

JAPAN INTERNATIONAL COOPERATION AGENCY  
THE ISLAMIC REPUBLIC OF PAKISTAN  
THE PROVINCE OF BALOCHISTAN

**BASIC DESIGN STUDY REPORT  
ON  
THE COASTAL FISHERIES DEVELOPMENT PROJECT  
IN  
THE PROVINCE OF BALOCHISTAN,  
THE ISLAMIC REPUBLIC OF PAKISTAN**

**MARCH 1993**

**Fisheries Engineering Co., Ltd.**

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## PREFACE

In response to a request from the Government of the Islamic Republic of Pakistan, the Government of Japan decided to conduct a basic design study on the Coastal Fisheries Development Project in the Province of Balochistan and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Pakistan a study team constituted by members of Fisheries Engineering Co., Ltd. from December 9th to 18th, 1992.

The team held discussions with the officials concerned of the Government of Balochistan and conducted a field study at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the Project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Islamic Republic of Pakistan and the Government of Balochistan for their close cooperation extended to the team.

March, 1993

A handwritten signature in cursive script, reading "Kensuke Yanagiya".

Kensuke Yanagiya  
President  
Japan International Cooperation Agency



March 26th, 1993

Mr. Kensuke Yanagiya  
President  
Japan International Cooperation Agency  
Tokyo, Japan

Letter of Transmittal

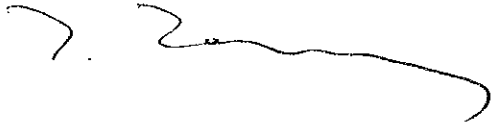
We are pleased to submit to you the basic design study report on the Coastal Fisheries Development Project in the Province of Balochistan, the Islamic Republic of Pakistan.

This study has been made by Fisheries Engineering Co.,Ltd., based on a contract with JICA, from December 1st, 1992 to March 26th, 1993. Throughout the study, we have taken into full consideration of the present situation in the Province of Balochistan, and have planned the most appropriate project in the scheme of Japan's grant aid.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, Ministry of Foreign Affairs, Fisheries Agency of Ministry of Agriculture, Forestry and Fisheries, and Embassy of the Islamic Republic of Pakistan in Japan. We also wish to express our deep gratitude to the officials concerned of Coastal Development and Fisheries Department and Planning and Development Department of the Government of Balochistan, Pakistan Office of JICA, and Embassy of Japan in Pakistan for their close cooperation and assistance during our study.

At last, we hope that this report will be effectively used for the promotion of the project.

Very truly yours,

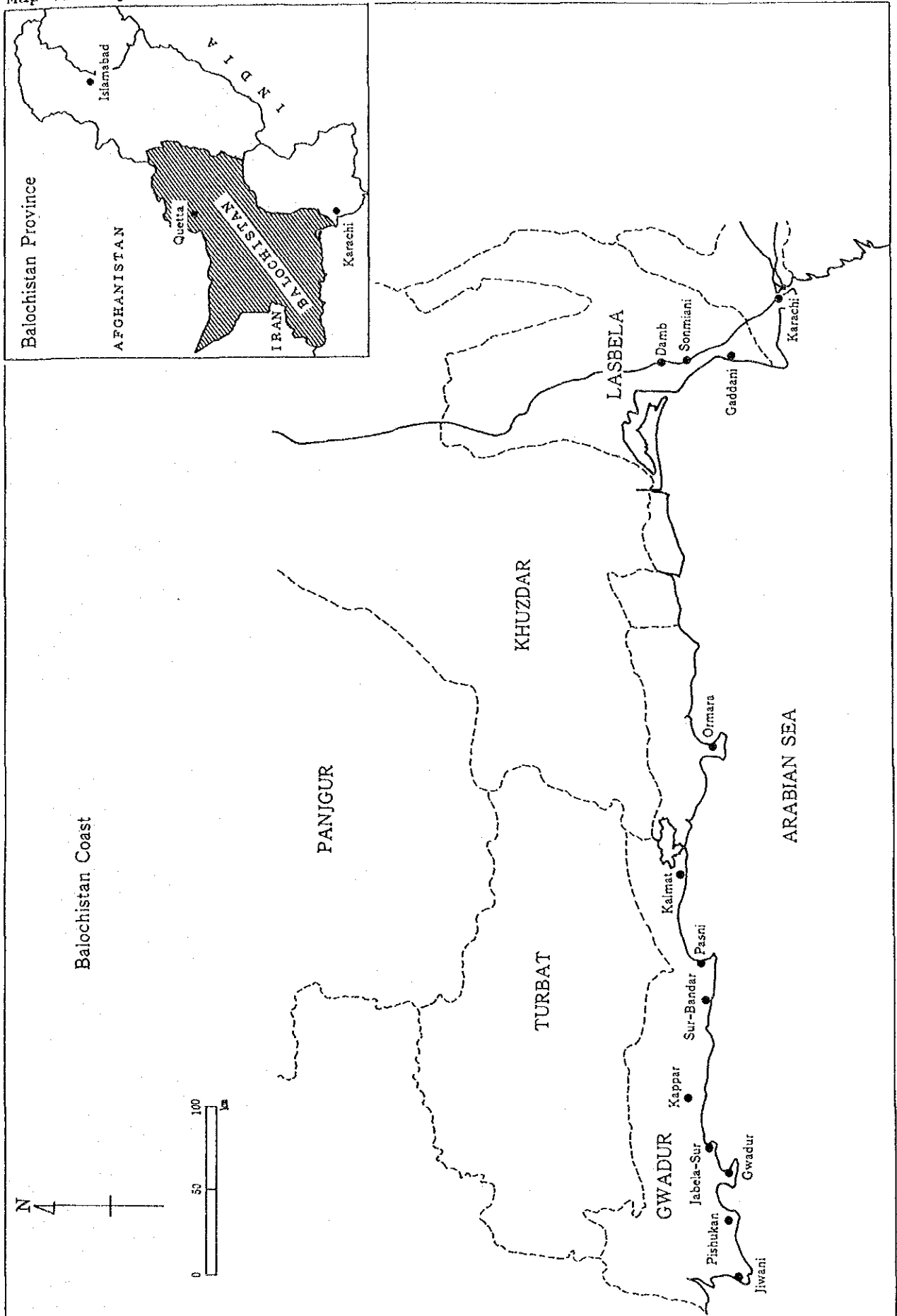


Project Manager, Toyomitsu Terao  
Basic Design Study Team on  
the Coastal Fisheries Development  
Project in the Province of Balochistan,  
Fisheries Engineering Co.,Ltd.





Map of Project Area





## SUMMARY

The coastal area of Balochistan Province of the Islamic Republic of Pakistan extends some 770 km in an east-west direction. Close to 90% of the coastal population is reported to be in fishing households, with the vast majority depending on the fishing industry for their livelihood. Up to the 1970s, there were virtually no powered fishing vessels in the provincial fleet; the majority were sailboats.

The basic impetus to motorization was the donation of marine engines under a Japanese grant-aid in 1980 along with concurrent technical assistance from the FAO. Motorization of small-medium fishing vessels in Balochistan Province has shown rapid growth over the past decade. As a result, at present, more than 3,000 vessels are equipped with outboard motors, while more than 600 have inboard engines, with output ranging as high as 100 PS or more. However, since the greater part of the coastal belt is quite remote from consuming centers, this entails heavy transport costs for both catches and production equipment, placing fishing families under a severe operating handicap vis-a-vis those in the Karachi area. As a result, the purchasing power of Balochistan fishermen is generally low, and so acquisition and renewal of fishing equipment imposes a severe financial burden on them.

The Balochistan Provincial Government has for some time been engaged in an ambitious program to develop its coastal fisheries, as manifested in the improvement of fishing technology and the upgrading of the fishing port at Pasni. Since fishery development is clearly indispensable to the development of the coastal economy of the province, a need has been recognized for the public sector to supply basic items of fishing equipment at low cost. Accordingly, the Balochistan Provincial Government has formulated the Coastal Fisheries Development Project as one of the pillars of its overall fishery development program. The Federal Government has, in turn, requested a grant-aid from the Government of Japan to realize this Plan.

Based on this Request, the Government of Japan decided to conduct a Basic Design Study on the subject Plan. From December 9 to 18, 1992, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team to Pakistan to undertake the survey. The Study Team confirmed Plan contents through discussions with the officials concerned in the Balochistan Provincial Government. Also, with a view to evaluating the background and appropriateness of the Plan as well as the composition of the requested fishing equipment and materials, the Team conducted a field survey and interviews regarding the present state of fisheries production in the province along with the implementing and operating structure for the Plan.

Upon returning to Japan, the Team analyzed and evaluated the survey findings, assessed the need for the requested equipment, and prepared a Basic Design for the contents, technical specifications, and quantities of the subject equipment. The findings have been compiled in this Basic Design Report. Following is a summary of the equipment materials that will be needed to implement the subject Plan:

1. Inboard Marine Diesel Engines and Spare Parts:
 

25 PS Class	10 units
40 PS "	30 "
50 PS "	40 "
70 PS "	15 "
100 PS "	5 "
Spare parts	1 lot
2. Outboard Kerosene Engines and Spare Parts:
 

7 PS Class	300 units
15 PS "	500 "
Spare parts	1 lot
3. Fish Finders: 10 units
4. Workshop Equipment:
 

Hydraulic press, drilling machine, grinder, air compressor,	2 sets
--	--------

diesel generator, and others	
Tool kits	8 kits

5. Net Materials:

Netting	400 rolls
Float lines, sinker lines	1 set
Hanging twine and mending twine	1 set
Floats, buoys	1 set

It is anticipated that the time required for equipment procurement will be: 3 months for the implementing design, 4 months for production of the target equipment and materials, and 3 months for shipment and delivery.

In connection with Plan implementation, the Balochistan Provincial Government plans to set up Fishing Equipment Distribution Committees composed of local government officials and fishermen representatives. The Plan equipment will be distributed to fishermen, in response to requests from the various Committees, through the local offices of the Directorate Fisheries of the Balochistan government.

By implementation of the subject Plan, it can be expected that fishery production will increase through enhanced fishing productivity and an increase of operating days.

Based on the above considerations, it has been concluded that the subject Plan will make a definite contribution to the regional economy of the Balochistan coast through the supply of the target fishing equipment and materials and that there is, accordingly, major significance in implementing this Plan on the basis of a grant-aid from Japan.



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## SECTION ONE: INTRODUCTION

In May, 1992, Balochistan Province, in the Islamic Republic of Pakistan, submitted a Request to the Government of Japan, through the Federal Government, for a grant-aid to implement the project entitled: "Supply of Marine Engines, Monofilament Nets, and Fish Finding Equipment". The coastal area of Balochistan extends in an east-west direction over a distance of some 770 km. In the absence of any other significant industries, the preponderance of households in this area are dependent on the fishing industry. While the bulk of the catches are shipped to the Karachi area, since most of the Balochistan coast is quite remote, entailing heavy transport costs, the incomes of fishing households are said to be lower than those in the Karachi area. For this reason, their purchasing power is also generally low, and the acquisition and renewal of fishing equipment imposes a substantial financial burden on them. The Government of Pakistan has been energetically coming to grips with this problem and has been putting considerable effort over the years into the development of coastal fisheries in Balochistan province through improvement of fishing technology and upgrading of the fishing port at Pasni. The provision at low cost of needed equipment for fish production has been recognized as an essential pillar of this fishery development policy, which has in turn led to formulation of the subject Plan.

Under a 1980 grant-aid, Japan has already provided various items of fishing equipment to the coastal areas of both Balochistan and Sindh Provinces, including 22 PS inboard engines, 7 PS -22 PS outboard motors, and fishing gear. The present Plan has been positioned as a successor plan to the 1980 project, providing for the supply of needed fishing equipment as a continuation of that initial program. The basic objective of the present project is to reduce the financial burden of fishermen in connection with obtaining and replacing production equipment.

The Japan International Cooperation Agency (JICA) dispatched a Study Team to Pakistan, from December 9 to 18, 1992, to conduct a Basic Design Study for the subject Plan. The Team was constituted of members of Fisheries Engineering Co., Ltd. The Study Team confirmed the request contents

through discussions with concerned parties in Balochistan Province. In addition, for purposes of assessing the background and appropriateness of the Plan as well as the composition of the required fishing equipment, the Team conducted a field survey and engaged in a series of discussions regarding the present state of fishery production in coastal Balochistan as well as the implementation and management structure for the project. The field survey included visits to fish landing bases at Gwadar, Sur, Pasni, and Zereen.

The basic areas of agreement on the project implementation, as reached during discussions between the Balochistan Government and the Study Team, were incorporated into a Minutes of Discussions, which was signed by both parties. Upon its return to Japan, the Study Team analyzed and examined the survey findings and assessed the need for the requested equipment. This was followed by the preparation of a Basic Design Plan recommending the composition, technical specifications, and quantities of the subject equipment.

The Report comprises a Basic Design for those equipment items that have been deemed to be optimum for implementing the subject Plan, along with a Project Implementation Plan and a Project Evaluation. The composition and itinerary of the Study Team, a list of discussants, and the Minutes of Discussions are included in the Appendix following the body of the report.

## SECTION TWO: BACKGROUND OF THE PLAN

### 2.1 Fishery Resources

#### 2.1.1 Fishing Grounds Environment

Pakistan's coastal belt covers a distance of 1,120 km, of which some 350 km are contained in Sindh Province, located in the eastern part of the country and comprising the Indus River delta, and about 770 km are located in Balochistan Province to the west. Territorial waters extend 12 nautical miles from the shoreline, and a 200 mile Exclusive Economic Zone has been established. Pakistan's continental shelf covers an area of 522,000 km<sup>2</sup>, of which the waters off Balochistan comprise just over 30%. The continental shelf in this province is thus much smaller than that of Sindh Province, which has a much shorter coastline.

Sea bottom materials off Sindh Province are typically sand and mud. The productivity of Sindh waters is enriched by nutrient salts carried down to the sea by the Indus River. In addition, the coast contains many creeks, endowed with mangrove forests, which provide ideal growing conditions for shrimp and fry. Abundant resources of shrimp and other demersal species with muddy habitats as well as plankton feeders, such as sardines and horse mackerel, support trawl and purse seine fisheries.

By contrast, the sea bottom along the Balochistan coast is mainly reef material. The continental shelf broadens only in Sonmiani Bay, where the bottom material in any places is sand or mud. In the waters off the central part of the province, the Oman Current, originating in Oman, meets and blends with the counterclockwise Indian Current from the Indian Ocean at depths of 200 m - 1,000 m, which raises the basic productivity of the grounds. During the monsoon season, along the 1000 m depth line, upwelling currents develop which are also reported to increase fish production from October onward. In the waters off the central part of the province, there are a number of gill net fisheries directed at shark, skipjack, tuna, and Spanish mackerel as well as long line and hand-line fisheries, which are well suited to operations in rocky areas.

## 2.1.2

## Extent of Fishery Resources

Several exploratory surveys have been undertaken on Pakistan's fishery resources, such as that conducted in 1975/76 in the northern part of the Arabian Sea by the research vessel, Nansen, with the assistance of FAO/NORAD. Based on the findings of recent years, as compiled in a report of the Asian Development Bank, the estimated size of fishery resources in Pakistan waters is as shown in Table 2-1:

Table 2-1. Estimated Size of Fishery Resources in Pakistan Waters  
(in '000 tons)

Species	Small		Large		Shrimp	Squid	Total
	Demersal	Pelagic	Pelagic	Pelagic			
Present							
Resource Size	500	500	NA		88	10	NA
Maximum Sustainable							
Production	189	250	NA		35	2	NA
Largest Catch							
on Record	128 a)	131	20		29 b)	-	308
Maximum Potential							
Catch Expansion	61	119	5		6	2	193
Maximum							
Economic Catch	189	160	25		29	-	403

NOTES: a) Includes production for self-consumption: 17,318 tons

b) May be underestimated by some 6,000 tons

SOURCE: Asian Development Bank, Pakistan Fisheries Sector Study

The Asian Development Bank has also done estimates on waters off Balochistan, according to which the present size of fish and crustacean resources is estimated at about 572,000 tons, and the maximum sustainable production at about 300,000 tons. The total Balochistan catch in 1991 came to 102,000 tons. Since vessels registered from outside the province are believed to account for 50,000 - 60,000 tons of this total, there is

still leeway for further development, with the potential production increase estimated to be in the order of 140,000 - 150,000 tons.

## 2.2 Fishery Production

### 2.2.1 Fishing Population

According to government statistics, the total fishing population in the country as a whole, full- and part-time combined, was about 254,000 in 1989. Of this total, 163,000 were engaged in the inland water fishery, and the remaining 91,000 in the marine fishery. Some 68,000 of the sea fishermen live in Sindh Province, 23,000 in Balochistan. The total populations of the two provinces are 19.1 million and 4.4 million, respectively. Thus, the ratio of fishing to total population is somewhat higher in Balochistan than in Sindh.

There are reported to be 37 fishing communities and/or ports along the Balochistan coast, extending from Gaddani on the east to Jiwani on the west. The ten most important fishing bases are: Gaddani, Sonmiani, Ormara, Kalamat, Pasni, Sur-Bandar, Kupper, Gwadur, Pisukan, and Jiwani. The coastal population is in the order of 162,000, of which 90% are fishing households. This coastal population is only 3% of the provincial total, with extremely low density. The virtual absence of alternative sources of livelihood along the coast dictates the overwhelming dominance of fishing households in the area.

### 2.2.2 Types of Fisheries

#### (1) National Level

The country's main fishery, in terms of catch volume, is the surrounding net fishery, a branch of the purse-seine fishery, which is directed at sardines and operates in waters off Sindh Province. The body of the surrounding net is rectangular-shaped, with a length of 210 m and a depth of about 30 m. Unlike conventional seines, it does not have rings on the sinker line side or purse lines. The vessels in this fishery are based mainly in Karachi and Korangi. Virtually the entire catch is processed into fish meal for use as fertilizer and feed. Production has been

reasonably constant since the mid-1980s, with the catch almost totally consumed domestically.

A shrimp trawl fishery is also conducted on the continental shelf, centering around the Indus River delta. There are approximately 1,100 fishing vessels attached to this fishery, which had a catch of about 23,500 tons in 1989. The majority of this shrimp is exported, earning considerable foreign exchange.

There is also a gill net fishery which operates along the entire coastal belt. The main type is bottom gill net, which fishes in shallow coastal waters for a variety of species. Other commonly observed fishing methods include beach seine, bottom long line, hand-line, and cast net.

## (2) Balochistan Province

As already noted, the fishing grounds off Balochistan Province differ from those in Sindh in terms of their narrow continental shelf and a characteristically reef sea bed. Owing to this seabed topography, except for the area around Sonmiani Bay, there are few areas conducive to trawl operations. The surrounding net fishing is also uncommon in this province. The main fishery in Balochistan is gill net, supplemented by bottom long line, cast net, and hand-line. The provincial government has, for some time, prohibited trawl fishing, with the result that no trawl vessels are currently registered in the province.

### 1) The Gill net Fishery

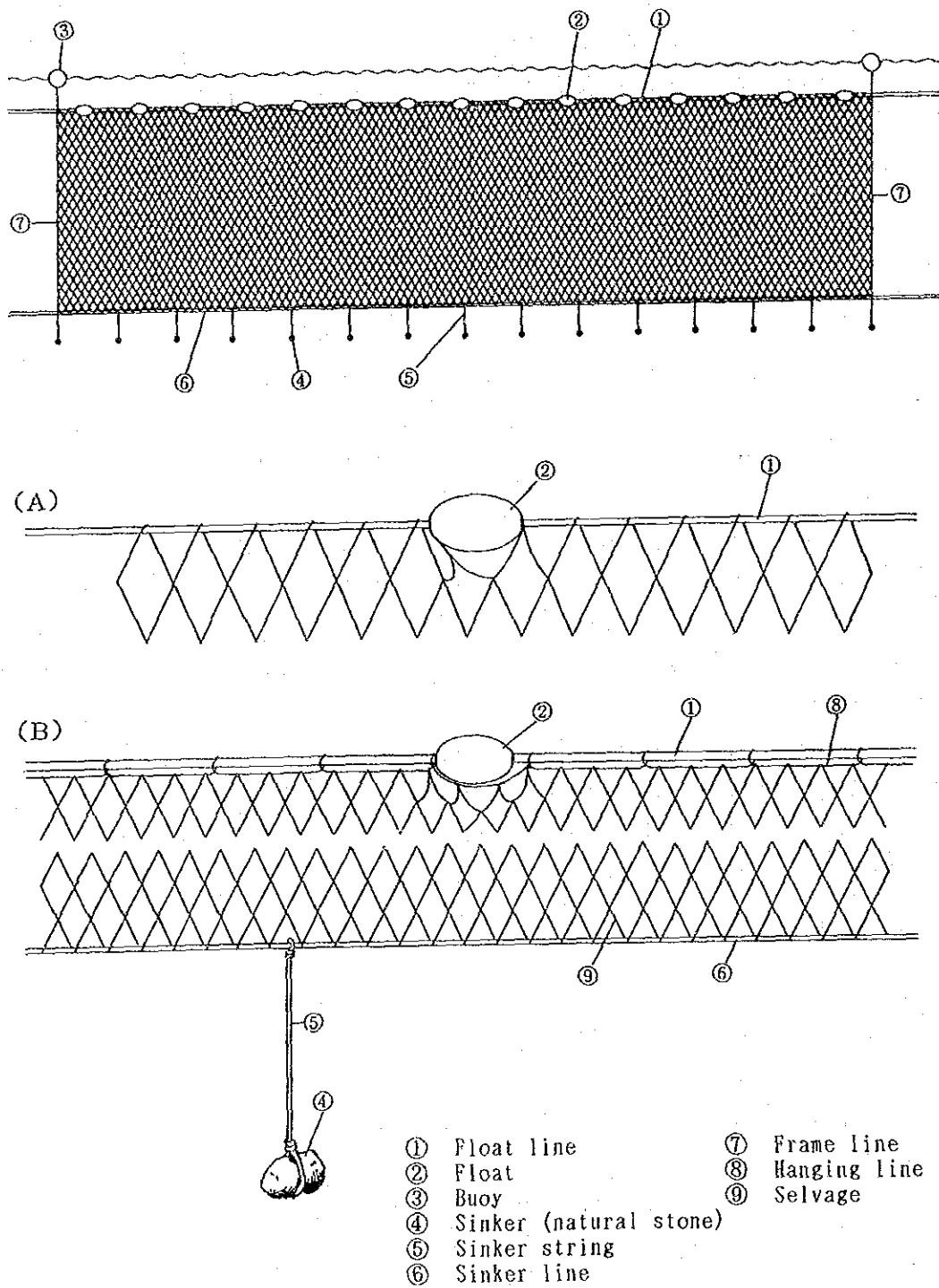
The gill net gear in Balochistan may be classified into four branches; Thukri, Jorra, Cherepi, and Ruch, depending on the size of net or fishing method used. Gill net operations using small-size vessels, such as Katti and Ekdar, and directed at small fish and shrimp are called Thukri. This is a small-scale gill net fishery, operated in 2-3 rolls, one roll of which has a float line length of about 200 m and a net depth of 2-3 m, taking such species as shrimp, small red snapper, croaker, jewfish, horse mackerel, silver sillago, sea catfish, and squid.

Jorra and Cherepi are medium-scale fisheries, using almost the same size gear. They operate with float line lengths of 330 - 1,300 m and net depths of 5-7 m, depending on the size of vessel and crew. Net mesh is large (10-16 cm), and target species include such commercially important species as red snapper, croaker, jewfish, weakfish, ray, thread fin fish, pomfret, emperor, mackerel, and spanish mackerel.

Jorra refers generally to bottom gill net fishing, but Cherepi vessels can be employed interchangeably in both bottom gill net and drift net operations.

Ruch is the most prevalent type in the gill net category. They are operated by boats of rather large size, by Balochistan standards, such as Hora, Rachin, and Machera, with the gear construction shown in Figure 2-1. The Ruch type gill net is practiced in 13-14 roll units, with a rather large unit size of a hanging length of 180 m and a net depth of about 9 m. In the example given in Figure 2-1, twine thickness is 607 R Tex, equivalent to 210 D/27, but, in our survey, much of the twine was found to be in the range of 210 D/18 - 210 D/30 . Mesh size varies considerably, between 14 cm and 18 cm. As shown in the above figure, the Ruch method does not generally use lead sinkers but rather natural stone. When used as drift nets, the sinker weight is decreased, but, when used as bottom gill nets, the weight of the fitted stones is increased so as to stabilize the gear on the sea bed. The length of the buoy line is adjusted to fit the needs of drift net or gill net operations, as the case may be, while a net set depth is adjusted to accommodate the nektonic strata of the fish.

Figure 2-1 Gear Construction of Ruch Type Gill Net





Whereas Thukri is directed at small fish and shrimp, mainly in muddy and sandy areas, with the sinker line inevitably touching the seabed, in the case of Ruch, whether used for drift net fishing or bottom gill net operations, the sinkers are not directly connected to the sinker line, while the natural stones are hung on from the sinker lines. Depending on how the Ruch gear is used, sinking force is adjusted on the basis of stone weight. In the Thukri gear, however, since no sinker volume adjustment is required, the lead sinkers are attached through the sinker lines.

## 2) The Long line Fishery

The general specifications for long line gear in Balochistan Province are as shown below. The gear may be classified into surface and bottom long line, both of which are of a stationary type. Material standards for the two types are virtually identical.

- a) Main line: Nylon 210 D/48, 1.38 mm dia., 2,400 m
- b) Branch lines: Nylon, monofilament, 0.5 mm dia.x 2 twist, 0.4 m
- c) Installation interval for branch lines: 2.0 m
- d) Fish hooks: No. 3, 1200 hooks

The long line fishery typically employs 10 -13 m long fishing vessels, equipped with outboard motors of 10 -15 PS and manned by a crew of about 8. Trips generally last 3-4 days, with squid and horse mackerel used as bait. While bait may be purchased prior to leaving port, the general practice is to catch bait with 50-70 m gill nets during the journey from port to grounds. Catch species of this fishery include mackerel, tuna, shark, red snapper, spanish mackerel, and bombayduck. Vessels operate from September until May. During the monsoon season from June to August, many vessels are said to convert to Thukri or other small-scale gill net operations in inland waters and creeks, where sea conditions remain calm.

## 3) The Cast Net Fishery

The cast net fishery operates throughout the year, using small vessels such as Katti and Ekdar. Their catches include small pelagic species, such as sardines and horse mackerel, along with shrimp, silver sillago, and other small fish species. It is reported that some 3-4 fishermen on a vessel cast the nets. Net length runs some 5 m, with the maximum spread area reaching about 60 m<sup>2</sup>.

### 2.2.3 Fish Production

#### (1) National Level

The total fish catch in Pakistan in fiscal 1989 was 446,000 tons, of which 76% (340,000 tons) were landed by the marine fisheries and the remaining 24% (100,000 tons) by the inland waters fishery. The inland water catch was almost entirely consumed domestically for edible use but, in the case of the sea catch, while 30% was consumed domestically as edible fish and another 20% exported, fully 50% was processed into fish meal for use as animal feed. The following Table 2-2 shows trends in total catch by area over the 1980-89 period:

Table 2-2. Pakistan Fish Catches by Area  
(in '000 tons)

Area/Years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
<u>Marine Fisheries</u>										
Fish	: 232	261	278	283	308	333	331	336	348	341
Sindh	: 156	161	179	175	193	203	214	217	217	218
Balochistan:	55	69	69	76	78	93	85	86	99	96
EEZ	: -	-	2	3	7	9	4	1	1	1
Crustaceans	: 25	30	26	28	28	26	26	30	30	25
Sindh	: 24	28	25	27	27	25	26	29	29	24
Balochistan:	1	1	1	1	0	0	0	1	0	0
EEZ	: -	-	-	-	-	-	-	-	-	-
<u>Inland Water Fisheries</u>										
Fish	: 46	56	59	60	70	75	83	91	96	105
TOTAL	: 279	317	337	343	378	408	415	427	445	446

Note: Figures rounded to nearest thousand tons

Source: Handbook of Fisheries Statistics of Pakistan (1990)

(2) Balochistan Province

The total 1991 catch in Balochistan Province amounted to about 102,000 tons, with sardine and mackerel landings in excess of 20,000 tons, tuna at about 11,000 tons, and shark and ray at some 22,000 tons. These species comprised close to half the total provincial catch. Table 2-3 shows the total catch for 1991 by landing area:

Table 2-3: Marine Fishery Catch in Balochistan Province,  
Classified by Area (1991)

Area	Fish Production (in tons)
Gaddani	6,201
Sonmiani	6,850
Ormara	14,932
Kalimat	3,892
Pasni	22,286
Sur-Bandar	4,542
Kupper	2,997
Gwadur	25,519
Pisukan	4,522
Jiwani	10,341
TOTAL	approx.102,000

Source: Provincial Coastal Development  
and Fisheries Department (1992)

The catches are generally shipped in preserved form (iced, salted, dried). As shown in Table 2-4, taking 1991 as an example, of the total 102,000 ton catch, 78% (by fresh weight) was shipped outside the province, and all of this fish was destined for or landed in the Karachi area. Of the remaining 22% consumed within the province, 55% was shipped to inland areas, while 41% was consumed by fishing households.

The major forms of in-province consumption are fresh, iced and salted. The total value of the Balochistan fish catch in 1991 was 760 million rupees (about ¥3,800 million).

Table 2-4. Distribution of Catch by Type (1991)  
(in '000 tons)

Type	Fresh Weight	Destination		
		Karachi	Province(Inland)	Self-consumed
Salted	9 :	5	4	-
Salt-dried	28 :	27	1	-
Iced	33 :	25	8	-
Fish meal	22 :	22	-	-
Shrimp	1 :	1	-	-
Fresh	9 :	-	-	9
TOTAL	102	80	13	9

Source: Provincial Coastal Development  
and Fisheries Department (1992)

Thus, the bulk of the catch is shipped to the populous Karachi market. This reflects in part the mountainous terrain throughout most of Balochistan Province as well as the undeveloped state of the provincial highway system, which makes it inconvenient to ship fish to interior markets within the province. While Karachi is much more accessible than inland areas of Balochistan Province, the majority of fishing bases in the province are quite remote from the metropolis, and so the high transportation cost put Balochistan fish producers at a relative disadvantage vis-a-vis those in the Karachi area. The result is that, in order to maintain competitiveness at the retail level, producer prices are squeezed, as is evident in the marked differential in average producer prices between the Karachi area and Balochistan markets. Fresh shrimp, for example, fetch only 7 rupees (Rs) per fish in Gwadar, as against 22 Rs (3 times higher) in Karachi.

Karachi is also the source of both consumer necessities and production materials for Balochistan fishermen. When transport costs to Balochistan are added on to the prices of these products, they end up costing twice as much in Balochistan as in Karachi. These differentials in terms of both producer prices and the cost of purchased supplies put heavy pressure on fishing operations, constituting a major factor in reducing the purchasing power for production equipment among Balochistan fishermen.

The average per-capita income for fishermen in Balochistan Province during 1991, as derived from the total value of the provincial catch (760 million Rs), may be estimated at 33,000 Rs. Since a CIF price of an 8 PS outboard engine included in the Request is estimated at around 27,000 Rs, the average fishery income per-capita in the province can be roughly equivalent to the import price of an outboard engine for small vessel use.

## 2.3 Fleet Strength

### 2.3.1 National Level

Table 2-5 shows the number of motorized fishing vessels participating in Pakistan's marine fisheries as of 1989. In addition to these vessels, 13,745 sailboats and 4,487 rowboats were also registered as of that year. Almost all of these non-powered vessels operate in the inland waters fishery.

Table 2-5 Number of Fishing Vessels in Pakistan's Marine Fisheries (1989)  
(No. of Vessels)

Vessel Type	Balochistan Province	Sindh Province	Total
Inboard-powered	438	1,913	2,351
Trawl	-	1,671	1,671
Gill net	438	242	620
Outboard-powered	2,786	2,730	5,516
TOTAL	3,224	4,643	7,867

Source: Handbook of Fisheries Statistics of Pakistan (1990)

As shown in this table, which comprises both Balochistan and Sindh Provinces, although the number of outboard-powered vessels in both areas is almost the same, the share of inboard diesel engines is 41% of total vessels in Sindh, while only 13% vessels in Blochistan Province are equipped with inboard engine.

### 2.3.2 Balochistan Province

#### (1) Types and Sizes of Fishing Vessels

Virtually all of the fishing vessels in Balochistan Province are of wooden construction, built within the province. Based on existing surveys, the Balochistan vessels may be divided into five types, depending on method of construction and size.

The Katti type is a small canoe-type boat with a total length of less than 6 m and frames of timbers called "Babool" and outside planking of Keuring pine. In addition to shrimp gill net, hand-line, and cast net operations, these boats also serve as transport vessels for landing fish at points not directly accessible to large fishing vessels such as Rachin boats. These vessels generally do not have fixed decks.

Ekdar boats are known for their bottoms, which are made out of hollowed log. Outside planking is placed on the upper sides, and the vessels are generally wider than the Katti type. Ekdar boats too have no permanent decks. Though smaller in size than Rachin vessels, they are said to be highly stable, for the sake of their considerable breadth.

Rachin type fishing vessels are the most common variety in Balochistan Province, with lengths widely ranging from 5 - 20 m. The keel is generally made from Keuring pine, while the framing timbers and sterns use Babool. Since the introduction of inboard engines in 1980, these vessels have been built mainly in lengths of over 12 m, though boats below this length are also seen, equipped with longtail or outboard engines. Many of these smaller vessels have installed two outboards to supplement the low horsepower. There is also a Hora-type vessel which is virtually identical to the Rachin, though the latter is generally designed with a larger mold depth. The average complement of the Rachin is estimated at around 4 for a 6m type vessel, and around 10 for a 15m type vessel.

Machera vessels are among the largest fishing boats in Balochistan. The majority of the gill net vessels, which operate for long periods (10-14 days) are of this class. Formerly, the principal catch species (e.g., skipjack, tuna, shark) were brought in mainly in salted form or processed on board into dried products, but, in recent years, the bulk of the fish from these vessels have been iced, with some boats even equipped with insulated fish holds.

## (2) Fishing Vessels Statistics

Table 2-6 presents data, as of 1991, on fishing vessels serving in the sea fisheries of Balochistan Province, classified by size class. Of the 3,878 vessels directly involved in fish production, 633 had inboard engines, 3,086 had outboard engines, and 159 were non-powered.

Table 2-6 Fishing Vessels in Balochistan Province (1991)  
(Number of vessels)

Tonnage Class	0 - 1	1 - 5	6 - 15	16 - 25	Total
Inboard Engines:					
Trawl	0	-	-	-	-
Gill Net	0	33	228	354	615
Other	0	-	18	-	18
Outboard Engines:					
Gill Net	180	2,351	459	90	3,080
Other	-	-	6	-	6
Non-Powered: (Gill net, etc.)	100	24	31	4	159
TOTAL	280	2,408	742	448	3,878

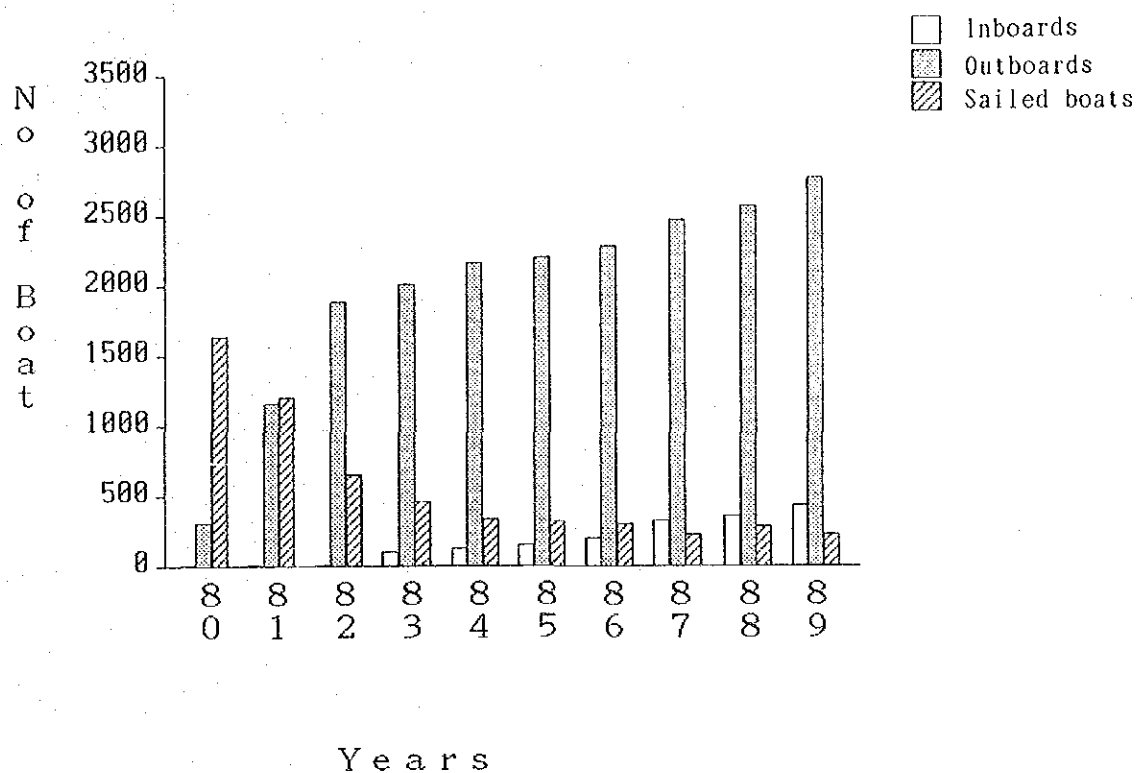
Source: Provincial Coastal Development  
and Fisheries Department (1992)

According to the data from Coastal Development and Fisheries Department of the Balochistan Government (1993), 73% of all inboard vessels in the province are registered in the Pasni area or points west, while in the east of Pasni, there are few inboard vessels. In the west, one still finds sailboats, though in greatly reduced numbers from former days. 17% of the sailboats in Balochistan Province are based in Pasni or points farther west. The share of outboard-powered boats is almost constant along the entire coast.

The following Figure 2-2 shows trends in registrations of powered and sail vessels in Balochistan Province over the 1980 decade.



Figure 2-2. Trends in Registrations of Motorized and Sail Vessels in Balochistan Province



Source : Handbook of Fisheries Statistics of Pakistan (1990)

As shown in the above figure, while the number of outboard vessels rose throughout the 1980s, there has been a decline in the number of sailboats. The number of outboards showed a particularly sharp rise from 1980 to 1982; during this two-year period, their number grew by about 1,500 boats. As discussed below, a total of 1,263 outboard motors were donated to Balochistan and Sindh Provinces in 1980 under a Japanese grant-aid project. Considering the fact that the bulk of the outboards provided to Sindh Province under this project were later used by fishermen in Balochistan Province and that an FAO technical assistance project was implemented at the same time, it may be presumed that the sudden motorization of small-size fishing vessels below 5 tons in Balochistan was triggered mainly by these aid programs.

Still another factor giving a fillip to vessel motorization was the longtail engine. Although this is classified as an outboard motor in provincial statistics on fishing vessels, unlike conventional outboards, the longtail engine is actually an industrial engine intended for shore use, equipped with a long shaft for installation on deck. Output is low, at 5 - 10 PS, and larger boats may, therefore, be equipped with two such engines. Since prices of longtails are lower than for outboards, they have become quite popular, though, owing to the fact that they were originally intended for shore use, their useful life is shorter than that of conventional outboard motors.

Fishing vessels equipped with inboard engines have also exhibited major growth over the past 10 years. Up to the 1970s, not a single vessel in Balochistan Province had been equipped with an inboard engine. It is reported that the first inboard installations took place between 1978 and 1980, when 22 PS marine diesels were installed on 4 Rachin vessels in the 15 m class. The majority of inboard-powered vessels are said to serve a dual function: in addition to basic fishing operations, they are sometimes used to transport their own catches, as well as those of outboard vessels, to Karachi. The need for preserving catches with ice is now keenly recognized, and so the vessels are anxious to reduce the time required to reach fishing grounds, landing ports, and markets. Hence, there is a continuing trend toward the use of higher-powered engines, with a considerable number of vessels now equipped with inboard engines of over 100 PS.

#### 2.4 The Fishery Development Plan

With a view to encouraging efficient growth in the Pakistan economy as well as a rise in living standards, the Federal Government is presently implementing its 7th Five Year Plan, which got underway in fiscal 1988/89. Although the present Request project is not specifically incorporated in the Implementation Plans provided under the current Five Year Plan, as pointed out in the Request document, development of the fishing industry is an essential element in developing the regional economy along the remote Balochistan coast. The subject Plan can, therefore, be deemed to have the high priority in the aspect of the supply of basic fishing equipment at low cost.

The fishery development programs carried out to date in Balochistan Province are as shown below.

Table 2-7. Completed Fishery Development Projects

Period of Execution	1978/83	1981/84	1984/90	1991
Implementing Body :	Bal P.	Bal P.	Bal P.	Federal Govt.
Aid Organization :	FAO/UNDP	Japan	A.D.B	Belgium
Total Project Cost: (million Rs)	15	80	563	1,000
Project Content:	Improving fishing gear & technology	Supply of fishing equipment	Building Pasni port; inboards, other	Building Gwadur port

Remarks : Bal P.; Balochistan Province

A.D.B.; Asian Development Bank

Source : Provincial Coastal Development and Fisheries Department (1992)

Japan's previous grant-aid program for the provision of fishing gear and equipment, which was carried out in 1980, has been positioned as the antecedent of the subject Plan. The 1980 project involved the supply of 22 PS inboard engines, 7 - 22 PS outboard motors, and a variety of fishing gear and equipment to the coastal areas of Balochistan and Sindh Provinces. The items provided under this grant-aid are summarized in the Table 2-8.

Table 2-8. Composition of Equipment Supplied Under the 1980 Project

<u>Equipment Type</u>	<u>Quantities</u>
Inboard engines: 22 PS	50 units
Outboard motors: 7 PS	713
12 PS	500
22 PS	50
Spare parts for above	1 lot
Workshop equipment	6 sets
Fishing nets, ropes, floats	1 lot

The equipment received under this program was initially divided equally between the two provinces. The original area distribution of the inboard and outboard engines within Balochistan Province is shown in Table 2-9 below.

It is understood that, since installation of the outboard engines on the existing traditional boats was not well progressed at the initial stage, the bulk of these engines initially allocated to Sindh Province were later diverted to Balochistan Province through the market mechanism.

Table 2-9. Area Distribution of Fishing Vessel Engines in Balochistan Province, Based on the 1980 Project (In Number of Engines)

<u>Area</u>	<u>Inboard Engines</u>	<u>Outboard Engines</u>
Gaddani	4	126
Ormara	6	102
Pasni	6	144
Gwadur	7	210
Jiwani	2	47
TOTAL	25	629

Sources: Provincial Coastal Development and Fisheries Department (1992), and other

According to discussants in the Balochistan provincial government, up to 1977, the entire fishing fleet in the province was composed of sailboats, with motorized vessels literally non-existent. Since the sterns of these coastal boats were sharply angular, their hulls had to be partially remodeled to permit the installation of outboard motors. As a result, during the initial stage of the project, distribution of these outboards was rather sluggish but, thanks to the efforts of those involved, the fishermen gradually became technically enlightened so that, by 1984, all of the engines had been distributed. The supply of inboard engines, on the other hand, was exhausted within a few months. Subsequently, following a program funded by the Asian Development Bank, inboard use was further expanded, mainly through the importation of used engines from the Middle East and elsewhere. At present, the number of fishing vessels equipped with inboards in the province exceeds 600, including a number of large engines rated at over 100 PS.

### SECTION THREE: CONTENTS OF THE PLAN

#### 3.1 Plan Objective:

The subject plan, Coastal Fisheries Development Project in Balochistan Province, is intended to provide fishermen with essential production equipment at low cost so as to reduce their financial burden when purchasing such equipment and thereby improve their living conditions.

#### 3.2 Consideration of the Request

##### 3.2.1 Need and Appropriateness

As shown in the review of the project background in the prior section, given the total absence of other industrial activity, the great bulk of households along the Balochistan coast must depend on fisheries for their livelihood. While most of the catches are shipped to the Karachi market, owing to the remoteness of much of the coastal area, a substantial premium is added to the cost of shipment. As a result, the incomes and purchasing power of fishery households in Balochistan are significantly lower than among those in the Karachi area, while the financial burden involved in purchasing and renewing fishing equipment is extremely onerous. There is no data comparing the operations and accounts of fishing families in the two areas, but prices paid to fishermen for their catches and for consumer goods were cited as examples of this disparity.

The Balochistan provincial government has, for some time, been putting its efforts into developing the province's coastal fisheries, and its determination is evidenced by the improvements that have been made in fishing technology and the construction of facilities at Pasni port. In addition to this fishery development policy, the authorities have also recognized the need for providing fishing equipment, on the basis of aid from public agencies, in response to the socio-economic conditions mentioned above. While it is clearly desirable, as seen from the objectives of the present Plan, that fishing equipment be distributed at low costs, were the Plan to be implemented on the basis of borrowed funds,

loan repayments would have to be added to the distribution costs of the equipment, making it difficult to meet the Plan conditions. In this sense, it is appropriate for the Plan to be carried out on the basis of a grant-aid.

### 3.2.2 Composition of the Requested Items

The requested items, as confirmed by this Study, are as shown in Table 3-1. They have been listed in order of the priorities assigned by the implementing organization in Balochistan Province.

Table 3-1 Composition of the Requested Equipment

<u>Priority Class</u>	<u>Items Requested</u>	<u>Quantity</u>
1.	Inboard engines & spare parts	
	26 PS	30 units
	39 PS	30
	52 PS	30
	70 PS	10
	110 PS	a few units
	Spare parts	1 lot
2.	Outboard motors & spare parts	
	8 PS	400 units
	15 PS	600
	Spare parts	1 lot
3.	Refrigerated trucks	2 vehicles
4.	Fish finders	10 units
5.	Workshop equipment	8 sets
6.	Fishing net materials	50,000 Kg

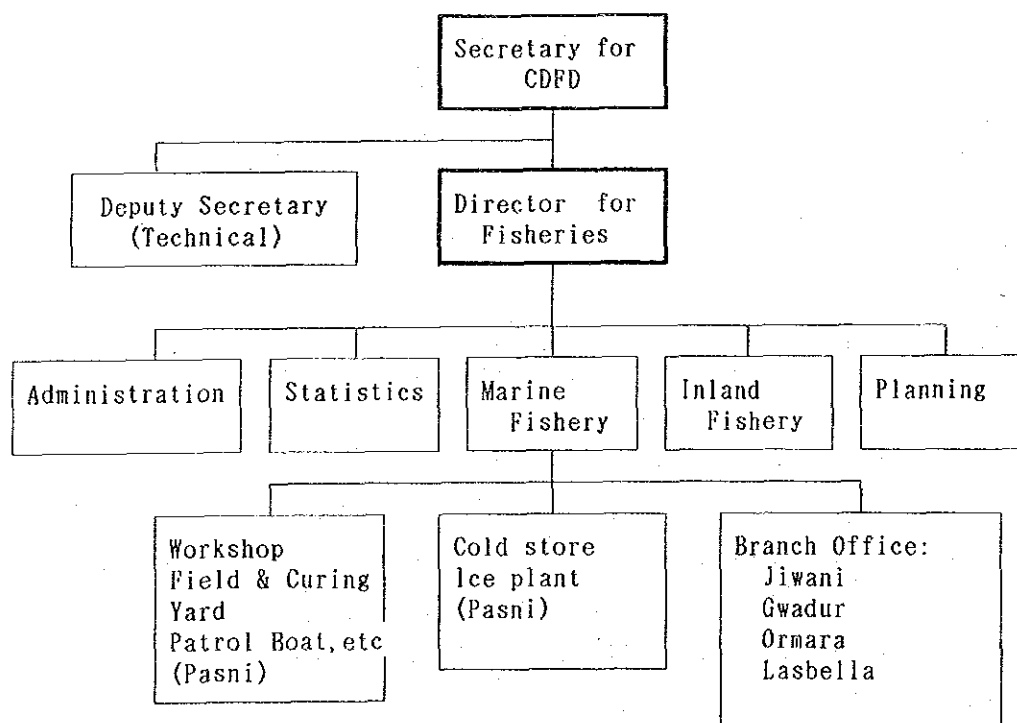
### 3.3 Outline of the Plan

#### 3.3.1 Implementing Organization

The organization with responsibility for the subject Plan is the Coastal Development and Fisheries Department (CDFD) of the Balochistan provincial government. The implementing organization is the Directorate Fisheries (DF), a subordinate body to the CDFD.

The CDFD is headquartered in the Provincial capital, Quetta, while the DF is based in Pasni. A chart of organization for the organizations concerned with the project is shown in Figure 3-1. As of the time of our field survey at the end of 1992, the total staff of the DF, including branch offices, stood at 206 persons, with 67 at the head office in Pasni and 139 at branch offices. According to DF data, workshops geared to the repair of marine engines are located in six places: Jiwani, Pishukan, Gwadur, Sur, Pasni, and Gaddani. A staff of 45 provides services in connection with the repair of fishing vessel engines.

Figure 3-1 Organization Chart for Concerned Organizations





### 3.3.2 Operating Structure

#### (1) Organization

The fishing equipment included in the Plan is intended to be used by the following groups:

<u>User Groups</u>	<u>Plan Equipment Items</u>
Fishermen	Engines, fish finders, net material
Provincial Government	Workshop equipment

In connection with Plan implementation, the Provincial Government plans to establish Fishing Equipment Distribution Committees (FEDC) at 6 locations: Gaddani, Sonmiani, Ormara, Pasni, Gwadar, and Jiwani. The Committees will select the fishermen who receive the fishing equipment. The workshop equipment will be used at the field workshops directly operated by the DF.

The FEDCs will be composed of the following persons:

- 1) Chairman of the local parliamentary body
- 2) Elected representative of the local fishermen
- 3) Representative of the Directorate Fisheries of the Provincial Government
- 4) Representative of the municipal government

#### (2) Distribution Procedures and Management Plan for the Requested Equipment

All equipment, apart from the Workshop items to be used directly by the Provincial government, will be temporarily stored in warehouses owned and operated by the DF at Pasni and Gwadar, pending their transfer to final users. The Pasni warehouse building, owned by the DF, is a one-story structure with several rooms, located alongside the Workshop and fish-drying areas in the compound adjoining the DF head office building. It has

a total floor area of 600 m<sup>2</sup> and roughly 3 m height ceilings. The warehouse at Gwadur is located in a similar complex, facing the port, with an identical floor area of about 600 m<sup>2</sup>.

#### Engines, Fish Finders, and Net Materials:

This equipment will be distributed to fishermen, in response to requests from the FEDCs, through the local branch offices of the DF. While it is considered that the Plan equipment can be distributed within current budget parameters by mobilizing the structures presently in place at the headquarters and branch offices of the Directorate Fisheries, should the transport of this equipment be delegated to a private contractor, it is estimated that the cost of these services would amount to a maximum of around 675,000 Rs.

It was explained that, apart from the IQRA tax of 7%, the engines and net materials will be exempt from all import duties and compound sales taxes. Fishermen receiving these products must give an undertaking that they will not resell them for at least two years. Any infraction of this rule will mean compulsory reimbursement to the Provincial Government of the full value of the items purchased (e.g., 100% of CIF price plus taxes that would otherwise have been applicable). The same administrative procedures were adopted in connection with the distribution of inboard engines under the FAO Fishery Project (1978/83) and the Japanese Grant-aid (1981-84), and it is reported that there were no infractions in either case. With regard to the fish finders, it was explained that, in order to ensure the success of the test introduction, they will be provided free of charge to selected fishermen with a view to educating fishermen on the benefits of using this equipment.

#### Refrigerated trucks:

The persons who would be directly using the refrigerated trucks have been planned to be private distributors of fish products, as selected by the Committees, with operations to be governed by a contract with the DF. As explained earlier, the bulk of the fishery products from Balochistan waters are shipped to Karachi. Thus, with the exception of fishermen directly landing their products in Karachi, collection and transport of

catches are done through distributors. Apart from the principal landing bases, collection frequency is generally low at most points, owing to their isolation.

The Refrigerated trucks by the Request would be operated in accordance with provisions in the leasing agreement that the vehicles be used to collect fish catches from remote areas. However, since it is considered that the priority of the Refrigerated trucks in this project is low by reasons described in the following section, these vehicles have been excluded from the Plan equipment.

#### Workshop equipment:

The workshop equipment, which is to be geared to the repair of marine engines, will be used at the 6 existing workshops operated by the DF as well as 2 new DF workshop facilities at Damb and Ormara.

### 3.3.3 Requirement, Scale and Quantities of the Equipment

#### (1) Inboard Engines and Spare Parts

The Request letter specifies 10-30 marine diesel main diesel engines in each output class, ranging from 26 to 110 PS. In the 1980 grant-aid program, 22 PS engines were provided. Behind the present request for inboards, including higher output models of up to 110 PS, lie the following considerations. During the past decade, marine diesels have achieved good penetration as main engines. Also, in response to the improvement in fishing port facilities, there is a clear trend toward larger-sized hulls concentrated in particular areas. In addition, in order to shorten travel time to fishing grounds and landing ports, higher vessel speeds are required.

At present, 633 vessels in Balochistan Province are equipped with inboard engines, and these are concentrated in the Pasni, Gwadar, and Jiwani areas. No data were available on the output of all inboard engines installed on fishing vessels, but the Study Team was given information by the DF on engine outputs among a sample of 38 vessels in Gwadar, Pasni,

and other major areas. Based on this data, the number of vessels classified by the engine output is shown as Table 3-2. The smallest engine among the 38 vessels was 22 PS and the largest 135 PS.

Table 3-2 Inboard Engine Outputs  
for Selected Fishing Vessels

Engine Output	No. of Vessels	Share (%)
20 - 40 PS	12	32%
40 - 60 PS	11	29%
60 - 80 PS	5	13%
80 - 100 PS	3	8%
Over 100 PS	7	18%
TOTAL	38	100%

Source: Directorate Fisheries (1992)

It may be safely presumed that the engine output range covered by the Request almost perfectly mirrors current patterns. Along with the diffusion of inboard engines, improvements are being steadily made in the maintenance and repair setup for marine engines, primarily at DF Workshops. The technological capability is steadily building up in trouble-free routine maintenance operations, even on engine models of high output. With respect to the output class of planned engines, considering the insistent trend toward higher outputs with a view to shortening travel time to fishing grounds and landing ports, it would be appropriate to consider a distribution plan weighted to reasonably high-output models. Giving due consideration to these factors, it has been chosen, in this Plan, to reduce somewhat the number of low-output engines originally requested while increasing, correspondingly, the number in high-output classes. The results are shown below:

Plan Output Classes (PS)	Plan Quantities (No. of Engines)
25 PS	10
40	30
50	40
70	15
100	5
TOTAL	100

Looking at trends over the past five years in the number of fishing vessels in the Balochistan fleet equipped with inboard engines, we see that their number has increased from 336 vessels in 1987 to 633 in 1991. In other words, the annual average increase has been 74 vessels.

Assuming similar future increases in the number of inboard-powered vessels, it may be expected that the planned quantities will be fully distributed in little more than one year.

With due regard to rigging costs and working efficiency when installing inboard engines on fishing vessels, the Plan incorporates stern arrangements for the inboard engines to be provided.

## (2) Outboard Engines and Spare Parts

A total of 1,000 kerosene-fueled outboard motors have been requested: 400 units of 8 PS output and 600 of 15 PS. Outboard engines may be classified into three types, depending on the fuel oil: (1) gasoline; (2) gasoline-kerosene (with gasoline used to start the engine and kerosene to drive it); and (3) diesel. For this project, the second (kerosene) type has been requested. This is because virtually all outboard motors in Balochistan Province are of this type and because, as shown in Table 3-3, kerosene prices in the province are much lower than gasoline. We are, therefore, planning to use kerosene motors, as requested.

Table 3-3 Unit Prices of Fuel Oil

Type of Fuel	Price (Rs/ltr)
Gasoline	8.10
Kerosene	6.50
Diesel fuel	5.30

Source: Directorate Fisheries (1992)

Over the past 5 years, the number of fishing vessels newly equipped with outboard motors in Balochistan province has grown from 2,477 in 1987 to 3,090 in 1991, representing an average annual increase of 153 vessels. Judging from the size of the fisherman population in the area, there is still ample room for further increases in the number of small-sized boats, and so it may be anticipated that, for the time being, this increasing trend will be maintained. On the other hand, however, in light of the steady increase in the number of inboard-powered fishing vessels in Balochistan and the fact that, owing to resource constraints, the increase of catch effort in fishing grounds accessible to small boats is reaching saturation conditions in terms of income potential, it is difficult to believe that the future rate of increase in outboard-powered boats will be comparable to that of the past decade.

Based on the above considerations, we have calculated plan quantities for outboards by considering the replacement demand among existing fishing vessels equipped with superannuated outboard motors and longtail type engines.

At present, it may be estimated that some 80% of outboard-powered vessels are equipped with longtail engines, with the remaining 20% using conventional outboards. Longtail engines may be classified into gasoline (kerosene) and diesel types, but the breakdown between these classes cannot be determined from available statistics. Based on estimates obtained during the field surveys at selected landing bases, an appropriate ratio would be 2 gasoline (kerosene) vs. 1 diesel.

The average useful life for gasoline-powered longtails may be estimated at 3 years and that for diesel longtails and conventional outboards at 5 years. Based on the above considerations, we have estimate that, at present, about 800 outboard motors will be required to satisfy replacement demand among existing boats.

According to the Request document, 2 output classes (8 PS and 15 PS) of outboard motors are considered to be necessary. Considering the output distribution among 51 boats sampled at Gwadur, Pasni, and other major points, 55% of the outboards installed had a rated output of 8 PS, while 43% were 15 PS, with an almost equal distribution between the two classes. On the other hand, among Japanese exports of outboard motors to Pakistan by one of major manufacturers over the 12-year period 1980 - 1991 (totaling 1,778 units, including the 1,213 motors donated under the 1980 grant-aid project), 42% were rated at 8 PS, 30% at 15 PS, and 27% at 25 PS or higher, with the 15 PS and over classes dominating these exports during the latter part of the decade. As shown by this example, in recent years, the trend toward high horsepower motors has clearly been accelerating. Considering the above, in this Plan, the ratio between 8 PS and 15 PS motors has been set at 2 : 3, as shown in the Request document. Accordingly, the 800 outboard motors to be provided under the Plan will comprise 300 units in the 8 PS class and 500 in the 15 PS.

### (3) Refrigerated Trucks

Two refrigerated trucks with a 4-ton load capacity have been requested. Frozen fish production is still at an infant stage in Balochistan Province. As noted earlier, virtually the entire catch is stored and transported in salted, salt-dried, and iced form. The refrigerated trucks have, accordingly, not been primarily intended for the transport of frozen fish but rather to improve the effectiveness of temperature control within the van body during collection and transport of catches, operations which extend over a number of days.

While improvement of the distribution net work can be considered to be one of the more important tasks in terms of developing the fishing industry in the project area, it must be recognized that, under present conditions, where development of cold storages, ice plants and related

equipment infrastructures remains inadequate, the implementation effectiveness of merely increasing transport capacity will be small. Thus, it is difficult to assign a high priority to the request for the Refrigerated trucks within the context of the subject Plan. Based on these considerations, the Refrigerated trucks have been excluded from the Plan equipment.

#### (4) Fish Finders

10 fish finders have been requested for use in shallow waters. Since coastal fisheries in Balochistan has had no experience to date with this type of equipment, the fish finders are to be operated only on an experimental basis. The Plan incorporates a total of 10 units, divided equally between recording paper and CRT types. The waters in which the finders are to be used have a depth of less than 150 m. Applications will focus on locating schools of demersal fish and in exploring sea bottom topography.

#### (5) Workshop Equipment

Various types of basic workshop equipment are planned for use in the maintenance and repair of currently operating marine engines in the project area as well as of the new marine diesel and outboard engines included in this Plan. The following items are planned to each of the eight locations at which the repair equipment is to be used.

<u>Areas</u>		<u>Repair Equipment</u>
Damb, Ormara (2 locations)	(1)	Machinery items, such as hydraulic presses, table-top drills, grinders, compressors, and emergency generators.
	(2)	General purpose tools, specialized tools for use on inboard and outboard engines.
Existing locations (Jiwani and others)	(1)	General purpose tools, specialized tools for use on inboard and outboard engines.



(6) Fishing Net Materials

The Study confirmed that the fishing net materials included in the Request comprise the following types of nets and accessories:

Fishing nets

Nylon (PA) gill nets

(A): 210D/12,	-	80 mesh depth
(B): 210D/24,	11.4 cm	80 mesh depth
(C): 210D/36,	15.2 cm	80 mesh depth
(D): 210D/39,	15.2 cm.	80 mesh depth

Float lines

Polyester (PE) ropes

Diameters: 6 mm, 9 mm, 12 mm, 18 mm

Sinker lines

Nylon (PA) ropes

Diameters: 6 mm, 9 mm, 12 mm, 18 mm

Floats

Floats and mark buoys

1) Netting specifications

The length of a unit roll of gill net for the most commonly used type of netting in Balochistan Province runs 40 m-500 m, with no uniform pattern. Net depth is considered to be generally 80 mesh, while hanging ratios are mostly in the 0.4 - 0.6 range. The normal operating size per vessel runs 4 - 10 rolls but, on large-size vessels, netting length may be as high as 5,000 m. Thus, the operating size of gill net can vary considerably, depending on such factors as vessel size, engine horsepower, and size of crew.

In Japan, for example, PA monofilament is used most frequently as gill netting material. But monofilament nets break easily and, when they do,

repair is difficult. Thus, as per the Request document, the use of PA multifilament is desirable as the netting material.

With regard to the thickness of the net twine, the smallest size shown in the Request is 210 D/12. Taking Japan as an example again, this standard is used in salmon drift nets in the northern-seas fisheries, which are directed at fairly large-sized species. And almost all nets even for such species as cod, sole, Atka mackerel, and mackerel use 210 D/9 or below. Gill nets in Balochistan characteristically use relatively thick net twine, with small mesh and large hanging ratios relative to the size of the target species. This is, we presume, the result of the fishing method to take fish by entangling the body in netting rather than catching it in the mesh. The use of thick net twine is presumably predicated on a desire to reduce wear and tear and permit long usage, even at a slight sacrifice in catch efficiency.

In light of the above facts, it has been concluded that there is still a considerable requirement for netting of, say, 210 D/6, with 5-6 mesh, for catching shrimp and small- to medium-sized fish. We are, therefore, including this netting standard in the subject Plan. With regard to (A) type 210 D/12 netting, in the absence of a mesh size indication, we have set this at 9-10 cm.

The (D) type netting in the Request has almost the same standards as (C). Mesh size is identical, while twine thickness varies by only about 0.2 mm, making it difficult to detect any differences in usage. Generally speaking, the ratio of mesh size (L) in gill nets to maximum enmeshed girth of the target fish (G),  $L/G = 1/2.2 - 1/2.3$  is considered desirable. In other words, the appropriate mesh size is considered to be 42-45% of the maximum girth of the target species. Taking, for example, the calculations for 4-5 year old skipjack, assuming a girth of 45-60 cm, the proper mesh size could fall in the 18-27 cm range. In the case of the large-mesh Japanese drift nets directed at fish larger than skipjack, the mesh size is, generally, close to 18 cm or more, and this can be considered a practical example of the relation between mesh and girth size. Based on the above considerations, in this Plan, we have set the mesh size of (D) type netting at 18 cm or more.

## 2) Float line specifications

PE is commonly used for float lines in Balochistan Province. Polypropylene (PP), although somewhat expensive as a float line, offers superior performance than PE, but is not being used.

The Danline type of PP rope is good but its filament, at 2,000 - 3,000 Denier, is somewhat lacking in flexibility. Based on these considerations, we plan to use flexible, yet economical, PE in relatively small-scale gill nets and PP Danline in large-size gill net applications. Based on the measurements taken in the field surveys, it will be planned to determine rope thickness with reference to the figures shown in the Request. Since hanging ratios of 0.4 - 0.6 are most common, it is considered that, based on a uniform 0.5 ratio, the length of float lines should be 50% of that of a roll of netting.

In Figure 2-1, presenting a general example of Ruch type gill net, two methods of float line assembly were shown as (A) and (B). In (A), both the net and floats are directly attached to the float line rather than using hanging lines. In (B), as is sometimes seen in Japan as well, the hanging lines are attached parallel to the float lines.

In the project area, usage of both hanging lines and net selvage is quite rare. Since these methods are useful for reinforcing the netting, the planned nettings are provided one mesh of selvage, together with hanging lines.

## 3) Sinker line specifications:

In the project area, sinker lines may be both thicker and thinner than float lines, though, on average, the majority were found to be slightly thicker. When PA is used as the line material, its thickness is almost identical to that of the float line (PE) but, in the case of vinylon (PVA) or Manila hemp, a somewhat thicker material is used. In certain gear, PE is used in sinker lines, due to its slightly lower price. However, material with a specific gravity of 1 or more is desirable in sinker lines and so, from a performance standpoint, it comes down to a choice between PA and PVA.

In Japan, PVA is still solidly entrenched but, at the present time, with the increased price of PVA spun thread rope, PA would be appropriate. As to the thickness of the sinker lines, when the sinker and float lines are of the same material, the general practice is to use a sinker line that is somewhat thicker than the float line. But, when the float line is PE, there is no need to make the diameter of the PA sinker line any thicker. Accordingly, PA has been specified for the sinker lines, while diameters have been planned with due regard to the those shown in the Request.

In sinker line assembly, side lines are not generally used. This may be attributed to the fact that net hauling operations are done manually rather than mechanically. In this Plan, the assembly method is referred to that shown in Figure 2-1.

#### 4) Float specifications

The Plan includes floats of about 100 g buoyancy for small-scale net use (with dimensions, for example, of 95 x 45 x 10 mm) and 400 g buoyancy for large-scale use (e.g., 140 x 85 x 20 mm). The mark buoys have been designed for shallow water use, using ABS material and with an outside diameter of 300 mm.

#### 5) Specifications of other materials

When assembling gear, assembly twine (including hanging lines) is required to connect netting and ropes, ropes and floats, and ropes and sinkers. PA, Polyester (PET), and PVA twine are generally used for this purpose but, from the standpoint of performance and economy, PA spun twine is clearly desirable. This is planned to have about double the thickness of the netting twine. A PE of dia. 5 mm is included for net unit connectors, buoy lines, and sinker strings.

Since mending twine is used to mend broken netting, it should, in principle, be of the same standard as the net twine. When the netting breaks, it should be mended with one string of twine, if this is thicker than the net twine, or 2 strings, if of the same thickness as the net twine.

## 6) Quantities

Based on the above considerations, it is considered that the planned netting should be of the composition shown in Table 3-4. With respect to the quantities to be provided for the various standards netting (A) to (E), it is noted that the Request asks for an equal distribution (25% each) of the 4 net types. However, since fishing vessels using large-scale nets, such as type (E), constitute only a small portion of the vessel population, the Plan calls for 100 rolls each of types (A), (B), and (C) and 50 rolls each of (D) and (E).

Table 3-4 Plan on Nettings

<u>Types of Netting</u>	<u>Net Twine Standards / Mesh</u>
Nylon netting (A)	210D/ 6, 60 mm STR
Nylon netting (B)	210D/12, 90 mm STR
Nylon netting (C)	210D/24, 114 mm STR
Nylon netting (D)	210D/36, 152 mm STR
Nylon netting (E)	210D/39, 178 mm STR

Since the netting lengths have all been set at 150 m, with an 80 mesh depth and a hanging ratio of 0.5, the lengths of the float and sinker lines have both been set at 75 m. In the case of net haulers, the sinker line is often made shorter than the float line, but, since hauling operations in Balochistan are all manual, this requirement does not exist. In the field measurements by the Team as well, the lengths used were found to be virtually the same. The weights of the mending and hanging twine have both been set at about 10% of netting weights. Since the nets in the area are placed at intervals of about 1.5 m, 50 floats per roll are planned.

## 3.4 Technical Cooperation

In the course of its discussions with the Coastal Development and Fisheries Department, the Study Team was sounded out on the possibility of providing training in Japan for technical fishery officials of the

Provincial Government. The intent would be to dispatch one official in the area of fishing technology and another in the field of fishing vessel engines.

It is considered that this training request should be noted in connection with the Plan implementation, in terms of the past and future efforts of the Provincial government to diffuse technical developments in fishing gear and methods as well as maintenance and repair technology for small-size fishing vessel engines in the coastal fisheries sector.

## SECTION FOUR: BASIC DESIGN

### 4.1 Design Conditions

#### 4.1.1 Maintenance Technology

The fishing equipment examined in this study include several items, such as inboard and outboard engines, whose useful lives vary greatly on the basis of maintenance technology and the effort devoted to routine inspections. In Balochistan Province, a considerable number of the outboard engines supplied under the 1980 grant-aid are reported to be still operating after more than 10 years' service, and, in the field survey, the Team independently confirmed several actual examples of this fact. It should be noted that a portion of the maintenance techniques that have been built up at the fishing village level can be applied generally to marine engines, regardless of type, and this is surely one of the major benefits derived from the previous fishery projects.

In the present Plan too, in the interest of further nurturing the maintenance structure for marine engines, the Team has set ease of maintenance as the primary condition in evaluating target equipment. Thus, the selection criteria in this Study will focus on specifications conforming as much as possible to the maintenance technology level that has been reached in the project area as well as a construction that will permit easy maintenance and repairs, so that this work can be carried out smoothly in remote areas lacking repair facilities. For example, in the case of the outboards, the implementing organization repeatedly requested that kerosene models are examined. While this request was intended primarily to reducing operating expenses, it is considered that it was also motivated by a desire to use accumulated maintenance experience to the fullest.

From a similar standpoint, it is noted that, at the implementation stage, when selecting manufacturers, consideration should be given to whether or not they have an agent in Pakistan with a proper setup for after-sale service, particularly the capability to promptly supply spare parts.

#### 4.1.2 Extra Spare Parts

In the case of both the inboard and outboard engines, it has been asked that the Plan make special provision for spare parts. This request did not refer to the standard supply of spare parts included in the engine price but rather to an extra allowance of parts beyond that included in the equipment cost. In this Plan, therefore, it has been decided to incorporate an allowance for extra spare parts, based on a standard of 10% or 15% of engine price.

#### 4.1.3 Finished and Unfinished Products

The marine engines and fish finders are planned to be shipped as finished products. In the case of marine engines, for instance, there will be no need for engine assembly, the user must be able to put the engine immediately into operation after rigging; after installing the engine, propeller assembly, and fuel tanks on the vessel.

On the other hand, the net items are not planned to be brought in in finished form but to be shipped as materials; netting, lines, floats, buoys, and others. The rationale for this policy is that it will permit a proper determination of composition of the gear at the time of distribution, in relation to the scale of operations that can be delegated to local fishery operation bodies.

During the implementation stage, as required, it should be considered affixing labels indicating equipment standards. In addition, in response to requests from the implementing organization, an assembly plan for the finished gill net to be supplied by this project should be considered.

#### 4.1.4 Packing and Operating Manuals

While the main highways in Balochistan Province, such as the one between Pasni and Gwadar, are paved, other roads, such as that linking Pasni and Ormana, were unpaved at the time of the survey. To avoid shipping problems over difficult roads, it will be necessary to pay close attention to the packing of the marine engines and fish finders.



Manufacturers' operating manuals are planned to be provided with the delivery of the marine engines, fish finders as well as the hydraulic presses, drilling machine, grinders, compressors, and generators for workshop use.

## 4.2 Specifications of the Equipment

### 4.2.1 Inboard engines and spare parts

NO.	Descriptions	Outline of specifications	Q'ty
(1)	Inboard engine (A)	4-cycle marine diesel engine of natural aspiration system, with mechanical cooling and lubricating system, crank case side covers for maintenance, and stern arrangement No. of cylinders : Two Displacement : approx. 1806 cc Output, continuous : approx. 26PS/2100 rpm	unit 10
(2)	Inboard engine (B)	No. of cylinders : Three Displacement : approx. 2710 cc Output, continuous : approx. 39PS/2100 rpm	30
(3)	Inboard engine (C)	No. of cylinders : Four Displacement : approx. 3613 cc Output, continuous : approx. 52PS/2100 rpm	40
(4)	Inboard engine (D)	No. of cylinders : Four Displacement : approx. 4330 cc Output, continuous : approx. 70PS/2300 rpm	15
(5)	Inboard engine (E)	No. of cylinders : Four Displacement : approx. 6494 cc Output, continuous : approx. 105PS/2300 rpm	5
(6)	Spare parts	Extra spare parts for Inboard engine from type (A) to (E)	lot 1

### 4.2.2 Outboard engines and spare parts

NO.	Descriptions	Outline of specifications	Q'ty
(1)	Outboard engine(A)	Kerosene powered 2-stroke outboard engine Fuel tank : Kerosene approx. 18 ltrs. Gasoline approx. 6 ltrs. Transom height : for approx. 20 inches Displacement : approx. 160 ~280 cc Max. output : approx. 7 PS~10 PS	unit 300
(2)	Outboard engine(B)	Displacement : approx. 240 ~280 cc Max. output : approx. 15PS	500
(3)	Spare parts	Extra spare parts for the Outboard engine	lot 1

#### 4.2.3 Fish finders

NO.	Descriptions	Outline of specifications	Q'ty
	(1) Color video type	CRT : 8 inch, color CRT Sounding range : More than 200 m depth Output power : 300W Frequency : 50 kHz Accessories : Transducer holder, Battery 12V	unit 5
	(2) Paper recording type	Recording paper : 150 mm width Dry type Sounding range : More than 200 m depth Output power : 300W Frequency : 50 kHz Accessories : Transducer holder, Battery 12V	5

#### 4.2.4 Workshop Equipment

##### (1) Damb and Ormara

2 sets

NO.	Descriptions	Outline of specifications	Quantity
	Hydraulic press machine	15 tons	1unit
	Drilling machine	13 mm, 200W, 1ph, with stand	1
	Grinding machine	150 mm, 350W, 1ph	1
	Air compressor	0.75 kW, 1ph	1
	Work bench	1500 x 900 x 740 mm	2set
	Parts wagon	850 x 580 x 370 mm	2
	Parts shelf	900 x 450 x 1800 mm	2
	Lever block	250 kg	1
	Adjustable pipe wrench	40 mm dia.	1pc
	Gear oil filler pump		1
	Grease pump		1
	Air duster	with short nozzle and lever	1
	Rubber hose		10m
	Air transformer	with air cleaner	1set
	Hose band		20pc
	Torque wrench, plate type	920 kgf.cm	1
		1300 kgf.cm	1
		1900 kgf.cm	1
	Copper hammer	2 lb.	2
	Electric drill	13 mm	1
	Drill set	0.5mm interval 25 pcs/set	1
	Quick chuck		5
	Hand drill	6 mm	1
	Hand grinder	125 mm	1
	Vice	130 mm	1
	Terminal kit		1
	Tap and die set		1

Oil measure	2 ltr.	1
Oiler	180 cc	1
Oil pan	400 x 250 x 95 mm	1
Electric solder		1
Solder wire		1
Hacksaw frame	250 mm	2
Hacksaw blade set	12 pcs/set	2
Torch lamp	kerosene type	1
Wire brush		5
Files	flat, half round, round, 250 mm 2 pcs/set	1set
Magnet base		1
Dial gauge set		1
Vernier caliper,	150 mm, within 0.05 mm	1
Cylinder gauge		1
Diesel generator	2.7 KVA	1set
Extension cable,	20m, with reel	1
Battery charger,	12V	1
Battery tester		1

(2) All 8 Districts

8 sets

NO.	Descriptions	Outline of specifications	Quantity
	Crank aligner		1set
	Crank jig set		1
	Heil-coil kit		1
	Special tool kit for outboard engine		1
	General tool kit for outboard engine		3
	Special tool kit for diesel engine		1
	General tool kit for diesel engine		1

4.2.5 Gill net materials

NO.	Descriptions	Outline of specifications	Q'ty
(1)	Fishing Net	Nylon multifilament, depthwise stretched, blue-gray colored, double-one mesh-selvage, single knot, 80 MD x 150 m/ roll	roll
	1) Nylon netting (A)	210D/ 6, 60mmSTR	100
	2) Nylon netting (B)	210D/12, 90mmSTR	100
	3) Nylon netting (C)	210D/24, 114mmSTR	100
	4) Nylon netting (D)	210D/36, 152mmSTR	50
	5) Nylon netting (E)	210D/39, 178mmSTR	50
(2)	Float line	Soft-medium lay, green-gray colored, 200 m/coil	coil
	1) Polyethylene (A)	380D~400D, 4 mm dia.	40
	2) Polyethylene (B)	380D~400D, 6 mm dia.	40
	3) Polyethylene (C)	380D~400D, 9 mm dia.	40
	4) Polypropylene (A)	3000D, "Danline" type, 12 mm dia.	20
	5) Polypropylene (B)	3000D, "Danline" type, 16 mm dia.	20

(3)	Sinker line		Soft-medium lay, brown colored, 200 m/coil	coil
	1) Nylon multi	(A)	4 mm dia.	40
	2) Nylon multi	(B)	7 mm dia.	40
	3) Nylon multi	(C)	10 mm dia.	40
	4) Nylon multi	(D)	12 mm dia.	20
	5) Nylon multi	(E)	18 mm dia.	20
(4)	Frame line		Soft-medium lay, brown colored, used as frame line, buoy line, sinker string, 200 m/coil	coil
	Polyethylene		380D~400D, 5 mm dia.	300
(5)	Mending twine		Nylon multifilament twine, medium lay, blue-gray colored	spl
	1) Nylon multi	(A)	210D/6, 500g/spool	100
	2) Nylon multi	(B)	210D/12, 1 Kg/spool	100
	3) Nylon multi	(C)	210D/24, 1 Kg/spool	200
	4) Nylon multi	(D)	210D/36, 1 Kg/spool	200
	5) Nylon multi	(E)	210D/39, 1 Kg/spool	200
(6)	Hanging twine		Spun nylon, medium lay, blue-gray colored, used as rigging twine and hanging line	spl
	(1) Spun nylon	(A)	10' 3x 3, 500 g/spool	100
	(2) Spun nylon	(B)	10' 3x 5, 500 g/spool	200
	(3) Spun nylon	(C)	10' 3x 8, 500 g/spool	400
	(4) Spun nylon	(D)	10' 3x12, 500 g/spool	400
(7)	Floats		PVC sponge type float for shallow water, specific gravity=0.2~0.25, brown color	pc
	(1) Float	(A)	140 L x 85 B x 20 dia(hole) mm	10,000
	(2) Float	(B)	95 L x 45 B x 10 dia(hole) mm	10,000
(8)	Buoys		ABS spherical shaped buoy for shallow water, orange or yellow color, 300 mm dia.	400

#### 4.3 Procurement and Supervision

##### 4.3.1 Procurement Plan

In principle, all Plan items are planned to be sourced in Japan. The delivery point for the equipment will be the Pasni warehouse owned by the Balochistan Provincial Government.

The Plan equipment comprises marine engines, fish finders, workshop equipment, and net materials, which will be sourced from a number of manufacturers. As in similar past projects, general trading companies are considered to be qualified as prospective bidders. As one of the conditions for insuring final delivery to the implementing organization and proper after-sale service arrangements by the procurement contractor, it is desirable that the latter have a representative office in Pakistan, and it will be planned to stipulate such a condition in the prequalification for bidders. From the same standpoint, in selecting manufacturers, consideration should also be given to their service setup within Pakistan, particularly the existence of an agent capable of supplying spare parts promptly.

The primary supervisory responsibility of the procurement contractor in Pakistan will include customs clearance of the Plan equipment and materials, inland transport, delivery to designated warehouses, equipment audits, and orientation on maintenance procedures for the main equipment items. With the exception of the equipment orientations, these functions would be performed by the Pakistan representative office of the contracting firm. However, for equipment briefings, it will be necessary to dispatch a technician for brief periods.

##### 4.3.2 Supervisory Plan

Following the Exchange of Notes between the Federal Government of Pakistan and the Government of Japan, implementation of the subject Plan will start with the conclusion of a consultancy agreement between the Government of Balochistan, the Plan implementing organ, and a consultant of Japanese nationality which will be recommended by JICA. The consultant

will prepare technical specification sheets and bill of quantities as required for Plan implementation, and other documents as required for the tender and the equipment procurement contract. Subsequent to approval by the Government of Balochistan and completion of the necessary formalities, followed by an examination of bidders prequalifications, tenders, and tender documents, a selection will be made of the procurement contractor.

After the contract is signed with the Government of Balochistan and verified by the Government of Japan, the procurement contractor will initiate procurement activities for the Plan equipment. The consultant will be responsible for overall supervision of the procurement phase through delivery of the equipment. These responsibilities will include approval of equipment specifications and presence at factory tests. One member of the consultant will also be dispatched to the project area to be present at the equipment audit at the time of delivery.

#### 4.3.3 Division of Project Responsibility

##### (1) Areas of responsibility of the Government of Japan :

If this Plan is implemented on the basis of a grant-aid from Japan, the Government of Japan will be responsible for defraying the cost of the following items within the context of its grant-aid system:

- 1) Procurement of Plan equipment and materials.
- 2) Consultancy services in connection with implementing design, assistance in tender operations, and procurement supervision.

##### (2) Areas of responsibility to be assumed by the Governments of Pakistan and Balochistan:

Assuming that the Plan is implemented on the basis of a grant-aid from Japan, the Pakistan Government and the Balochistan Provincial Government will have responsibility for the following aspects of the project:

- 1) To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

- 2) To exempt taxes and to take necessary measures for custom clearance of the materials and equipment brought for the Plan at the port of disembarkation.
- 3) To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry in Pakistan and stay therein for the performance of their works.
- 4) To bear all the expenses other than those to be born by the Grant, necessary for the equipment and materials as well as for the transportation and the installation of the equipment and materials.
- 5) If and when the products, purchased by the Grant from the Government of Japan, are sold or leased to fishermen, the Government of Balochistan shall take necessary measures to ensure the followings;
  - 1. to deposit, in local currency, the amount to be obtained by such sale or lease in a suitable account of the Government of Balochistan as a counterpart fund,
  - 2. to utilize the above-mentioned counterpart fund for the purpose of fishery development and maintenance of the equipment purchased by the Grant from the Government of Japan,
  - 3. to report, through the Government of Pakistan, to the Government of Japan upon the use of the fund.

#### 4.3.4 Implementation Schedule

The implementation schedule for the subject Plan will be divided into the following phases: detailed design, tenders, production of equipment, and shipment. The function requiring the most time will be that of equipment production. The estimated production times for the various equipment types are as shown below:



Marine engines	about	4 months
Fish finders	"	3 months
Workshop equipment	"	4 months
Net materials	"	4 months

Based on the longest time estimate, we estimate the required production time for equipment production in Japan to be about 4 months. The implementation design is estimated at 3 months, ocean transport from Japan to Pakistan plus inland transport within Pakistan at 2 months, and delivery to warehouses and audits prior to delivery at 1 month. The above estimates are summarized in the following Implementation Flow Chart.

Implementation Flow Chart

Month	01	02	03	04	05	06	07	08	09	10	11
Detail Design		Site works	Home works	Documents Validation							
		(Total 3.0 months)									
Equipment Procurement					Production			Transportation △ Delivery			
		(Total 7.0 months)									

## SECTION FIVE: PROJECT EVALUATION AND CONCLUSIONS

### 5.1 Project Evaluation

In the coastal area of Balochistan Province, which extends over an east-west distance of some 770 km, almost 90% of the resident population belong to fishing households and so are totally dependent on the fishing industry. The greater part of this coastal area is quite remote from consuming areas and, owing to the high transport costs for both fish products and production goods, fishing households in the province are placed at a tremendous disadvantage relative to their counterparts in the Karachi area. As a consequence, their purchasing power is generally low, and the financial burden involved in acquiring and renewing fishing equipment and supplies is extremely onerous. The Balochistan Provincial Government has, for many years, been devoting its energies to an ambitious plan for developing the coastal fisheries, as evidenced by improvements in fishing technology and the construction of fishing port facilities at Pasni. As one of its key fishery development policies, the Provincial Government has recognized the need to supply equipment and materials required for fish production at low prices, and this has led to the formulation of the present Coastal Fisheries Development Project. Promotion of the fishing industry is indispensable in terms of developing the regional economy of the remote Balochistan coast. There can, therefore, be no argument over the considerable significance and high priority that have been accorded to this Plan, which is designed to make basic fishing equipment available at low costs.

Until the 1970s, there were almost no motorized fishing vessels in Balochistan Province, with the fleet composed principally of sailboats. The basic impetus to motorization came from the supply of marine engines under a Japanese grant-aid implemented in 1980 along with technical assistance provided concurrently by the FAO. Motorization of small- to medium-sized fishing vessels in the province has shown rapid progress over the past decade. As a result, at present, more than 3,000 vessels are equipped with longtail type engines and outboard motors, while more than

600 vessels operate with inboard engines, with engine outputs of some boats exceeding 100 PS.

There is a wide dispersion in the useful lives of both inboard and outboard engines, depending on the level of maintenance techniques and the effort expended on routine inspections. But, in Balochistan Province, a considerable number of the outboard motors contributed under the 1980 grant-aid are still operating after more than 10 years' service. Meanwhile there has been a steady accumulation of maintenance know-how in fishing villages, and this achievement has been recognized as one of the major benefits from the antecedent projects. The problems encountered in the early stages of vessel motorization, such as those related to engine rigging to accommodate traditional vessel designs, have now been solved. In this sense, the present Plan can be implemented under much more favorable conditions than prevailed back in 1980.

The inboard and outboard engines, as well as the gill net materials, are to be distributed to the fishermen. It is anticipated that, based on distribution of the planned inboard engines, there will be an increase in the number of fishing vessels newly equipped with such engines, which in turn would enhance fishing productivity by enlarging fishing grounds and reducing round-trip days between grounds and markets. and the distribution of outboard motors under the Plan will encourage replacement of superannuated outboard and longtail engines and, by shortening the time required for maintenance and repairs, should result in an increase in operating days.

As planned by the Balochistan Provincial Government, if the distribution price is set at 20% of CIF value, plus the IQRA tax. and when figuring the various other tax exemptions on this equipment, fishermen will be in a position to procure the Plan equipment at a huge saving over market prices. The differential between market prices and those at which the equipment is to be distributed under this Plan may be estimated at a total of 53 million Rs in the case of the inboard and outboard engines alone. The increase in disposable income provided by these savings can improve operating conditions in the beneficiary fishery households through the building of financial assets and working capital.

The leasing charges or sales proceeds to be generated by the distribution of the Plan equipment are to be deposited as a counterpart fund in a designated account of the Balochistan Provincial Government. This money should be used exclusively for provincial fishery development programs and for maintenance of fishing equipment.

## 5.2 Conclusions and Recommendations

### (1) Significance of the Plan

The Coastal Fisheries Development Project in Balochistan sets as its basic objective a sustainment and enlargement of the fishery activities through supplying key production equipment to the province's coastal fishermen. In the absence of alternative industries, the great majority of households on the Balochistan coast must rely on fisheries for their livelihood, and so it has been deemed necessary that fishing equipment be provided on the basis of public assistance.

### (2) Future Fishery Development Plans

The marine fisheries of Balochistan Province have indeed entered the age of vessel motorization, with virtually the entire fleet having been motorized over the past decade. A major contributing factor to this accomplishment was the introduction of outboard and longtail engines, which could be installed without the need for major structural modifications on traditional vessel shapes. And, since these engines are low in price, they are presently installed on some 3,000 fishing vessels. However, owing to their short life, one cannot ignore the financial burdens they impose on fishermen in terms of routine maintenance and short replacement cycles.

The inclusion of outboard engines in this Plan is clearly a reflection of the priority that has been attached to solving the present problems that fishery households are currently confronting. However, in formulating future fishery development plans, the stage will sooner or later be reached at which consideration should be given to a changeover to inboard engines, which are generally more advantageous in terms of trip costs,

useful life, and seaworthiness. But the substantial initial investment associated with the use of inboard engine would be a major difficulty standing in the way of such a conversion; in addition to the higher purchase prices, hull modifications would be necessary on the small fishing vessels currently in service, such as remodeling sterns and installing fixed decks. Nevertheless, from a longer-term perspective, it would be well worth considering the relative merits of inboard engines in terms of improving financial returns in fishery households.

### (3) Recommendations

Looking ahead toward realization of the program, the following suggestions are offered to the Balochistan Government and the Coastal Development and Fisheries Department :

1) The significance of carrying out the subject Plan lies in the distribution of fishing equipment at low prices. Accordingly, with respect to the transport of the target items from warehouse to the fishermen's area of residence as well, it is desirable that a system be developed for holding these shipping costs to an absolute minimum by utilizing the various branch offices of the Directorate Fisheries so as to avoid imposing an extra financial burden on the beneficiaries.

2) In addition to the motorized vessels currently operating along the Balochistan coast, this Plan will result in the installation of many new engines. In order to properly maintain and repair these engines, the Directorate Fisheries Workshops will be called upon to provide even more support for this activity than in the past. It is desirable, therefore, that technicians be trained in maintenance and repair techniques through training seminars directed at the 48 present employees of the Workshops along with staff members from related departments.

3) In case that the counterpart fund is established by the implementation of this Plan and then drawn upon as appropriate, it would be helpful if the following information were included in the utilization reports to the Government of Japan:

- i. Total costs (by expenditure category) of the technical assistance programs devoted to the rigging, maintenance, and repair of marine engines, together with the period and location of the effort.
- ii. Total costs (by category) of technical assistance programs devoted to the installation, maintenance, and repair of fishing equipment, together with the period and location of the effort.
- iii. Should there be a need for technical assistance in improving fishing gear and methods, the total cost (by category), period, and location of such programs.

## APPENDICES

- I Minutes of Discussions
- II Members of the Study Team
- III Survey Itinerary
- IV List of Discussants
- V Survey Photographs





MINUTES OF DISCUSSIONS  
BASIC DESIGN STUDY  
ON  
THE COASTAL FISHERIES DEVELOPMENT PROJECT  
IN THE PROVINCE OF BALOCHISTAN, THE ISLAMIC REPUBLIC OF PAKISTAN


In response to a request from the Government of Islamic Republic of Pakistan, the Government of Japan decided to conduct a Basic Design Study on the Coastal Fisheries Development Project in the Province of Balochistan (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).


JICA sent to Pakistan the study team, which is headed by Mr. Toyomitsu Terao, Fisheries Development Planner, Fisheries Engineering Co., Ltd., and is scheduled to stay in the country from 9 December to 18 December 1992.

The team held discussions with the officials concerned of the Government of Pakistan and conducted a field survey at the study area.

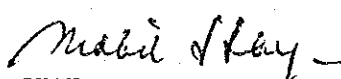
In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the Basic Design Study report.

16 December 1992

  
Akihiro Mitarai  
Resident Representative,  
Pakistan Office,  
Japan International  
Cooperation Agency

  
M. Hashim Baloch  
Secretary,  
Coastal Development and  
Fisheries Department,  
Government of Balochistan, Quetta

C O U N T E R S I G N E D

  
( SHAHID HUMAYUN )  
DEPUTY SECRETARY  
ECONOMIC AFFAIRS DIVISION  
GOVERNMENT OF PAKISTAN  
ISLAMABAD.

## ATTACHMENT

### 1. Objective

The objective of the Project is to improve socio-economic condition of the fishermen engaged in the small scale fishery of the province by providing basic fisheries equipment.

### 2. Project Area

The project area is located at the coast of the Province of Balochistan, as shown in Annex I.

### 3. Executing Agency

The Coastal Development and Fisheries Department of the Balochistan Government will be responsible for the administration and execution of the Project, and for the implementation and operation of the Project after the requested equipment and materials are delivered to Pakistan.

### 4. Items Requested by the Government of Pakistan

After discussion with the Basic Design Study Team, the following items have been definitively confirmed as the request by the Government of Pakistan.

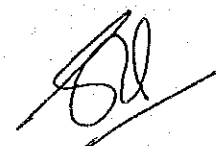
- 1) Outboard engine
- 2) Spare parts for outboard engine
- 3) Inboard engine
- 4) Spare parts for inboard engine
- 5) Echosounder
- 6) Fishing net with accessories
- 7) Engine workshop equipment
- 8) 4WD refrigerated truck

However, the final components of the Project will be decided after further studies by the team.

### 5. Japan's Grant Aid System

(1) The Government of Pakistan and the Government of Balochistan have understood the system of Japan's Grant Aid explained by the team.

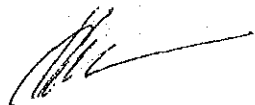
(2) The Government of Pakistan will take the necessary measures described in Annex II, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.



(3) The Government of Balochistan will take the necessary measures described in Annex III, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

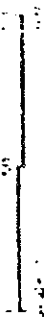
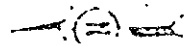
#### 6. Schedule of the Study

Based on the Minutes of Discussions and technical examination of the study results, JICA will complete the final report and send it to the Government of Pakistan by the end of April 1993.



# Annex I. Location of the Project Site

## MAP OF BALUCHISTAN COAST



Panigur

Quetta

Mirpur

JHALLAWAN

MAKRAN

LASBELA

BELA

Kappur

Jahel Sar

Gundar

Boz Bander

354.2

17

Kalmit

Puri

Omara

LEGEND

- Roads (Metalled)
- Roads (Unmetalled)
- ... Trails

ARABIAN SEA

Gaderi Hubo  
KARACHI  
Korangi

Annex II. Necessary Measures to be taken by the Government of Pakistan in case Japan's Grant Aid is executed.

1. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
2. To exempt taxes and to take necessary measures for custom clearance of the materials and equipment brought for the Project at the port of disembarkation.
3. To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry in Pakistan and stay therein for the performance of their works.
4. If and when the products, purchased by the Grant from the Government of Japan, are sold or leased to fishermen, the Government of Pakistan shall take necessary measures to ensure the items described in article 4 of Annex III.



Annex III. Necessary Measures to be taken by the Government of Balochistan in case Japan's Grant Aid is executed.

1. To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry in the Province of Balochistan and stay therein for the performance of their works.

2. To maintain and use properly and effectively that the equipment and materials purchased under the Grant.

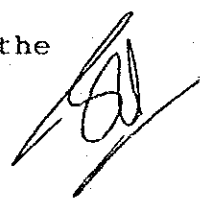
3. To bear all the expenses other than those to be born by the Grant, necessary for the equipment and materials as well as for the transportation and the installation of the equipment and materials.

4. If and when the products, purchased by the Grant from the Government of Japan, are sold or leased to fishermen, the Government of Balochistan shall take necessary measures to ensure the followings;

(1) to deposit, in local currency, the amount to be obtained by such sale or lease in a suitable account of the Government of Balochistan as a counterpart fund;

(2) to utilize the above-mentioned counterpart fund for the purpose of fishery development and maintenance of the equipment purchased by the Grant from the Government of Japan;

(3) to report, through the Government of Pakistan, to the Government of Japan upon the use of the fund.



Appendix- II Members of the Study Team

Name	Title and Organization
Toyomitsu, TERA0	Fisheries Development Planner Fisheries Engineering Co.,Ltd.
Yoshiyasu, SHIMOZAKI	Fishing Boat and Gear Planner Fisheries Engineering Co.,Ltd.

Appendix- III Survey Itinerary

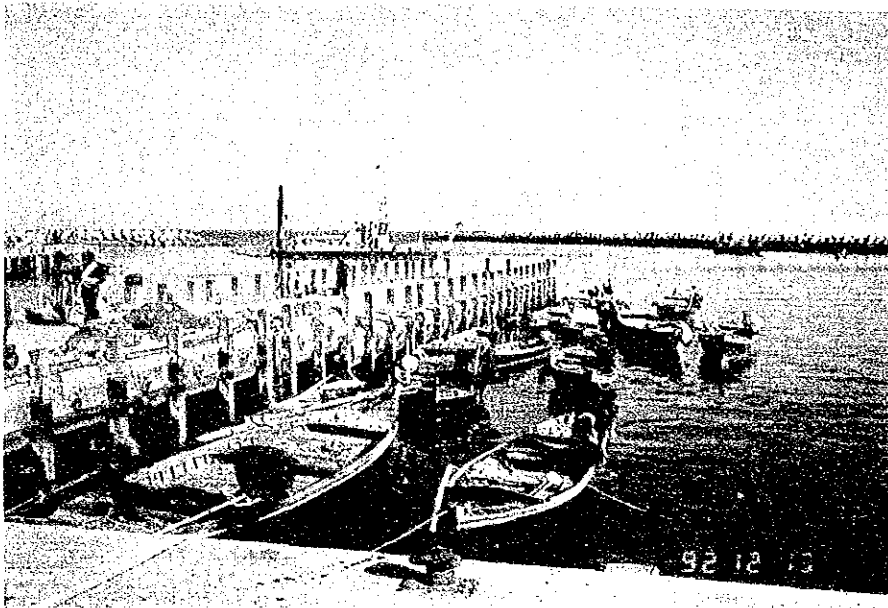
Date		Itinerary	Study Works	
Dec. 8th	Tu	Narita 15:45	PK 761	Travel
9	We	→Karachi 03:20	PK 761	Travel
		Karachi →Quetta 09:15 10:35	PK 324	Travel
		Prelim. discussion with Coastal Development & Fishery Dept		
10	Th	Courtesy visit to Planning & Development Department Discussion with CDFD		
11	Fr	Quetta→Karachi 16:35 17:50	PK 325	Travel
12	Sa	Karachi →Gwadar 08:30 10:30	PK 501	Travel
		Discussion with Fisheries Directorate Balochistan Investigation at Gwadar and Sur		
13	Su	Investigation at Pasni Discussion with Fisheries Directorate		
14	Mo	Discussion with Fisheries Directorate Investigation at Zereen		
		Pasni →Karachi 15:50 17:20	PK 556	Travel
15	Tu	Karachi →Quetta 09:15 10:35	PK 324	Travel
		Discussion with CDFD Signature of M/D by Secretary, CDFD Reporting to PDD		
16	We	Quetta→Islamabad 11:35 12:55	PK 324	Travel
		Reporting to JICA Pakistan Office Signature of M/D by Resident Representative, JICA		
17	Th	Reporting to Economic Affairs Div., Federal Government Reporting to Embassy of Japan		
		Islamabad →Karachi 19:00 20:55	PK 309	Travel
18	Fr	Karachi →Frankfurt 08:00 14:20	LH 635	Travel



Appendix-IV List of Discussants

Name	Title	Organization
Mir Hussain Ashrif	Minister	Ministry of Coastal Development and Fisheries, Balochistan Province (MCD)
Neimat Ullah Buzdar	Secretary to Minister	MCD
M. Hasim Baloch	Secretary	Coastal Development and Fisheries Department, Govt. of Balochistan Province (CDF)
Mohammad Younus Khan	Deputy Secretary (Fisheries)	CDF
G.M. Marri	Managing Director	Pasni Fisheries Harbour Authority, CDF
Jawaid Basir	Director Fisheries	Directorate Fisheries Balochistan (DFB), CDF
Moula Bakhsh Baloch	Deputy Director	DBF
Jafal Abdullah	Inspector	Fisheries Dept., DFB
Moula Bakhsh	Fisheries Officer	Fisheries Office (Gwadur)
Mirza Qamar Baig	Additional Chief Secretary	Planning and Development Department, Government of Balochistan (PDD)
Haji M.A. Rashid	Secretary (Implementation)	PDD
Ghulam Farooq Nausherwani	Secretary	PDD
Mohammad Ashray	Assistant Chief	PDD
Faisal Hussain	Counciler	Municipal Committee (Gwadur)
Masahiko Tanoi	1st. Secretary	Embassy of Japan in Pakistan
Akihiro Mitarai Kaoru Iwasaki	Resident Representative Assistant Resident Representative	Pakistan Office of JICA





①

One of jetties for small fishing boats at Pasni Fishing Port, constructed in 1990 by an ADB loan.



②

Jetty for medium size fishing boats at PFP. Vessels equipped with inboard engine are moored.



③

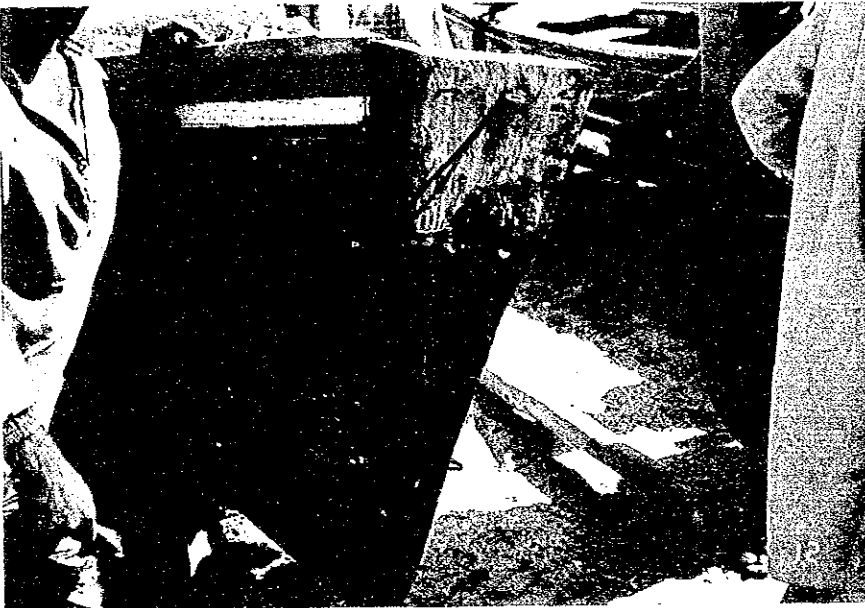
The beach in front of Sur, adjacent to Gwadur. Boats are moored in natural beach. Although most are outboards, some inboards were observed.



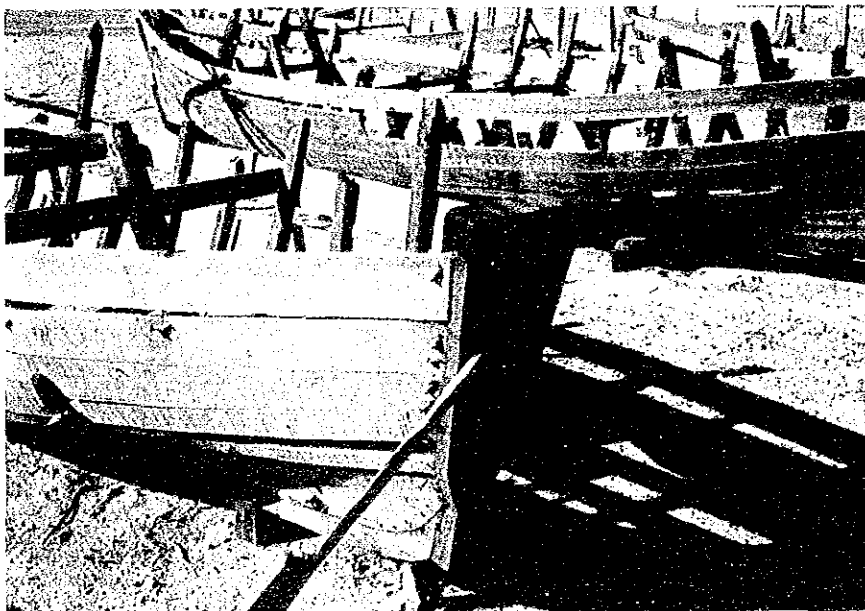
- ④ A small fishing boat equipped with 8PS outboard engine, Eastern Beach of Gwadur.



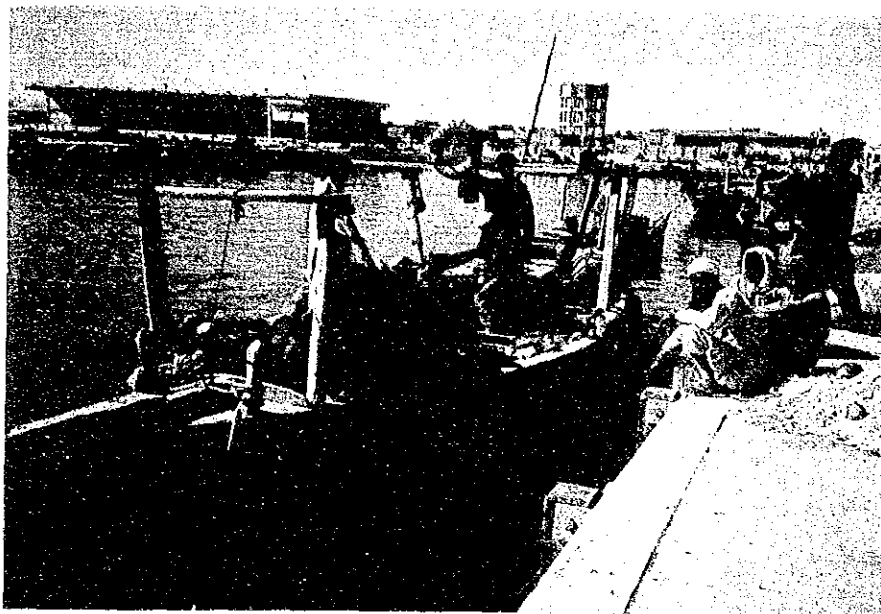
- ⑤ An example of modification of stern construction to install outboard engine.



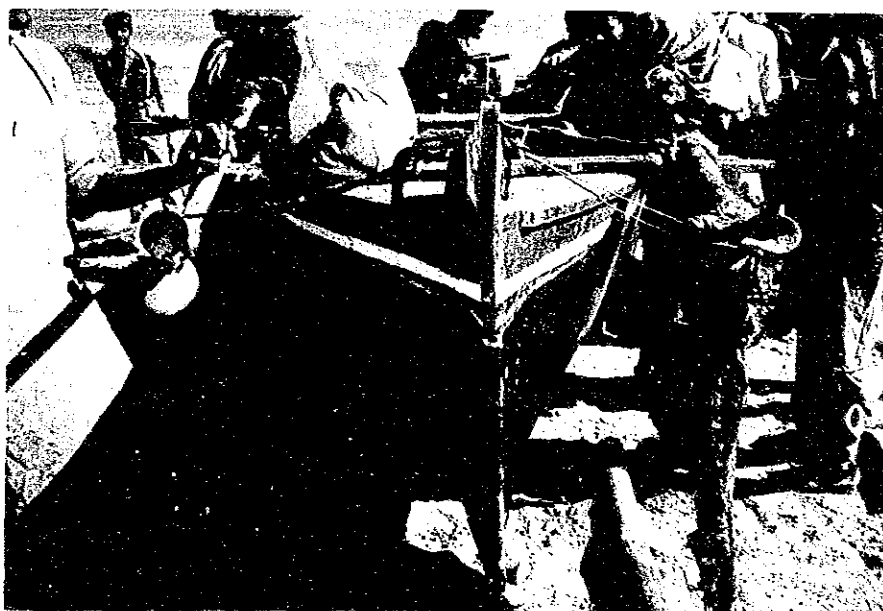
- ⑥ Stern construction of newly built small vessel



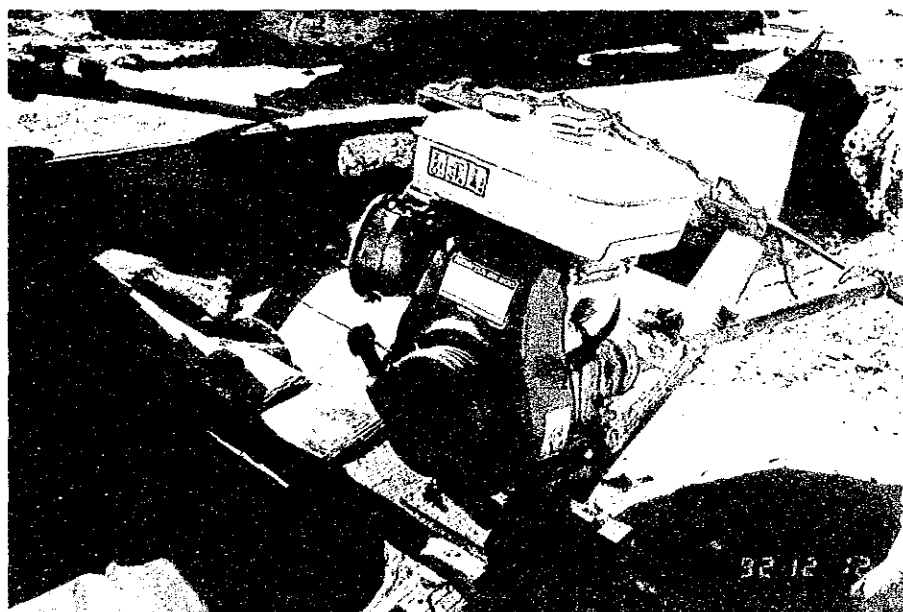




- ⑦ A fishing boat equipped with inboard engine, approx. 10m OAL, decked construction.



- ⑧ An example of small boat equipped with two units of longtail engine.



- ⑨ An example of engine unit of longtails, using omni-type engine equipped with a fuel tank at the top.







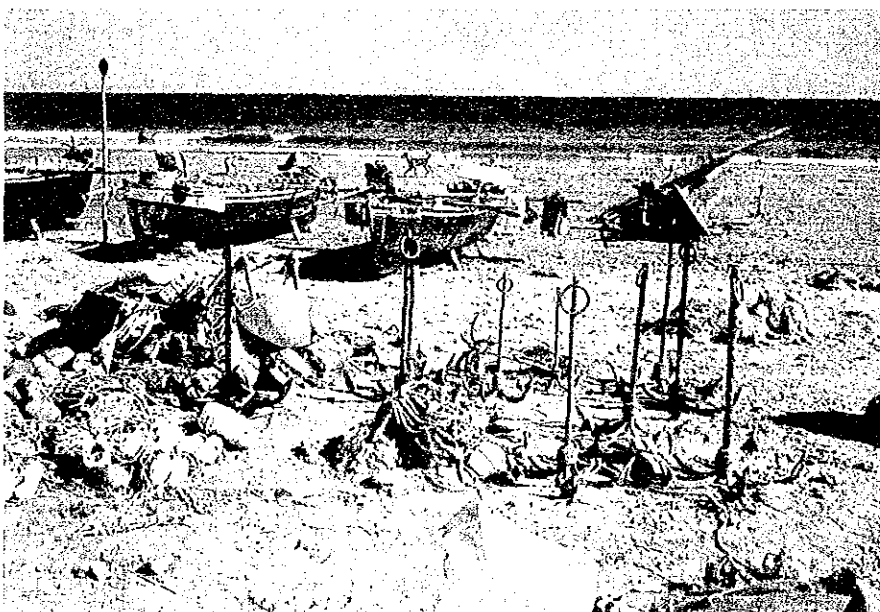
⑩

An example of float line construction of gill net. Side line and hanging line are not used.



⑪

Sinkers of gill net, using natural stone.



⑫

Mark buoy and anchor.





JICA