excessive.

There are, however, many problems standing in the way of realistic implementation of this program.

2-1-4 Contradiction between the Plan and the Requests

Firstly, the original request made by the Bangladesh Government to the Japanese Government was for a grant of 500 engines and 500 wooden vessels. But, under the subject Plan, the wood boats are to be constructed locally using local funds.

Based on a communication from the Ministry of Fisheries and Livestock to the Survey Team, this request was changed to one for engines only. Once this change is recognized through formal diplomatic channels, the above contraction will be removed.

2-1-5 Installation of the Subject Engines

Secondly, part of the program was to install 500 engines on new vessels to be built by the BFDC, with the remaining 1,500 engines to be distributed to fishermen for installation on their existing vessels.

However, as explained in detail in Section 1, Bangladesh's wooden boat-building technology is quite backward. The boat-building industry has developed in an unplanned, haphazard fashion owing to:

1) lack of organization and concentration;
2) lack of industry standards for quality control and evaluating the skills of craftsmen;
3) the fact that no use is made of specifications; boats are built based only on the experience and

feel of the craftsmen, without benefit of drawings;

4) lack of an inspection organization.

As a result, there are no unified standards for the boats that are built, and sizes and shapes vary considerably from vessel to vessel. Thus, it will be impossible to develop a management system embracing the individual yards that have developed on such a haphazard basis.

The fishing vessels to be built by BFDC can conceivably be standardized. And, even in yards outside BFDC, it should be possible to build hulls for new ships appropriate to the engines. But, when installing engines on existing vessels, the considerable variation in vessel sizes and shapes will require that an instructor in engine installation be permanently stationed in the yard. Even so, it must be anticipated that installation will not be possible on all vessels.

2-1-6 Scheduling

Thirdly, there is the problem of scheduling. According to the operational plan, in the first year, 100 boats are to be built and 500 engines provided; in the second year, 200 vessels and 1,000 engines; in the third, 200 vessels and 500 engines.

The following table shows the results of BFDC's "Mechanization of Country Fishing Boat Scheme", under which engines were procured and sold to fishermen.

TABLE 19

PROCUREMENT OF MARINE ENGINES BY BFDC

	U.S.S.R. Produced	Japanese Made	Total
1974	46	-	46
1976	90	-	90
1977	-	106	106
1978	-	83	83
Total	136*	189	325

(* of which 75 are unsold)

Engines have also been procured privately. A total of 1,156 vessels were motorized during the 1974/75 Fiscal Year. From this fact, we can conclude that only a limited number of engines can be absorbed each year.

Furthermore, with respect to the building of a boat yard and engine facilities, the construction materials (steel, cement, etc.) must be largely imported with scarce foreign exchange. Consider, for example, the fact that construction of the Dacca International Airport has been underway for ten years; yet, the projects remain unfinished, with many structures suspended in mid-stream. Judging by this situation, it seems evident that it would be difficult, solely with local funds, to complete the above construction program within one year.

2-1-7 Purchasing Power of the Fishermen; Amortization Program

Fourthly, there is the problem of purchasing power. The price of a motorized vessel is 142,000 Taka. Allowing for a 50% subsidy (56,800 Taka) by the Government, the sales price becomes 85,200 Taka.

Of this, the down payment would come to 28,400 Taka; the balance of 56,800 Taka would be repaid with installment payments of 100 Taka per day.

According to the BFDC, the motorized vessels can land 4 maunds (149 kilograms) per vessel per day while operating 135 days per year. Fish prices are projected at an average of 150 Taka per maund. Thus, annual earnings per vessel, based on 4 maunds x 135 days x 150 Taka, would come to 81,000 Taka.

Annual expenses of the fishermen would be as follows:

... Operating costs per vessel, as calculated by the BFDC, would run:

Fuel	15,500 Taka/year
Maintenance	13,000
Depreciation	15,258
Amortization (installment) payments (100 taka x 135 days)	13,500
Subtotal	57,258

Assuming the down payment is financed through a bank, we have postulated an interest rate of 9% (having been told the rate varies between 9% and 12%), which yields:

...Interest cost -- 28,400 Taka x @9%= 2,556 Taka/year

Also, each boat will have to have an engine technician and a five-man crew. On this basis:

Wages

Engine technician (30 Taka x 1 person x 135 days)	4,050 Taka/year
Crew (15 Taka x 5 persons x 135 days)	10,125

Subsistence (10 Taka x 6 persons x 135 days)	8,100
Subtotal	22,275

Totalling variable costs, interest expense, wages and subsistence, we have a total of ---

82,089 Taka per year

On this basis, we are left with a deficit of 1,089 Taka per year.

In addition, we have not taken into account costs relative to the repayment of the borrowed down-payment or the sales commission of landings which must be paid to the BFDC.

We have used figures on crew size and wages based on other operating programs of the BFDC so believe these estimates to be appropriate.

Assuming a government subsidy of 66% -- the same as in the plan for "Introduction of 2,000 Motorized Fishing Boats" -- and the same amortization period as above, the daily amortization (installment) payment is reduced to 50 Taka per day. On this basis, our cost estimate becomes:

Fuel	15,500 Taka
Maintenance	13,000
Depreciation	15,258
Amortization (50 Taka x 135 days)	6,750
Interest payments	2,556
Wages and Subsistence	22,275
Grand Total	75,339

Subtracting the above total from the projected annual income of 81,000 Takas, we have now a net profit of 5,661 Takas.

At this earnings rate, the down payment of 28,400 Takas can be amortized in about 5 years.

The figure of 66% for a government subsidy conforms to that of other operating programs of the BFDC and so is considered feasible.

An import duty of 15%, a sales tax of 25%, and a BFDC commission of 6% are included in vessel price. If we ignore such taxes and commission, the effective subsidy rate becomes 12.4%, when the nominal subsidy is 40%, and 50.4% when nominal figure is 66%.

Bangladesh fishermen are generally impoverished and many have been traditionally subject to domination by so-called "middlemen". Thus, when these fishermen purchase motorized vessels, it is desirable that they be given substantial assistance from a government financial organization in the form of low-interest loans, so that they will not fall increasingly under the control of such middlemen as a result of advances for vessel purchase, fishing operations, and living expenses.

2—2 Effective methods for dispensing the aid; problem areas

The Bangladesh fishing industry, particularly the boat-building sector, has only just embarked on the modernization of construction methods. The bulk of the industry lags well behind Japanese technical levels, standing on the threshhold of modernization.

Under such conditions, it is most desirable that a comprehensive aid program be developed, up to and including technological transfer, embracing the supply of timber, grants of engines and equipment and machine for a boat yard and fishing gear, introduction and improvement of a boat-building and

engine maintenance system appropriate to local conditions, and training and instruction of counterpart fishermen.

Only in this way can the full effect of the aid program be realized.

However, the purpose of this study was related to implementation of the grant program. The dispatch of experts and the training of personnel incorporated in the above suggested program are mainly items falling within the field of technological cooperation and, as such, exceed the responsibilities of the Survey Team. They will not, accordingly, be taken up in this report.

2-2-1 Methods of Donating Boats and Engines

Under conditions prevailing in a country which, with few exceptions, is not constructing modern fishing vessels, it would be best, from the standpoint of providing modern vessels to fishermen and increasing their catch, to build the boats in Japan and send them to Bangladesh equipped with engines. Looking at the matter from the Bangladesh side, however, if these boats are built in Japan, they will be relatively expensive. When ocean freight, import duty, sales tax, and other costs are added on to the basic price, even allowing for a subsidy from the Bangladesh Government, the final price would inevitably far exceed the repayment capabilities of the small scale fishermen who would be the ultimate buyers. In addition, there are limits even to the Japanese Government's budget, so that if the price is high, the number of vessels must be cut back. The policy of the Bangladesh Government is, rather than satisfying a small number of fishermen by making available a small number of first-class vessels to a small number of buyers, to bring contentment to a large number of small-scale fishermen by providing them with an opportunity to work and earn a liveli-

hood. The Government wishes to make it easy for them to engage in fishing operations by providing, at one time, the cheapest possible boats and engines along with fishing nets and gear.

Taking this into consideration, building the boats in Japan for importation into Bangladesh would not meet these conditions. Accordingly, we must consider building the boats locally.

The construction of non-wooden ferro-cement and FRP vessels in Bangladesh, would not be satisfactory, since most of the materials (for FRP vessels, in particular) would have to be imported, so that the boats could not be built quickly. Also, there would be many problems concerning the useful life and maintenance of steel vessels. If the parts (components) were brought in from Japan, there is the possibility that a knock-down system of construction would meet the requirements, but this would require a considerable period of preparation.

With respect to wooden boats, as already pointed out in Section 1.

1. the construction of wooden boats is done on a very haphazard basis, and the yards are not yet standardized; thus, we could not get conditions of local boat yards.

2. since boats are built on the basis of experience and feel, without benefit of working plans or design specifications, there are no unified standards or specifications.

Thus, it would appear quite impossible, from a practical standpoint, for a Japanese company to undertake to direct and supervise local construction. From the above, we would deem it difficult under present circumstances to make the vessels part of the grant-in-aid program.

For reference, according to the BFDC's operational program, 40-foot wooden vessels are costed at 40,000 Taka (¥ 600,000). The cost breakdown is as follows:

1.	Timber (250 cu. ft. -- about 7 m^3)	26,000 Taka
2.	Nails, bolts, etc. (200 maunds -- 187 kg.)	4,000
3.	Wood treatment materials	2,500
4.	Caulking	950
5.	Labor (160 men)	4,150
6.	Painting	1,000
7.	Other costs	1,400
	Total Cost	40,000

2-2-2 A Program for Engine Grants Only

If the vessels are eliminated from the grant program and the budget diverted into engines, let us next consider a program under which the engines become the target of the aid program.

Some 10 years ago, outboard engines were received under the FAO/UN Freedom from Hunger Campaign. But these engines were not suitable for the oceanic conditions in the Bay of Bengal. Experience was actually very poor, with operating costs high on account of the fuel being gasoline. As a consequence, inboard engines are now strongly preferred.

Turning now to horsepower, considering that --

1. since the fishing methods used are mainly set bag nets and drifting gill nets, high horsepower is not required;
2. speed is not a factor;
3. and duty rates for engines over 25 HP are high --

the fishermen desire engines of between 20-24 HP.

The boats in the DANIDA Project have been using 14.4 HP engines which are somewhat underpowered. From this standpoint, we would imagine that 20-24 HP engines should be adequate.

Fuel can be obtained at a price of 12.3 Taka per gallon (about 40 yen per liter). Since Bangladesh is tied to the Middle East by religion, despite its being a non-oil producer, its supply of fuel is felt to be stable.

In addition to engine bodies, it is necessary to provide propellers, shafts, and an appropriate amount of spare parts.

The problems that would be encountered in an aid program focused solely on engines and accessories would be as follows:

1. Engine installation--

If the engines are installed on localled produced boats, guidance will be necessary, particularly on engine mounting and shaft installation. However, with the boat yards widely scattered and a wide dispersion of sizes and techniques, it will be impossible to guide and supervise installations on boats so divergent in size and building methods.

2. Number of engines that can be sold--

The fishermen are keenly interested in Japanese made engines. Thus far, the number of engines that have been marketed through commercial channels under the BFDC "Mechanization of Country Fishing Boat Scheme" has run about 200 per year. If we take into account subsequent development as well as the high priority being placed on coastal fishery development and other factors, we can project a consumption of some 500 units per year.

From the preceding, we feel it would not be a wise policy, under a program for providing only engines and related accessories, to supply an unlimited number. A suitable target should be determined taking into account fishing gear and related accessories.

2-2-3 A Plan for Engines and Related Equipment and Facilities

This assistance program excludes the fields of technical cooperation. Its essential features would be as follows:

1. A grant of engines and related items-- propellers, shafts, and spare parts.
2. A grant of lumber for an engine repair facility and a boatyard; materials for wood-working facilities.
3. Materials for fishing gear.

Problems with respect to the provision of engines and related accessories relate to engine installation and the storage of spare parts.

Installation will involve the problems discussed earlier. However, we believe that the provision of materials for boat construction along with a place in which to concentrate building activity and effect an exchange of technical information among contractors, will contribute to the standardization of sizes and methods.

We feel there should be an appropriate supply of spare parts covering 2-3 years. But, if these parts are held by individual fishermen, we fear that, owing to loss, storage conditions, and variation in accident rates among the fleet, effective utilization will not be possible. For this reason, a spare parts depot and material for an engine workshop should be provided to make possible the effective utilization of spare parts and complete engine maintenance.

In connection with boat-building equipment and materials for an engine workshop, there will be minimum requirements for machinery, such as sawing equipment, wood-working machinery, machine and hand tools, suited to the technical capabilities of the area along with materials for buildings and sheds.

Design guidance would be provided with respect to layout and construction of the buildings and positioning and installation of machinery.

With respect to fishing gear, we would provide 3-4 types of nylon twine, rope, and floats as materials with which the fishermen could make their own nets and gear for their primary fishing methods: set bag nets and drifting gill nets.

Section 3 Recommendations regarding the grant program and its implementation

3 — 1 Proposed implementation plan

Based on a review of the survey findings, the Research Team proposes the following plan for optimum implementation of the project.

3-1-1 Objectives

This implementation program is geared to a cooperative assistance project covering contemplated grants from the Government of Japan to the Government of Bangladesh during the 1979 Fiscal Year.

There exists a plan to mechanize fishing vessels for the purpose of developing the Bangladesh coastal fisheries in an area centering on Barisal and Monglas, under the auspices of the BDFC of the Bangladesh Government.

This proposal will set forth the specific aid categories, system, and planned amounts for the grants-in-aid to be implemented by the Japanese Government along with the areas of responsibility in the program to be shouldered by the Bangladesh Government.

3-1-2 Details of the Program

1. The Japanese Government is to make a grant of engines, including spare parts, materials and equipment for Boat Yard machinery, engine workshop and fishing gear.
2. BFDC will obtain the necessary site at Barisal and construct boat-building facilities with materials received from the Japanese Government.
3. BFDC will, at the facilities to be constructed at

Barisal under this plan, construct fishing vessels of an average length of 40 feet, with engines of 20-24 horsepower, equipped with the necessary fishing gear.

4. The fishing vessels to be built will be sold, through the Bangladesh Kirishi Bank (BKB) to fishermen selected by a selection committee, to be organized by BFDC, from among applicants meeting the "Selection Criteria for Recipients", as hereafter set forth.

5. BFDC, in cooperation with engine manufacturers, will give instruction and training in engine care, maintenance and installation to the local wooden boat builders and to engine technicians.

6. Before delivering the fishing vessels, BFDC will provide on-the-ground training to the fishermen who will use these vessels in the handling, care, and maintenance of vessel, engine, and fishing gear.

3-1-3 Grant Items from the Japanese Government

1. Engines and spare parts 500 units
2. Materials and equipment for Engine Workshop and Boat Yard 1 location
3. Fishing gear enough for 500 vessels

3-1-4 Items which are to be the Responsibility of the Bangladesh Government

1. To obtain a site in Barisal appropriate for a shipyard and erect a suitable fence around this property; also to bring in main power lines.

2. To arrange for the smooth importation of engines, spare parts, materials and equipment for boat-building facilities, fishing gear, etc.

3. To arrange for the expeditious transport of the engines, spare parts and materials for the boatyard and fishing

gear to the subject location.

4. To exert its best efforts in the storage and maintenance of the above items and exercise all possible care to prevent soilage, destruction, flooding, pilferage, and rusting

3-1-5 Selection Criteria for Recipients

1. That they be fishermen exclusively engaged in actual fishing operations.

2. That the program exclude any fishermen already owning one or more power vessels or already receiving financing for vessel or gear from the Bangladesh Government or an international organization.

3. That priority be accorded to persons with some knowledge of the handling, operation, and maintenance of diesel engines.

4. That the recipient display an enterprising spirit and a willingness to abide by the regulations established by BFDC.

3 — 2 The items and the estimated budget for this program

1. Engines	500 units	¥ 350,000,000-
2. Equipment for Engine Workshop and Boat Yard	1 location	¥ 150,000.000-
3. Materials for fishing gear	1 set per Vessel	¥ 200,000,000-
	Total Budget	¥ 700,000,000-

(Prices are calculated as of August, 1979, CIF Chittagong.)

3-2-1 Marine diesel engines (500 units)

--- 20-24 HP, including propeller, shaft, and spare parts

@ ¥700,000 ..... ¥ 350,000,000

a) Engine price (including propeller and shaft)

FOB	¥ 600,000
Ocean freight, etc.	20,000
Sub-total	620,000

b) Spare parts (sufficient for a normal 4,000 operating hours)

(at about 13% of (a))	80,000
Total	¥ 700,000

Specification of Marine diesel engine

1. General

The engine shall have sound structure and shall be made of the first class material.

The engine shall be operated in extreme climatic conditions i.e. sea water temperature 35°C, humidity 95% of the Bay of Bengal.

The engine shall be designed for the purpose of motorisation of locally built wooden fishing boat. The design and specification of the engine shall conform to the traditional wooden boats of Bangladesh.

The engine shall have excellent interchangeability on its parts for easy maintenance.

The engine shall have good enough maneuverability for marine practice.

The engine shall be such that will be easily overhauled, inspected and reassembled with simple tools and measurements.

2. Type of engine

4-stroke cycle, vertical, naturally aspirated in-board engine, with suitable power/weight ratio, completed with marine reverse/reduction gear and with shafting and propeller.

3. Output

20 to 24 SHP, continuous rating.

4. No. of Cylinder

Two (2)

5. No. of Revolution

At continuous rating, r.p.m. of crankshaft to be not more than 2100.

6. Starting system

Manual hand start.

7. Cooling system

Direct sea water cooling.

8. Type of governer

Centrifugal type all-speed governer.

9. Propeller

Solid and fixed pitch propeller with three (3) blades made of manganese bronze or equivalent.

10. Specific fuel oil consumption ratio

Not more than 230 gr/SHP/hr. at continuous rating.

11. Reverse/reduction gear

Shall be designed and manufactured for marine practise. completely coupled with engine proper. The reduction ratio in "Go-Ahead" shall be about 2.5:1.

12. Shafting

The material shall be suitable anti-corrosive quality with suitable length and diameter. Stern tube and necessary bearing of good quality and size for marine propulsion.

13. Fuel oil injection pump

Shall be individual per each cylinder of Bosch type or equivalent.

14. Detailed specification

Full technical specifications of engine proper together its drawing and performance curve under marine use and detail of design of shafting and propeller shall be submitted.

15. Spare parts

Necessary and adequate spare parts for 4000 hrs normal operation shall be furnished for each engine.

16. Training for installment and maintenance of engines

Should have training courses for installment and maintenance of engines for local engineers and ship-builders who will be in the service of the boat yard and the engine workshop in Barisal.

17. Operation manuals

Operation/maintenance manuals of fishing boats and diesel engines for fishermen shall be furnished.

18. Servicing system

Servicing system for after-care of engines should be set up.

3-2-2 Equipment and materials for Engine Workshop & Boat Yard ¥150,000,000-

a. Materials for Boat Yard ¥ 60,760,000-

Sawmill 300m^2 x @ 62,000 ¥ 18,600,000-

Boatbuilder's shop
480m^2 x @ 62,000 ¥ 29,760,000-

Woodworker's shop
200m^2 x @ 62,000 ¥ 12,400,000-

Cements, gravel and sand are not included.

b. Equipment for Sawmill ¥ 38,400,000-

(a)	Band sawing machine	1No.	¥ 6,800,000-
(b)	Automatic carriage	1No.	¥14,400,000-
(c)	Lumber rolling machine	1No.	¥ 1,400,000-
(d)	Steel framework of the rolling machine	1No.	¥ 800,000-
(e)	Advance conveyance dead roller devices	1No.	¥ 3,300,000-
(f)	Cross sliding roller conveyor carrier	1No.	¥ 400,000-
(g)	Bandsaw grinding machine	1No.	¥ 1,000,000-
(h)	Bandsaw strecher	1No.	¥ 1,000,000-
(i)	Stellite side grinding machine	1No.	¥ 900,000-
(j)	Saw leveling block	1No.	¥ 300,000-
(k)	Swage shaper	1No.	¥ 200,000-
(l)	Bandsaw welding equipment	1No.	¥ 400,000-
(m)	Stellite bar	500Nos.	¥ 120,000-
(n)	Bandsaw grindstone	30Nos.	¥ 210,000-
(o)	Cup grindstone	30Nos.	¥ 120,000-
(p)	Bandsaw	25Nos.	¥ 1,750,000-
(q)	Tools for above		¥ 300,000-
(r)	Generator	2Nos.	¥ 4,000,000-
(s)	Miscellaneous		¥ 1,000,000-

c. Equipment for Woodworker's & Boatbuilder's Shops ¥ 9,200,000-

(a)	Equipment for boat landing	1No.	¥ 1,360,000-
(b)	Sawing machine	1No.	¥ 1,250,000-
(c)	Hand planning machine	1No.	¥ 1,080,000-
(d)	Single surface planning machine	1No.	¥ 1,220,000-
(e)	Thin bandsaw grinding machine	1No.	¥ 630,000-
(f)	Plane knife grinding machine	1No.	¥ 670,000-
(g)	Spare parts for above		¥ 1,500,000-
(h)	Electric plane 110m/m	5Nos.	¥ 170,000-
	82m/m	5Nos.	¥ 130,000-
(i)	Electric surcular saw 380m/m	1No.	¥ 60,000-
	160m/m	5Nos.	¥ 100,000-
(j)	Disc grinder	1No.	¥ 30,000-
(k)	Electric finishing grinder	1No.	¥ 40,000-
(l)	Squill vice	30Nos.	¥ 300,000-
(m)	120-type vice	1No.	¥ 30,000-
(n)	Wood working drill	25Nos.	¥ 50,000-
(o)	Click bolt	5Nos.	¥ 15,000-
(p)	Click tapper	2Nos.	¥ 10,000-
(q)	Hand saw for steel	5Nos.	¥ 5,000-
(r)	Taps & dies	1No.	¥ 100,000-
(s)	Chain block 1Ton	1No.	¥ 60,000-
(t)	Cord reel	3Nos.	¥ 60,000-
(u)	Other tools		¥ 330,000-

d. Materials for Engine Workshop structure. ¥12,400,000-

$200m^2$ x @ 6,200 = ¥12,400,000-

Cement, gravel and sand are not included.

e. Equipment for Engine Workshop ¥ 5,140,000-

(a)	Small lathe machine	1No.	¥ 1,000,000-
(b)	Drill press	1No.	¥ 100,000-
(c)	Electric welder	1No.	¥ 210,000-

(d)	Electric grinder	1No.	¥ 50,000-
(e)	Electric drill	1No.	¥ 40,000-
(f)	Chain block 1/2ton	1No.	¥ 50,000-
(g)	Electric disc saunder	1No.	¥ 40,000-
(h)	Digital tachometer	1No.	¥ 150,000-
(i)	Micrometer	2Nos.	¥ 200,000-
(j)	Torque meter	2Nos.	¥ 400,000-
(k)	Nozzle tester	1No.	¥ 100,000-
(l)	Air compressor	1No.	¥ 200,000-
(m)	Other tools & measurements		¥ 2,600,000-

f. Detailed engineering, the preparation of designs, specifications and tender documents, the analysis of tender and recommendations.

Consultant fee ¥12,700,000-

g. Advice and confirmation on construction works of Engine Workshop & Boat Yard. ¥ 5,400,000-

1. Engineer---Construction works
   1 person x @ 600,000 x 3 months ¥1,800,000-
2. Machine engineer---On machine installation
   1 person x @ 600,000 x 1 month ¥ 600,000-
3. Electrician---On electric works
   1 person x @ 600,000 x 1 month ¥ 600,000-
4. Travelling, lodging, food expences and allowance
   3 persons x @ 300,000 = ¥900,000-
   150 man-days x @ 10,000 = ¥1,500,000-

h. Instruction for machine operation ¥ 6,000,000-

1. Sawing machines
   1 person x @ 600,000 x 3 months ¥1,800,000-
2. Woodworking machines
   1 person x @ 600,000 x 3 months ¥1,800,000-
3. Travelling, lodging, food expenses and allowance.
   2 persons x @ 300,000 = ¥600,000-
   180 man-days x @ 10,000 = ¥1,800,000-

3-2-3 Materials for fishing gears ¥ 200,000,000-

a. Nylon twine ¥ 24,600,000-

110D/15ply 12,000kg x @1,200 = ¥14,400,000-

110D/9ply 4,000kg x @1,200 = ¥ 4,800,000-

110D/6ply 4,500kg x @1,200 = ¥ 5,400,000-

b. Vinylon rope ¥ 40,650,000-

20m/m 250 coils x @68,600 = ¥17,150,000-

5m/m 5,000 coils x @ 4,700 = ¥23,500,000-

c. Vinylon twine ¥ 44,580,000-

240ply 10,620kg x @1,500 = ¥15,930,000-

90ply 9,100kg x @1,500 = ¥13,650,000-

21ply 10,000kg x @1,500 = ¥15,000,000-

d. Float ¥ 90,000,000-

1,000,000pcs x @90 = ¥90,000,000-

e. Miscellaneous ¥ 170,000-

Details:

1. Materials for 20 rolls of gill net specified below per each engine.

Dimentions

Twine; Nylon 110D 15ply

Mesh; 100m/m

Mesh Deep; 20

Length; 100m

Hanging length; 50m

Material list

Twine	Nylon 110D/15ply	1.0kg
Float line	Vinylon 5m/m	50m
Float sub-line	Vinylon twine 90ply	70m
Foot line	Vinylon twine 240ply	50m
Foot sub-line	Vinylon twine 90ply	50m
Float	76x36.5 HD7.5m/m	50pcs
Mending twine	Vinylon twine 21ply	500g

2. Materials for 10 rolls of gill net specified below per each engine.

Dimentions

Twine; Nylon 110D 9ply

Mesh; 60m/m

Mesh Deep; 34

Length; 100m

Hanging length; 50m

Material list

Twine	Nylon 110D/9ply	0.6kg
Float line	Vinylon 5m/m	50m
Float sub-line	Vinylon twine 90ply	70m
Foot line	Vinylon twine 240ply	50m
Foot sub-line	Vinylon twine 90ply	50m
Float	76x36.5 HD7.5m/m	50pcs
Mending twine	Vinylon 21ply	500g

3. Materials for 10 rolls of gill net specified below per each engine.

Dimentions

Twine; Nylon 110D 6ply

Mesh; 40m/m

Mesh Deep; 40

Length; 100m

Hanging length; 50m

Material list

Twine	Nylon 110D/6ply	0.7kg
Float line	Vinylon 5m/m	50m
Float sub-line	Vinylon twine 90ply	70m
Foot line	Vinylon twine 240ply	50m
Foot sub-line	Vinylon twine 90ply	50m
Float	76x36.5 HD 7.5m/m	50pcs
Mending twine	Vinylon 21ply	500g

4. Half a coil of Vinylon rope 20m/m for anchor rope per each engine.

5. Repairing Twine

Nylon 110D/15ply 4kg per each engine.
Nylon 110D/9ply 2kg per each engine.
Nylon 110D/6ply 2kg per each engine.

6. Sinkers are not included.

3 — 3 Recommendations concerning program implementation

3-3-1 Recommendations to the Government of Japan

The wooden boat building sector in Bangladesh has only just begun to introduce modern construction methods. Thus, the industry, for the most part, stands at a pre-modernization stage. Accordingly, it is vastly different from the technical levels in the Japanese industry, which has completed its modernization.

If the present technical levels in Bangladesh are evaluated on the basis of those prevailing in Japan, any such evaluation will inevitably be negative. However, there is in existence a Bangladesh wooden boat-building industry which has managed to arrive at its present stage of technology, and this stage should not be negated. Thus, if Japan is to help write a page in the history of the Bangladesh wooden boat building industry, she has no alternative but to demonstrate to the Bangladesh Government the various stages through which Japan has passed and endeavor to write history for this industry by having Bangladesh itself absorb these successive stages via its own experience.

To carry out this responsibility, we feel it would be best to work under a comprehensive plan whereby Bangladesh actually builds the vessels domestically, employing techniques adapted to current technological level and conditions and its ability to absorb technological transfer at the industry's present stage of development.

However, there are currently many constraints on the Japanese grant-in-aid program. We would like to envision the most comprehensive possible program within these parameters but realize that the dispatch of experts and training of technical personnel do not fall within the scope of this grant-in-aid cooperation program.

Nevertheless, from the standpoint of modernizing vessel design and developing boat-building techniques, we strongly recommend the dispatch of experts on wooden boat construction.

3-3-2 Recommendations to the Government of Bangladesh

Many fishermen in Bangladesh are relatively poor. Few have the savings or assets necessary to purchase a fishing vessel. Thus, it is vital that they be in a position to borrow the down-payment for a motorized vessel.

Since before the Liberation War, fishermen have been borrowing capital for fishing and living expenses from fish middlemen and have, as a result, fallen under their economic control. While it is true that this system is tending to disappear, its vestiges still remain. It is desirable that the program contribute to the enrichment of the lives of the fishermen by leaving them ample leeway in the repayment of the funds they borrow to acquire motorized vessels.

For this purpose, it would be desirable for the Government of Bangladesh to heavily subsidize the purchases (in the order of 66%) and to make available, through a government controlled financial institution, low interest loans.

Furthermore, to accelerate the turnover of funds and improve the efficiency of operations, it would be best to have the amortization payments processed through a financial organization with a view toward improving the rate of collection.

Appendix

Appendix

Members and diary of Japanese survey team

I. Members

Leader	Mr. Zennosuke TAKAGI	Fisheries Consultant Ex FAO Expert
Member	Mr. Naoyuki SATOH	Engineer, Fisheries Egineering Company Ltd.
Member	Mr. Kohichi MURAMATSU	Engineer, Fisheries Engineering Company Ltd.
Coordinator	Mr. Takashi KATOH	Staff, Experts Assignment Department, Japan International Cooperation Agency.

II. Diary

Date		
Jun. 28 Thu.	Lv. Tokyo	Ar. Bangkok
29 Fri.	Lv. Bangkok	Ar. Dacca
	Courtesy call at Embassy of Japan and JICA's Dacca office.	
30 Sat.	Meeting with Bangladesh Fisheries Corporation (BFDC)	
Jul. 1 Sun.	Holiday	
2 Mon.	Visit Mr. Muhammed Ali, Joint Sesretary, External Resources Div., Ministry of Finance.	

		Visit Dr. Mahumudal Karim, Section Chief, Fisheries Section, Planning Commission.
		Meeting with Ministry of Fisheries & Livestock.
Jul.	3 Tue.	Survey at Khulna.
	4 Wed.	Survey at Mongla.
	5 Thu.	Survey at Khulna.
	6 Fri.	Survey at Barisal.
	7 Sat.	Lv. Barisal by Rocket Steamer Service Ar. Dacca.
	8 Sun.	Lv. Dacca Ar. Chittagong Survey at Chittagong
	9 Mon.	Visit to Boat Yard of BFDC's "Boat Building & Mechanisation Project"
	10 Tue.	Lv. Chittagong Ar. Dacca
		Meeting with Ministry of Fisheries & Livestock.
	11 Wed.	Preparation for the next meeting.
	12 Thu.	Meeting with Ministry of Fisheries & Livestock.
	13 Fri.	Lv. Dacca Ar. Bangkok
	14 Sat.	Lv. Bangkok Ar. Tokyo

JICA