


**BASIC DESIGN STUDY REPORT
ON
THE PROJECT
FOR
THE MODERNIZATION OF
SMALL SCALE FISHERIES
IN
COMMEWIJNE DISTRICT,
EASTERN SURINAME**

MARCH, 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

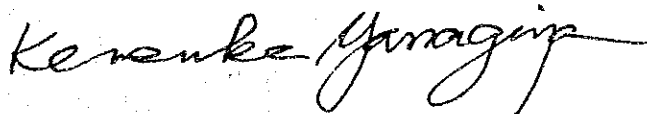
In response to the request of the Government of the Republic of Suriname, the Government of Japan has decided to conduct a Basic Design Study on the Project for the Modernization of Small Scale Fisheries in Commewijne District, Eastern Suriname and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Suriname a survey team headed by Mr. Kunihiro SHINODA, Construction Division, Fishing Port Department, Fisheries Agency, from August 27 to October 5, 1989.

The team exchanged views with the officials concerned of the Government of Suriname and conducted a field survey in Nieuw Amsterdam. After the team returned to Japan, further studies were made. Then, a mission was sent to Suriname in order to discuss the draft report and the present report has been prepared.

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

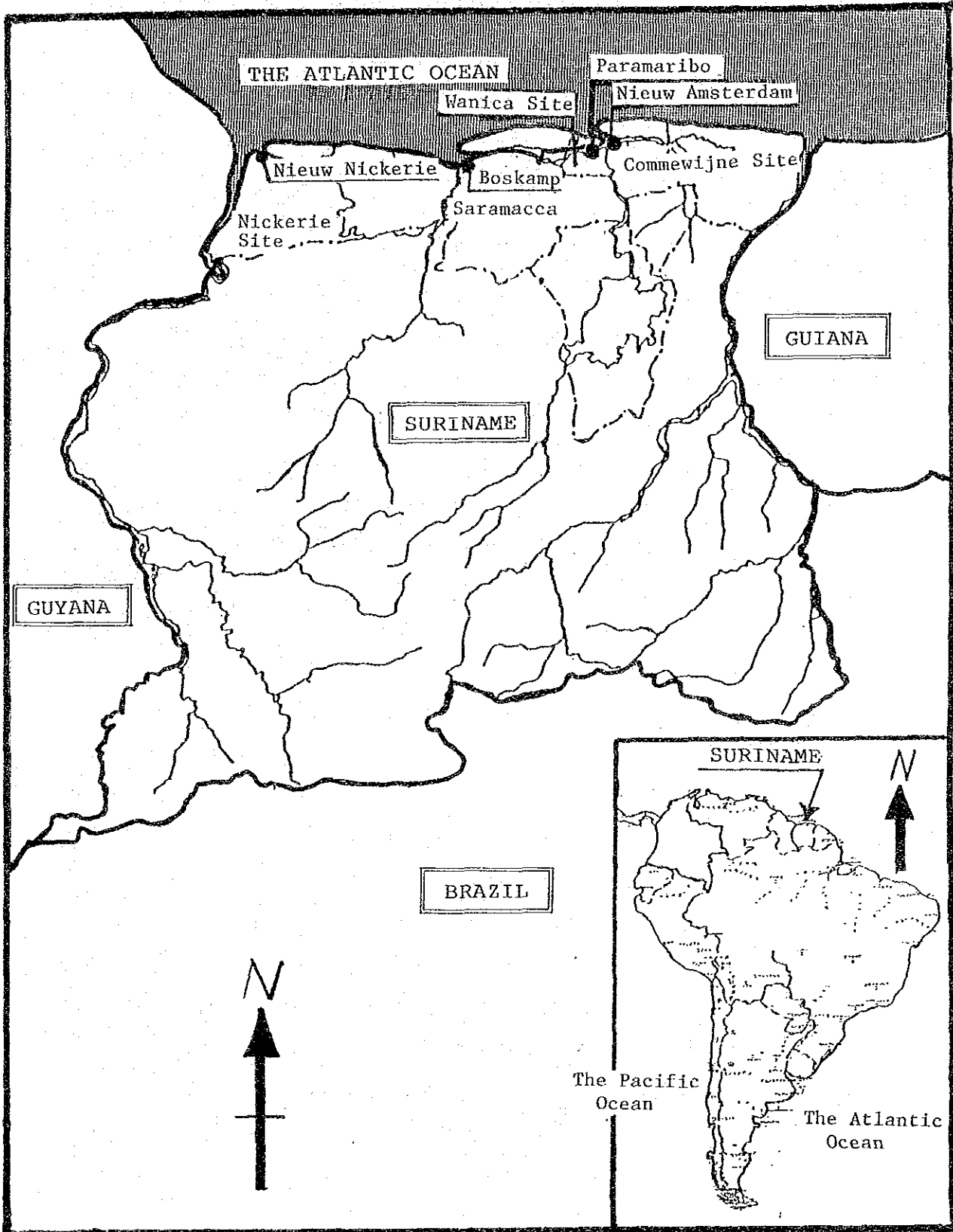
I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Suriname for their close cooperation extended to the team.

March, 1990



Kensuke Yanagiya
President
Japan International Cooperation Agency

MAP OF SURINAME



SUMMARY

The Republic of Suriname is located on the northeast of South America, having a total area of about 163 thousand square kilometers and the coastline 380 kilometers long. Its continental shelf is noted for its abundant shrimp and demersal fish resources. The shrimp resources have been developed for a long time, and the exported products of the shrimp fisheries, together with the alumina products, have contributed to Suriname's economy by earning foreign money.

Recently Suriname's economy, however, is sluggish due to decreasing shrimp resources and falling international prices of Alumina products. Under these conditions the Government of Suriname formulated a "Five-year Fisheries Development Plan" in 1987, and, in line with the Plan, projected 4 fishery centers to modernize its coastal fisheries, aiming at self-supply of fish protein, increase of employment opportunities, obtaining of foreign money and so forth by exploitation of rich demersal fish resources. One center is under construction at Nieuw Nickerie (Western Suriname) with the assistance of EC, another at Boskamp (Central Suriname) funded by Belgium. In connection with this, the Government of Suriname now requested the Government of Japan to offer a grant aid on the construction of a fishery center at Nieuw Amsterdam, Commewijne District, Eastern Suriname.

The Government of Japan, responding to the request, sent a Basic Design Study Team to Suriname, through Japan International Cooperation Agency (JICA), for a period from August 27 to October 5, 1989. The Team carried out a site survey including natural conditions collected materials available, and discussed the details of the request with Suriname officials concerned. Based on the results above, the Team drafted a Basic Design Study Report in Japan, and explained it to the Suriname officials concerned from January 12 to 23, 1990, in Suriname.

As the results of the survey the Team concluded that in order to carry through the project aiming at modernization of the small-scale fisheries of Commewijne District through increasing the working ratio of the fishing fleet, upgrading the quality of the catches, improving the fish distribution system and so forth the construction of the fishery-related infrastructure including a fishery center is essential to the project. The Team also judged that the project is appropriate in that Commewijne fishermen are having an eager desire for a fishery center, the site condition presents no problem with the construction of facilities, and the viability of the proposed center is great because it is located near Paramaribo, a big fish consuming city, and fishing activities around the proposed site are active. The following are necessary facilities and equipment and materials according to the basic design study to implement the project.

1. Marine structures

(1) Pontoon	body:	36 m long, 10 m wide
	access bridge:	30 m long, 5 m wide
(2) River wall	sheet pile type:	65 m long, 3.5 m high
(3) Slipway	grade of 1/7	42 m long, 7 m wide

2. Shore facilities

(1) Ice-making equipment	plate ice,	6.0 tons/day,	2 units
(2) Ice store	-10°C	30 tons capacity,	1 unit
(3) Cold storage facility	-20°C	10 tons capacity,	2 units
(4) Generator		125 KVA,	2 units
(5) Main building		270 m ²	
(6) Administration building		131 m ²	
(7) Repair shop		180 m ²	
(8) Fuel oil tank	diesel oil, 10kl		1 unit

	gasoline, 17kl	1 unit
(9) Water tank	city water, 30 tons	1 unit
	rain water, 30 tons	1 unit

(10) Exterior work

3. Fishing equipment and materials

(1) Radio telephone	150 MHz, 25 W	3 units
(2) Ice box	1,042(L) × 500(B) × 490(D)mm	140 ps
(3) Fish box	30kg	1,000 ps
	1000 ℓ	5 ps

4. Others

(1) Truck	1 ton	2 units
(2) Insulated van	2 tons	3 units
(3) Winch for Slipway	15 KW, with motor	1 unit
(4) Cradle for Slipway		1 unit
(5) Ice conveyer		1 unit

The Fisheries Department of the Ministry of Agriculture, Animal Husbandry & Fisheries is responsible for implementation of the project. After completion, all of the facilities will be managed, for the time being, by SAIL (Suriname American Industries Limited), the most reliable fisheries corporation with a long experience in management of a fishing base in Suriname. In the near future beneficiaries of the project, fishermen themselves, intend to take over and manage the facilities through a fishermen's cooperative which they will form under the leadership of the Fisheries Department. It is judged that the proposed fishery center is viable financially with steady margins of ice, fuel oils, fish products and so forth.

Once the project is implemented, in the small-scale fishery sector all of the

aspects covering production through distribution are improved. This will make it possible for Commewijne District fishermen to increase their catch with improved working ratio of their fishing fleet, and to sell their increased catch at a higher price with improvement in quality as well. Thus the small-scale fishery of Suriname will be improved in both quantity and quality, and take the first step toward modernization. It is obvious that the modernization of fishery contributes greatly to the national economy of Suriname.

The team concludes that the implementation of the project under the Japan's Grant Aid is of great significance.

C O N T E N T S

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MAP

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CHAPTER 1 INTRODUCTION

CHAPTER 1 INTRODUCTION

In Suriname the only flourishing fishery is a shrimp trawling fishing, which is earning foreign currency. Despite its vast potential, demersal fish resources are partly exploited by only the gillnet fishing introduced from Guyana. All other fisheries are premodern small scale ones which are operating on the daily basis.

On the background above, the Suriname Government, striving the development or modernization of small scale coastal fisheries in order to supply fish protein to the nation and export fish by exploiting the abundant demersal fish resources, set about constructing fishery centers with necessary infrastructure at Nieuw Nickerie (western) and Boskamp (central) by EC and Belgian assistance respectively. In connection with the above, the Suriname Government now requested the Government of Japan to offer a grant aid on the construction of a fishery center at Nieuw Amsterdam in Commewijne District (eastern).

The Government of Japan, responding to the request, sent a Basic Design Study Team headed by Mr. Kunihiro SHINODA, Construction Division, Fishing Port Department, Fisheries Agency, through Japan International Cooperation Agency (JICA), to Suriname for a period between August 27 and October 5, 1989. In order to accomplish the most suitable basic design, the Team had a series of discussions about the background, content, necessity and appropriateness of the request with the Suriname officials concerned, investigated the progress of EC and Belgian assistance, and also carried out a necessary site survey including measuring and a geological survey.

Main points of the mutual agreement resulted from discussions with the Suriname officials concerned were confirmed on the Minutes of Discussions concerning the "Project of the Modernization of Small Scale Fisheries in Commewijne District, Eastern Suriname" signed mutually.

Based on the analysis and review of the results of the field survey, the Team assessed the effect in developing the Suriname fisheries caused by the Project

and prepared a draft final report on the basic design with the most suitable scale and content.

The Government of Japan then sent a Draft Report Explanation Team headed by Mr. Fumio FUJII, Planning officer, Office of Overseas Fishery Cooperation, Fisheries Agency, to Suriname for 12 days between January 12 and 23, 1990 to discuss the Suriname officials concerned about the report.

This report covers the basic design, implementation schedule, recommendations and so on that are judged the most suitable to for the implementation of the Project.

The members list of the Study Team, Survey Itinerary, List of persons concerned and the Minutes of Discussions are shown in the annex.

CHAPTER 2 BACKGROUND OF THE PROJECT

CHAPTER 2 BACKGROUND OF THE PROJECT

2-1 Outline of Suriname

(1) General characteristics

Suriname is located on the northeast coast of South America, having a total area of about 163 thousand km² (a half of Japan). The country is bounded on north by the Atlantic Ocean; on the west by the Corantijn river, which separates it from Guyana; on the east by the Marowijne river, which separates it from French Guiana, and on the south by a mountain chain, covered by dense forest, which separates it from Brazil.

The relief, in the northern half of the country, is mainly low and flat. The southern half of the country displays a gentle rise to 600 or 700 m along the southern border. About 80% of Suriname is covered by tropical rain forest, where soils are mostly unsuitable for permanent agriculture. The arable land is 5% of the country, 8,000 km², of which only 10% are cultivated actually.

Rainfall affects the weather but temperature and humidity vary little through the year. Generally the period between January and April is called the short dry season, the period between April and August the long rainy season, the period between August and November the long dry season, and the period between November and December the short rainy season, but these seasons vary drastically, resulting in no short dry and rainy seasons in some years.

Averaged annual rainfall is close to 2,200 mm, increasing from about 1,900 mm along the coastline to a maximum 3,000 mm over the heights.

(2) Brief history

The coast of Suriname was discovered by the Spaniards late in the fifteenth century. The British founded first a colony here in 1630, and the Dutch had also established trade posts in the early 17th century, gradually extending this control. After a length conflict between Great Britain and the Netherlands, at the peace of Breda in 1667, Suriname was assigned to the

latter in exchange for the colony of New Amsterdam (now New York) in North America.

Dutch Guiana developed a generally prosperous plantation economy, based on the labour of African slaves. As a result of the abolition of slavery in 1863, the labour shortage was produced in plantations, and various attempts were made to attract Dutch, Portuguese, German and Chinese immigrants without success. In 1873 the immigration of Indians from British India began, and a similar movement of Javanese from the Dutch East Indies began in 1894, continuing until 1939; about 70,000 migrated to Suriname.

The discovery of bauxite in the 20th century further transformed the economy, while the Second World War, during which the Netherlands was occupied by German forces, accelerated the political evolution of the colony. After the War the first general elections demanding self-government was held in 1946. In 1954 Suriname obtained complete Internal autonomy within the Kingdom of Netherlands which retains control over defence and foreign affairs. In May 1975 it was agreed that Suriname should become independent on November 25, and independence was duly achieved on that date.

(3) Human geography

Owing to the heterogenous composition of the population, various cultures and religions are found in Suriname. The Europe origins and Creoles are predominantly Christians; the Bushnegroes believe African local religions; the Hindustan origins profess Hinduism; the Indonesian and Lebanon origins are predominantly Moslems; the Chinese are Buddhists. A sound educational system introduced from the Netherlands is established. General education is compulsory for children between the ages of six and twelve.

The estimated population of 409,000 (1988) is of diverse origin and consists of Creole (35%), Hindostani (34%), Javanese (16%), Bushnegroes (10%), Amerindians, Europeans, Chinese, Jews, Lebanese and a mixture of all ethnic groups (5%). About two thirds of the population is concentrated in and around the capital city of Paramaribo, with most of the remainder living in

the coastal areas and along the rivers.

(4) Politics and economy

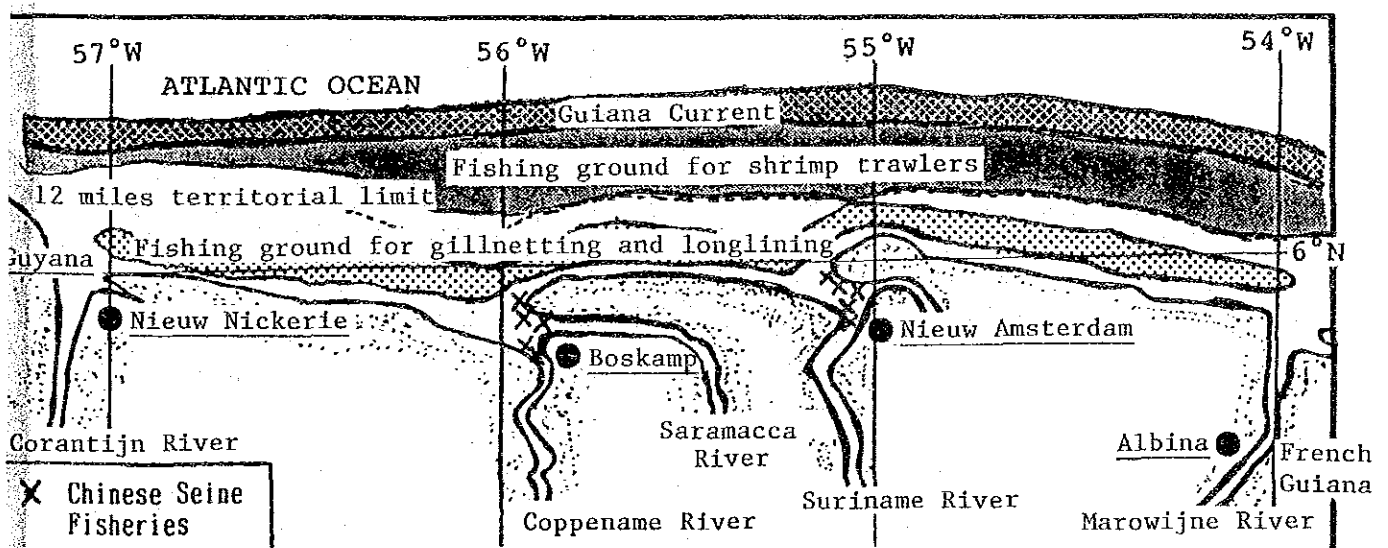
Suriname is a constitutional republic country governed by presidential decrees, with respective independence of the legislature, the executive, and judicature. Until 1978 since independence, its economy has been growing at the rate of as high as 8% annually, but following the 2nd oil crisis in 1979 its growth has turned to minus, and the stoppage of Dutch assistance of US\$ 100 million annually in 1982 has retarded its recovery.

Agriculture utilizing only a minor part of 10% (740 km²) of arable land and bauxite mining and processing amounting to about 80% of the total export value (1987) are still the important facets of the country's economy. Agricultural was growing favorably at the rate of 2.6% annual for the period between 1975 and 1988, expanding its share in GDP. By contrast mining industry including bauxite production, SF 80 million in 1982, was reduced to half of SF 160 million in 1975, and is slow still in recovery. As a result of establishment of the civil government the improvement of the economy can be expected, but it will take a long time due to a stagnant key industry, mining, even if Dutch assistance under negotiation is reopened.

2-2 Suriname Fisheries

2-2-1 Fishing Grounds and Fishing Activities

Fig.1 Fishing Grounds of Suriname

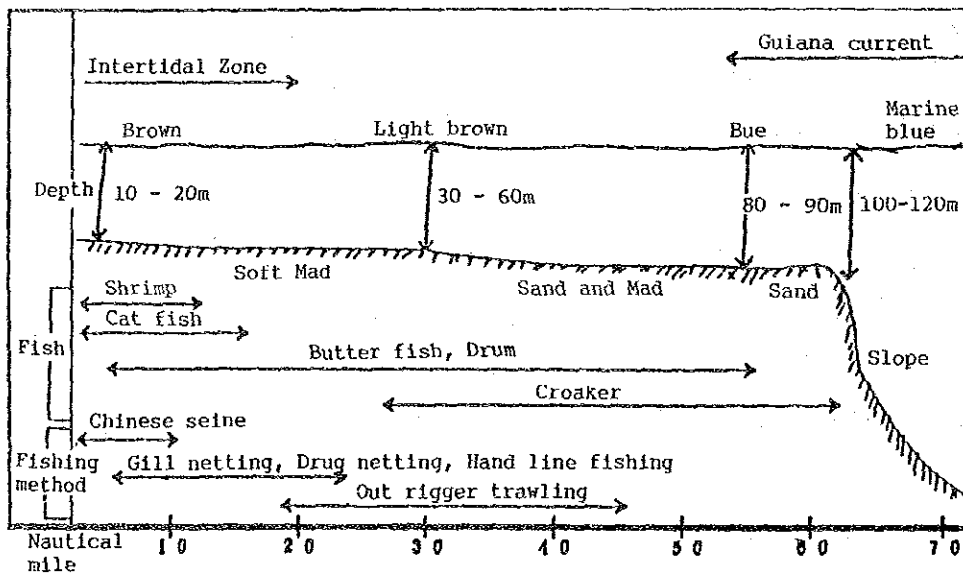


(1) Outline of Suriname fisheries

Suriname has a 380 km coastline and 140 thousand km² EEZ. Since the west-bound nutrient-rich Guiana Current and 5 big rivers flow into the continental shelf, good fishing grounds for shrimp, demersal fishes, etc. are formed offshore Suriname (Fig. 1 and Fig. 2). The government research vessel "COQUETTE" has estimated a potential at 150 thousand tons annually including catfish, drum, croaker, snapper, etc. The fisheries activities are divided into three different categories;

- ① Shrimp trawl fishery offshore (30~80 m depth)
- ② Small scale fishery in the estuarine areas, river and inshore water (2~30 m depth)
- ③ Small inshore fishing

Fig.2 Schema of Suriname Fisheries



① Shrimp trawl fishery

The coastal area of Suriname was famous as a good fishing area for shrimp fishing, and has been exploited by American companies using Florida type double rigger shrimp trawlers. In 1958 an American company, Suriname America Industries Limited, SAIL, has constructed a pier and processing

factory and begin to collect and process shrimps caught by American fishing boats and local boats. After that many changes were experienced such as the withdrawal of American boats and participation of Japanese and Korean boats. Once about 100 Japanese shrimp boats operated by 7 Japanese companies were found offshore Suriname, but at the present time only 26 Japanese boats owned by Suriname-Japan joint ventures are operating. Korean boats dominate now this fishery.

As a result of heavy harvesting by 200 trawlers for more than 30 years, the fishing ground began to show signs of being overfished, making catch per day lessened. The Suriname government is considering various counterplans to preserve its important export resources.

② Small scale fisheries

Small scale fishing activities are divided into 3 categories; Chinese seine fishing in the estuarine areas, gillnet fishing in the water shallower than 30 m, and long-line fishing offshore.

Districts of Nieuw Nickerie, Boskamp, Commewijne and Albina see these activities.

a. Chinese seine fishing (Fig. 3 and 4)

Chinese seine is a kind of trapnet. It is installed at an estuary or in the shallow sea, trapping small fishes moving on a tide current. A 6 ~10 m long, one or two persons manned canoe with a outboard motor, called the Suriname type (Fig. 5), hauls in the net on the daily basis. Small shrimps, small fishes, catfishes are caught.

Fig. 3 Chinese Seine - Type 1 (Shallow sea)

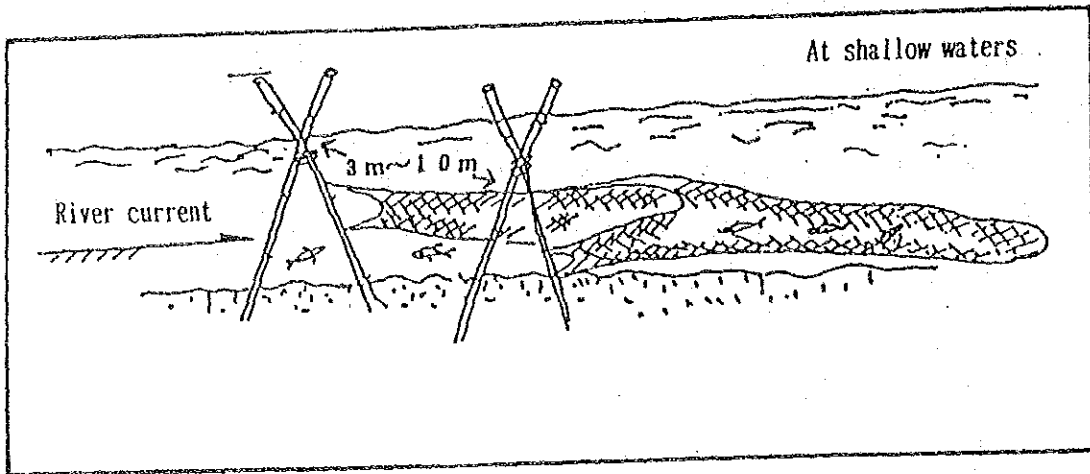


Fig. 4 Chinese Seine - Type 2 (Deeper sea)

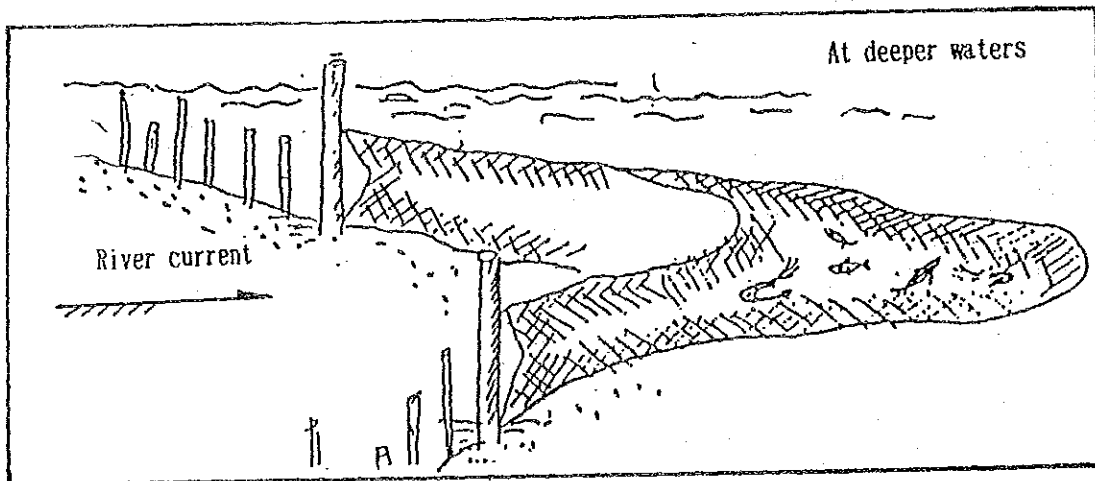
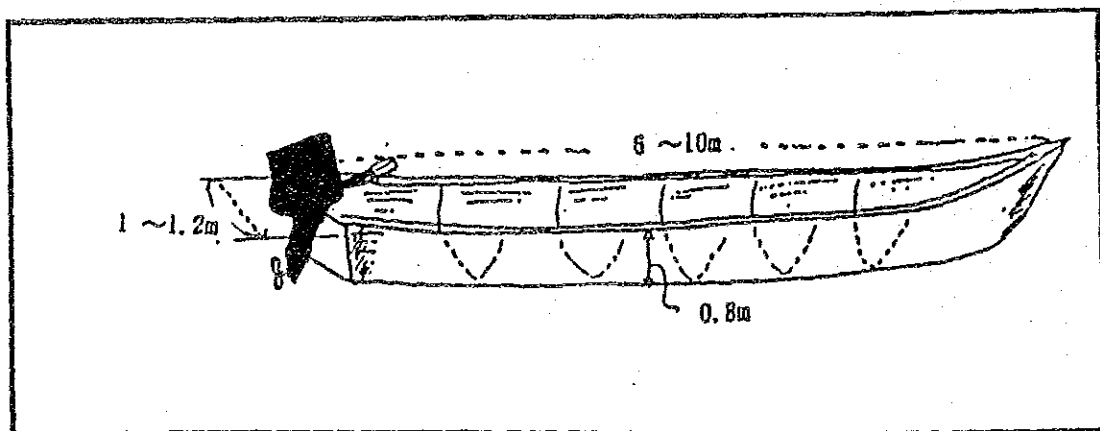


Fig. 5 Suriname Type Fishing Canoe

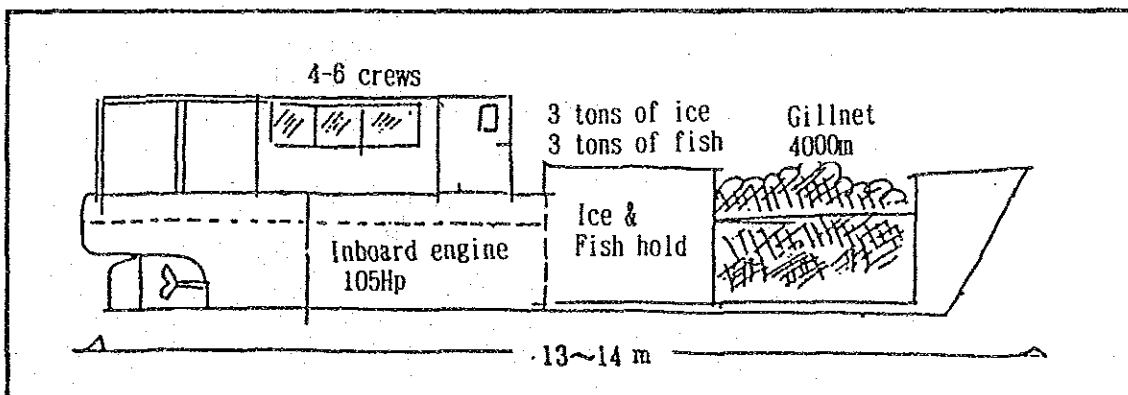


Small shrimps are dried at villages and marketed at Paramaribo Fish Market and local markets. Small fishes, mainly croakers, are salted or dried. Catfish, usually 30 to 50 cm long, is salted or smoked. Smoking process is very primitive. Fishes are laid in an enclosure, airy little, made of tin plates and boards, smoked with mangrove logs for one or two days and nights.

b. Gill net fishing

It is operated in a water shallower than 30 m, 30 miles off the coastline. The net is set in the mid-depths and left unattended for 5~6 hours until hauled in. Each net hauling work spent 3 ~4 hours. Fishing is carried out through day and night, and one trip takes usually 5 to 7 days, 3 to 4 days during the height of the fishing season. The 4~6 persons manned fishing boat was originally introduced by Guyana fishermen, and so called the Guyana type, whose dimensions are generally 13 ~14 m (L) × 2.3 m (B) × 1.5 m (D), bigger than the Suriname type, and an outboard motor of 40 HP or a diesel inboard engine of 105 HP is equipped.

Fig. 6 Guyana Type Fishing Boat



(Specifications of Gillnet)

- Twine Polyethylene 380d/27
- Mesh 8 inches
- Net weight 1,000kg
- Weight of sinker 400kg in total (placed every 12 feet)
- Floater Pineapple shape, 180 units by 4000m
- Hanging 36 meshes by 12 feet
- Anchor Natural stone (abt.15 kg) ; both sides of the net

③ Aquaculture and inshore fishing

One private enterprise is carrying out aquaculture in farm ponds constructed in a sugar cane field behind Rust En Werk village in Commewijne District, and is producing Giant river prawn and Kwie Kwie (about 10 cm in size), which is popular with Suriname people.

2-2-2 Fish Distribution and Consumption

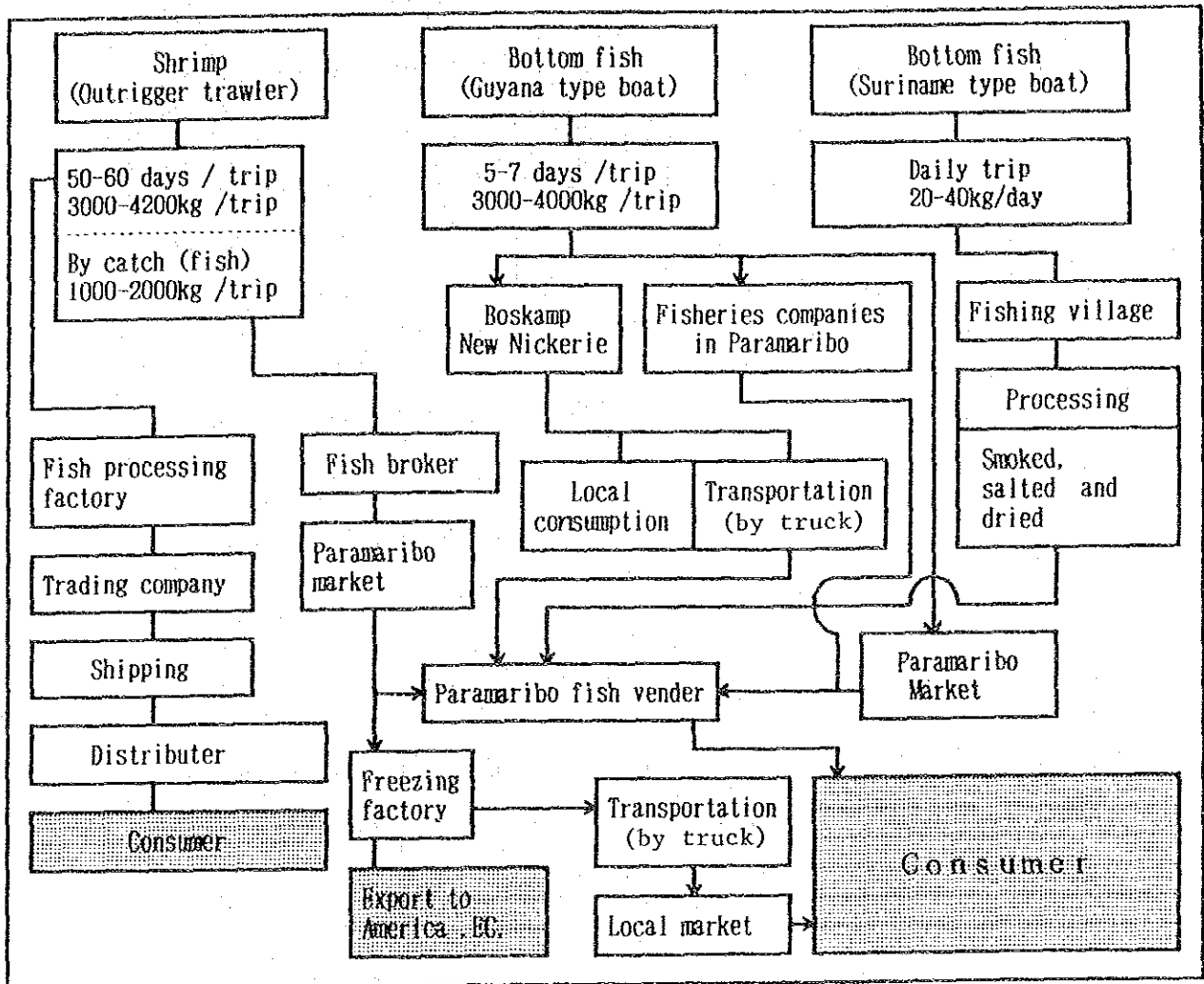
The fish products distribution is divided into 2 channels; for shrimp and for demersal fish and freshwater fish (Fig.7. Production-Consumption Flowchart).

The table 1 below shows the kinds and outlets of products.

Table 1 Fish Products and Outlets

Type of Fishing Boat		Fishing Method	Fish Species	Distribute
Florida type shrimp trawler		Double rigger trawling	Head-on Shrimp (1st. Grade) (Pink)	Japan
			Headless Shrimp (Pink, Brown, White)	Japan, America, EC
			By-catch bottom Fish	Red snapper, Rockcod, Seabass Crocodile fish, Catfish, Drum fish
Bottom fish	Guyana type	Gill netting	Red snapper, Rockcod, Sea bass, Butter fish, Crocodile fish	Export (Processing) Domestic (Fresh)
	Suriname type	Chinese seine, long line fishing	Small shrimp, Crab, Catfish, Crocodile fish	Domestic (Fresh, Salted, Smoked)
Fresh water	Suriname type	Spoon net Tuck net	Kwiekwie, Warapper	Domestic (live)
	Aquaculture	-	Giant river prawn, Kwiekwie, Terapia	Domestic Except prawn

Fig.7 Production-Consumption Flowchart



(1) Shrimp

Shrimp fishing in Suriname has been carrying out by American and Japanese double-rigger trawlers since the days of Dutch Guiana. Their catches have been exported almost entirely and the marketing pattern remains as it was. Shrimps, headless or head-on, are packed with ice in a 1.8~2.0 kg inner carton and frozen by a contact freezer, and SAIL's products are bought and exported by Japanese firms, and SUJAFI's products by Japanese fishing companies.

Table 2 Japanese Trawl Fishing Fleet

Year	Shrimp (Headless)	Boats	Fishing company
1978	622 tons	24	Nissin ,Hakodate kokai, Seiwa suisan
1979	520 tons	25	Nissin ,Hakodate kokai -
1980	477 tons	16	Nissin ,Hakodate kokai -
1981	687 tons	26	Nissin ,Hakodate kokai Hokuto
1982	658 tons	29	Nissin ,Hakodate kokai, Hokuto
1983	515 tons	26	Nissin ,Hakodate kokai, Hokuto
1984	350 tons	24	Nissin ,Hakodate kokai, Hokuto
1985	531 tons	32	Nissin ,Hakodate kokai -
1986	830 tons	35	Nissin ,Hakodate kokai -
1987	552 tons	24	Nissin ,Hakodate kokai -

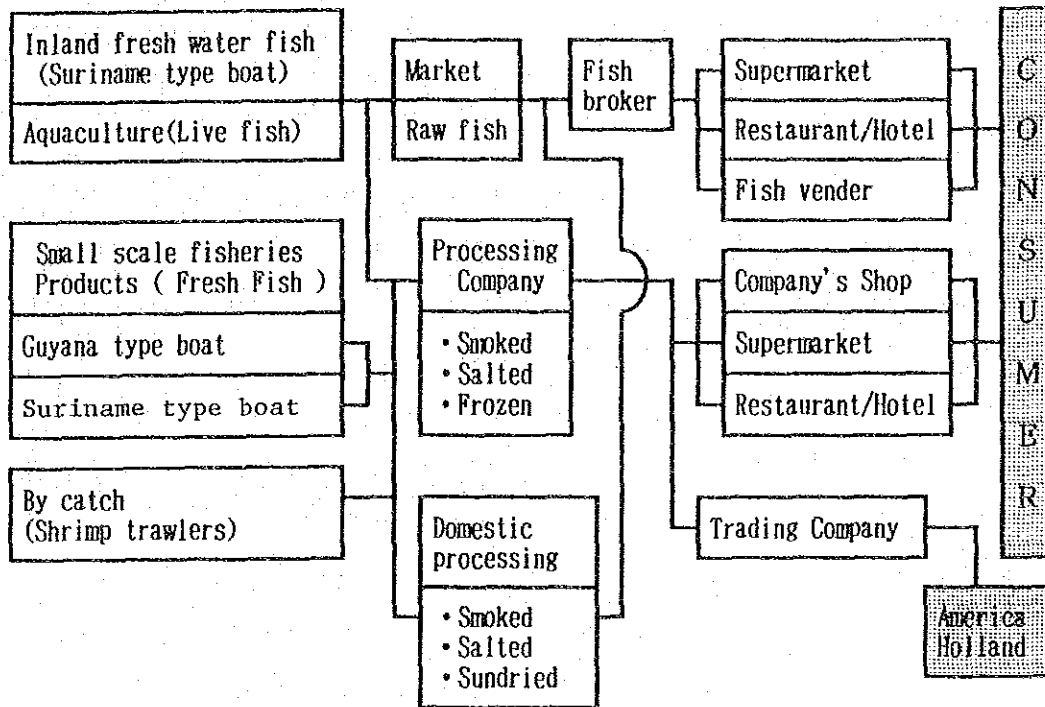
(Source: JOSFA)

(2) Demersal fish and freshwater fish

Paramaribo with 193,900 population (1987), the capital of Suriname, is the biggest consuming city in the country, and has two big general markets at which fishes are arrived from all over the country.

Products of small-scale fisheries are marketed through 3 channels; for raw fish, for frozen fish and for dried (and smoked) fish as shown in Fig. 8.

Fig. 8 Distribution Flowchart of Demersal and Freshwater Fishes



① Raw fish

In Suriname since no refrigerating equipment is installed on board any fishing boat except shrimp trawlers, fishes landed at Paramaribo fish markets or village beaches are all raw. And some cultured freshwater fishes and mangrove crabs are sold in the living state.

Suriname type fishing boats carrying no ice land raw fishes little on markets, but dry them at villages. Larger Guyana type fishing boats land their catches in the raw state. By-catches caught by shrimp trawlers are collected by vendors specialize in buying them in the half-frozen state and marketed.

The price of fish is determined between brokers and shipowners on the day's marketing. Some brokers have their own stalls in the market and retail

fishes, and others sell wholesale to vendors or ship by truck to local markets. The consuming public therefore usually buy raw fish at a market. Suriname consumers, who live mainly in the coastal area, like fish in its raw state due to lack of distribution system and quality control system.

② Frozen fish

Sea bass, snapper, catfish, etc. harvested by Guyana type fishing boats and larger fishes caught by shrimp trawlers are frozen. These big and high-grade fishes are sold for restaurants and hotels or exported; others are packed into vinyl bags for retail shops and supermarkets. In Paramaribo there are a few processing plants which buy these larger fishes only, and, at the riverside on the outskirts of Paramaribo, some Guyana type fishing boats land their catches directly to the trucks of the contract purchase plants. Paramaribo has about 50 fish processing plants, large and small, and it seems safe to say that there is a considerable demand for fish.

The following is the big 6 processors in Paramaribo.

Table 3 Processors in Paramaribo

Company's name
CARIBBEAN SEAFOOD
SURFISI
SUNAFISH
MURFISH
WEIBOLT FISHERIES
AMKO

③ Dried fish

Dried fish contains smoked, salted and dried, and plain dried fish. Its marketing routes are 1) dried shrimps and smoked/salted and dried catfishes (harvested by Suriname type boats), and 2) smoked/salted and dried high-grade larger fishes (collected by above-mentioned processors). Almost all

the dried fishes are consumed domestically, urban and rural, and partly exported to Holland. One of reasons why Suriname people who like raw fish consume such dried fishes is because they have poor distribution system or cold chain system. It is of necessity for Suriname to establish an integrated distribution system from production to consumption.

(3) Trend of fish demand

Though small in scale, the Fisheries in Suriname are playing an important role in supplying protein to the people as compared with the stock-farming which is in need of imported feed. And fish is cheaper than livestock products as shown in Table 4.

Table 4 Price List of Foodstuffs at Paramaribo

Items	SF/kg	Items	SF/kg
Beef	25.00	Frozen Red snapper fillet	17.50
Beef (Block meat)	28.00	Frozen Red snapper steak	10.50
Pork	20.25	Frozen Seabeam	17.50
Chicken	18.00	Frozen Drum	8.50
Smoked Catfish	5.00	Frozen headless Shrimp	27.50

(Source: Fisheries Dept.)

No exact information about fish consumption in the country is available. According to FAO statistics, the annual per capita consumption of fish was about 20 ~25 kgs in 1980, when 3,000~4,000 tons of salted and dried fish and canned fish were imported, and 11 kgs in 1984 when fish imports was banned.

A Belgian fisheries biologist working for the Fisheries Department told about the present situation as follows; apart from the shrimps harvested by trawlers, the year of 1987 saw 10,800 tons of fish landings in Suriname, of which 4,000 tons were exported and 6,800 tons were consumed domestically. On this figures it was estimated that the Suriname people of about 400,000

consumed about 17.0 kgs of fish per capita in the year.

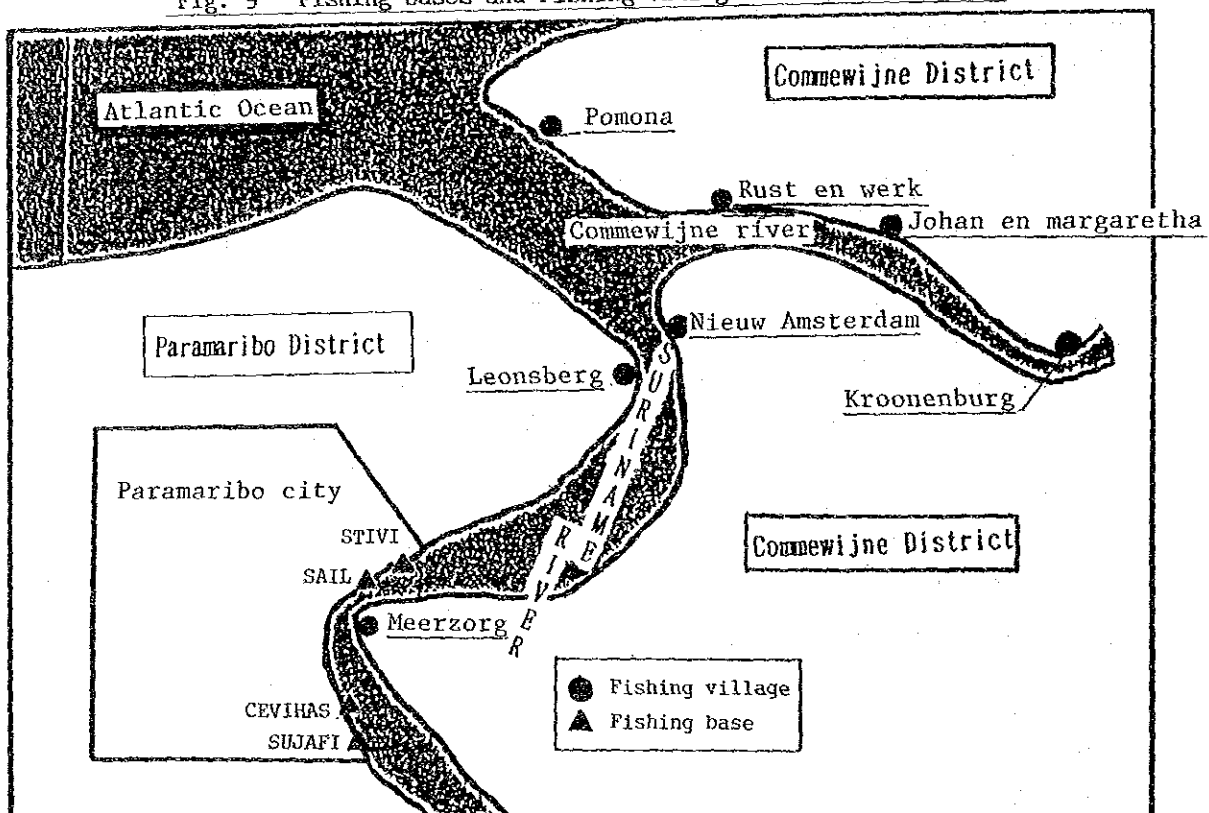
As Suriname succeeds in the modernization of its small-scale fisheries and improvement of distribution system the demand for fish will be substantially increased.

2-2-3 Fishery-Related Facilities at the Proposed Site

(1) Fishing companies

Fishing companies located around the proposed site are as follows;

Fig. 9 Fishing Bases and Fishing Villages Around Paramaribo



- STIVI Stichting Voor Visserijbevordering (Fishing Corporation)
- SAIL Suriname American Industries Ltd. (Fishing Corporation)
- CEVIHAS Central Visserij Haven (Fishing Corporation)
- SUJAFI Suriname Japan Fisheries CO., Ltd. (Suriname-Japan Joint Venture)

1) STIVI

STIVI is one of 3 fishing corporations which the Government invests. It once practiced marketing of fishing gear and fuel oils (with branch offices at Paramaribo, Boskamp and Nieuw Nickerie), purchase of fishes and fish processing, but recently in accordance with a government policy its business was limited to fish processing and marketing of frozen fishes. In 1985 its production was 300 tons of frozen fish; sales were SF3 million; 45 employees worked.

2) SAIL

SAIL is dealing exclusively with Korean fishing boats, and is freezing, processing, storing, and exporting their shrimps with supplying and repairing.

Its business is as follows;

• Shrimp trawler (Double rigger type)

Company's own boat	15
Korean boat	79 (10 Korean companies; the biggest one owns 10 boats)

• Processing factory

Shrimp grader	2 units
Contact freezer	8 units

• Ice-making machine

30 tons/day	2 units (tube ice)
15 tons/day	1 unit

• Cold store 400 tons (-20 °C) 1 unit

• Production capacity - 2,000 tons a year. Its 80% is exported to Japan through Japanese buyers, Nichirei, Marubeni, Hakodate-kokai, etc.

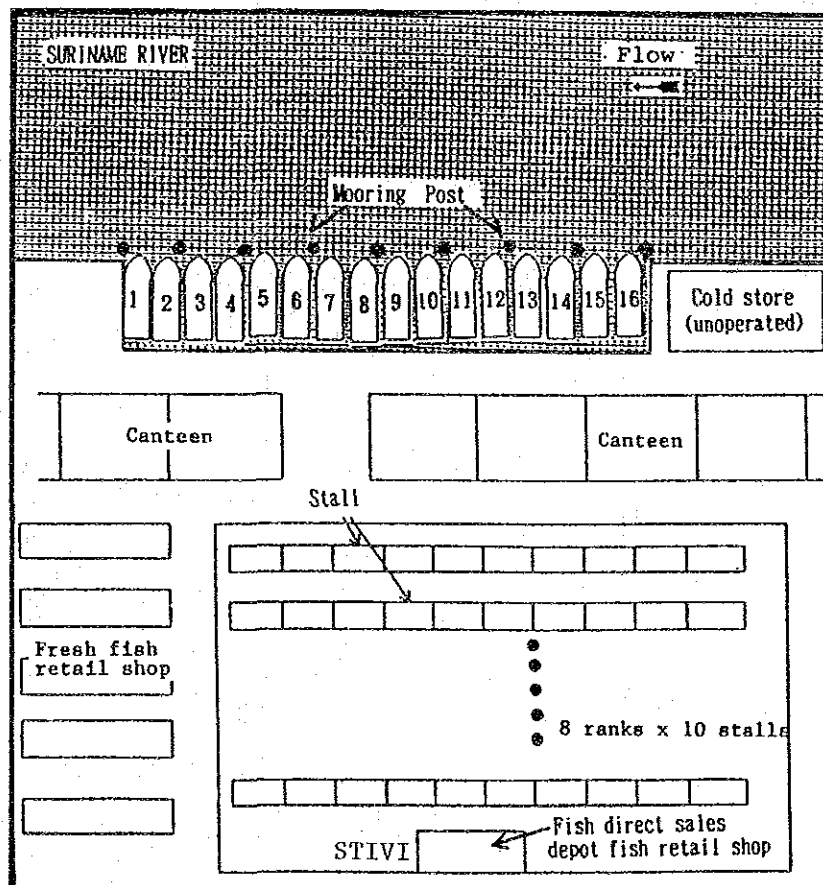
• Employee 230 persons except crew members.

SAIL contributes greatly to the Suriname economy by the biggest foreign-exchange earnings among the 3 corporations. Its business is stable and active due to good supplying service and repairmen.

(2) Fish market and distribution system

Paramaribo Central Market covering about 3 ha in area is situated on the bank of the River Suriname, ranging 300 m from a ferryboat terminal to south. Superannuated due to old age of 18 years, the market is presenting a din and bustle with a heavy traffic of people and hand carts on rather narrow passages. Fishes, meat, vegetables and sundries are retailed and wholesaled. The Market is controlled by the Ministry of Economic Affairs. The fish market occupies one fifth of the premises. The wharf facing the river has a space enough for 16 Guyana type fishing boats side by side, but due to a low river wall of 1.5 m and a shallow depth of water of 60 cm, the exposure of a riverbed at low tide make it difficult for fishing boats to land their catch (Fig. 10). There is a landing place for the Suriname type fishing boats some 30 m down the wharf. It has a very narrow space enough for only 3 Suriname type boats to bring their stern to it, and few boats land their catch due to their operating pattern, business hours of the market, tide and so on.

Fig. 10 Fish Market of Paramaribo Central Market



A one-storied building near the wharf houses several fish retail shops and 80 marketing stalls, 8 ranks of 10 stalls, used by about 150 vendors. Other vendors are selling fishes outside the building, and a rental fee of the market is SF7.20 within the building and SF7.00 outside per week. There is also a direct sales depot of STIVI in the corner of the building. Another is a 200 tons cold storage facility on the upper stream side of the wharf. The facility was built by Kandor Co. of Holland and was used for fishmummies to deposit their fishes left unsold, but it has been unserviceable due to malfunction 2 years before.

Fishes are bought by 4 to 5 brokers at the market at an agreed price between brokers and shipowners or their salesmen. A broker offers a price on the day's marketing to a shipowner, and when agreed the broker pays in cash. Brokers sell fishes at 50% raise of the price to vendors, who sell them at more 50% increase to consumers. No license is required for a broker, but vendors running business in the market are licensed. The following table shows the prices of retailed fish.

Table 5 Fish Price at Paramaribo Market

Items	Unit	SF
<u>Vendors</u>		
(raw fish)		
White sea bass 30 cm size	5 ps	10.00
Red snapper 40 cm size	3 ps	10.00
Treadfin beram 20 cm size	5 ps	10.00
15 cm size	10 ps	5.00
Sea bob (small shrimp) 5~6 cm size	6 kg	35.00
Kwie kwie 10~15 cm size	25 kg	425.00
(salted & dried fish)		
Paoema (dried catfish)	1 bag	7.50
Wit-witie	1 bag	2.50
Kandra (filleted sea bass)	1 bag	6.50
Bangbang	1 bag	9.00
Zoute vis	1 bag	2.50

<u>SAIL's direct sales depot</u> (frozen fish)		
Kandra tikie	per kg	7.50
Botervis	per kg	10.00
Witwittie hele	per kg	7.00
Witwittie geseden	per kg	8.00
Koebie geseden	per kg	8.00
Snoke hele	per kg	8.00

Another market dealing with fresh food and daily necessities is at Kankantree 3 km south of the Paramaribo Central Market. Its scale is about one-fifth of that of the Paramaribo Central Market and is rather dull due to inconvenient access.

(3) Fishing boat repair facilities

SAIL and SUJAFI can repair main/auxiliary engines, winches, electric apparatuses and radio equipment for shrimp trawlers. SDSM (Surinaamse Dok-en Scheepsbouw mij N.V.) provides two floating docks capable of carrying 2 shrimp trawlers together. Now one of them is out of order and the construction of a new one is projected. There is a slipway owned by Weibolt Slipway Co. up the River Suriname. All of the shrimp trawlers more than 100 are using these two companys' facilities for bottom cleaning and repairing propellers, rudder, etc., but shipowners have to supply such mending materials as paint, zinc plates, etc., because both SDSM and WEIBOLT have no stock of them due to a scanty hard money.

Table 6 Docking Charge

(unit: SF)

ITEM	SDSM	WEIBOLT
Docking charge	600	450
Staying fee a day	350	400
Bottom cleaning	2,000	2,000
Sand blasting	21.50/m ²	20.00/m ²
Painting, bottom (excluding paint)	250	250
Painting (excluding paint)	11/m ²	10/m ²

As shown above, one shrimp trawler costs about SF10,000 for bottom cleaning every 10 months with the supply of paint and zinc plates by her owner, excluding the repair of her propeller, rudder, etc. Bottom cleaning and a repair of propeller of the Guyana type fishing boat is conducted on a proper riverbank according to ebb and flow. Engines are repaired on board by hired repairmen; sometimes removed engine parts are brought to the repair shops in the city.

2-3 Fisheries Development Program

2-3-1 National Development Program and Fisheries Development Program

No National Development Program has been formulated since independence in 1975. The National Planning Office had prepared a first draft program in November 1988 and, after reviewing, intends to finish a final program by March 1989. As of September 1989, however, it is completed yet.

According to the draft, an emphasis is placed of the agriculture and fisheries sector due to an absolute shortage of hard currencies. In the fisheries sector, the development of aquaculture and increase of shrimp production, currently about 3,000 tons, up to 12,000 ~15,000 tons yearly are planned.

The year of 1987 saw the 5-year Fisheries Development Program. The major objectives are as follows;

- ① An increase of fish production in protein supply

- ② An increase of employment opportunities
- ③ An increase of hard currency production
- ④ The rational exploitation and development of natural fishing grounds, through deep-sea fishery and small-scale fishery

To achieve the 4 objectives they put an emphasis on snapper production.

The Suriname small-scale fisheries are promising due to abundant fish stocks. The program formulated a general policy to be established and implemented as follows;

- 1. Institutional regulations consisting of 1) Control, 2) Management and Surveillance, 3) Research and Training, and 4) Financing.
- 2. Infrastructural regulations
- 3. Production facilities

1. Institutional regulations

1) Control

- a) Coordination and control of importation of fishing vessels, gear and other equipment.
- b) Creation of a central institute catering for research, extension and development of aquaculture.
- c) Reorganization of present structure of the Fisheries Department, with priority to an administrative function and a research function.
- d) Formulation and implementation of an appropriate price and distribution policy.

2) Management and Surveillance

- a) More drastic regulations in order to preserve stocks. Participation of the Navy and the Air Force.
- b) Diversification of the fishing fleet in order to arrive at rational fish stock exploitation.
- c) Improvement of product quality (control of processing).

- d) Management of shrimp trawlers in order to prevent overfishing.
 - e) Promotion of the production of dried, salted, smoked, frozen and canned fish products in order to increase added value through diversification and fostering import substitution.
 - f) Participation of the private sector in fisheries development.
- 3) Research and Training
- a) Collection and discrimination of relevant information (biological and statistical).
 - b) Carrying out basic investigation on marine resources, in collaboration with foreign and international organizations.
 - c) Carrying out applied research in the fields of fish biology, limnology, economy, feed technology and fishery management.
 - d) Encouragement of development and use of the most efficient fishing technologies and aquaculture technologies.
 - e) Market research, domestic and export, supply and demand structure, production activities, distribution, price, etc.
 - f) Investigation of impact of fishery policy on international currency situation.
 - g) Training of extension workers and fishermen to attract more people to the sector.
 - h) Technical assistance to fishermen, processors and retailers.
- 4) Financing
- a) Enlargement and improvement of access to credit for individual fisherman.
 - b) Support for the acquisition of fishing boats and gear. Coordination of the import of equipment.
 - c) Diversification of loan system to promote export-oriented activities.
 - d) Creation of insurance scheme for fishing boats, engines and gear, etc. for the small-scale fishery.

2. Infrastructural regulations

- a) Creation and improvement of fishery centers and facilities that generate employment.
- b) Construction of a central fishery harbor with auction, storage and freezing facilities.
- c) Creation of aquaculture centers.
- d) Optimal use of existing capacity.
- e) Construction of a slipway for maintenance and repair of the small-scale fishery.

3. Production facilities

- a) Formulation and implementation of a fishing boat building and repair program.
- b) Supply of fishing gear, engines and spare parts for the existing small-scale fishing fleet.

2-3-2 Foreign Aid

Prior to the requested grant aid of Japan the following two foreign aid Projects are in progress.

(1) Coastal Fisheries Development Project in Boskamp

1) Progress of the Project

The Project funded by the Government of Belgium has been implemented since 1978 at Boskamp, the junction of two rivers, the Coppename and the Saramacca, in Saramacca District in central Suriname. Its Phase I and II have been completed, and Phase III is now in progress. Work of each phase is as follows;

Phase I Basic design; improvement of utility including electricity and water service.

Phase II Leveling of the Project site; construction of roads, sewerage

and a pier; granting land to fishermen; forming communities.
Phase III Supply of fishing materials; construction of a boat-building yard and ice-making plant.

The Project site covers a reclaimed swamp of 2 ha. Fishermen's dwelling place is divided into 48 lots, 400 ~800 m² each; 25 families won their lots to settle in a raffle until now (Fig. 11).

2) Schedule of the Project

In the area 4 Guyana type fishing boats and 20 Suriname type fishing boats are in activity, harvesting 300 tons of demersal fish yearly. The Project aims at the development of the water area shallower than 25 m, 30 miles off the coastline. The Project is as follows;

① Hindrance to the Project

- Shortage of importing fishing materials (engine parts, fishing gear, etc.)
- Poor capacity of fishing boats
- Illegal activities of shrimp trawlers

② Objectives of the Project

- Improvement of living standard of fishermen
- Increase of fishing production

③ Description of the Project

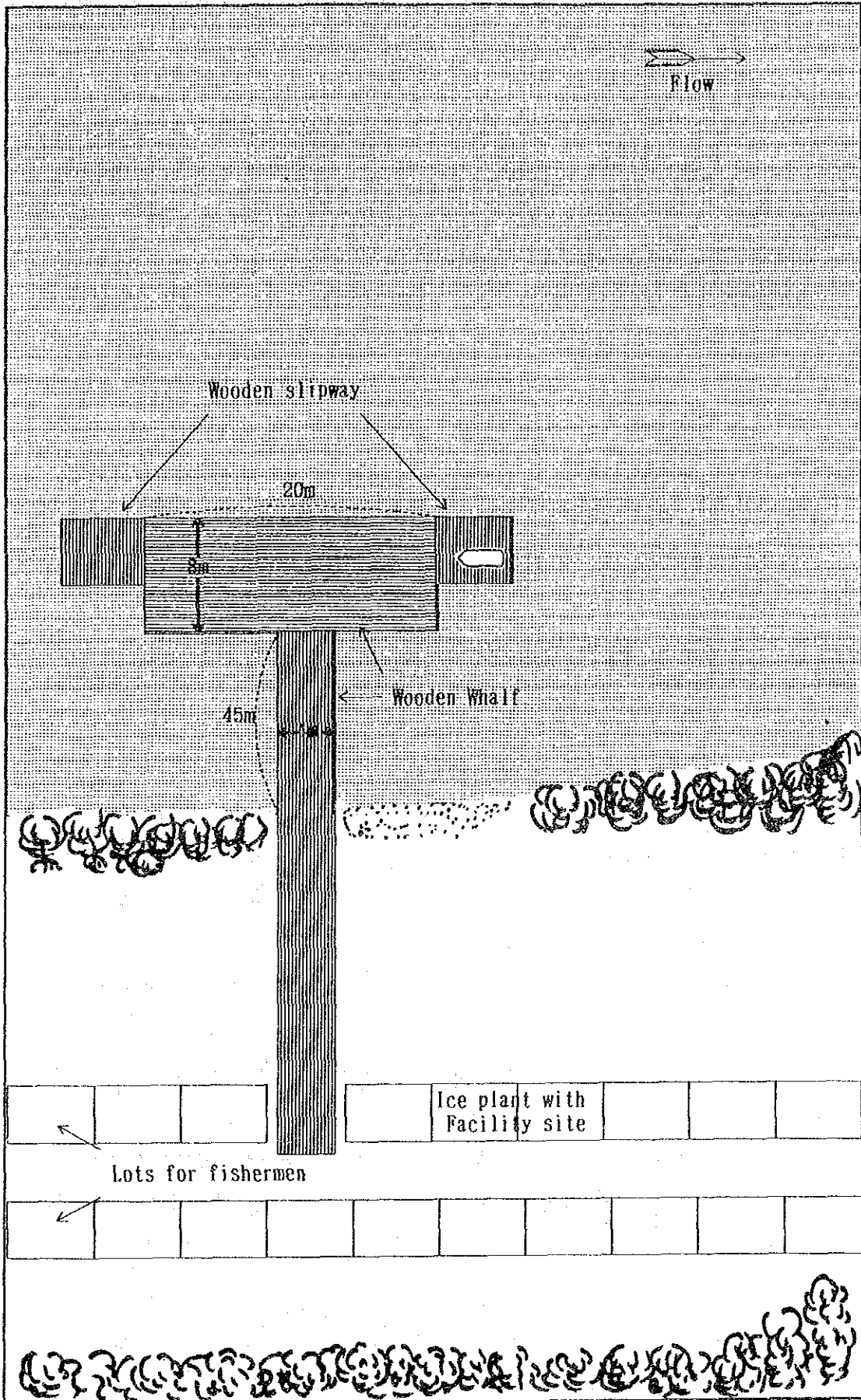
• Boat-building yard

Most of the Guyana type fishing boats equipped with an inboard engine or outboard motor were introduced by Guyana fishermen. The boat-building yard aims to develop boat-building technics under the guidance of foreign marine engineers, and thus make it possible for the Suriname nation to build the Guyana type fishing boat equipped with an inboard engine and the other type of small fishing boat most suitable to Suriname by themselves.

• Ice-making plant

A 10 tons/day ice-making plant is to be constructed in order to improve

Fig. 11 Boskamp Site



quality of raw fish exported for the U.S., paralleling the improvement the fishing fleet, and thus increase exports.

• Improvement and extension of fishing technique

The fishing technique contains not only fishing methods but the management of shore facilities through the promotion of exchanging information and forming cooperatives.

• Development and management of marine resources

Suriname has carried out a fishery resources research with assistance of Norway and FAO. From 1979 to 1983, a Japanese trawler "Nisshin Maru" surveyed population magnitude of demersal fish. It is projected to develop 300~600 m deep sea shrimp. Shallow water resources are to be harvested and managed with proper consideration to avoid overfishing. For this purpose the construction of patrol boats at the above-mentioned yard is scheduled.

(2) Fisheries Development Project in Nieuw Nickerie

The Project funded by EC, consisting of a pontoon, refrigerating equipment, ice-making facilities, repair shop and so on, is similar to the Project in Commewijne District discussed on this paper.

The Project site, about 1.7 ha in area, is situated at the mouth of the River Nickerie in the northwest coast of Nieuw Nickerie District, facing Guyana.

Nieuw Nickerie has a population of some forty thousand, of which 300 are fishermen including part-timers.

The Project has just started in June 1989, and is to be managed by two fishermen's cooperatives after completion.

Description of the Project

The Project site is to be raised the ground level 30 cm higher than the high tide level because the site and the sea surface at the high tide are almost the same in level.

According to the Project, the fishermen's cooperative will buy out all the catches and ship them by refrigerating trucks to urban areas. About 90% of ice produced by the proposed ice-making facilities are mostly for the local fishery, and the remaining 10% are for domestic use. For the 25 Guyana type fishing boats, spending about 3 tons of ice on a 6~7 days trip, the ice-making facilities will be of great help.

The components of the Project are as follows; the cost is estimated at EC\$ 2.5 million.

- | | |
|-----------------------|-----------------------------------|
| ① Pontoon | 1 unit |
| ② Cold storage | 150m ² , about 60 tons |
| ③ Ice-making facility | 2 units, 10 tons/day each |
| ④ Oil/Water tanks | 10 tons each |
| ⑤ Repair shop | 1 unit |

Fig. 12 Nieuw Nickerie Project Site

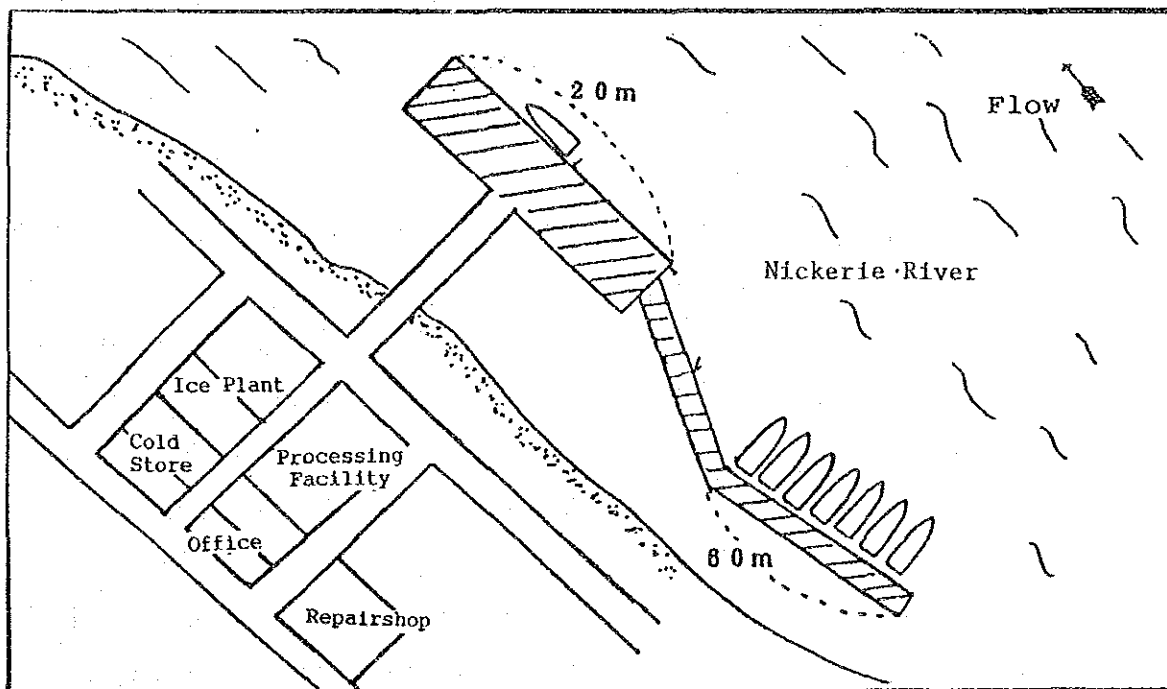
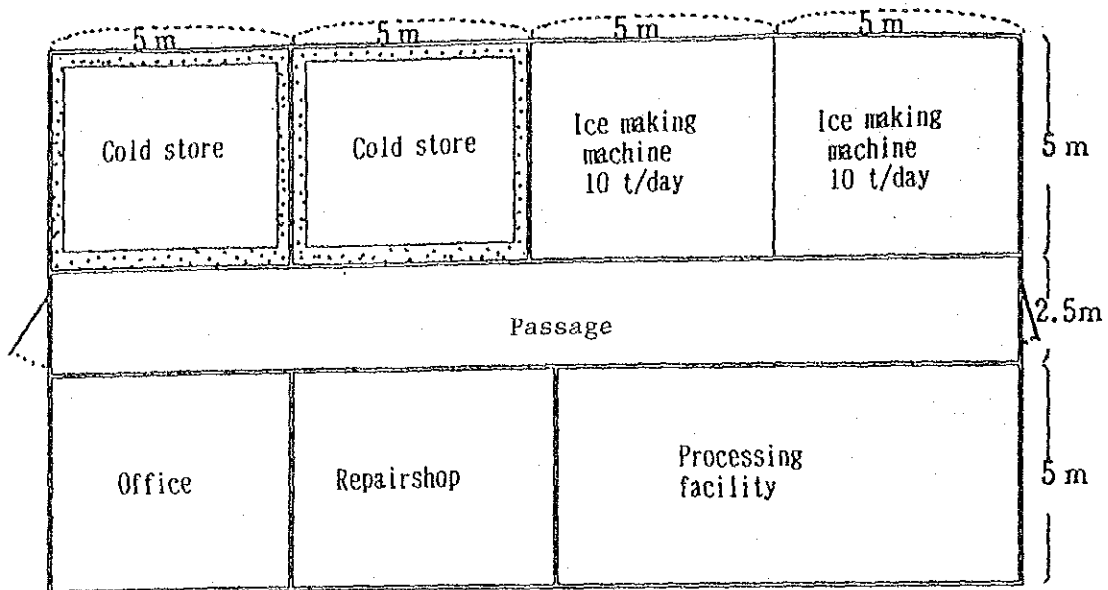


Fig. 13 Nieuw Nickerie Proposed Facilities



2-3-3 Japan's Fishery Cooperation

In 1975, the Government of Japan, responding to the request of the Suriname Government, has granted two training ships, "SREFIDENSI I" and "SREFIDENSI II", to train Suriname fishermen for shrimp trawl fishing. As a result, at the present time 215 trained fishermen are participating actively in shrimp trawl fishing. The granted ships, belonging now to SAIL (Suriname American Industries Ltd.), is continuing training.

The cooperation was also conducted on the private basis. In 1982, OFCF (Overseas Fishery Cooperation Foundation) supported the "Coastal Fishery Development Project," and supplied a small FRP fishing survey boat, equipment and materials, and also sent technical experts.

2-4 Process and Content of the Request

2-4-1 Process of the Request

Small scale fishing activities in Commewijne District are the daily Chinese seine fishing at the mouth of the Suriname with the Suriname type canoes and the driftnetting at the continental shelf with the Guyana type fishing boats

staying for one week at sea.

The villages and their fishing activities covered by the Project are shown on the table below.

Table 7 Fishing Activities in Commewijne District

Village name	Fishermen	Fishing Boat		Fishing Method
		Suriname	Guyana	
Pomona	65 - 70	58	2	Chinese seine Bottom longline Drift gill net
Rust En Werk	50 - 55	45	-	Chinese seine Bottom longline
Johan En Margaretha	50 - 55	45	-	Chinese seine Bottom longline
Kroonenburg	35 - 45	30	-	Chinese seine Bottom longline
Nieuw Amsterdam	110 - 130	20	20	Chinese seine Bottom longline Drift gill net
Total	310 - 355	198	22	

Catches of the Chinese seine fishing concentrated at the mouth of the River Suriname are mainly small shrimps, drums and catfishes, which are brought back to villages by no ice carried canoes due to the paucity of the ice making facility anywhere, and thus dried, salted or smoked.

On the background above, the Government of Suriname has formulated the Project to modernize the small scale fishery in Commewijne District, including the construction of a fishery center at Nieuw Amsterdam. In the Project they expect to extend the fishing effort to the fishing ground shallower than 30 m and also establish an integrated distribution system beginning with production, and requested the Government of Japan to offer a grant aid on the Project.

2-4-2 Outline of the Request

It is to construct a fishery center at Nieuw Amsterdam, whose functions are as follows;

(1) Support of fishing activities

To make it possible for the fishing boats to land their catch and load supplies regardless of tide, a pontoon will be constructed. In addition, to support of fishing activities a slipway, repair shop, cold storage/ice-making facilities, fuel oil tanks and fresh water tanks will be constructed.

(2) Improvement in fish quality and promotion of fish distribution

With the construction of ice-making facilities fishing boats will be supplied with ice to keep their catch fresh, and also the promotion of fish distribution and stabilization of fish price will be expected through a proper shipment arrangement with the construction of cold storage facilities.

(3) Management and control of fishing activities

To manage and control fishing boats, distribution and marketing an administration building will be attached. The center will be managed by SAIL at the beginning and finally by a cooperative form.

Requested equipment and materials are as follows;

Table 8 Requested Facilities, Equipment and Materials

Item	Specifications (capacity, size, etc.)	Q'ty
Jetty	65 m × 5 m	1
Shore protection	100 m	1
Slipway	8 m × 35 m	1
Ice-making machine	10 tons/day	2
Ice storage	40 tons	1
Contact freezer	0.9 tons/day	2
Cold storage	20 tons, -25°C	2
Generator	250 KVA	2
Processing table	2.0 m × 1.5 m	2
Building for cold storage, processing, etc.	300 m ²	1
Offices for manager, night watch, meeting room, etc.	250 m ²	1
Workshop & Warehouse	300 m ²	1
Fuel storage	100 m ²	1
Water tank	20 tons	1
Pavement for parking areas, etc.	2,500 m ²	1
Inboard engine	70 HP	10
Outboard motor	25 HP	50
Ice box		200
Gill net	200 mm mesh	40
Bottom long line	main rope 0.6 mm	100
Fishing boat for trial	38 ft, 2.9 G/T, 70 HP	3
Transportation boat for products	42 ft, 4.6 G/T, 105 HP	1
Refrigeration truck	5 tons capacity	1

CHAPTER 3 OUTLINE OF THE PROPOSED SITE

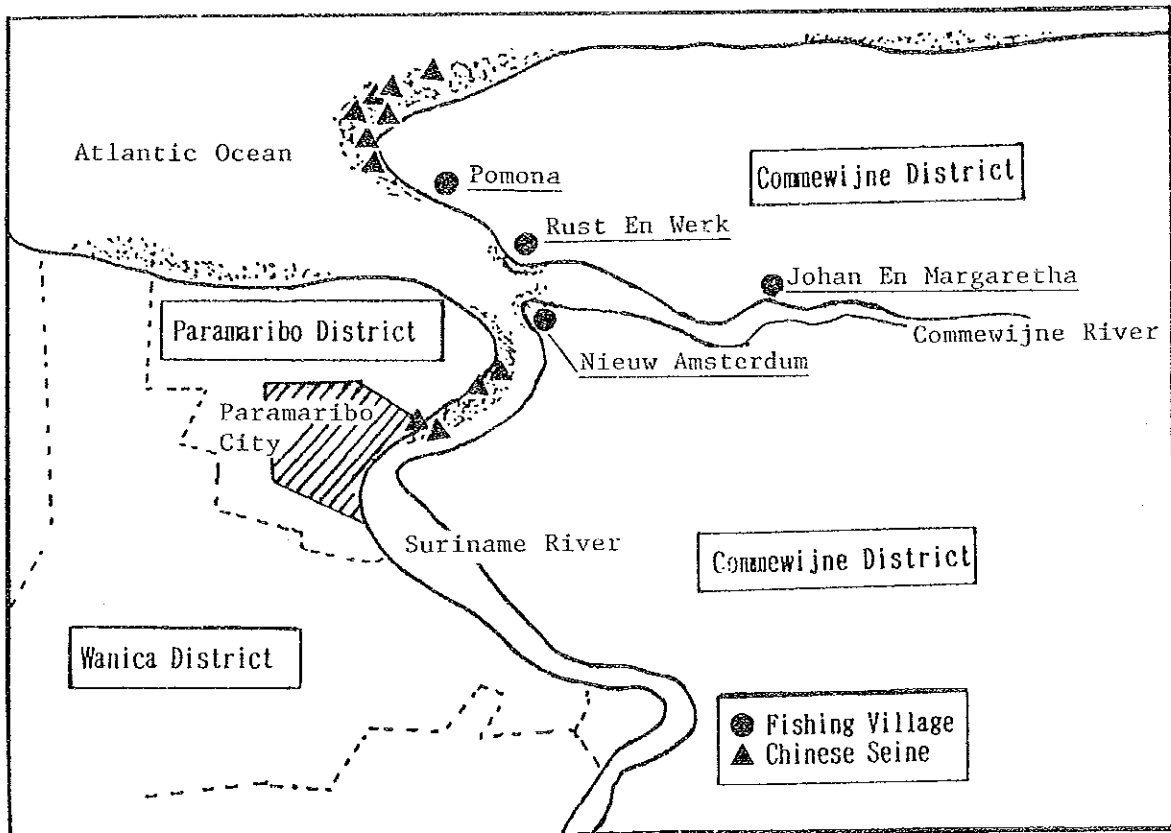
3-1 Outline of the Proposed Site

(1) Fishing villages in Commewijne District

The District is located at the eastern side of the Suriname River, facing the Districts of Paramaribo and Wanica, had once a flourishing agriculture, mainly sugar cane, and fruit culture including oranges. Recently agriculture has, however, become unprofitable for villagers, and the Suriname Government is striving to develop fishery in the area, aiming on the activation of economy.

The year of 1985 saw a population of 14,000, of which 1,526 was fishermen.

Fig. 14 Commewijne District



The Project covers the following 5 villages (Fig. 14) along the River Suriname and the River Commewijne . Their current fishing activities are as follows.

① Pomona

Pomona is located at the mouth of the River Suriname; the traffic depends upon only boat service like a solitary island out on the sea. Water rests on rainfall but was supplied by a Governmental water service boat during the dry season. Fuel oil has to be brought from Nieuw Amsterdam and Paramaribo with polyetherene tanks. No electricity available; a generator generates electricity for only 2 to 3 hours after sundown.

At the mouth of the River Suriname is a wooden jetty for Guyana type fishing boats, supply boats, and ferryboats to Leonsberg.

The fishing fleet of Pomona consists of the Suriname type fishing boats. On the beach are 5 to 6 simple jetties serviceable to landing catch or loading materials.

Fishermen drys small shrimps and croakers on bamboo drain boards or smoked catfishes (50 cm in size) in their simple kilns. Most of fishermen are rather young; the old and children are living in Paramaribo due to education; houses in the village seem to be guard sheds.

② Rust En Werk

Rust En Werk is situated at the mouth of the River Commewijne, facing Nieuw Amsterdam. There is a Governmental jetty. The village has an access serviceable to vehicles to the main road. In 1990 a project funded by Belgium is to be implemented to construct the electricity facilities and roads.

Fishermen's houses are larger and more comfortable than guard sheds in Pomona, suggesting a rather wealthy living. The northern area of the village once was a sugar cane field but is now farm ponds for giant river prawns, a pasture ground and salt farms.

③ Johan En Margaretha

The village, adjoining Rust En Werk, is up the River Commewijne. Fishermen are engaging in estuary and river fisheries with the Suriname type fishing boats. The geographic setting of the village is very much like Rust En Werk.

④ Kroonenburg

This hamble of 82 families and with 30 Suriname type fishing boats is far up the River Commewijne. The nature of the village is nearly alike to other villages in Commewijne District. Fishermen are carrying out a Chinese seine fishing or long-line fishing.

⑤ Neiuw Amsterdam

Neiuw Amsterdam, at which the proposed fishery center will be constructed, is located at the junction of two rivers, the Suriname and the Commewijne, and is an area of swamp on clayey soil.

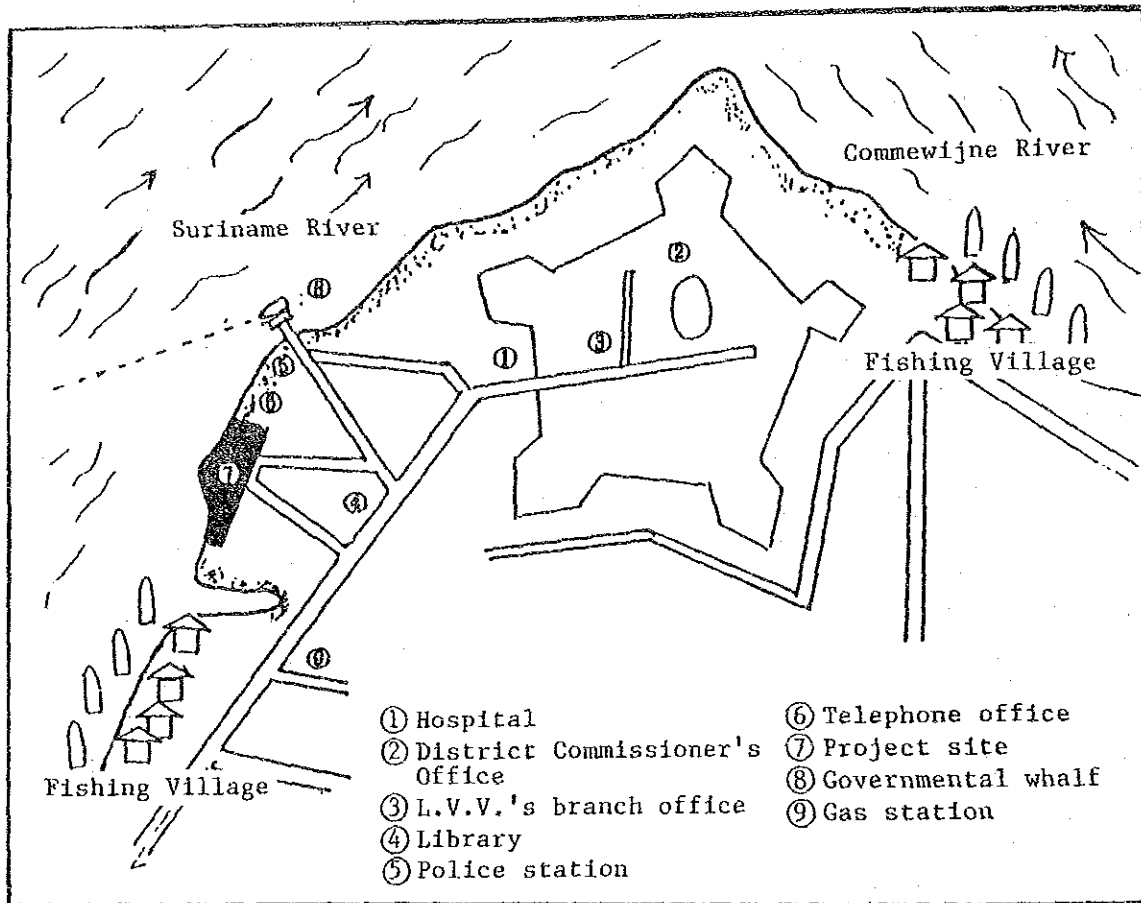
Its major products are sugar cane, rice and fruit produced by people of Indian origin and Javanese with comparatively well arranged irrigation canals. Fishery is conducted by mainly Guyanese using the Guyana type fishing boats. Neiuw Amsterdam is of most importance in the District, with a administrative center with the office of District Commissioner, a branch office of the LVV, police station, hospital, telephone office, library, gas stations, and so on. Infrastructure such as road, water supply, sewage, electricity, etc. is well arranged. It is easy of access; within one hour trip from Paramaribo by ferryboat and car; connected with Leonsberg by frequent ferryboats across the River Suriname. There are also relics of fortresses and batteries constructed during World War II, now called the "Monument."

The Government of Suriname is striving to develop fisheries as a substitute of agriculture, with Neiuw Amsterdam as a central base, formulating the "Project of Modernization of Small Scale Fisheries in Commewijne District," aiming at

dispersion of congested population in the national capital region and creation of employment opportunities through activation of the local economy.

A sketch of Neiuw Amsterdam is shown on the below.

Fig. 15 Neiuw Amsterdam



3-2 Natural Conditions

The proposed site is located in Nieuw Amsterdam, 10 km northeast in a straight line from Paramaribo, 13 km on the River Suriname by boat. Its natural conditions are as follows:

(1) Weather conditions

Observations at Neiuw Amsterdam and Paramaribo are shown on the following page.

(2) Waves

During the field survey 0.1 ~ 0.2 m wave height, period of less than 2 sec, no breaking crest, were observed on the River Suriname. No gust called "Sibi-busis", which causes higher waves, was experienced. Also when larger vessels and speedboats passed along the front of the proposed site waves of 0.4 m high with a period of 3~4 seconds were observed.

Table 9 Monthly Weather Conditions (mean)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Observation	Period
Precipitation (mm)	196	131	120	170	297	299	216	148	78	82	97	167	Nw. Amsterdam	1951~1980
Temperature, highest(C°)	29.2	29.4	29.9	29.9	29.7	30.0	30.5	31.3	31.9	31.9	31.4	23.8	Paramaribo	1971~1985
Temperature, mean(C°)	26.4	26.6	26.9	27.1	26.9	26.4	27.0	27.7	28.0	27.9	27.6	26.5	"	"
Temperature, lowest(C°)	22.4	22.3	22.7	24.7	23.6	23.6	23.6	24.6	23.5	24.7	23.1	22.7	"	"
Relative humidity (%)	83	81	80	82	84	85	83	87	79	79	81	84	"	1971~1984
Sunshine (hr)	6.2	6.2	6.6	6.1	5.8	5.9	7.2	8.0	8.5	8.3	7.4	5.8	"	1971~1985
Insolation (MJ/M2 day)	17.9	19.8	20.2	19.4	18.3	17.8	19.9	21.5	22.4	22.0	20.1	17.6	Nickerie Airport	1961~1980
Wind velocity (m/s)	0.6	0.8	0.8	0.8	0.8	0.6	0.4	0.6	0.7	0.7	0.7	0.5	Paramaribo	1974~1985
Wind direction	NE	NE	NE	NE~SE	NE~SE	NE~SE	NE~SE	NE~SE	SE	SE	SE	SE	"	"

(3) Tide and water levels

The following is an analysis of data for the period 1966 to 1983 recorded by a tide staff installed at the proposed site in 1966.

Table 10 Tide and Water Levels

	NSP (m) Natural Suriname Level	DL (m) Datum Line
Highest Water Level	2.00	+ 3.28
Springs Mean High Water	1.60	2.88
Mean High-Water	1.12	2.40
Neaps Mean High Water	0.57	1.85
Mean Water Level	0.16	1.44
Neaps Mean Low Water	- 0.32	0.96
Mean Low Water	- 0.81	0.47
Springs Mean Low Water	- 1.14	0.14
Lowest Water Level	- 1.46	- 0.18
Datum Line	- 1.28	± 0

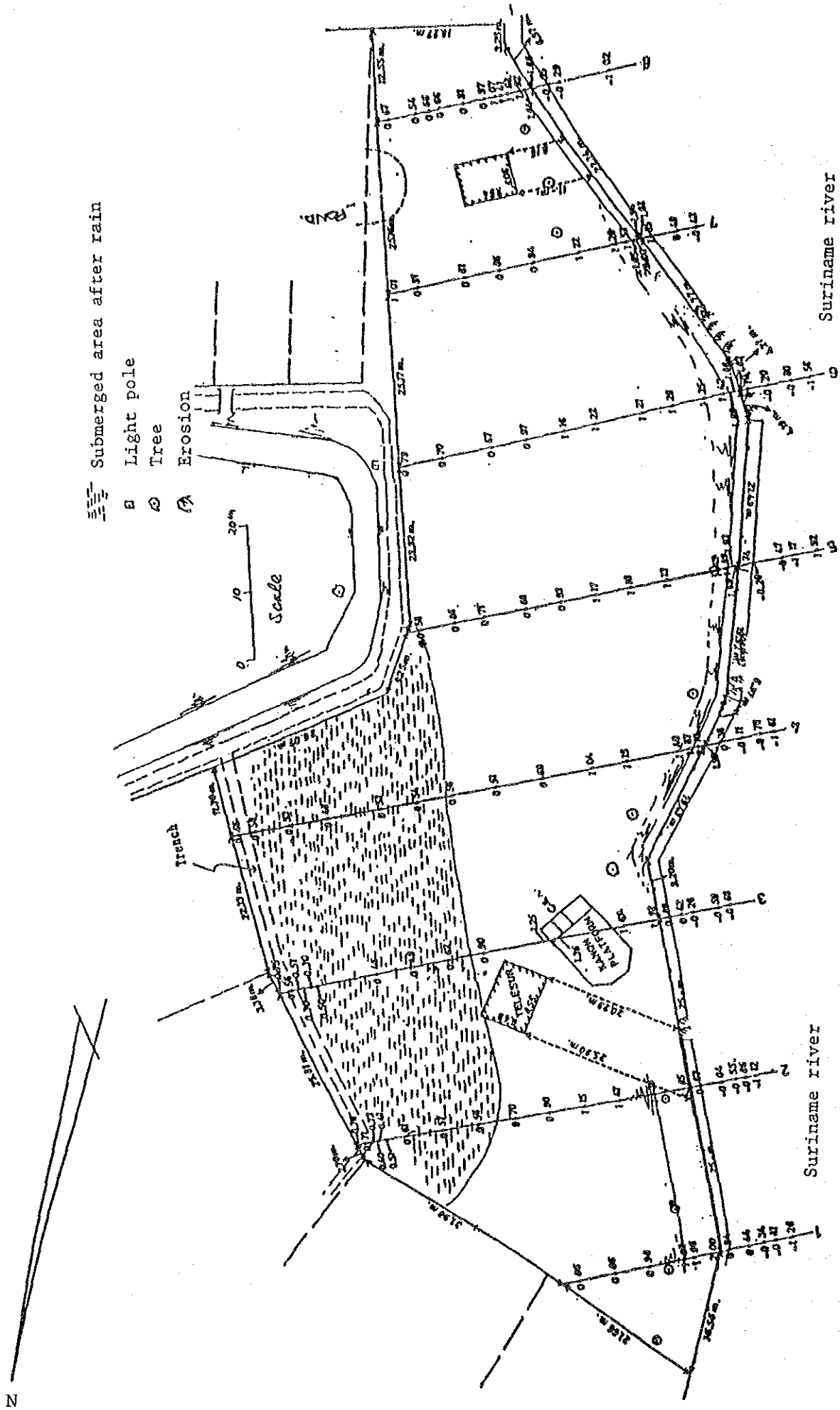
(4) Discharge conditions

At the proposed location of a pontoon and slipway each velocity of flow at 1 m, 2 m and 3 m in depth was measured with a current meter; the maximum was 1.2 m/s and the direction was generally paralleled to the shoreline. Also the path of flow was observed, using a floater; no vertical variation was observed.

(5) Landform

According to the field survey the landform in and around the proposed site presents the following features (Fig. 16).

The site is an area of back swamp; a low, flat land of soft foundation formed with sedimentary clay and silt, developing behind a natural embankment of a river. When such a land is flooded once a submersion duration is prolonged



- Submerged area after rain
- Light pole
- Tree
- Erosion

Fig. 16 Topographical Chart

due to poor drainage. Actually several hollow places and ditches are found in and around the site, and the water is likely to stay here after a rainfall due to no outlet. There are also places covered with water after a rainfall. The river wall is covered with 10 cm thick concrete boards, but earth and sand inside the boards flowed out and the wall is broken everywhere. Judging from the fact that on the levee crown of the river wall are several cracks of 5~10 mm wide, the shoreline of the side is perhaps being eroded.

(6) Riverbed landform

Depth-sounding was conducted around the proposed location of a pontoon with an echo-sounder and sounding lead.

To survey the nature of the soil on the riverbed a sample was scooped up at the shoreline with a shovel at low tide. The nature of the soil offshore was surmised by observing a mud stucked on an anchor of a boat. The soil offshore is black gray water silt clay containing lots of fine pieces of shell. It is estimated that a layer of 1 m top of the riverbed have a strength permitting a monken to sink by gravity ($N = 0$).

The height of the foundation of the riverbed around the proposed passage varies by 1~2 m according to an observation period. From this it is guessed that the corrosive action is considerably active on this side of the Suriname. By contrast at the opposite side of the river, Leonsberg, sedimentation is making it difficult for boats to be moored.

(7) Nature of the soil

According to topographic maps, geological maps and related materials available, boring and Dutch-cone drilling surveys and laboratory tests, the nature of the soil is as follows.

The foundation of the site is a marine sedimentary layer called the "Demerara Layer", forming a coastal plain. This sedimentation has been continueing since the Holocene epoch, 10,000 years age. Soil consists of clay, sand and

humus; watery and soft due to a rather short period of sedimentation. Under the "Demerara Layer" a granitic base stratum, which was formed in the pre-Cambrian 600 millions years ago, lies. The upper layer of the foundation of the site is metamorphosed into clay completely due to a strong weathering. The results of the field survey are shown on attached Fig. I-6-⑥, reference materials on Fig. I-6-⑦-1 to ⑦-3. As shown on them, the soil stratum lie almost horizontally. The top between the ground level and 5 m deep is a very soft stratum of clay, C_u (undrained shear strength) of less than 1 ton/m²; the next, GL- 5~10.0 m, is a mild solid one with a N value of 15 at the standard penetration test; the third, GL-10.0 ~ 19 m, is of very soft clay with a C_u value of 1 to 2 tons/ m². These three layers form the "Demerara Layer". Under this, deeper than 19 m, seems to be a granitic base stratum metamorphosed into clay, whose upper portion of 3 m in depth has a C_u value of 4 to 8 tons/m².

The sulfate content of the soil sampled at 0.5 m below the surface was examined; its value of 140 ppm is so low that the chemical attack on concrete will not occur.

(8) Construction materials

Information about banking and aggregate was collected. Being unavailable near the site due to no hills, soil excavated from the topsoil is used as banking. Since banking of clayey sand or of clayey grits is usually desirable, exposed sandy grounds around the site are used as borrow pits. The nature of the soil of the surveyed borrow pit was of mainly clay mixed with sand or sandy clay. River sand as well as land sand is used as aggregate. River sand is collected up the Suriname and Corantijn rivers; land sand at Zanderij where the international airport is located. Both of them are of quartz sand, with enough durability. The results of a chemical test are shown as follows:

	<u>Content of Cl (%)</u>	<u>Content of SO₂ (ppm)</u>
River sand	0.001 less	330
Land sand	—	100

(9) Earthquake

According to the interview survey and data available in Japan, no earthquake is experienced in Suriname. Based the "Earthquake Map of the World" issued by the Building Research Institute of the Ministry of Construction of Japan it is estimated that the maximum acceleration of an earthquake which may occur in Suriname within 100 years is less than 20 gals (Attached Fig. I-6-⑧). Based on this figure the lateral seismic coefficient (K_{II}) (Attached Fig. I-6-⑨) will be as follows:

$$K_{II} = \alpha / g = 20/1,000 = 0.02 \rightarrow 0.05$$

$\left\{ \begin{array}{l} \alpha : \text{Acceleration of earthquake} \\ g : \text{Acceleration of gravity} \end{array} \right.$

CHAPTER 4 CONTENTS OF THE PROJECT

CHAPTER 4 CONTENTS OF THE PROJECT

4-1 Objectives of the Project

The Project is in line with the "5-year Fisheries Development Plan" formulated in 1987 aiming at a reasonable development of the small-scale fisheries in Suriname, and its objectives are to achieve the following by constructing a new fishery base at Nieuw Amsterdam, the center of Commewijne District without fisheries-related infrastructure.

- Increase in catch by improved working ratio of the fishing fleet
- Improvement of the fish price by improved quality of catch
- Stabilization of the fish price by systematic shipment of products

4-2 Study of the Contents of Request

4-2-1 Appropriateness and Necessity of the Project

The Project is to be implemented in Commewijne District which no improvement plan of small-scale fisheries-related infrastructure has been executed. By this Project the modernization of the small-scale fisheries in Suriname will be implemented throughout the country, together with the two projects being implemented in Districts of Nieuw Nickerie and Boskamp respectively. It is judged therefore that the necessity of this Project is great and thus it is appropriate to a Grant Aid Project.

4-2-2 Relationship to and Overlapping with other Foreign Assistance

The Government of Suriname is now carrying out the two projects similar to this Project; one funded by EC in Nieuw Nickerie (western) and another sponsored by Belgium in Boskamp (central). The Project in Commewijne District is part of the integral development plan and does not overlap with any of them.

4-2-3 Study of the Contents of the Project

To be concrete, the above-mentioned objectives are as follows;

(1) Increase in catch by the increased working ratio of the fishing fleet

1) The construction of the fishery center at Nieuw Amsterdam on the mouth of the River Suriname will make it possible for fishing boats, which are landing their catch and loading supplies at Paramaribo, to save time and increase their working ratio, resulting in the increase in catch.

2) At present repair and maintenance of fishing boats in Commewijne District are conducted by a primitive method of beach-landing according to tide. The construction of the repair shop at the fishery center will make it possible for fishing boats to save time and expenses, resulting in the increase in working ratio.

(2) Improvement of the fish price by improved quality of catch

1) All most of the Commewijne fishing boats are operating without ice on board. Supplying ice will improve freshness their catch and make it possible for them to land part of their catch at a raw state.

2) Methods for handling fish will be improved by using fish boxes through operation. By this the quality of fish will also be improved.

(3) Stabilization of the fish price by systematic shipment of products

Having no cold stores, Paramaribo Fish Market closes at 1100 in the morning; once time is over the price of fish is beaten down. The construction of the fishery center makes it possible for fishing boats to land their catch at any time within its business hours. Also cold stores and vans of the center will make it possible to ship its products systematically, resulting in the stabilization of fish price.

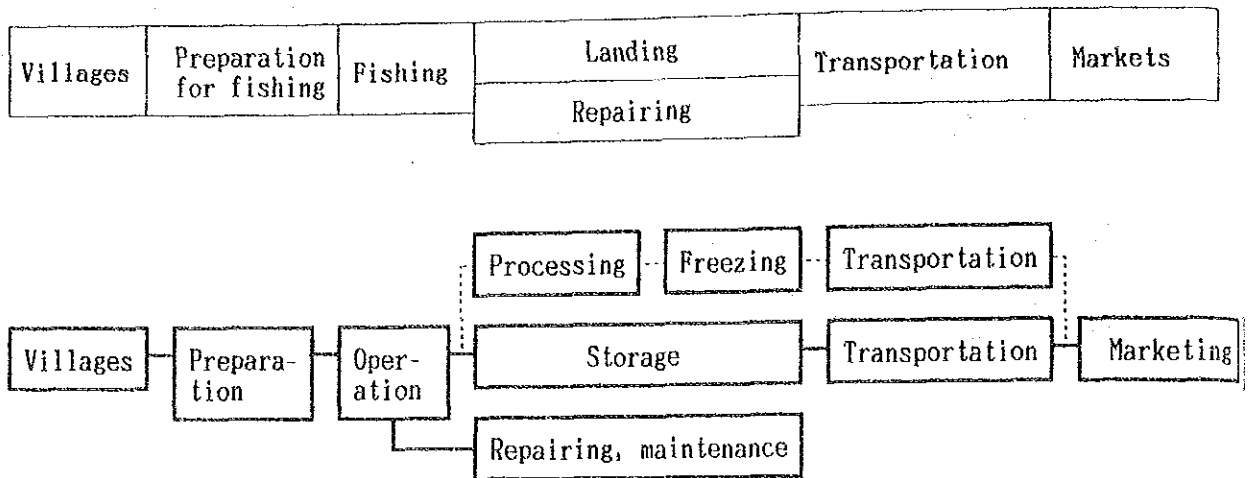
In order to achieve these objectives the required functions of a fishery base

fall largely into 3 categories; the function as a supply base, function as a landing base and function as a repair base.

To fulfil the function of a supply base, facilities, equipment and materials that make it possible to supply fuel oil, ice, water to fishing boats are required. It is necessary for a landing base to have facilities, equipment and materials to receive, select and wash catch, and then to store it keeping its freshness. It is necessary to furnish a repair base with facilities, equipment and materials for repair and maintenance of fishing boats so that they can operate safely in overall capability.

The flow chart of functions above is shown on the following page.

Fig. 17 Flow Chart : Functions of Fishery Center



Contents of Request

- ① Ice-making, Ice storage facility
- ② Water tank, fuel storage
- ③ Generator
- ④ Jetty, shore protection

- ① Fishig boat
- ② Outboard motor
- ③ Inboard engine
- ④ Ice box
- ⑤ Gill net
- ⑥ Bottom long line

- ① Cold storage
- ② Refrigerating machine
- ③ Building for cold storage, processing, etc.
- ④ Processing table
- ⑤ Administration building
- ⑥ Workshop & Warehouse
- ⑦ Slipway
- ⑧ Pavement for parking areas, etc.

- ① Refrigerating truck
- ② Transportation boat for products

Contents of Project

- ① Ice-making, Ice storage facility
- ② Water tank, fuel storage
- ③ Generator
- ④ Jetty, shore protection
- ⑤ Truck
- ⑥ Ice conveyor

- ① Fish box
- ② Ice box

- ① Cold storage
- ② Building for cold storage, processing, etc.
- ③ Administration building
- ④ Repair shop
- ⑤ Maintenance & repair equipment
- ⑥ Slipway, cradle
- ⑦ Pavement for parking areas, etc.

- ① Insulated van
- ② Radio equipment

(4) Modification of the content of the request

1) The following items are cancelled due to the reasons described below.

① Contact freezer

Although suitable for shrimp, this refrigerating system is not suited to freeze croaker and sea catfishes which are harvested in the coastal fisheries. It is judged that at present this system is not necessary for current catch. Besides, the Project does not cover processing and freezing.

② Processing table

The products of the Project are for domestic consumption, not for export.

③ Fishing boats

FRP fishing boats are rather expensive and it seems that there is little possibility for transition from the Guyana/Suriname type fishing boats to the FRP boats in the near future.

④ Outboard motors

These have already been introduced into Suriname. The supply of outboard motors is no longer necessary.

⑤ Inboard engines

In order to install on board the Guyana type boat, the boat must be modified in design.

⑥ Transportation boats

Transportation boats are not necessary because products can be carried by insulated vans from the center to the Paramaribo Market.

⑦ Gill nets

Gill nets are available in Suriname.

⑧ Bottom long lines

These are available in Suriname.

⑨ Refrigeration truck

In Suriname the distribution system for the frozen fish is not established, and the distance between the center and the Paramaribo Market or other consuming areas is rather short.

2) The following equipment and materials are supplemented.

① Cradle for the slipway

A cradle is provided for hauling fishing boats on the slipway.

② Insulated vans

Insulated vans are provided to carry the products from the center to the Paramaribo Market.

③ Radio equipment

Radio equipment is installed at the center, Fisheries Department and Paramaribo Market respectively so that the center can arrange shipment through prompt communications.

④ Service truck

Service trucks are supplied for carrying fish, ice, materials and so on in the center.

⑤ Ice conveyer

In order to make ice loading work efficiency an ice conveyer is furnished in the ice store.

4-2-4 Study of the Requested Facilities, Equipment and Materials

① Mooring facility

In order to fulfil the functions (1) and (2) above it is of necessity to construct a mooring facility at the center. Commewijne District has now 198 Suriname type fishing boats and 22 Guyana type fishing boats. However, 58 Suriname type boats based on Pomona village nearby the mouth of the Suriname River will not use the center. The expected number of fishing boats to call at the center therefore will be 140 Suriname type boats plus 22 Guyana type boats. Based on these figures the scale of a mooring facility should be considered. Taking a method for bringing small Suriname type fishing boats alongside in two rows into consideration, the most suitable scale should be decided.

② River wall

At the proposed site the gravity-type bank protection was executed, but in part superannuated and collapsed. The required length should be decided in accordance with a necessity for protection of the center.

③ Slipway

Suriname has no repair facility for the Suriname type and Guyana type fishing boats. These boats are landed on the beach for repairing and painting at high tide and launched from there. In order to fulfil a function of a repair facility, a slipway is essential for the center. Since the Suriname type boat need not a slipway due to its small size, a suitable one for only the Guyana type boat should be constructed.

④ Cold store

In order to keep catch in good quality a cold store should be constructed. By this the current limited landing hours in early morning (only two hours from 5 to 7 a.m.) at the Paramaribo Market due to tide will be eliminated, and boats will be able to land their catch at the center any time for a whole day. A suitable capacity should be designed based on a quantity of fish landed by the Suriname/Guyana type fishing boats in Commewijne District.

⑤ Ice-making equipment and ice store

Ice is essential for fishing boats. Now there is no ice-making plant in Commewijne District and in Paramaribo ice is in short supply. Fishing boats, in particular the Suriname type boats, will be able to land their catch in fresh state. As a result, fishermen will be able to earn more income. The capacity should be decided in accordance with the conditions concerning the number of fishing boats and their catch in a high fishing season.

⑥ Generator

Commewijne District is now supplied electricity at 12 KV high voltage by an electric company (EBS) in Paramaribo. People is using it after reducing voltage to 220 V/127 V through a transformer on a pole, but the capacity of the transformer, and wiring as well, is serviceable to only domestic use. EBS has a plan to service electricity necessary for the proposed fishery center by late 1993. Until then all of the equipment and machinery must be

driven by generators to be installed in the center. On the completion of a EBS project the generators will be usable in case of emergency. The capacity should be subject to power necessary for the center.

⑦ Fuel oil tank and water tank

While the Suriname type fishing boats and part of the Guyana type fishing boats are using gasoline, generators and refrigerating vans and the remaining Guyana type boats are using diesel oil. Two kinds of oil tank, then, should be constructed. A water tank will be essential for the ice-making plant and fishing boats, and an additional tank to catch rainwater should be provided against the failure of water supply. The required capacity of each tank should be decided in accordance with the requirements of the center.

⑧ Main building, administration building and repair shop

A main building to receive and store fishes landed, an administration building to control the fishery center, and a slipway attached repair shop to repair and maintain fishing boats are essential for the center to fulfil its complete function. Each should be decided based on its necessary capacity, equipment, personnel and so on.

⑨ Pavement

An area, including a parking lot, of 2,500 m² is requested to be paved. The most suitable area should be decided in accordance with the functions of the center.

⑩ Fish box

Fish boxes are used for handling fishes so as not to injure their bodies when fishes are carried from a fishing boat to a cold store, stored in a cold store and shipped by refrigerating van to market. Necessary quantity and dimensions should be decided in accordance with a daily catch, storing quantity, shipment and so on.

⑪ Ice box

An ice box is to be supplied to a Suriname type fishing boat which is

fishing without ice. Its size shall be suitable for the boat to load it on board. Necessary numbers shall be on the number of the Suriname type boats.

Since these boxes are to be sold to fishermen, its sales must be used efficiently for the development of fisheries.

⑫ Truck

One for carrying catch and one for supplying ice should be considered.

⑬ Radio equipment

Radio equipment is used for communications between the fishery center, Paramaribo Market and Fisheries Department in order to support the management of the center. A 150 MHz radio telephone should be provided to each facility.

⑭ Insulated van

A refrigerating van is essential for the center to ship its products to Paramaribo Market. Based on daily average shipment the specifications and quantity of refrigerating van should be decided.

⑮ Winch and cradle for the slipway

The items are used to haul up the Guyana type fishing boat on the slipway. The capacity and quality should depend on the weight of the boat.

⑯ Ice conveyer

In order to make handling ice in the ice store efficiency an ice conveyer is provided.

4-3. Outline of the Project

4-3-1 Implementation Arrangements

The Fisheries Department of the Ministry of Agriculture, Animal Husbandry & Fisheries (LVV) is the implementation agency of the Project and SAIL is to execute the operation and maintenance. SAIL is a national fishing corporation owned by the Government of Suriname, making a business of operating a shrimp trawling fleet, export of frozen shrimps, supply of fishing materials and

repairing fishing boats, and, training fishermen with Japan-granted training vessels. Although operating no small-scall fishing, SAIL has much experience in a fishing base management including processing fish products, running freezing and cold-storage facilities, managing a fishing fleet and repairing fishing boats, and also employs lots of skilled persons in these field. From this point of view, the corporation is most suitable as an executing agency of the Project in Suriname. Also because the corporation is earning hard currency by the export of shrimp, it will be able to procure spare parts, fishing gear and materials necessary for the center to supply to fishing boats.

SAIL employs 230 workers excluding crew members, and is running a shrimp processing plant, cold storage/ice storage/freezing facilities, ice-making plant, repair shop and so on.

The following are its recent sales and balance.

(Unit: 100 million yen)

	1985	1986	1987
Sales	33.3	52.4	63.7
Balance	△ 1.8	6.1	7.0

(1) Staffing plan

A general manager who has broad experience in coastal fisheries and fish distribution will be required for the proposed fishery center. Employees of the center will hold another office concurrently wherever practicable, and some expatriates will be recruited according to positions. The number of staffs required will be as follows;

1) Main Building

Worker in charge of ice (truck driver)	1
Accountant	1
Clerk in charge of marketing (van driver)	2
Clerk in charge of marketing (truck driver)	1
Clerk in charge of fuel oil/water	1
Engineer	1
Refrigerating van driver	1
<hr/>	
Total	8 persons

2) Administration Building

General Manager	1
Sales Manager	1
Accountant General	1
Clerk	2
Night Watchman	2
<hr/>	
Total	7 persons

3) Repair Shop

Engineer	1
Mechanic	2
<hr/>	
Total	3 persons

(2) Transfer to a fishermen's cooperative

There is no fishermen's cooperative in Commewijne District now. The Government of Suriname has an intention to transfer the management of the fishery center from SAIL to a fishermen's cooperative in Commewijne, and fishermen themselves want to manage it in future. Formation of a cooperative needs training. It is desirable that the Fisheries Department and Cooperative Department of the LVV, in cooperation with SAIL, should train fishermen, the direct beneficiaries, in managing the center promptly on the completion of it.

These trained fishermen will be able to run the center after a certain interim period.

4-3-2 Proposed Site and Its Condition

The proposed site is situated at the junction of two rivers, the Suriname and the Commewijne, 13 km far from Paramaribo and 14 km far away from the mouth of the River of Suriname. It is a good stand for a fishing base in that it is located near a major consuming of Paramaribo as well as the fishing ground for the Suriname type fishing boats and provided with necessary utilities such as electricity and water. Of 5 fishing villages covered by the Project 4 villages except Nieuw Amsterdam are lie scattered on the northern bank of the Commewijne river. According to the trend of sedimentation, the proposed site is located on the corrosive side of the river, with a comparatively dull corrosive action, though sedimentation is active on the opposite side of the river.

4-3-3 Outline of Facilities, Equipment and Materials

The following are the major facilities, equipment and materials covered by the Project.

1. Mooring facility	1
2. River wall	1
3. Slipway	1
4. Main building	1
5. Cold storage facility	2
6. Ice-making equipment	2
7. Ice storage facility	1
8. Generator	2
9. Administration building	1
10. Repair shop	1
11. Water tank	2
12. Fuel oil tank	2

13. Exterior work	1
14. Other equipment and materials	
Fish box	1,005
Ice box	140
Truck	2
Insulated van	3
Radio equipment	3
Ice conveyer	1

4-4 Technical Assistance

The coastal fishery in Suriname has, both in technique and management, various problems awaiting solution or improvement. Although shrimp fishermen can get on-the-job training by SAIL on board the Japan-granted training shrimp trawlers, the small-scale fishermen cannot have even such a chance; their fishing methods and fishing gear remain undeveloped.

It may be therefore of necessity for the Government of Japan to send the experts in the following fields so that its economic assistance can produce better results, and the Government of Suriname intends to request Belgium to offer technical assistance due to the problem of language (Dutch).

(1) Management of the coastal fishery base

The expert in this field takes charge of managing the fishery center, and makes it economically and financially viable in a management form of fishermen's cooperative without support of a governmental subsidy.

(2) Fishing methods and fishing gear

In order to modernize the small-scale fisheries, it is necessary to encourage mechanization of fishing and to introduce efficient fishing methods and fishing gear. For this purpose, experts who have long experience in coastal fisheries, fishing methods and fishing gear will be required.

CHAPTER 5 BASIC DESIGN

CHAPTER 5 BASIC DESIGN

5-1 Basic Design Policy

The main point of the basic design policy of the Project is as follows;

- Saving of labor and energy

The proposed fishery center should not be a mere convenient facility. For the management of the center as well as Commewijne fishermen a reduction of expenditure must be the first objective to make the center economically and financially viable. The basic design was made on the basis of this; that is, all of the facilities, equipment and materials should be ones that make it possible to save labor and energy and thus to reduce their running cost.

The Project consists of two components; Facility, and Equipment and Materials. To be concrete, each component was designed in accordance with the following.

- 1) As to the facilities, taking the local construction situation into consideration, reasonable construction methods and materials are adopted.
- 2) Considering the mutual relation with similar existing facilities in Paramaribo, suitable facilities serviceable for the requirements, and not too large in scale, are constructed.
- 3) Facilities concerning civil engineering works are particularly constructed with the most reliable, secure construction methods based on the local natural conditions and construction situation.
- 4) Facilities and equipment that make easy maintenance possible are designed.
- 5) Facilities and equipment capable of meeting the future fisheries development in the Commewijne District are designed.
- 6) The results of the field survey and discussions with the Suriname side are fully reflected in the basic design.

5-1-1 Civil Engineering Work

(1) River wall

The riverside of the proposed site is now protected by a gravity type river wall, but it is being corroded and partly collapsed due to deterioration. A new river wall of the sheet pile construction, a levee crown height of 3.5 m and a length of 65 m, should be constructed to protect the site.

(2) Mooring facility

A pontoon with a access bridge should be constructed so that the Commewijne fishing boats can land their catch and load supplies free the tide.

(3) Slipway

For the Guyana type fishing boats, a concrete panel slipway that makes it possible to pull up them on a cradle should be constructed.

5-1-2 Shore Facilities

(1) Main building

A main building has the functions of receiving, storing and shipping fishes. It should be a one-storied steel frame building with a floor area of 270 m², housing two cold stores (-20°C), each 10 tons capacity, two plate ice-making equipment, each 6 tons capacity/day, an ice store of 30 tons capacity, an anteroom, platforms, waiting room, store, dressing room, toilet, machinery room and generator room.

(2) Administration building

This is the hub of the fishery center to control activities. Also it fulfils the function as a communication center in Commewijne District.

The building is a one-storied steel frame house with a floor area of 131 m².

housing offices, conference room, night watchmen's room and toilet.

(3) Repair shop

This is a facility for repair and maintenance of fishing boats in Commewijne District. It houses an engine repair room, workshop, spare parts store, office and toilet; a one-storied steel frame house of about 180 m² of a floor area.

(4) External work

This includes the banking work of 6,400 m³ in volume in the proposed site of 1 ha in area, and the pavement of 1,437 m² including a parking lot, access roads and outdoor working yard nearby the repair shop. Also the drainage work and exterior lighting work should be added.

(5) Fuel oil tank

Two fuel oil tanks, one is of diesel oil for generators, inboard engine equipped fishing boats and refrigerating vans, and another is of gasoline for outboard motor boats and trucks, are planned. At present apart from Nieuw Amsterdam 4 fishing villages have no oil supply facility at all; village fishermen are obliged to sail to Paramaribo to supply fuel oil, spending 2 hours (12 miles) on a round trip. This trip is affecting their fishing activity as well as daily life. The installation of oil tanks at the center will save their hours, extend their fishing hours longer and make it possible to increase catch. In addition, a blanket purchase of oils will make it possible for the center to supply oils stably as well as to cheapen the oil price.

(6) Water tank

Although a water supply pipe branched off a water main along a trunk road in Commewijne District are laid down in the proposed site, its capacity is not

enough. In order to supply water stably the construction of 2 water tanks is planned; one is to be connected with the city water main for ice-making equipment, drinking water for fishermen and staff members of the center, and another is for catching rainwater to use for toilets or general service.

5-1-3 Other Equipment and Materials

(1) Fish box

At present the handling of fish at the Paramaribo Market is very rude; fishes, raw and half frozen either, are thrown on the concrete yard. In order to control the quality of fish and to raise the landing efficiency, introduction of fish boxes is essential.

(2) Ice box

All of the Suriname type fishing boats are now operating without ice. Even though their operation is on the daily basis, their catch inevitably loses their freshness under such a hot weather condition as Suriname, resulting in being dried or smoked, and also their fishing hours are restricted. Supplying ice boxes to them will make it possible for them to bring back their catch to the center in a raw state.

(3) Truck

Trucks, carrying fishes, ice, materials, etc., can make work in the center efficient. The capacity is designed as 1 ton so that the truck can turn around easily on the mooring facility. The kind of truck should be selected among imported vehicles in Suriname in view of easy-maintenance and availability of spare parts.

(4) 150 MHz radio telephone

In order to make it possible for the center to forward its products profitably