No. 4

BASIC DESIGN STUDY REPORT
ON
FISHERIES DEVELOPMENT PROJECT
IN
SAINT LUCIA

AUGUST, 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

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P R E F A C E

In response to the request of the Government of Saint Lucia, the Government of Japan has decided to conduct a basic design study on the Saint Lucia Fisheries Development Project and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Saint Lucia a study team headed by Mr. Jun-ichiro OKAMOTO, Deputy Director, Long-Distance Fisheries Division, Fisheries Agency, from 29 March to 20 April, 1987.

The team had discussions on the Project with the officials concerned of the Government of Saint Lucia and conducted a field survey in Castries, Gros Islet, Bannanes, Anse la Raye, Canaries, Choiseul, Laborie, Vieux Fort, Micoud, Praslin and Dennery. After the team returned to Japan, further studies were made and the present report has been prepared.

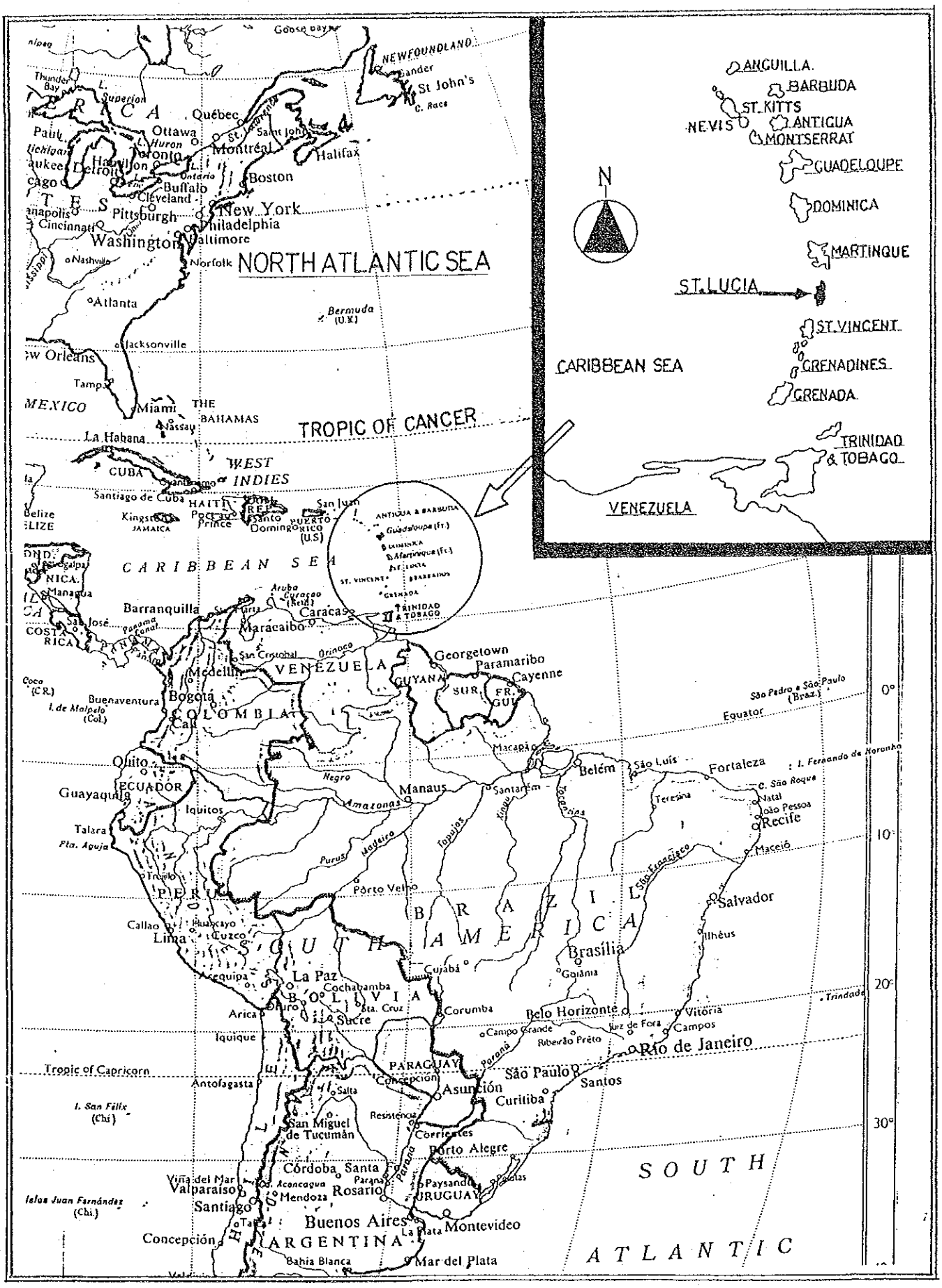
I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of Saint Lucia for their close cooperation extended to the team.

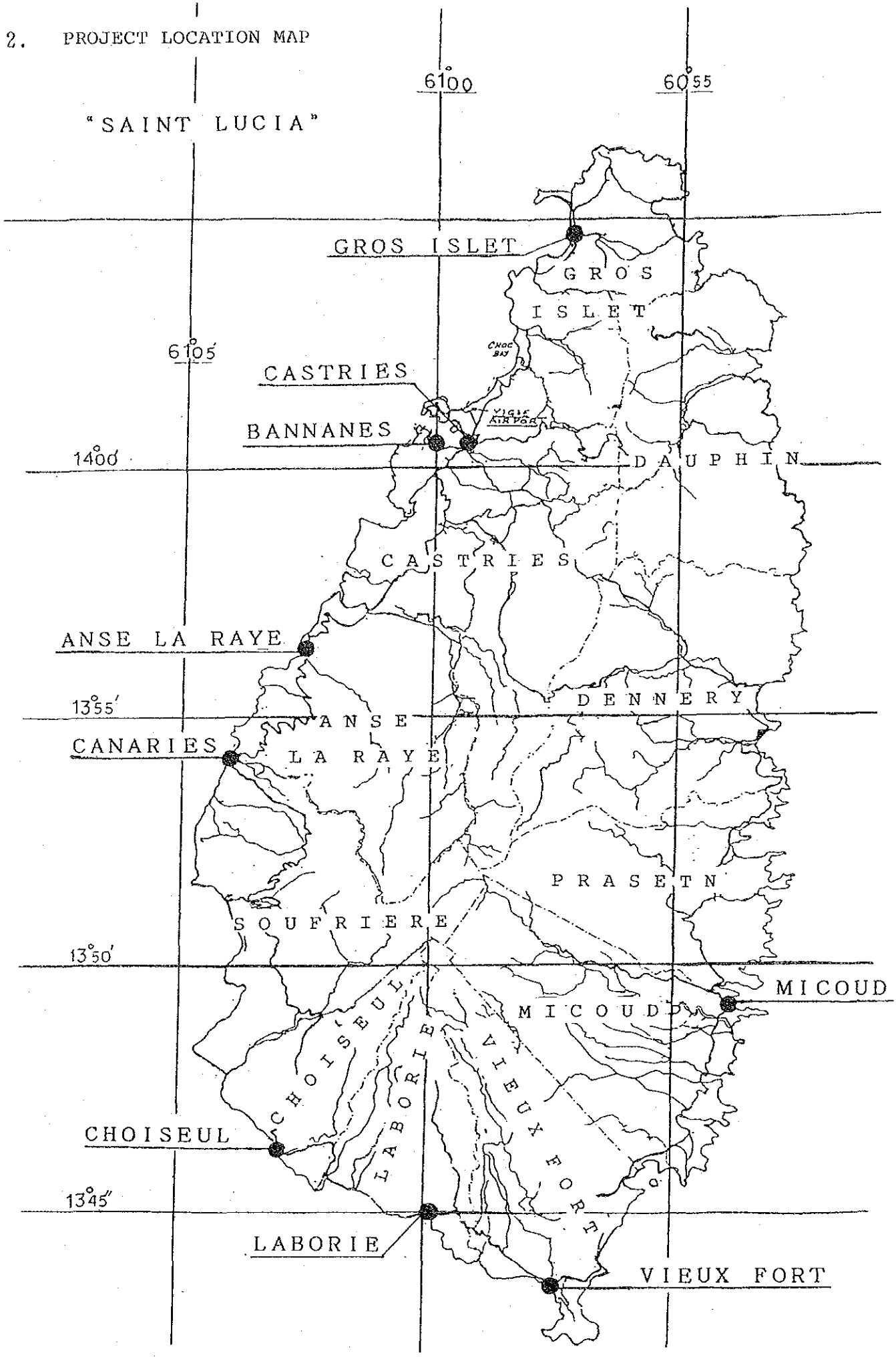
August, 1987

Keisuke Arita
President
Japan International Cooperation Agency

1. SAINT LUCIA



2. PROJECT LOCATION MAP



SUMMARY

S U M M A R Y

St. Lucia is an island country volcanic origin and quite mountainous, among the Lesser Antilles in the Eastern Caribbean Sea. Though its economy depends upon agriculture which is mainly composed of bananas, the Government of St. Lucia has recently put emphasis on attracting foreign investment in the manufacturing industry. At the same time, the tourist industry is also a mainstay of St. Lucia's economy, due to its attractive scenery and moderate tropical marine climate.

The staple foods of the nation are bananas and fish, but St. Lucia depends heavily upon imported foodstuffs, which amount to EC$28.3 million, 24% of all imports, including fish products. Furthermore, despite it being surrounded by the sea, because of lack of fisheries infrastructure and an adequate distribution system, fisheries production is as little as 1,000 tons annually, resulting in the import of the majority of fish products to satisfy domestic demand.
Under these circumstances, the Government of St. Lucia has been implementing a Fisheries Development Plan aiming at self-sufficiency in fish products as protein foodstuffs with the assistance of the Canadian International Development Agency, CIDA, since independence in 1979. The first phase of the plan (1979-1983) has been completed through the assistance of CIDA, which is now formulating a plan for Phase II (1984-1989).

The Government of St. Lucia is desirous of prompt implementation and the assistance of CIDA on the second phase of the plan and, at the same time, has requested the Government of Japan to offer grant aid for improvement of fisheries-related infrastructure at fishing villages, introduction of fishing craft and fishing gear and construction of the Castries Fish Market, which are not duplicated in CIDA's assistance.
In response to the request, the Government of Japan decided to conduct a basic design study on the Project and entrusted the study to the Japan International Cooperation Agency, JICA. JICA sent a survey team to St. Lucia from March 29 to April 20, 1987. The team had discussions with GOSL and CIDA officials and carried out the field survey. As a result, it was confirmed that the implementation of the project is significant for development of the fisheries industry in St. Lucia and would contribute greatly to its national economy. The scale and specifications of the project are as follows;

(1) Fisheries Infrastructure in Fishing Villages

Fisheries-related infrastructure consisting of a canoe ramp provided with a winch system, a fish retail shop, lockers for fishermen, a workshop, and toilet and wash-room facilities shall be constructed at 6 villages; Gros Islet, Bannanes, Anse la Raye, Choiseul, Laborie, and Micoud. This will improve fishermen's living standards. Also, a distribution centre to expand fish distribution to remote agricultural communities shall be constructed at Anse la Raye and Laborie.

(2) Castries Fish Market

The existing fish market at Castries, the capital of St. Lucia, which has 40% of the whole population of the country, has become very filthy due to superannuation. A new fish market with a steel frame structure, covering an area about 21.0m by 15.0m, and an office building plus toilet facilities with a total of 68 square meters in area shall be constructed. Required equipment shall also be provided.

(3) Fishing craft and fishing gear

In order to increase fish production substantially, to promote the replacement of wooden canoes with FRP craft, and to survey and manage fisheries resources within 200-mile EEZ properly, the following shall be provided.

1) 7.6M canoe type FRP fishing vessels (No. I Transition Vessel) ・・・40
2) 7.9M type FRP demonstration vessels (No. II Transition Vessel) ・・・ 3
   8.7M type FRP demonstration vessel (No. II Transition Vessel) ・・・ 1
3) 11.8M type FRP research vessel ・・・・・・・・・・・・・・・・・・・ 1
4) fishing gear and materials for the No. II Transition Vessel and the research vessel.

Details of Facilities and Equipment

(1) Fisheries-related infrastructure in fishing village

Item \ Site	Gros Islet	Bannanes	Anse la Raye	Choiseul	Laborie	Micoud
Canoe ramp (No. of canoes)	1 (20)	1 (25)	2 (15) (25)	1 (40)	2 (30) (35)	1 (20)
Winch	1	1	2	2	3	1
Fish Market	39㎡	—	39㎡	39㎡	58㎡	39㎡
Locker	80㎡ (20 persons)	104㎡ (25 persons)	160㎡ (16 persons) (24 persons)	160㎡ (16 persons) (24 persons)	264㎡ (30 persons) (35 persons)	80㎡ (20 persons)
Toilet & Washroom	40㎡	40㎡	40㎡	40㎡	40㎡	40㎡
Workshop	72㎡	72㎡	72㎡	72㎡	—	—
Destribution Centre	—	—	96㎡ Cold store 1.5t Ice making equipment 2.0t Insulated van 1	—	96㎡ Cold store 1.5t Ice making equipment 2.0t Insulated van 1	—
Remark	Embankment for rampway	—	—	—	Embankment for rampway	—

(2) Castries Fish Market

Item	Facilities
Main building	abt. 21m(L) ×15m(B) = 315㎡ Steel frame structure with a colored metal roof
Attached building	① Office abt. 4m(L) ×7m(B) =28㎡ ② Toilet abt. 4m(L) ×10m(B) =40㎡
Equipment	① Rainfall receiving tank and service water tank 5 tons + 5 tons = 10 tons Unit type ② Marketing stall 36 sets ③ Retail shop of Castries Fisheries Complex abt. 12㎡ ④ Cold store abt. 4m(L) ×4m(B) =16㎡ (−10℃) Prefabricated type

(3) Fishing vessel and fishing gear

Kind of vessel \ Item	Hull Outfittings	Engine Outfittings	Nautical Instruments	Fishing Machinery	Q'ty	Fishing Gear
Canoe Type FRP Vessel (No. I Transition Vessel)	abt. 7.60×1.87×0.75m Dunnage board Anchor 1 set Life jacket 3	Outboard motor 40PS Spare parts	———	———	40	———
FRP Demonstration Vessel (No. II Transition Vessel)	7.90×2.06×0.73m Insulated fish hold Anchor 1 set Life jacket 3	Diesel 34PS Spare parts	Fish finder Tranceiver	Hydraulic miniroller Head lining reel (4)	3	Long line Gill net Trolling line Hand line
FRP Demonstration Vessel (No. II Transition Vessel)	8.70×2.06×0.73m Insulated fish hold Anchor 1 set Life jacket 4	Diesel 60PS Spare parts	Fish finder Tranceiver	ditto	1	ditto
Research Vessel	11.80 ×3.25×1.58m Insulated fish hold Anchor 1 set Life jacket 6 Fire extinguisher 2	Diesel 125PS Spare parts	Fish finder Radar SSB radio telephone	Line hauler Net hauler Hand lining reel (4) Warping end drum (2) Three-way roller	1	Long line Driftnet

The executing government agency of the Project is the Fisheries Management Unit (FMU), Ministry of Agriculture, Lands & Fisheries. This agency is also responsible for the management and control of the proposed facilities and equipment.

From the standpoint of the present technical level, it is concluded that cold stores, ice-making equipment and fishing craft can be handled without difficulties by the local people. Operating costs of each demonstration vessel will be covered by the revenue derived from its catches. Approximately EC$ 22,000 (¥11,420,000) required annually for operation and maintenance of the research vessel plus expenses necessary for long-term training and the smooth supply of various parts will be able to be financed by a budget and revenue.

The increase in fish production resulting from the improvement of fisheries infrastructure and the introduction of FRP fishing craft and improved fishing gear and the expansion of fish consumption through construction of a new fish market at Castries will contribute greatly to the development of the fisheries industry, and then, to national economy of St. Lucia. The team concluded that the Project is valid as a Japanese Grant Aid Project.

CHAPTER 1 INTRODUCTION

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More than half of the supply of fish for local demand in St. Lucia depends on imported fish products and the consumption of fish per capita tends to decrease year by year due to the low level of artisanal fishing activities.

The Government of St. Lucia has requested CIDA to offer an assistance in the development of fisheries industry to promote the domestic demand for fish and to substitute artisanal fish products for imported fish products.

In response to this request, CIDA has carried out the Fishing Development Plan's Phase I since 1976, and now is implementing Phase II for the period 1984 - 1989.

Thus a Fisheries Development Plan was formulated and carried out with the CIDA's assistance, but the Government of St. Lucia has requested the Government of Japan to offer grant aid on a project which is in harmony with the CIDA's assistance.

The project aims at improvement of the fisheries-related infrastructure at fishing villages, introduction of fishing craft and improved fishing gear and construction of a fish market at Castries.

In response to this request, the Government of Japan decided to conduct a basic design study and sent, through the Japan International Cooperation Agency, JICA, a team to conduct a field survey necessary for study of the contents of the request and to hold discussions with St. Lucia's governmental agencies and prepare the most appropriate basic design for the project on the basis of the propriety and effects of grant aid.

The study team headed by Mr. Jun-ichiro OKAMOTO, Deputy Director, Long-distance Fisheries Division, Fisheries Agency, had discussions on the project with the officials concerned of the Government of St. Lucia and conducted a field survey from March 29 to April 20, 1987. The main points of the agreement resulted from discussions with the St. Lucia officials concerned were confirmed in the Minutes of Discussions which were mutually signed.
After the team returned to Japan, further studies and analysis were made and the present report has been prepared.

CHAPTER 2 BACKGROUND OF THE PROJECT

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2 - 1 Nature and Economic and Social Situation of St. Lucia

St. Lucia is an island country in the middle part of the Lesser Antilles fringing the Eastern Caribbean Sea. The islands which stretch northward from Grenada to Dominica are called the Windward Islands and St. Lucia lies 21 nautical miles south of Martinique, 78 miles west of Barbados, 40 miles north of St. Vincent and 205 miles northeast of Venezuela, and has an area of 616 km². The island is volcanic in origin and is quite mountainous in the centre with the highest point, Morne Gimie rising to 959m above sea level. Its terrain includes tropical rain forests and numerous attractive beaches.

Though the climate is described as Tropical Marine, the constant blowing of the northeast trade winds has a tempering effect on the constantly high temperature. The temperature ranges between 24 ℃ and 30 ℃. There are two seasons: a dry season extending from December to May and a wet season from June to November. Rainfall is rather plentiful, annually more than 3,500mm in the mountainous interior, and about 1,600mm on the average. Humidity, which would otherwise be high, is reduced by tempering effects of the trade winds.

The population is about 136,000 at the census of 1985 and the annual increase is estimated to be 1.5 per cent. English is the official language of St. Lucia, but a strong French influence in language and customs still exists and French patois is spoken by most of the people. Christianity is the predominant religion. Over 90% of the people are Roman Catholics and the rest are Anglicans, Methodists, Baptists and so on.

St. Lucia's Gross Domestic Product (GDP) increased from EC$ 314 million (US$116 million) in 1982 to EC$ 388 million (US$144 million) in 1985, revealing a phenomenally high rate of growth for so small an economy. Growth in St. Lucia's economy was dependent on growth in agriculture whose main product is bananas (of which over 80% is exported) followed by coconuts and cocoa.

The breakdown of GDP by major sector (in 1985) shows that Government is still the most important sector (contributing 21.6%), followed by Wholesale and Retail Trade

(15.9%) and Agriculture (15.0%). Although the economy is still heavily oriented toward agriculture, in recent years progress has been made toward diversification including Tourism, Manufacturing and Construction. The economy is expected to continue to grow with the projected economic growth for 1986 being 6 per cent.

2 - 2 National Development Program

The overall development strategy that the Government of St. Lucia is pursing places emphasis on;

- Agriculture
  (1) Increasing production of the principal export crop, bananas, as well as the other traditional crops - coconuts and cocoa.
  (2) Diversifying exports by encouraging the production of high value fruits like mangoes and avocados.
  (3) Increasing food production both for domestic markets and for export.
  (4) Reorganization of the sector through agrarian reform so that farmers can earn a reasonable standard of living. By doing that it is hoped that not only an outflow will be halted, but also that more youth will be attracted back to agriculture.
  (5) Increasing fish production through improved marketing and fish landing facilities and the introduction of advanced technology both in terms of boats and fishing gear.

- Tourism
  (1) Attracting a larger number of tourists from both traditional and new areas.
  (2) Increasing tourist facilities plant to accommodate this increase and encouraging greater local participation in this sector.
  (3) Encouraging the development of tourists attractions and intersectoral linkage to increase the level of tourist spending in St. Lucia.

- Manufacturing
  (1) Providing the necessary infrastructure (roads, water, electricity, telecommunications, factory space) to encourage both local and foreign investment.
  (2) Making available to investors adequate incentives of a fiscal nature to encourage their location in St. Lucia.

(3) Stimulating a climate of favourable industrial relations conducive to the development of industry.
(4) Streamlining the bureaucracy to speed up the process of establishment of new industries.
(5) Providing industrial freezones for industries in areas which are considered to be critical to the overall industrial development of St. Lucia.

- Construction

(1) Continued expenditure on basic infrastructure (roads, electricity, water supply).
(2) Major emphasis on the Housing Sector.

The purpose of the development is to;

(1) establish a firm base for economic growth,
(2) raise and diversify production, exports and employment,
(3) reduce dependence on external assistance,
(4) attain a level of self-sustaining economic growth and development, and
(5) increase the quality of life of the people of St. Lucia.

2 - 3 Overview of the Fisheries Industry and the Existing Problems

The fisheries industry in St. Lucia consists of two major sectors; (1) a primary (harvesting) sector and (2) a tertiary (marketing) sector.
The secondary (processing) sector has been very small in the past and has just begun activity recently with the commencement of operation of the Castries Fisheries Complex.

The fisheries industry in St. Lucia is an artisanal industry utilizing traditional and usually small-scale harvesting technology. The great majority of fishing craft are "canoes", a Carib model fashioned from dugouts of the gommier tree with a planked freeboard. These open boats, measuring 8.5m x 1.5m on the average, have limited capacity to accommodate any sort of advanced fishing gear, have a low catch carrying capacity and limited seaworthiness. Because no ice hold can be equipped to preserve the catch on the existing craft, fishermen are forced to make a day's trip and a high canoe speed is a requirement for quality and market reasons. There is a decided tendency toward the installation of higher horsepower outboard

motors and this results in high operating (fuel) costs. Some 700 canoes, based all around the island, are used in operations with hand-lines for demersal fish or trolling gear for pelagic species. The number of fishermen is about 2,000, 2～ 3 persons/canoe, with two-thirds of them working at part-time fishing. Some 50 per cent of St. Lucia's canoes are owned by working fishermen and the remainder by retired fishermen, vendors and others. Many owners own two or more boats.

The fishery resources available to the industry in St. Lucia fall into two categories, i.e. shelf stocks (demersal and reef species) and migratory (pelagic) stocks. Environmental conditions in the vicinity of St. Lucia are dominated by the north-east trade winds and the westward-flowing equatorial surface current. Due to the mountainous terrain, precipitation causing by the trade winds is heavy and streams are numerous, but these are small and discharge few nutrients. As a result, the productivity of the waters is relatively low, and moreover, the island's distance from the South American coast precludes the benefit from the richer nutrient and highly productive estuarine areas of that continent. However, it has been suggested that an annual catch of 18-40 kg/ha exclusive of oceanic pelagic species is achievable with existing small-scale harvesting technologies on the shelves in Caribbean. This implies that, from a shelf area of some 55,000 ha, the available resources for the fishing industry in St. Lucia lies between 1,000 and 2,200 tons annually, say 1,500 tons. As a result, from the standpoint of the present harvesting level, a potential increase in catches may be expected. As for migratory (pelagic) stocks in St. Lucia, how the local marine climate supports them, despite the wide fluctuation in velocity and salinity of the westward-flowing current, virtually nothing is known. At present approximately 85% of the St. Lucian catch appears to be pelagic fish stocks, including those of the coastal pelagic kingfish (15 per cent) and the oceanic pelagic dolphin, tuna and flying fish (65 per cent). Since there is already concern that coastal pelagics in the Eastern Caribbean are being over fished, an increased catch evidently must rely upon the resources of the oceanic pelagics. However, these resources are subject to exploitation by fishing fleets of other countries at a number of points along the routes of stock migration. Consequently, the potential for additional production within the St. Lucian EEZ depends on international management of fisheries based on such resources.

Fishing activities are concentrated in the good weather season (January to June) when oceanic pelagics are approaching coastal areas, and when peak landings occur, marketing and distribution problems are often created. The period from July to

December is the low season which has a good deal of unemployment because of the inactivity of canoes. Trips to the fishing grounds are made on average thrice weekly. "Landing Records in 1986" are given in Appendix Ⅶ. It shows that more than 75% of the landings in St. Lucia are concentrated in the six months from January to June.

As mentioned above, the major species landed in St. Lucia consist of tuna, dolphin, kingfish, flying fish and sharks. The landings by species are shown in the table below, and common fishes of St. Lucia are given in Appendix Ⅷ.

Landings by species (1980 - 1983)

Unit: kg

Year	Tunas	Dolphin	Kingfish	Flying fish	Sharks	Others	Total
1980	194,850	188,550	117,000	243,000	19,350	353,250	1,116,000
1981	213,300	216,450	93,150	132,750	20,250	223,200	899,100
1982	255,150	259,200	133,650	106,650	16,200	157,050	927,900
1983	72,900	147,150	75,150	95,850	5,850	110,700	507,600

Source: FMU (Fisheries Management Unit)

Fish is a popular food product in St. Lucia, and, since there is a remarkable preference for fresh fish (mainly because of changes in color and taste in dolphin, barracuda and the like when iced or frozen), the local population would consume more artisanal fish if these were available. As a result, considerable fish products must be imported during the low season when artisanal fish is lacking. Main items of imported fish production are salted codfish, canned fish, chilled or frozen fish, smoked fish, dried fish, etc., and imports amounted to 480 tons (EC$ 2.9 million) in 1982 and have a tendency to increase.

The market structure of the artisanal fishing industry of St. Lucia is simple. The fishermen either dispose of their catch themselves or have vendors sell it for them. In Castries where all the facilities for marketing exist, marketing is done mainly by vendors. In the smaller towns and villages, fishermen usually market their catch themselves, utilizing facilities such as sheds and stalls owned by the town or village councils. Where there are no facilities at all, even the roadway is used. Fish landings exceeding immediate market requirements are often sent to Castries, the hub of the marketing system in St. Lucia. However, as a result of the inadequate fish holding capacity throughout the country, there is a loss of fish during the glut period and fishermen receive lower prices for their fish despite

the controlled pricing system. The marketing problems as far as the vendors concerned are caused by price fluctuation which depends on supply and by lower prices; that is, when fish has to be held over and sold in the iced or frozen state, the vendors are obliged to market these fish at lower price than that of fresh fish regardless of the increased costs for preservation and the resulting loss of weight because of consumer's preference for fresh fish.

Fisheries development has been given high priority status only over the last ten years. As a result, infrastructural facilities and services for fishermen are wholly deficient in St. Lucia. Navigational aids, e.g. beacons marketing the entrance to harbours, wharves, jetties, and the like for off-landing catches and the shipment of supplies are lacking at most location. Supporting facilities and services ashore (canoe ramps, petrol outlets, lockers, repair shops, etc.) are available at very few locations, cold storage facilities are provided at the Castries Complex only, ice-making plants are provided at Castries and Soufriere. The lack of fisheries infrastructure is the major impediment to fisheries development in St. Lucia.

2 - 4 Fisheries Development Program and Foreign Aid

Despite the small contribution of fisheries to St. Lucia's GDP (1.6%), the industry provides income and employment to many fishing communities and contributes significantly to St. Lucia's protein needs. In fact, both fishing and agriculture constitute the only means of livelihood in most coastal communities which suffer from economic and social isolation.

Since the late 1970's the Government of St. Lucia has recognized the importance and contribution of the fishing industry to the economic and social well-being of the nation, and the Government continues to strive to achieve the following objectives relevant to the fisheries sector; (a) provision of cheap protein food to the population in order to overcome problems of protein deficiency, (b) improvement of the social and economic conditions of fishermen and the fishing communities, (c) provision of adequate marketing, processing and distribution of locally caught fish, and (d) reduction of the high fish import bill. As a result, the Fisheries Development Plan (1984-89) was formulated in 1976. The Plan consists of three major components as follows;

(1) Training St. Lucians in fishing management, fishing techniques and boat-

building,

(2) Improvement of fishery-related infrastructure such as wharves and storage facilities, etc., and

(3) Construction of a fishing "complex" at Castries and organization of a distribution system for the production from this complex and outstations.

In order to implement the Plan, the Government of St. Lucia has requested the assistance of the Canadian International Development Agency (CIDA).
In response to this request, CIDA has analyzed the fisheries situation and pointed out the main policy issues arising from the findings as follows;

1) The exploitation of demersal and pelagic species in the off-season must be encouraged by the introduction of new technology. This will require improved fishing boats and equipment and training of fishermen. Given St. Lucian conditions, the most effective fishing boat will be one capable of fishing for a few days with adequate capacity for holding fish (ice holds) -- Transition vessel No. I. However, fiberglass boats of lengths similar to the existing canoes will offer the best prospects for success in getting fishermen away from the canoes promptly -- Transition vessel No. II.
2) Adequate facilities for the distribution and short-term storage of fish must be provided. This involves the construction of fisheries centres with facilities for the marketing of fish and the holding of ice until they can be carried to the Castries Complex, as well as other facilities for fishermen (canoe ramps, oil/gas outlets, gear storage, etc.)
3) Training must be expanded and conducted on such areas as fisheries management, technological development, co-operatives, processing and marketing of fish, and information/communication management.

Based on the policy issues mentioned above, CIDA recommended concretely the following points.

1) (a) Technology required for operations in deep waters should be introduced as rapidly as possible.
   (b) Demonstration of and training in the use of such technology should be expedited.
2) (a) Measures should be instituted to provide adequate services i) for the fishing fleet, e.g. harbour-approach markers, canoe ramps, lockers, repair shops, fuel/ice outlets, etc., and ii) for fish vendors and consumers, e.g. facilities for marketing (cutting, icing, display, storage

and transport.)

(b) At Vieux Fort and Dennery, depots for large-scale holding and transhipment of fish (i.e. substations of the Castries Complex) should be constructed.

3) (a) Programmes should be designed by means of appropriate training to develop a cadre of co-operative organizers and managers.

(b) The co-operative organization should be strengthened.

4) (a) To improve skills and productivity, fishermen should be given an opportunity for training.

(b) To develop skills on broader academic basis, certain staff members of the FMU should be given an opportunity to train at institutions abroad.

5) The Government of St. Lucia should approach foreign agencies to provide financial and technical support for the Plan.

Of the three major components of the Fisheries Development Plan (1984-89), part of the first component and the third one have been almost completed with the assistance of CIDA, and St. Lucia now has one of the most effective fisheries-management units in the Eastern Caribbean. Construction of the Fisheries Complex at Castries was completed in December 1984 and the complex is now fully operational. Also CIDA is giving support for the construction of large-scale holding and transhipment facilities at Vieux Fort and Dennery, further upgrading of the Fisheries Complex and the provision of vessels and training to the fisheries sector. Now the Government of St. Lucia has requested the Government of Japan to offer grant aid to implement a part of the plan which has not been executed yet.

2 - 5 Requests of the Government of St. Lucia

The request of the Government of St. Lucia contains the following items of the Fisheries Development Plan, not duplicating the CIDA's assistance.

(1) Construction of fisheries infrastructure at the following sites.

1) Anse la Raye

Anse la Raye is a small fishing village with a population of some 6,000. There exists in the vicinity of Anse la Raye many small agricultural communities which do not have access to fish. It is therefore proposed that the following facilities and equipment shall be provided.

a) canoe ramps and a winch system.

b) toilet and washroom facilities for fishermen.

c) storage lockers.
d) freezer facility (1,590 kg).
e) one distribution vehicle.

2) Canaries

Canaries, a small fishing village with a population of about 2,500, is located to the south of Anse la Raye. Many small agricultural communities which do not have access to fish exist in the vicinity, similar to the case of Anse la Raye. To improve this situation the following facilities and equipment shall be provided.

a) canoe ramps and a winch system.
b) toilet and washroom facilities for fishermen.
c) one distribution vehicle.

3) Choiseul

Choiseul is situated at the mouth of a river in the southern part of the island. In 1984, on account of a hurricane many canoes were lost and the canoe parking area was damaged. Choiseul has not recovered yet from this damage. In order to improve this situation the following shall be provided.

a) canoe ramp and a winch system.
b) toilet and washroom facilities for fishermen and vendors.
c) storage lockers for fishermen.
d) fishermen's workshop
e) relocation of the existing co-operative's fuel depot to the proposed site.

4) Laborie

A fishing base in the southern part of the island. There is a small fish filleting and cold storage plant. In order to meet peak production levels, the facility shall be expanded and distribution facilities for many remote communities shall be improved.

a) expansion of the cold storage facilities
b) a small fish market,
c) locker rooms for the fishermen's equipment,
d) canoe ramps and a winch system,
e) toilet and washroom facilities,
f) one insulated van.

5) Bannanes

Bannanes is a small fish landing site across the Castries Harbour from the Castries Fisheries Complex. Since the present facilities are wholly inadequate, the following facilities shall be provided.

a) canoe ramp and a winch system.
b) toilet and washroom facilities for fishermen.
c) storage lockers for fishermen.
d) fishermen's workshop.

6) Gros Islet

Gros Islet bordering Rodney Bay is the only fishing village to the north of Castries. There exists fish landing facilities, an open fish market and toilet facilities, but these are all inadequate. The following facilities shall be constructed behind the yacht channel to the south of the village.

a) canoe ramp with a winch system for the twenty traditional fishing canoes.
b) small fish market.
   8 market stalls (2m each), 20 locker rooms of $8m^2$, toilets and washroom for 20 crew members.
c) small chill store (1,500 lbs, 675 kg) or fish box with ice for overnight storage.
d) fuelling station with a simple wooden jetty.

(2) Boat Yard Facilities at Vieux Fort

The majority of carib canoes in St. Lucia are locally constructed, and the use of canoes fashioned out of dug-out trunks has taken a considerable toll on the forest reserves. Continued use of these dugouts threatens to totally destroy St. Lucia's forest reserves and cause a decline in water resources. At the same time, it is vital to switch from the canoe to new types of craft in order to increase production by the introduction of new technology. It is therefore proposed that boatyard facilities for the No. 1 Transition Vessel (FRP boat) be constructed. The boat-building yard project comprises the following;

1) a steel shed 26m×20m for boat construction purposes.
2) an administration/storage/toilet block 18m×9m
3) chain link fence to enclose the boatbuilding yard.
4) machinery and equipment.

(3) Research/Demonstration Fishing Vessel

1) Two "No. I Transition Vessels".
2) Two "No. II Transition Vessels".
3) Fishing gear for the above-mentioned vessels.
   longline, trolling gear, gill net, pot fishing gear and seining net.

(4) Reconstruction of the Castries Fish Market Facilities

The Castries Fish Market is part of the Castries Central Market, which is the single most important focal point for the social interaction of rural and urban populations and also is a point of cultural exchange that is indigenous to the St. Lucian economy and life style. However, the Market, being constructed in 1893, has become superannuated and cramped. It is therefore proposed that the Market be reconstructed and equipped with the following facilities;

1) Fresh fish and produce stalls
   This will consist of a steel frame structure of 3,914 ft^2 (362m^2), with a roof and open sides. The floor will be cast in cement to allow for easy cleaning.
2) Processed fish stall
   36 stalls with display counters.
3) Drainage works
4) Car parking area
5) Canoe ramp for 4-6 fishing canoes

CHAPTER 3 CONTENTS OF THE PROJECT

CHAPTER 3. CONTENTS OF THE PROJECT

3 - 1 Objectives

The mainstay of St. Lucia's economy has been the export crops such as bananas, coconuts, etc. and tourism. However, in recent years, the Government of St. Lucia has put emphasis on industrial development and encouraged foreign investment in order to reduce its dependence on agriculture. Despite its large contribution to satisfying the nation's protein needs, the fishing industry in St. Lucia constituted only 1.6 percent of GDP and employed only 5.8 per cent of the labour force and average income per fisherman was about EC$3,000 (US$1,111), as little as less than one third of the average income per person working in St. Lucia in 1982, and fishermen are suffering now from economic and social isolation. Under such an economic situation, it must be said that a project aiming at improvement of fishermen's livelihoods through increasing catches and income is of deep significance.

The present project aims at promotion of the development of the fishing industry in St. Lucia, and the objectives of the Project are as follows;

- Improvement of fisheries-related infrastructure to form the foundation of the fisheries industry.
- Introduction of FRP fishing craft and improved fishing gear to increase productivity.
- Extension of fish consumption through improvement of the distribution system with the Castries Fisheries Complex as the hub and reconstruction of the Castries Fish Market.

In order to achieve these objectives, the proposed facilities and equipment under the Project must be balanced and function organically in each sector of production, distribution and consumption.

3 - 2 Contents of the Request and the Basic Conception of the Project

Examination of the contents of the request was made in the order of priority given by the Government of St. Lucia.

3－2－1　Fisheries Infrastructure Improvement Plan

Conforming to the objectives of the Project aiming at improvement of the fishermen's economic and social standing, the survey team has conducted a field survey on the fishermen's living conditions, fisheries-related infrastructure and the actual situation of distribution in seven fishing villages included in the request; Gros Islet, Banannes, Anse la Raye, Choiseul, Canaries, Laborie and Micoud.
As a result, the team recognized the necessity of construction of a safe and serviceable canoe ramp and canoe parking area provided with a winch system capable of hauling canoes from the water by machine in stead of human power, fishermen's lockers for fishing gear, and toilet and washroom facilities imperative for sanitation control at six villages except Canaries. At Canaries, the proposed site is too narrow and is in danger of flooding during the rainy season because of its location on a river, and since there is no alternative site here, the plan for Canaries was cancelled after discussions.
As for the improvement of fish distribution, in order to transport surplus fish systematically from landing points to remote agricultural communities and populous Castries, distribution centres provided with an insulated van and which is managed by the Castries Fisheries Complex shall be constructed at Anse la Raye and Laborie where they can distribute the surplus from western fishing villages situated inconveniently and remote from the major distribution channel. At the same time, the construction of distribution centres will bring forth a substantial increase in fishermen's incomes resulting from improvement in the quality of their catches. However, since the new distribution system with the Castries Fisheries Complex as the hub has just been set up, it is concluded that the distribution centres should be constructed on as small a scale as possible.

3－2－2　Castries Fish Market Rehabilitation Plan

The Castries Central Market, including a fish market, is government-owned and controlled by the Castries City Council. The main building contiguous to the fish market was built in 1893 and is now utilized to display and sell craft works and foodstuffs. The Government of St. Lucia has a plan for reconstruction of a commercial area of 2.3 ha including the Castries Central Market consisting of the main building, Fish Market, Abattoir, Coal Market, etc. According to its master plan, the main building is to be improved, and a fish market, a meat market, and a foodstuffs market are to be newly build, and also a busterminal and a public garden are

to be arranged.
The existing fish market has become narrow and is unhygienic. The project aims to construct new market facilities and a new public lavatory to improve the narrow and unsanitary circumstances in the master plan for reconstruction of the Central Market, and it will contribute to the improvement of the environment. The scale and specifications of the proposed fish market were decided on the number of marketing stalls which are now insufficient for vendors, and also the necessity of a cold store was examined. Furthermore the scale and arrangement of an office building to control the Market and a public lavatory was examined.

3 - 2 - 3 FRP Fishing Boat Building Facilities Plan and FRP Fishing Boat and Fishing Gear Introduction Plan

The fishing industry in St. Lucia is an artisanal industry, i.e. an industry composed of private enterprises using a traditional Carib model canoe and small-scale fishing gear. Being influenced by weather and sea conditions, canoes are less serviceable, fishermen are forced to conduct one-day trips due to the lack of storage facilities on board, and fuel expenses due to the use of high-power outboard motors are detrimental to profitability. The Government of St. Lucia plans to introduction FRP fishing craft which can carry storage boxes necessary for maintaining the freshness of catches and which have greater seaworthiness and fishing capabilities to substitute for traditional wooden canoes, and, for this plan, the GOSL has requested grant aid to construct FRP fishing boat building facilities at Vieux Fort, the largest fishing base in St. Lucia. The team conducted a field survey at Vieux Fort but could not find any suitable site. Furthermore, taking the lower technological level in St. Lucia and the economic vulnerability of the boatbuilding industry due to the poor purchasing power of fishermen into consideration, the team concluded that, for the time being, introduction of foreign-made FRP boats is more reasonable than constructing FRP boats independently. Thus, this plan was cancelled after discussions with the St. Lucia side.
An alternative plan agreed upon by both parties was the supply of 40 FRP canoe type boats which local fishermen greatly desire and which in future will replace the existing fleet of about 700 wooden canoes - No. 1 Transition Vessel. These FRP boats shall be leased to those who are running their fisheries enterprises successfully, and finally be sold to them, and the revenue shall be used for fisheries development in the country.
FMU shall take charge of the guidance, diffusion and operation related to FRP fish-

ing boats, including these boats.
In addition, four FRP demonstration vessels and one FRP research vessel shall be supplied. Demonstration vessels will be distributed among 4 respective districts where FMU extension officers are stationed. The extension officers will conduct demonstrations and give directions using the granted fishing-gear. The research vessel, being based on Castries, shall carry out resource surveys and management within St. Lucia's 200-mile Zone. All of the vessels shall install an inboard diesel engine to save time and labor in fishing operations and will be expected to develop reasonable measures suitable for the present fisheries conditions to realize stable operations during the low season. The maintenance of these craft, the team concluded, is not a problem because St. Lucia has a Coast Guard-owned repair shop capable of repairing small craft.

Fisheries resources in St. Lucia seem to mainly consist of migratory pelagic species which are distributed more abundantly on the Atlantic side than on the Caribbean side. On the other hand, demersal species seem to be limited due to St. Lucia's narrow shelves of 55,000 ha in area which have rather low productivity. Under the circumstances, the exploitation of resources, both pelagic and demersal, must be carried out carefully with a mind to conservation and their optimum utilization. Through judging the fishing gear and methods presently used by fishermen in St. Lucia, the introduction of mass-catching type fishing gear is not suitable, and the team approved the requested fishing gear for the demonstration/research vessels as the first step toward improvement. It is hoped that the GOST will positively forward the diffusion of new fishing methods by using is fishing gear.

3-3 Outline of the Project

The Project is grouped into the 3 components of the Fisheries-related Infrastructure Improvement Plan in fishing villages, the Castries Fish Market Rehabilitation Plan, and the FRP Fishing Craft and Fishing Gear Introduction Plan, and the outline of the Project shall be described as follows.
The Central Planning Unit (CPU) within the Ministry of Finance and Planning takes charge of formulation of the Fisheries Development Plan and approaching foreign agencies for their support, and the Fisheries Management Unit (FMU) within the Ministry of Agriculture, Forestry, Lands, Fisheries and Co-operatives (MOALF) takes charges of implementation of the plan.

3－3－1　Fisheries Infrastructure Improvement Plan

The proposed project consists of the construction of fisheries-related infrastructure at 5 fishing villages on the western coast facing the Caribbean Sea; Gros Islet, Bannanes, Anse la Raye, Choiseul and Laborie, and one village of Micoud on the eastern coast facing the Atlantic Ocean. It aims at improvement of the fishermen's economic and social standing, and the construction of distribution centres at Anse la Raye and Laborie, aiming at the expansion of fish distribution to remote agricultural villages. The former project will be managed by the fisheries cooperative at each fishing village and the latter, as substations of the Castries Fisheries Complex, will be controlled by the FMU.
The details by site are given below.

Item \ Site	Gros Islet	Bannanes	Anse la Raye	Choiseul	Laborie	Micoud
Canoe ramp (No.of Canoes)	1 (20)	1 (25)	2 (15) (25)	1 (40)	2 (30) (35)	1 (20)
Winch	1	1	2	2	3	1
Fish retail shop	8 sets	—	8 sets	8 sets	12 sets	8 sets
Locker	20 persons	25 persons	40 persons	40 persons	66 persons	20 persons
Toilet & Washroom	〃	〃	〃	〃	〃	〃
Workshop	12 × 6m	12×6m	12 × 6m	12×6m	—	—
Cold store	—	—	1.5t	—	1.5t	—
Ice-making equipment	—	—	2t/day (plate ice)	—	2t/day (plate ice)	—
Insulated van	—	—	2.5t	—	2.5t	
Fish box	—	—	2 types 6 p/s each	—	2 types 6 p/s each	—
Remark	The sea front is ragged.	—	The site functions as a distribution centre.	Canoes are hauled at two stages.	As well as Anse la Raye	—

(1) Fisheries Infrastructure Improvement Plan

1) Canoe Ramp and Winch System

All existing canoe parking areas in St. Lucia occupy rather narrow spaces and face the open sea, and many canoes have been often lost due to hurricanes. It is of urgent necessity for fishermen to construct a serviceable canoe ramp with a winch system. The proposed sites are divided into two categories; one is located, as at Gros Islet, Bannanes, and Choiseul, inside an inlet or a river mouth and the other is, as at Anse la Raye, Laborie, and Micoud, facing the open sea.

① Sites inside an inlet or a river mouth

- Gros Islet

  This is a fishing village located to the north of Castries. The existing canoe ramp is situated on the sand beach in the north of Rodney Bay but is so narrow that many canoes have been destroyed due to hurricanes. The proposed site shall be an area in the north of a channel to the yacht harbour. The depth of the channel in front of the site is sufficient, but a lot of rocks submerged under the water must be removed. The proposed canoe ramp is planned for 20 canoes.

- Bannanes

  The existing landing site is situated on the shores of the Bannanes Harbour facing the Castries Fisheries Complex in the Castries Harbour and is located on the St. Lucia Air & Sea Port Authority property. The proposed site shall be constructed on the master plan for the Castries Harbour Front Re-development Plan. The depth of the waterside of the proposed site, which is now a plain, is sufficient and a rampway for 25 canoes shall be constructed after leveling of the ground and one winch shall be installed.

- Choiseul

  The proposed site is situated in the northern mouth of the Choiseul River. There is a concrete bank and it must be demolished to haul canoes from the water at two stages. Since a sandbank occupies the river mouth partly, two winches shall be installed at the canoe parking area and the pulling wire shall be led through two blocks, one placed at the river mouth and another placed in the river in front of the rampway.

② Sites bordering on the open sea

- Anse la Raye

  Two rampways, one for 25 canoes and another for 15, shall be constructed on each sand beach extending north and south, centering around an unused jetty. Sleepers shall be of a movable type so as not to spoil the beauty of the sand beach. Each site shall be provided with one winch.

- Laborie

  The proposed site is extended north of rows of piles of an old jetty and its sand beach presents spectaculor scenery. Two rampways to accommodate up to 30 canoes and two other rampways for 35 canoes, totalling 4 rampways, shall be constructed. Sleepers shall be of a movable type for the same reason as at Anse la Raye. Three winches shall be installed and the hauling method by which canoes anywhere can be hauled from the water shall be applied alike at every site.

- Micoud

  Micoud is the only fishing village, the Project located on the eastern coast of the island included and its site is a sand beach facing the Atlantic Ocean. The same rampway structure and winch system as at other sites shall be applied. A rampway for 20 canoes shall be installed and a winch shall be provided.

2) Other facilities and equipment

Fishermen in St. Lucia are now selling their fish on sand beaches, their catches being exposed to the direct rays of the sun. To improve this selling method, a fish market provided with 8 to 12 marketing stalls on which they can wash and gut fish shall be installed at each site in order to keep the freshness of fish and make sale more hygienic. In addition, lockers equal to the number of canoes shall be constructed to store fishing gear and outboard motors and the like, and, for the fishermen's well-being, a workshop and toilet and washroom facilities shall be provided near the canoe ramp at each site.

(2) Distribution Centre

The self-sufficiency rate of fisheries in St. Lucia stood at 44 per cent on the average in 1982. The mean self-sufficiency rate of fishing villages except for the 2 villages, Vieux Fort and Dennery which have surpluses for export to Castries,

is 22 per cent. Out of six fishing villages proposed in the Project, only 3 villages have a self-sufficiency rate larger than 22%, i.e. Micoud (38.7%), Anse la Raye (36.4%), and Laborie (55.1%). However, since Micoud is placed on a major distribution network, it seems that fishing villages which have rather large self-sufficiency rate are only Anse la Raye and Laborie in spite of the general shortage of fish. Furthermore, while these two villages at the western coast stand isolated from the major distribution channel, there exists in the vicinity of them many small agricultural communities. Accordingly, the team concluded the construction of distrubution centres controlled by the Castries Fisheries Complex at Anse la Raye and Laborie is reasonable in view of the expansion of fish distribution.

1) Building

The scale and function of the distribution centres shall be basically common to Anse la Raye and Laborie, and they shall be constructed similarly to the existing flying fish processing factory at Laborie. Inside the building, simple processing equipment and a cold store capable of keeping 1.5tons of fish to export surpluses to remote agricultural communities and the Castries Fisheries Complex and ice-making facilities, with a capacity of 2 tons/day, for FRP fishing craft and daily use shall be installed.

2) Equipment

Each distribution centre shall be provided with the following equipment so as to be able to fulfill the function above-mentioned.

An insulated van capable of carrying a maximum load of 2 tons, e.g. 1 ton of ice and 1 ton of fish, in order to transport fresh fish, and six large fish boxes and six small fish boxes, totalling 12 boxes, to retain the freshness of fish landed by canoes, and also, the necessary plastic baskets, desks, chairs, and lockers shall be provided.

3－3－2 FRP Fishing Craft and Fishing Gear Introduction Plan

(1) Canoe Type FRP Fishing Vessel (No. I Transition Vessel)

The fishing fleet of St. Lucia consists mainly of Carib model wooden canoes equipped with outboard motors, totalling about 700 including 540 registered craft as in the below Table.

Number of Canoes and Fishermen (April 1987)

Village	Canoes	Fishermen	Membership of Co-operative
Castries	80	250	136
Choiseul	60	180	86
Dennery	62	194	106
Gros Islet	20	64	38
Laborie	45	135	77
Micoud	20	40	26
Anse la Raye	40	120	78
Canaries	20	75	–
Soufriere	98	210	84
Vieux Fort	95	320	157
Total	540	1,588	788

Source: FMU

Note: 300 to 500 part-time fishermen are excluded from the Table.

FRP fishing boats now employed in St. Lucia's fisheries were purchased from Martinique where FRP craft are built locally. To substitute FRP craft for wooden canoes is in conformity with the policy of conservation of St. Lucia's forest reserves and water resources. The following Table shows the demand for replacement of canoes during the period 1985-1989.

Canoe Replacement Needs, 1985 - 1989

		1985	1986	1987	1988	1989
Canoe Replacement Needs - No.		40	45	50	55	60
a.	By Piroque-Type Craft	40	40	40	40	40
	Estimated Cost					
	10,000 Yen	5,040	5,191	5,346	5,507	5,670
	EC$ (1984)	560,000	576,800	594,080	611,920	630,280
b.	By Decked Craft	–	5	10	15	20
	Estimated Cost					
	10,000 Yen	–	1,386	2,864	4,425	6,078
	EC$ (1984)	–	154,500	318,270	491,730	675,300
Total	10,000 Yen	5,040	6,577	8,210	9,932	11,748
	EC$ (1984)	560,000	731,300	912,350	1,103,650	1,305,580

Note: Vessel costs are projected to increase by 3% a year during the period.
EC$ 1 = Yen 90.

The proposed FRP fishing vessels, numbering 40, are not only similar to existing canoes in size and equipped with an outboard motor, but also have better seaworthiness and stability and are capable of carrying insulated fish boxes to take fresh fish back. Therefore, the team concluded that replacement with FRP canoes is easy for St. Lucia's fishermen.
Regarding management of these vessels, as described in the previous section 3-2 "Contents of the Request and the Basic Conception of the Project", a kind of fund financed by the rent of the 40 vessels shall be established to assist in carrying out the fisheries development plan or to maintain and control the granted fishing gear and equipment, including outboard motors.

(2) Flash-decked Type FRP Demonstration Vessel (No. II Transition Vessel)
Considerable attention has been given to determining the appropriate size and type of fishing craft needed by St. Lucian fishermen by international agencies such as the F.A.O. As a result, the Government of St. Lucia decided that it should be a boat equipped with an inboard diesel engine, larger than the existing canoe in size, based on the experience of fisheries on other islands such as Barbados, St. Vincent and Grenada. The proposed vessels, similar to the existing canoe in size, are

divided into two categories, the 7.9M type and the 8.7M type. The former type shall be distributed to 3 villages, Castries, Soufriere, and Vieux Fort, and the latter shall conduct tours for guidance in fishing techniques and other activities. The features of the demonstration vessels are as follows;

① An inboard diesel engine consume gas oil which is cheaper in price than petrol used by an outboard motor.

② An inboard diesel engine can be used to drive fishing machinery as well as to propel the boat.

③ Various fishing gear can be used by fishing machinery, so a rapid increase in catches can be expected.

④ The increase in catches can be expected by fishing method using live bait kept in a bait tank and improvement of the quality of fish is achievable by the installation of ice holds.

To improve techniques, the FMU will take charge of all the vessels for the time being and use them for demonstration purposes.
Also the FMU extension officers will provide the following services to local fishermen in the districts of which they have charge.

- introduction of and instruction in the handling and use of modern fishing gear and methods,
- securing safety at sea,
- improving the standard of living of fishermen and guidance in selling and quality control of fish,
- registering fishermen and fishing craft, and
- enforcing fisheries laws.

The demonstration vessels will belong to the Training & Technology Branch within the FMU, and be financed sufficiently by a national budget plus 40% of proceeds after deducting the direct costs such as fuel expenses and provisions.

(3) FRP Research Vessel

The research vessel is to be based at Castries and engaged in marine research, resource surveys, conservation of resources within St. Lucia's 200-mile EEZ, and patrol of the island. Since the FMU officers and biologists on board must carry out various duties, besides accommodations for them, nautical instruments, a wireless telephone, a fish finder and fishing machinery such as a line-hauler, a net hauler and a hand reel shall be provided so as to enable them to do work efficiently.

(4) Fishing Gear

The sort and type of fishing gear to be used by the demonstration/research vessel shall be decided on the following basic policy. First, fishing gear for the demonstration vessel must be that which St. Lucian fishermen will be able to operate profitably on a commercial basis in future. Second, fishing gear for the research vessel must be for research and the exploitation of all fisheries resources including migratory pelagic stocks because the vessel is bigger in size and has a larger capability than the demonstration vessels.

3-3-3 Castries Fish Market Rehabilitation Plan

At the fish market of Castries, St. Lucia's capital which has the largest fish consuming population, vendors are dealing in 170 tons of fish annually including landings at Bannanes plus catches transported by sea from Gros Islet, Anse la Raye, and Canaries. On the other hand, imported fish products amounted to as much as 1,427 tons as compared with artisanal landings of 1,206 tons in 1982 and the demand for fish in St.Lucia, including the tourist industry, depends heavily on imported fish products. Under this supply demand situation, the imports of fish products from abroad will increase more and more if the Castries Fish Market, which is the hub of artisanal fish marketing, is not improved. From this point of view, there is a pressing need to make this Market hygienic and functional as well as to increase production. At present 20 marketing stalls for vendors are placed in the Market and about 2 tons of fish are sold daily during the high season from January to June. However, the marketing space is so narrow that even passages are crowded with customers and vendors, especially on the Thursdays and Fridays followed by holidays in this season. Therefore, the team concluded that the 36 marketing vendors in the request are reasonable.

Since dealing in fresh fish at the Market is concentrated during such late hours in the afternoon as 3 p.m. to 8 p.m. when fishing canoes return to port and the catches are landed, vendors must hold fish which they bought at a landing spot in front of the Market overnight in the iced or frozen state. However, due to the lack of storing facilities, vendors are obliged to sell their unsound fish at a low price. Accordingly, it is an urgent necessity for vendors to obtain a cold store, and as for its space, the team estimated approximately 4m x 4m of the floor area is appropriate because vendors will store half of the landings of 2 tons on that day, putting them in baskets and stacking them on shelves in a cold store. Also a small and economical unit cooler shall be installed for refrigeration purposes.

Consequently, in the Project, a fish market provided with a main building, an attached building and a cold store, and the required equipment and machinery shall be constructed or supplied, after the existing Abattoir, Fish Market, and Coal Market have been demolished in line with the master plan for reconstruction of this area.

CHAPTER 4 BASIC DESIGN

CHAPTER 4. BASIC DESIGN

4 - 1 Basic Policy

Due consideration of the following two points shall be given in the basic design of the project.

(1) Foreign assistance

The current fisheries development plan of St. Lucia is being carried out according to the plan formulated by foreign assistance agencies such as the Canadian International Development Agency, CIDA, and the Food and Agricultural Organization of the United Nations, FAO. Especially, CIDA has been extending aid since 1979 on not only formulating the development plan but also organizing the management system, training, improvement in fisheries infrastructure and distribution system, and increasing productivity. Accordingly, the project must be implemented within the long-term development plan formulated by CIDA.

(2) Current fisheries condition

The project consists of 3 major components; improvement in fisheries-related infrastructure mainly at villages on the western coast, introduction of FRP fishing craft and fishing gear aiming at increasing productivity and reconstruction of the Castries Fish Market to promote fish distribution and marketing. On implementation of the Project, due attention shall be given to the current condition of fishing grounds, the potential of fisheries resources, and management and maintenance of the project after completion so that facilities and equipment, not being beyond the capability of the St. Lucian side, can be utilized fully by the local people.

4 - 1 - 1 Fisheries Infrastructure Improvement Plan

The proposed infrastructure is the basic facilities for fishermen supporting the fishing industry of St. Lucia and is to be managed and controlled by the fisheries co-operative in each fishing village. However, those who will handle and operate facilities directly are individual fishermen, so facilities shall be solidly built and those whose handling and maintenance are easy. The following points shall be considered in construction.

(1) A part of the facilities must be constructed locally. Therefore, a suitable method of construction and construction materials available locally shall be applied

in consideration of local construction conditions.

(2) Facilities shall be designed systematically so that each component can be utilized functionally. Also, effective use of existing facilities shall be considered. The handling and maintenance methods most appropriate for local fishermen shall be applied with due regard to their previous experience.

(3) The labour force, materials, and services locally available shall be employed in construction as much as possible to provide an impetus to the local economy. This is also because facilities will be maintained and controlled by the local people after their completion.

4 - 1 - 2 Castries Fish Market Rehabilitation Plan

This plan plays an important role in the improvement of fish marketing and distribution. The project aims at appropriate reconstruction of the Fish Market to meet local hygienic standards and to provide a cold store as economically as possible. The basic policy of construction is similar to that described in 4-1-1 "Fisheries Infrastructure Improvement Plan", and shall be designed in harmony with the Castries Central Market Reconstruction Plan formulated by CPU.

4 - 1 - 3 Fishing Craft and Fishing Gear

For the Government of St. Lucia aiming at increasing production, the Project is the first step toward vessel replacement with FRP canoe model fishing craft and introduction of the No. II Transition Vessel. Accordingly, the vessels and fishing gear proposed under the project will perform a leading role in this plan. The basic design policy is as follows;

(1) The demonstration vessels must have a design that contribute to cutting down engine costs, reducing labour and increasing production through the installation of fishing machinery, and increasing proceeds through quality control so that they can demonstrate more profitability than existing canoes.

(2) The inboard diesel engine must be a troublefree type which has easy handling and maintenance and can show good results and which enjoys a good reputation because marine diesel engines are not popular in St. Lucia at present.

(3) As for fishing gear, types and specifications must be in proportion to the size of the proposed fishing craft. Because increased production and decreased

operation costs are given top priority, fishing gear with which fishermen can fish their most desired species shall be selected, and it must have a design suitable for the present skill level of fishermen so that they can handle it easily and maintain it with less expenses.

4 - 2 Basic Planning

4 - 2 - 1 Fisheries Infrastructure Improvement Plan

Scale of facilities and standardization

The fisheries-related infrastructure to be constructed at the six sites the similar objectives and includes many components in common. Accordingly, standardization can be carried out by complying with the following procedures;

- determination of the kind of work and the number of the working force.
- selection of machinery/equipment necessary for that work.
- determination of the spaces necessary for work and disposition of the machinery/equipment.
- calculation and totalling of each area of space.
- determination of the area of the facility including areas for passages, entrances, etc.

(1) Fishing boat hauling system

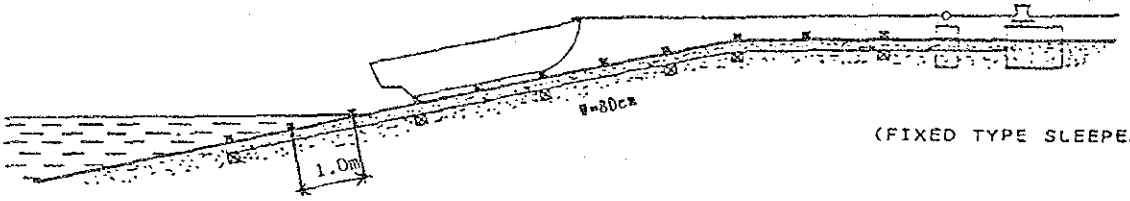
This is a system for hauling fishing craft from the water after completion of operations. Transverse sleepers (movable and fixed type) shall be provided on a ramp, and craft shall be pulled up by an electric-powered winch with a wire rope through snatch blocks.

1) Rampway

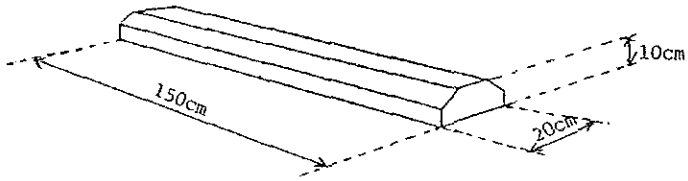
The nature of the six sites where the most important component, i.e. the rampway, is to be constructed falls into two categories. One is the natural sand beach such as at Bannanes, Anse la Raye, Laborie and Micoud (at Bannanes a reclaimed sand beach is to be prepared by the St. Lucian side), and the other is the artificial site, bordering on a river-mouth or a channel instead of the open sea, as at Gros Islet and Choiseul. At the former sites, movable type sleepers with a suitable work capacity, shall be provided partly to preserve the natural splendor of the sand beach. A gradient of 1/10 will be decided on the basis of present data, i.e. the fact that the height from sea level to the average ground

level is 70 ~80cm, and in consideration of the distance between the water's edge and the canoe parking area.

The length of the fixed type sleeper shall be 80cm and the pitch of each sleeper shall be one meter, because the existing canoes and proposed demonstration vessels are 7-8 meters in length. Taking advantage of its durability, antiabrasion and local availability, timber shall be used. These sleepers shall be connected with longitudinal timbers at the bottom and, to prevent the sleepers rising and also to secure stability, be fixed under the ground with horizontal timber with a pitch of about 4m.

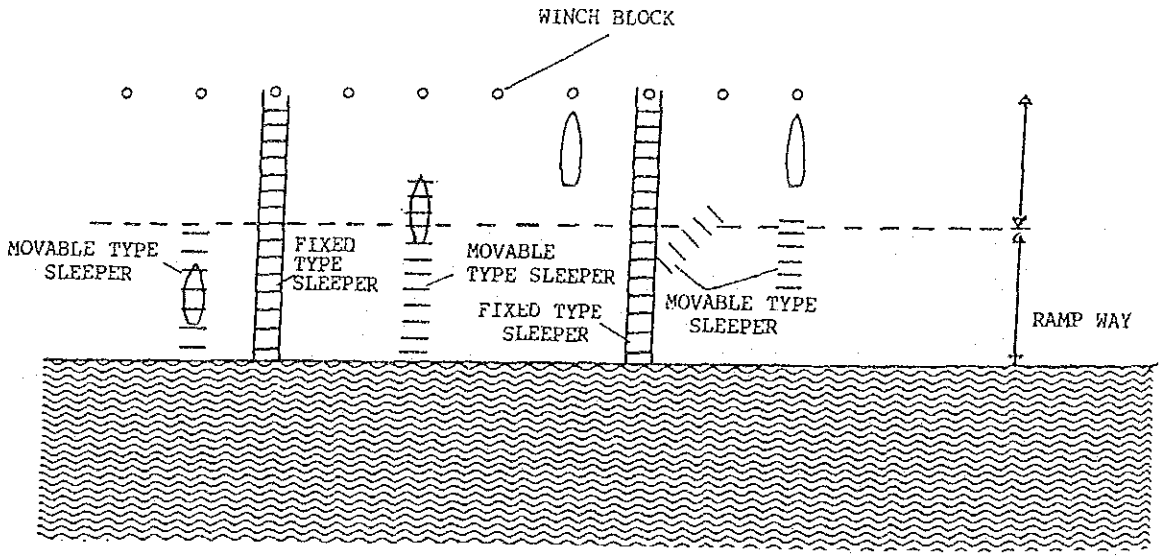


(FIXED TYPE SLEEPER)



(MOVABLE TYPE SLEEPER)

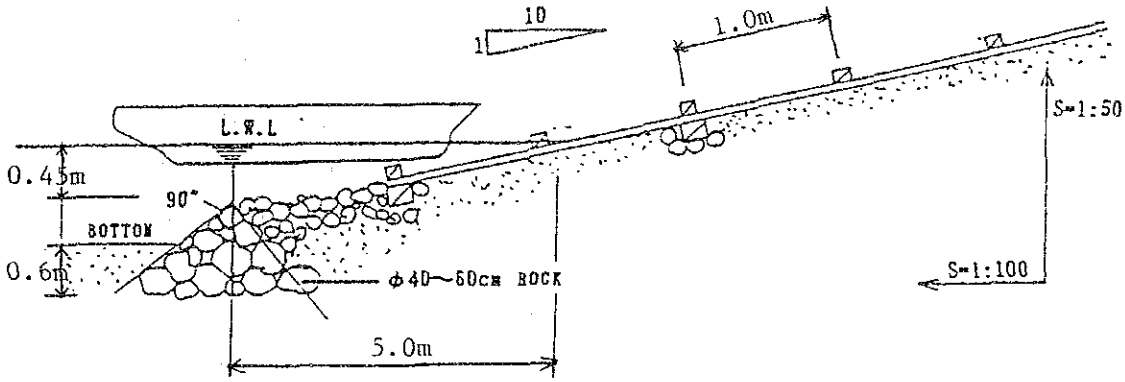
One lane by four boats shall be provided to meet the actual conditions of fishing operations. To keep the pretty view of the beach, two out of five lanes shall be provided with fixed type and the remainder with movable type sleepers.



One winch system shall be provided for each two lanes to reduce the work of drawing boats transversely.
At the latter sites, Gros Islet and Choiseul, all sleepers shall be of the fixed type as at the Castries Complex because the proposed rampway can be constructed at an artificial site without consideration of natural beauty.

2) Canoe ramps at Gros Islet and Choiseul

Neither site borders on the open sea. At Gros Islet the site is located at the middle of an islet, and the site at Choiseul is situated on a bank 30m up the river. The height from sea level to the proposed site is 70 ~80cm at low tide at either site.



Since the draft of the existing canoes is 25cm on an average, the designed depth of the waterside of 45cm will be enough. At both sites, the existing water wall must be dismantled partly and a new breast at an angle of 90 ° shall be constructed with stones (40~60cm dia) at a location in the water 5 meters from the waters edge. Gravel (10~15cm dia) shall be spreaded on this breast to make the current stable, and ground leveling with crushed stone and sand shall be done in the direction of the rampway.

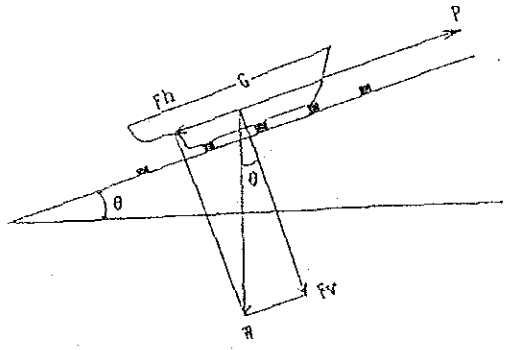
3) Winch system

The rampway is for wooden canoes, FRP canoes and flash-decked type FRP fishing boats (No. II Transition Vessel). As mentioned above, since snatch blocks are to be utilized when the craft is hauled from the sea, a capstan type winch is to be installed so that pulling up/down work can be done easier.

The weight of the hull of a wooden canoe is presumed to be about 450kg on the basis of its size and structure. Thus the total weight of such a craft is

estimated to be some 0.8 tons together with the weight of its water content, outboard motor, fishing gear, catch of fish, etc. The total weight of the FRP canoe is to be less than this.
The No. II Transition Vessel weighs 2.50t in normal conditions. After all, the weight of craft utilizing the proposed winch system will be presumed to be 2.80 tons at the maximum.

The pulling power P necessary to pull the No. II Transition Vessel up is given as follows;



$P = Fv \cdot Wr + Fh$

P : Pulling power (the tension on the wire rope)
W : 2.80t (the weight of the craft)
θ : 5.711° ($\tan\theta = 1/10$)
Wr: 0.25 – 0.35 (coefficient of friction of the sleeper)
Fv: $W\cos\theta = 2.80 \times 0.995 = 2.786$
Fh: $W\sin\theta = 2.80 \times 0.099 = 0.2772$

Accordingly, $P = 0.30 \times 2.786 + 2.772 = 1.113t$

Assuming that

Pulling speed $V = 10 \sim 13$ m/min
Efficiency of electric-powered motor $U = 0.8$
Value of KW converted into joule torque $K = 6.12$,

the capacity of electric-powered motor L_w is given in the following equation;

$$L_w = P \cdot V / K \cdot U = 1.113 \times 13/6.12 \times 0.8 = 2.955kw$$

Taking the mechanical efficiency of worm gears and blocks into consideration, the required capacity of the motor will be

$$2.995/70\% = 4.22kw$$

Wooden canoes may be often hauled from the water onto the sand beach without

sleepers as circumstances require. In this case, the coefficient of friction of sand, Wr, at a gradient of 1/8 will be 0.84.
Accordingly,

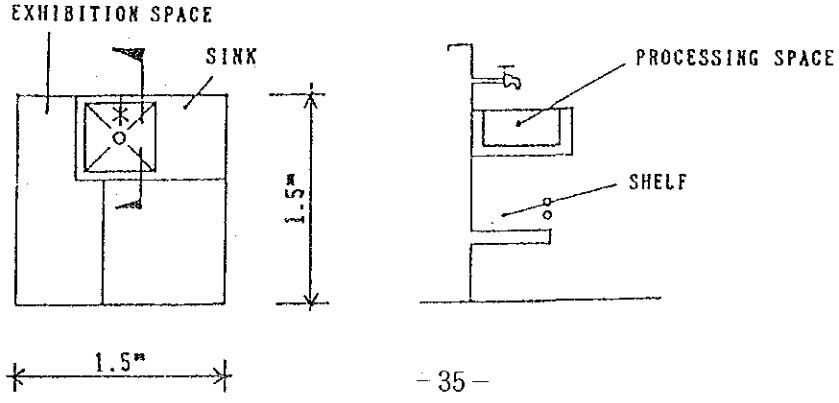
$$P = 0.8\ (0.84 \times 0.9923 + 0.124) = 0.766t$$

The required pulling power is less than that for the No. II Transition Vessel.

On the basis of the above calculations, the capacity of the motor shall be designed to be 5.5kw (230v, 60Hz, 6P), and the type of motor shall be of the marine type with durability against damage from salt in consideration of coastal conditions.

(2) Fish retail shop (Fish market)

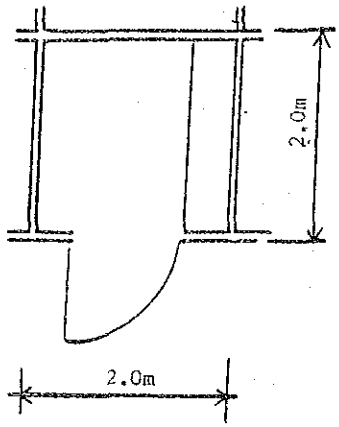
Usually catches landed by fishermen are marketed by vendors who have contracted with the fishermen. Each vendor utilizes one marketing stall for about half an hour to sell fish. The number of vendors at each site is almost equivalent to the number of canoes, i.e. 20 - 65, and 35 per site on the average.
Fishermen sail out fishing in the morning and return at two to eight o'clock in the afternoon and so the average number of canoes that return for these 6 hours will be $35 \div (60/30 \times 6hr) \fallingdotseq 3$ per 30 minutes.
However, on the assumption that 2.5 times as many as canoes may concentrate for 30 minutes, the maximum number of canoes will be taken as 8 and so 8 marketing stalls shall be needed. The marketing stalls shall be equipped with a washbasin and a simple preparation stand and a display shelf. One unit of marketing stall is to be 1.5m ×1.5m in measurements and 8 stalls shall be housed in one building - i.e. a fish market.
However, at Laborie, where the greatest quantity of fish is landed among the 6 sites, 12 stalls shall be provided.
Bannanes is located in the Castries Harbour and catches of fish are landed at the Central Market or the Castries Fisheries Complex directly, and so no retail shop shall be constructed here.



(3) Lockers for fishermen

At all sites lockers to match the number of canoes shall be constructed. Materials to be kept in them are outboard motors, fishing gear, fishing nets, maintenance tools, etc., so a space 2m x 2m x 2.3m (H) will be quite enough. A wooden rack shall be installed at one side in the lockers. Security and ventilation should beconsidered. Since one locker per canoe is provided, the required number of lockers is as follows;

Gros Islet	20
Bannanes	25
Anse la Raye	40
Choiseul	40
Laborie	65
Micoud	20



(4) Toilet and washroom facilities

These are for fishermen working on the maintenance of fishing gear, vendors (mainly women) and customers (consumers). Hours that the markets are most crowded are two to eight o'clock on afternoon when the fish market is open, and the maximum number is presumed to be about 60 altogether at the ratio of two men to one woman.

Since one toilet is required for 20 persons, the required number of toilets is 4 sets for men and 2 sets for women.

One washroom for men and one washroom for women shall be provided. Each washroom consists of two booths.

Toilet and washroom facilities shall be constructed at all 6 sites.

(5) Workshop

This is for maintenance and repair work of fishing gear. Supposing the maximum number of fishermen utilizing the workshop at the same time is 20 and the required space per man is 3.6㎡, a space of 3.6㎡×20=72㎡ will be enough. A fishing net hanger shall be provided inside.

Workshops will be constructed at only 4 sites, Gros Islet, Bannanes, Anse la Raye and Choiseul. This is because Laborie has no space to construct a workshop and Micoud already has a workshop in the vicinity.

(6) Distribution centre

1) Designed Capacity

According to the fisheries development plan, the fish demand-supply situation in 1982 is given in the following Table;

Demand-supply Situation in 1982

Place	Population	Estimated demand(t)	Supply (t)	Surplus or shortage(t)
Castries	50,244	1,091.4	123.0	- 968.4
Vieux Fort	10,080	249.9	379.2	129.3
Soufriere	8,989	194.2	71.2	- 123.0
Micoud	12,639	273.0	105.8	- 167.2
Dennery & Praslin	10,988	272.2	328.0	55.8
Anse la Raye	5,920	127.9	46.5	-81.4
Canaries	2,407	52.0	13.0	-39.0
Laborie	7,468	161.3	89.0	-72.3
Gros Islet	7,570	163.5	23.3	- 140.2
Choiseul	7,669	165.6	27.4	- 138.2
Others	17	0.4	-	- 0.4
Total	124,001	2,751.4	1,206.4	- 1,545.0

Source: CPU

The average self-sufficiency rate of St. Lucia as a whole can be seen as

$1,206.4 \div 2,751.4 = 0.44$, that is 44 per cent.

The average self-sufficiency rate of districts excluding three districts, Vieux Fort, Dennery and Preslin which come under the supply network of the Castries Fisheries Complex, can be obtained as 22% from the Table. The self-sufficiency rate of Anse la Raye and Laborie, where a distribution centre is projected to be constructed under the project, is 36% and 55% respectively, and, assuming the difference between 22% and their rates, i.e. 14% and 33% respectively, their surpluses can be represented in terms of weight as follows;

Anse la Raye $127.9t \times 0.14 = 17.8t$

Laborie $161.3t \times 0.33 = 53.2t$

These surpluses are concentrated during the 6 months of the high season similar to other villages, and it must be estimated that the monthly handling quantity may increase up to three times as much as the average quantity at

maximum. Also, working days of the distribution centre are 5 days a week, and, supposing the daily handling quantity increases similarly up to three times as much as an average quantity, then the daily handling quantity can be decided as follows;

Anse la Raye	17.8 ton/6 month × 3 =	8.9 ton/month
	8.9 ton/(30 day × 5 day/7 day) × 3 =	1.27 ton/day
Laborie	53.2 ton/6 month × 3 =	26.6 ton/month
	26.6 ton/(30 day × 5 day/7 day) × 3 =	3.8 ton/day

Since Laborie has a cold store for flying fish (capacity of 2 tons), the required capacity of the cold store is 3.8t − 2.0t = 1.8t.
Accordingly, the capacity of the cold store shall be decided to be 1.5 tons both at Anse la Raye and Laborie.

2) Specifications of Cold Store

The room temperature shall be maintained at −10℃, and fish shall be stored in fish boxes which are stacked on shelves. The required space for 1.5 tons of fish is 1.5 ×1.5 =2.25㎡, and so the space of the cold store shall be 4m×4m including working space. On construction of a cold store, prefabricated panels shall be used, and an air-cooling type refrigerating machine with simple structure and ease of maintenance shall be supplied.

Refrigerating Equipment	Complete set
Ambient temperature	+38℃
Room temperature	less than −10℃
Storage goods	Fish in fish boxes, 1,500kg
Refrigerant	R - 22
Refrigerating machine	Closed type compressor
Condensor	Air-cooled type condensor
Cooler	Overhead suspended type unit cooler
Defrosting method	Periodical automatic type

3) Specifications of Ice-making Equipment

It is estimated that 500 - 1,000kg of ice, depending on distance and hour, would be necessary to transport fish weighing about 1 ton with an insulated van to remote areas. Also, a quantity of ice equal to about half of the weight of the fish would be necessary for temporary storage of fresh fish in a fish box.

Accordingly, the required quantity of ice for storage is

for big box	250kg × 6 ÷ 2 =	750kg
for small box	125kg × 6 ÷ 2 =	375kg
Total		1,125kg

Also 5-6 FRP boats are expected to carry ice for fishing. Thus the total required quantity of ice is as follows;

for transport	500 - 1,000kg	average	750kg
for fish boxes			1,125kg
for 5-6 FRP boats			125kg
Total			2,000kg

That is, about 2t/day is to be the capacity of the proposed ice-making equipment. An air-cooling automatic type machine shall be applied to make maintenance easy, and the ice shall be of the plate type suitable for long distance transportation and the preservation of fresh fish.

Ice-making Equipment	Complete set
Capacity	2t/day
Compressor	7.5KW
Freezing drum	Stainless steel
Refrigerant	R - 22
Condensor	Air-cooled type
Air blower	400mm dia, 3 sets 2.7KW
Prefabricated ice house	1,800× 1,800× 2,000(H)mm
Panel thickness	100mm
Insulation material	Rigid urethane foam
Crusher	0.75KW, for plate ice

4) Store

This is for storage of fish boxes and tools for the insulated van. The space shall be designed to be about 16㎡.

5) Office

The required space of the office for one manager, one van-driver and one worker will be about 10㎡, and 2 desks, 4 lockers and 6 chairs shall be provided.
One toilet facility with 2 booths (one for men, one for women) shall be attached.

6) Insulated van

The insulated van carries fish of one ton plus plate ice of 0.5 tons to remote areas. Therefore, its capacity shall be 2 tons, and an aluminum covered insulated box shall be provided.

The distribution centre shall be constructed on a similar scale and with similar specifications at both Anse la Raye and Laborie.

4 - 2 - 2 Castries Fish Market

The proposed Castries Fish Market is to consist of marketing stalls for vendors in addition to a cold store and an office building and a retail shop for the Castries Fisheries Complex plus a public lavatory. This project is consistent with a larger redevelopment plan for the Castries Central Market and the above mentioned facilities shall be constructed in an area included in that master plan.

(1) Marketing stalls for vendors

While only 20 stalls are now installed at the existing fish market, about 50 persons are registered as vendors. Due to the lack of sufficient stalls, many vendors who have failed to get a stall are obliged to sell their fish in passages, especially on days of good catches or the day before a festival. In order to improve this situation 36 of new marketing stalls shall be provided. Since the size of the existing stalls 1.2m×1.2m is rather narrow for the display and processing of fish, the new stalls shall be 1.5m× 1.5m in measurements.

(2) Retail shop of the Castries Fisheries Complex

This is a branch store of the Castries Fisheries Complex for sales promotion under the management of the headquarters of the Complex. One counter style marketing stall and a cold store and a door shall be provided in the retail shop.

(3) Cold store

About one ton of fish, half of the daily landings, should be kept in this cold store, with the fish being kept on 3 shelves, 600(L) × 800(W) × 700(H)cm each, so the cold store will require a space of 4.0m × 4.0m =16㎡ including the passage.

To efficiently finish construction within the limited construction period, a pre-fabricated cold store is desirable. A required output of 7KW must be obtained, supposing the bodily temperature of fish to be 20 ℃ and the room temperature to be -10℃. An air-cooled unit cooler system of a simple structure and ease of maintenance shall be utilized. In this case, power consumption will be about 7～8 KW/hr.

(4) Office building

One person is needed to take charge of moving the fish in and out and another to control the equipment in the market. The office space for these two persons, provided with two desks and two lockers, shall be 4.0m× 7.0m =28.0㎡.

(5) Public lavatory

According to the CPU master plan, the number of daily visitors to the Castries Central Market, 2.3ha in area, is estimated to be about 4,000. The master plan allocates two sites for public lavatories, and the Project is responsible for one of them. Supposing the maximum number of visitors per hour is 500 for the 13 hours from 7 a.m. to 8 p.m., public lavatories for 250 persons must be provided. Twelve stools shall be provided in total, each to service 20 persons.

4 - 2 - 3 Fishing Vessel and Fishing Gear

(1) No. I Transition Vessel

1) Dimensions are similar to the existing carib canoes which are familiar to St. Lucia's fishermen, but a bottom structure suitable for landing on a rampway shall be adopted.
2) Lower power outboard motors are desirable from the standpoint of economy, but outboard motors of the same horsepower as that of the existing canoes shall be adopted in consideration of interchange ability and actual fishing conditions.
3) Major fishing methods are hand-lining, trolling and harpooning.
4) The hull shall have such a design as to be able to accommodate one insulated fish box on board to keep catches fresh.

(2) No. II Transition Vessel

1) Since there is no jetty at the base of the demonstration vessel, the shape and structure of the bottom and the stern and the arrangement of the propeller shaft and the rudder shall be suitable for landing on a rampway.
2) Steering system suitable for various fishing methods shall be adopted.
3) Main engine (inboard engine) should be an economical diesel engine whose maintenance is easy and durability is high.
4) For the sake of laborsaving, a hydraulic mini-roller (linehauler and net roller) driven by the inboard engine and hand reels shall be installed.
5) In order to keep the freshness of the catch, insulated fish holds shall be

prepared.

6) In order to highten fishing efficiency, a live-bait tank shall be prepared.

(3) FRP Research Vessel

1) To enable the vessel to cover the 200-mile zone all around the island, the duration of each cruise shall be 3 days at least.

2) The vessel must carry out various operations including resource surveys, experimental operations, marine research, etc. So equipment and apparatuses for surveys and accommodation (for a short sleep) for 6 persons shall be given a priority.

3) The main engine shall be an inboard diesel engine and proper hydraulic apparatuses driven by the main engine shall be installed.

(4) Equipment and apparatuses

Equipment and apparatuses including outboard motors, fish finders, a radar, wireless telephones, etc. shall in principle be reliable goods which have actual results over a long period of use in developing countries.

(5) Fishing gear

1) Simple fishing gear that is in proportion to the size of the craft and the other equipment on board shall be adopted.

2) Materials must be durable and also economical.

3) Fishing gear must have a simple design so that a few fishermen can handle it.

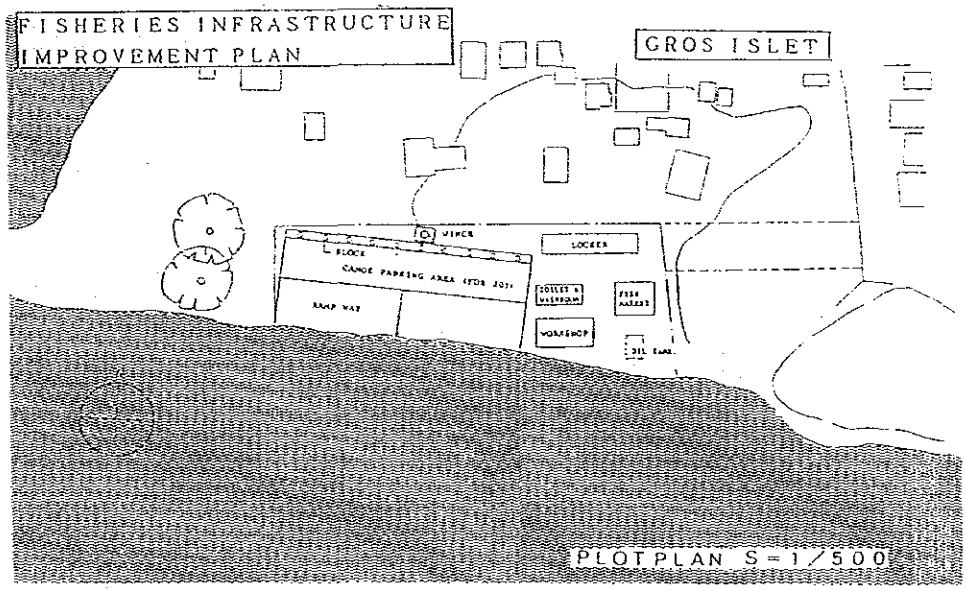
4－3　Basic Design

4－3－1　Fisheries Infrastructure Improvement Plan

(1) Layout plan

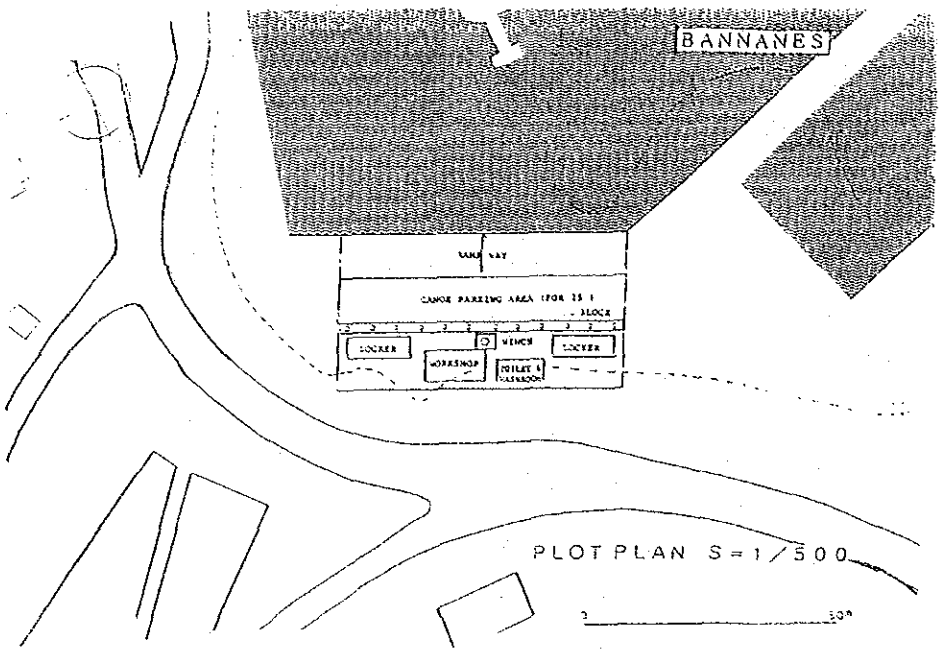
1) Gros Islet

The proposed site borders on the channel to the Gros Islet Yacht Harbour in Rodney Bay. The existing river wall shall be dismantled partly and the rampway shall be constructed on the west of the site and the workshop, toilet and wash-room facilities and lockers shall be constructed in that order on the east of the site from the channel toward the boundary line on the north of the site.
The fish market shall be placed near the access road on the east of the site; the position of a fuel oil tank planned to be laid under the ground by the St. Lucian side shall be settled between the channel and the fish market.



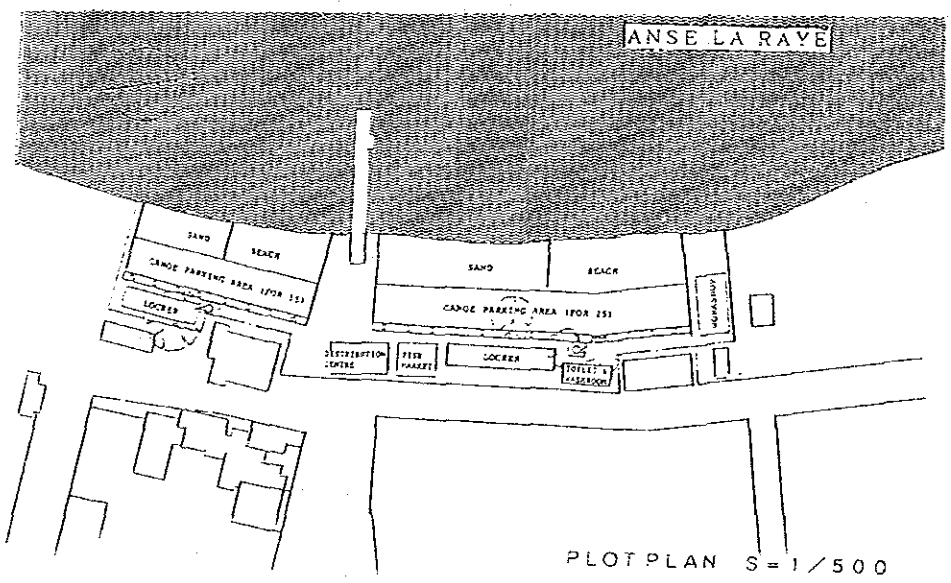
2) Bannanes

The Government of St. Lucia has a plan to reclaim a tract of land in front of the existing rampway area at Bannanes as part of the Castries Harbour Improvement Program. This reclaimed land, 50m from east to wast and 25m from south to north, is the proposed site. A rampway for 25 canoes shall be constructed on the north of the site and lockers, workshop, toilet and washroom facilities, and more lockers shall be placed in that order from the west along the Coconut Road. The reason why lockers are placed separately is that a field of vision toward the open sea must be kept as wide as possible.



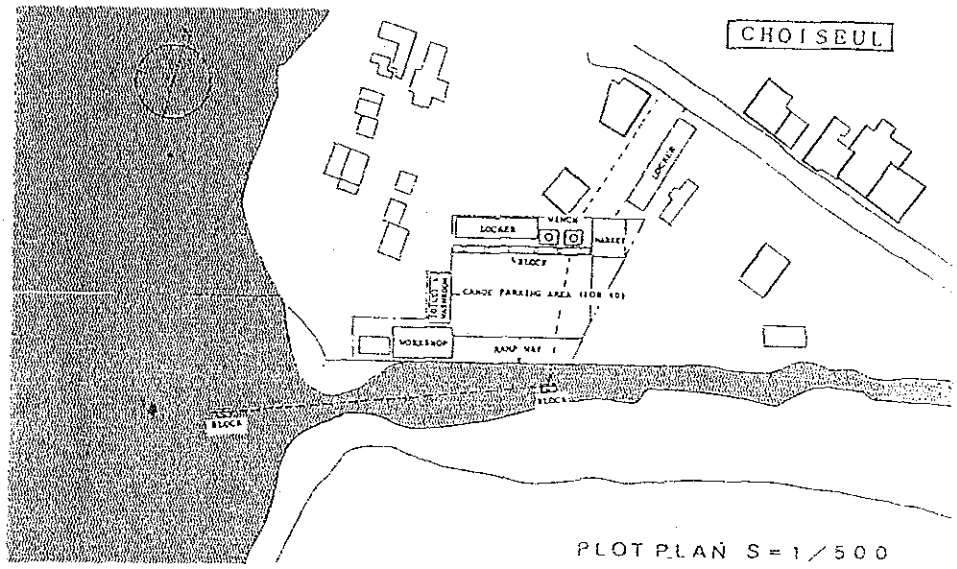
3) Anse la Raye

The coast of Anse la Raye is a natural long sand beach extending south to north. On the point of the main street extending toward the sea from the mountains is a jetty. The proposed site is an area, extending 80m to the north, 50m to the south and 35m to the east from this jetty. In order to preserve as much as possible a view including the sand beach and standing trees, the front area of the site shall be allocated for a rampway, while the back area will be for related facilities. From a functional point of view, a distribution centre and a fish market building shall be constructed near the jetty and lockers shall be placed on both sides of the jetty. Lockers on the north side shall be followed by toilet and washroom facilities and a workshop.



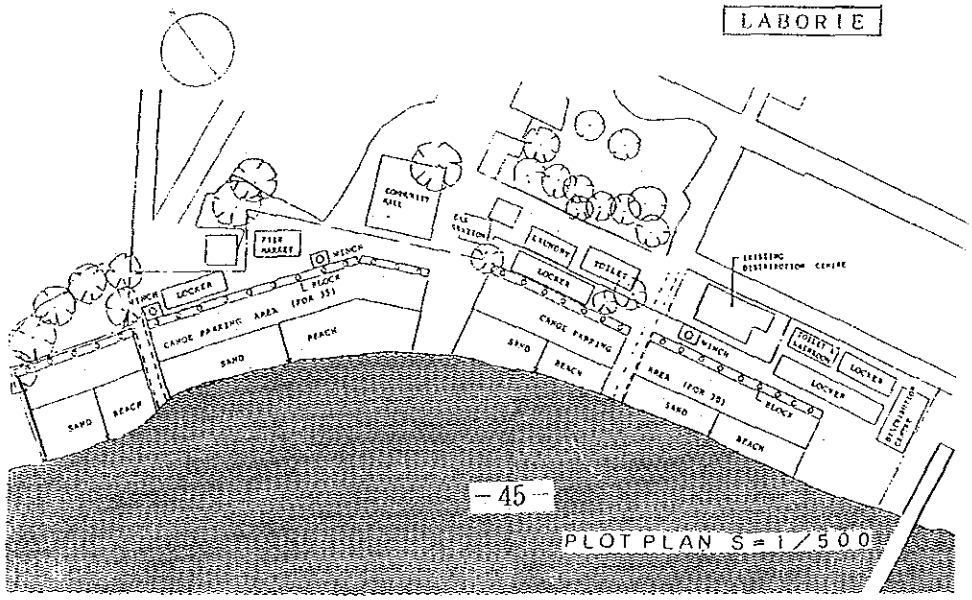
4) Choiseul

Since the coast of Choiseul is being eroded heavily, facilities shall be constructed at a new site on the right bank of the river. Part of the existing river wall shall be dismantled and be rebuilt so that fishing craft can come alongside the remoulded wall. Because the area of the site is rather narrow for 40 canoes, a rampway and a canoe parking area shall be constructed in the middle of the site and other facilities shall be arranged around them; facilities directly relevant to fishing operations shall be placed around the canoe parking area, while a small fish market shall be installed near the access road.



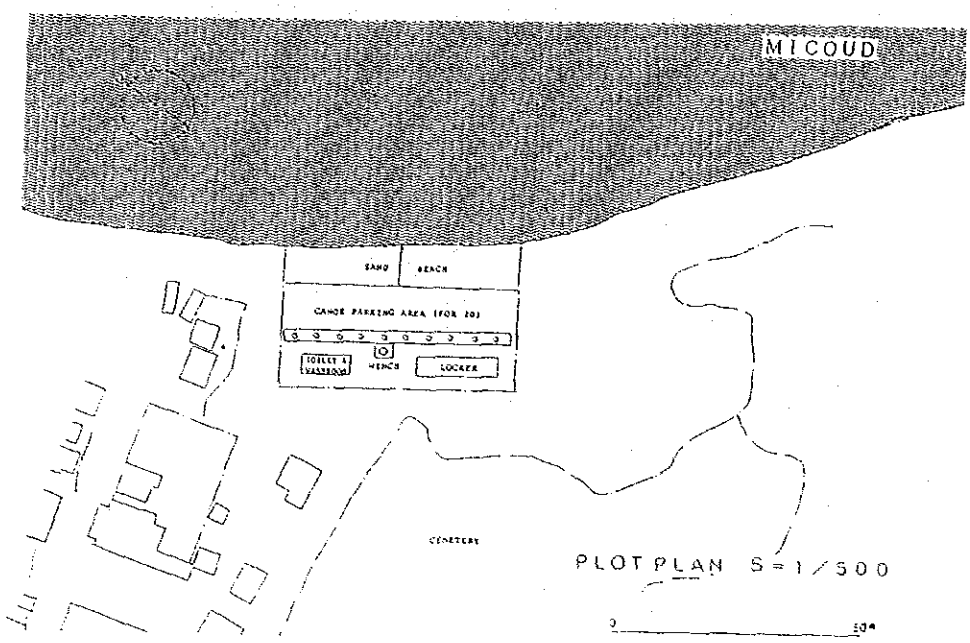
5) Laborie

The coast of Laborie, similar to Anse la Raye, is a long arc-shaped natural sand beach extending east and west. Two canoe parking areas shall be constructed independently in the eastern and western zones respectively, avoiding two existing sewerages, and behind them lockers are planned. Toilet and washroom facilities shall be arranged behind the lockers in the eastern zone; a distribution centre shall be placed near an access road by the jetty.



6) Micoud

The rectangular site, a natural sea beach, extends from south to north and is spacious. A canoe parking area shall be constructed along the beach and behind it toilet and washroom facilities and lockers are to be provided.

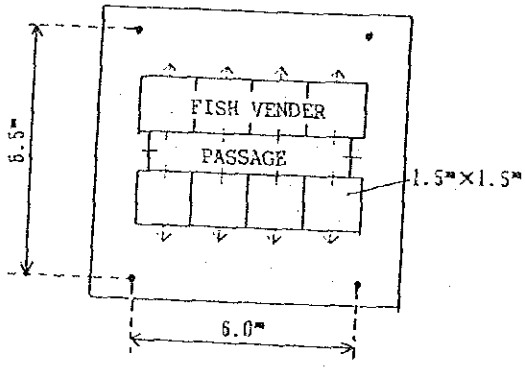


(2) Building Plan

1) Fish retail shop (Fish market)

- Plane plan

On both sides of a passage, four marketing stalls shall be installed, each facing outward away from the passage so that customers cannot look in on the activity inside. On the both sides of the passage, gutters for floor washing shall be provided. The space of the fish market shall be 6.5m x 6.0m, housing 8 stalls 1.5m ×1.5m each. Though the building is to be roofed, no external wall is provided in order to secure good ventilation.



- Structure

Having no wall and no fixing braces, the joint of the framework of the building must be of a rigid structure. To be so, it is considered that a steel frame structure is desirable from the standpoint of allowing a shorter construction period. Since hurricanes attack frequently, though there are no earthquake in St. Lucia, wind load must be emphasized in the structural calculation.

- Partial detail plan

The following points must be noted on the partial detail plan.

- Facilities are constructed at the seaside and are likely to be damaged by seabreezes.
- Air temperature is high locally.
- Wind force of hurricanes is very strong.
- Construction period is limited.

a. Roof

In order to reduce accumulated heat under the roof and to avoid wind load, as well as to shorten the term of work, a roof of corrugated steel sheets shall be utilized.

b. External and interior finish

Treatment against damage from salt shall be carried out and then it shall be painted. Mortar with a metallic trowel finish shall be applied on the floor.

- Equipment plan

a. Electric equipment

Sometimes sales can be made at night. Illumination of 250 luces and two waterproof outlets shall be prepared. Required power is as follows;

electric light	0.5KW
outlet	2.0KW

b. Water supply/drainage equipment plan

Water supply equipment

Nine taps, one each for the 8 stalls and one for floor washing shall be provided. Two-inch service pipe branched from the main shall be provided.

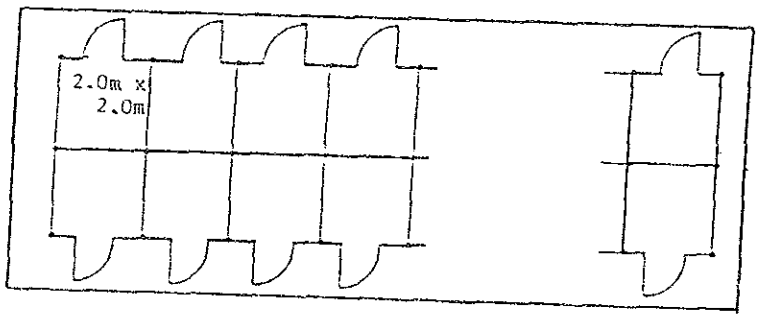
Drainage equipment

In the center of the passage between vendors' stalls a gutter shall be provided to lead drainage from stalls and the floor. The gutter shall be provided with a dust screening basket. A settling basket and an infiltration tank to dispose of waste water shall be provided outside the building.

2) Locker

· Layout plan

Lockers to equal number of canoes shall be supplied to each site. Locker units, 2.0m x 2.0m each, shall be connected back to back. The length of the connecting units, i.e. one building, shall be limited to 20m, i.e. for 20 fishermen. The reason why the length of one building is limited is that when the length is over 20m, convenience of the lockers may be reduced by their being a longer distance from the canoe parking area and also a visual field toward the open sea may be obstructed.



· Structural plan

It is judged that a steel pipe structure is most suitable for the pillars of the building because partitions can be used directly to the pillars, and solid pillars and walls are required for security and good ventilation

· Partial detail plan

a. Roof

To make execution of the work easy and to place a pent roof on an entrance, the roof shall be made of corrugated steel sheet so that a cantilever construction method can be applied. A gabled roof shall be adopted.

b. Wall

Wire netting whose ventilation is good and which is effective against burglary shall be utilized. On each side of the walls a canvas sheet shall be applied to abstruct the field of vision.

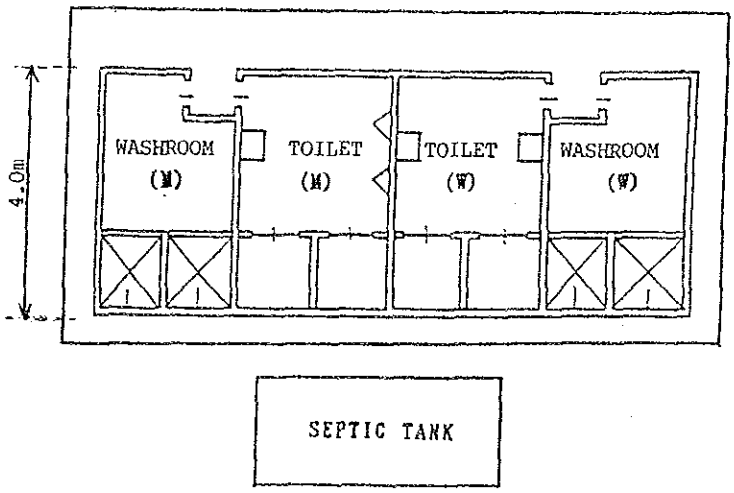
c. Interior finish

Mortar with a metallic trowel finish shall be applied on the floor.

3) Toilet and washroom facilities

· Layout plan

One washroom each for men and women respectively shall be adjoined to their respective toilets. The space of one block shall be 4.0m x 10.0m



· Structural plan

Since both surfaces of the walls, inside and outside, can be exposed to much water and since the wall faces are to be spacious due to the small entrances, concrete blocks available locally shall be used. Foundations and girders shall be made of RC.

· Partial detail plan

a. Roof

A shed-roof of corrugated steel sheets whose installation is easy and which needs no supporting materials shall be applied.

b. Wall

In order to maintain good ventilation, perforated concrete blocks shall be used partly.

c. Floor

Mortar with a metallic trowel finish and resin coating shall be applied on the floor.

- Equipment Plan

a. Electric equipment

Illumination of 150 luces shall be prepared in the toilets and a washrooms. Required power will be approximately 0.16KW.

b. Water supply/drainage equipment

- Water supply equipment

Toilet and washroom facilities shall be provided with water supply equipment.

- Drainage equipment

Waste water shall be led to a septic tank and be infiltrated into an infiltration tank.

4) Workshop

- Layout plan

The building shall have a space of 6.0m x 12.0m and shall have a roof and open sides to make works in cooperation with the outside area easy.

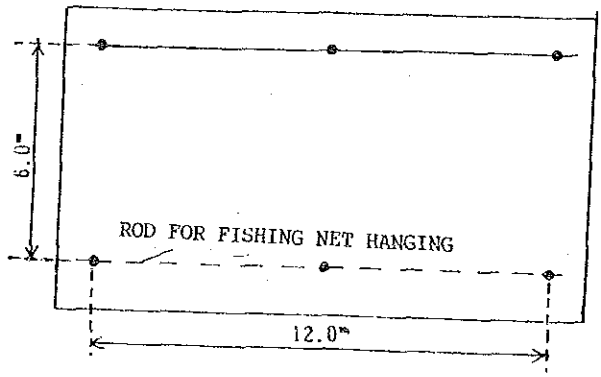
- Structural plan

Wall

The building shall consist of a steel frame structure without braces.

- Equipment plan

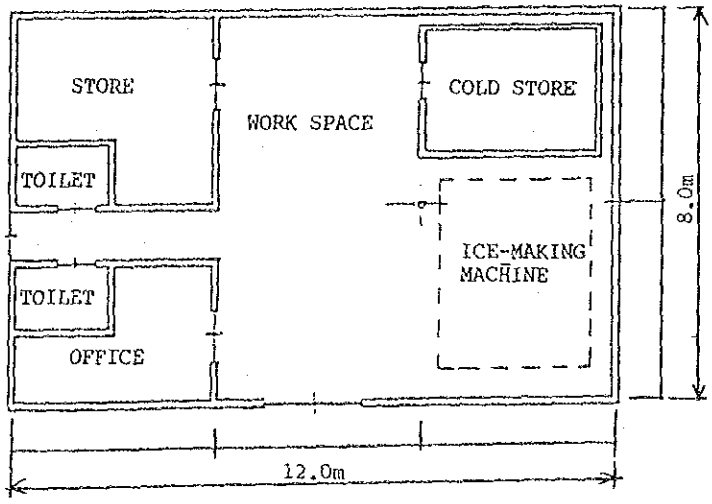
Illumination of 200 luces shall be prepared for night work. Required power is estimated to be about 0.4KW.



5) Distribution Centre

- Layout plan

A working room with an entrance shall be arranged between an ice-making room and a cold store on the right and an office room and a store room on the left in consideration of the function of the collection and shipment of goods. A prefabricated panel typed cold store shall be adopted in order to shorten the construction period.



· Structural plan

A steel frame structure shall be adopted because the ice-making room and the cold store need a rather high ceiling and also the space consisting of these two rooms plus the working room requires a longer span.

· Partial design plan

a. Roof

Since the roof over the ice-making room has a different level, and its roofing requires a lot of flashing work and metal plate work, corrugated steel sheets shall be used in consideration of uniformity of material.

b. Wall

Walls of the cold store and the ice-making room shall be bare without interior finish and be constructed with colored steel sheets with ribs.

c. Floor

On the floor a mortar with a metallic trowel finish shall be applied. After that, water-resistant, antiabrasion and nonskid synthetic resin paint shall be coated.

· Equipment plan

a. Electric equipment

Outlets and illumination shall be provided in each room, and power sources for the refrigerating machine and the ice-making equipment shall be provided.

electric light	0.7KW
outlet	1.0KW
refrigerating machine	7.0KW
ice-making equipment	7.5KW

b. Water supply/drainage equipment

Water supply equipment

for ice-making	2.0 inch
for working room & toilet	1.0 inch

Drainage equipment

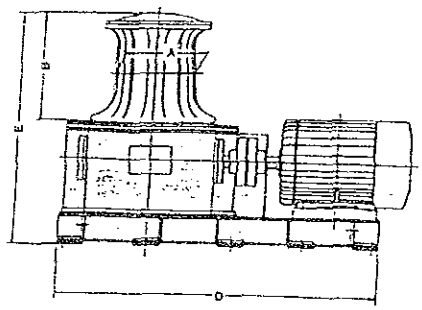
Waste water shall be led to a septic tank and be infiltrated into an infiltration tank.

(3) Materials plan

1) Electric-powered winch (capstan type)

Dimensions	about 240/350mm x 740mm x 980mm
Rolling load	about 1,500kg (Wire rope dia. 8mm)
Rolling speed	about 13m/min
Motor power & its specifications	5.5KW (AC230V, 50/60Hz, 6P) Drip-proof type, reversible, Marine motor

Other specifications



The following shall be provided.

- Drip-proof cover for motor and starter
- Rachet gear to prevent reversion
- Handlebar for emergencies
- Spare parts and tool box

At some sites the motor may be placed approximately some 1m higher than the capstan.

2) Insulated van (for the distribution centre)

Whole weight	about 4.5t
Tare	less than 2.5t
Dimensions	4.7(L) x 1.8(W) x 2.7(H)m approx.
Trim	aluminum
Horse power	about 100HP

3) Working table (for the distribution centre)

A stainless steel basin shall be attached.

Dimensions	2,000(L) x 600(W) x 800(H)mm x 2 sites

4) Fish box (for the distribution centre)

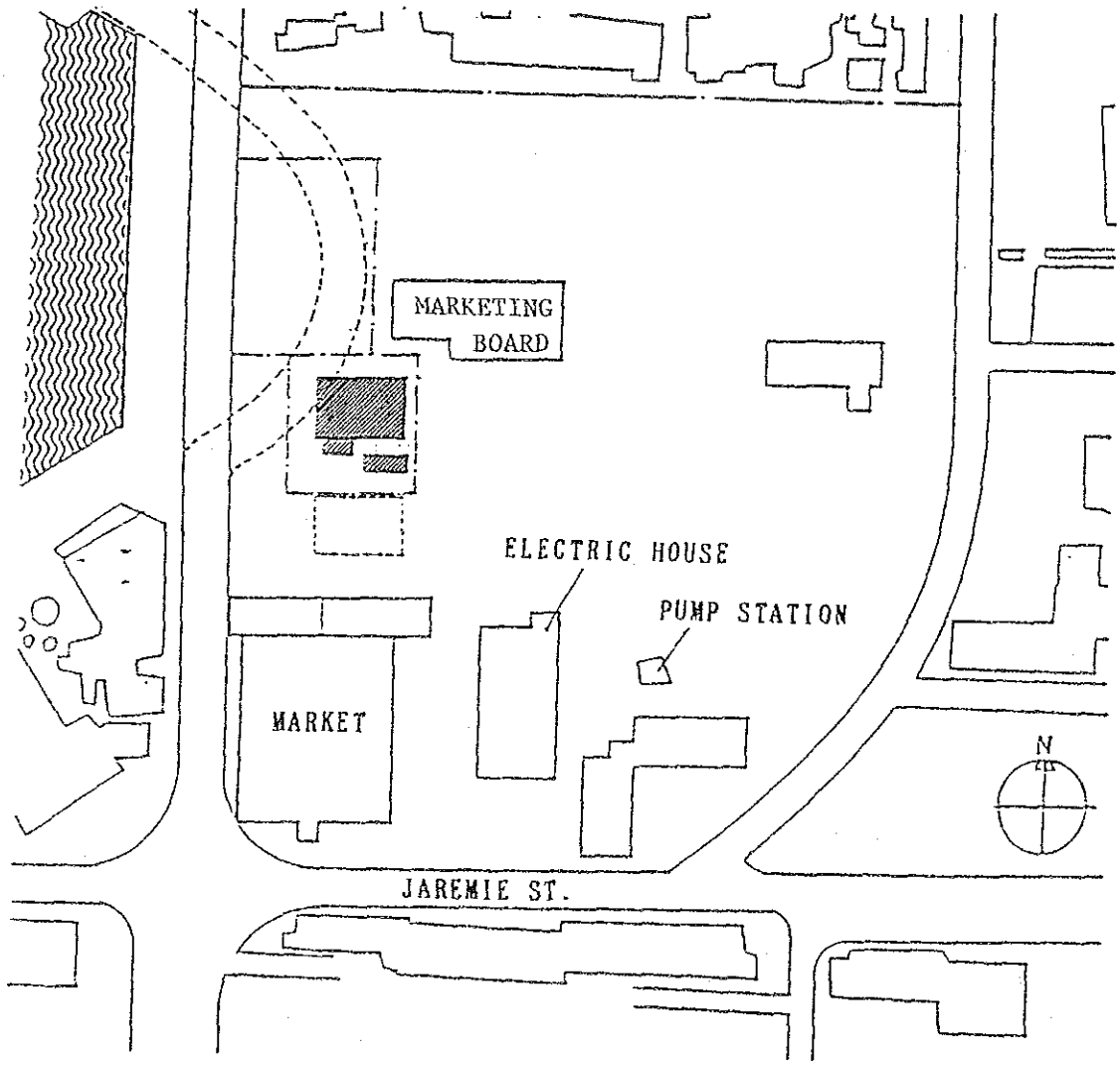
	(L)	(B)	(D)		
Insulated box (large)	1,250mm x	1,200mm x	1,200mm	6	(lidded)
Insulated box (medium)	980mm x	600mm x	650mm	6	(lidded)
Plastic box (small)	560mm x	360mm x	200mm	50	(no lid)
				62 x 2 sites	

4 - 3 - 2 Castries Fish Market

(1) Layout plan

The construction site is located on the west of the middle of the area of 2.3ha to be used for the redevelopment plan of the Castries Central Market. On the south of the proposed fish market a meat market which is similar in form is scheduled to be constructed. According to the master plan, a public square is to be arranged on the east of both markets and a bus terminal is to be placed on the east end of the square.

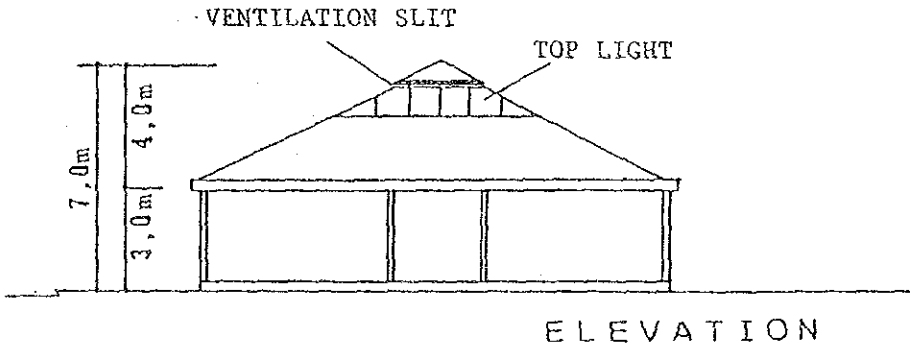
The main path of flow of visitors is assumed to be the east-west line connecting the markets and the bus terminal in the master plan. Accordingly, in the layout plan, it is decided that the path of flow of customers inside the building at the fish market shall be the east-west line also.

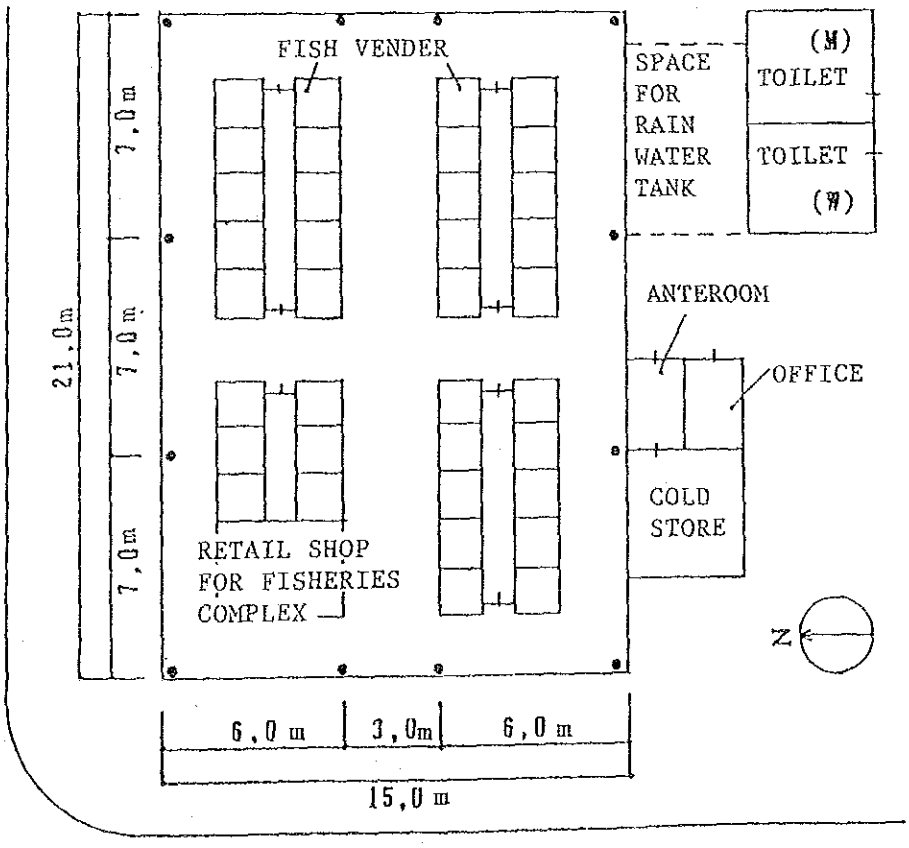


(2) Building plan

1) Layout plan

Marketing stalls adjoined back to back, facing the outside or a passage, shall be installed so that customers can not look in on the activity inside. Vertical and lateral passages, 3 lanes respectively, shall be provided. On the central passage, stalls shall be placed on both sides facing each other to create a throng. The retail shop of the Castries Fisheries Complex shall be placed on the west end of the northwestern stalls. The building has almost open sides so that the marketing activity inside the building can be seen from the outside, though lean-tos of the office building and the cold store shall be constructed on the south and the rainfall receiving tank and toilet facilities on the southeast.





2) Structural plan

· Main building

A steel frame structure is most suitable for the spacious main building which has no pillers and walls. When adjusting the slope of the roof of the proposed main building in accordance with the existing buildings to keep uniformity of design, it will become about 1/2. This means that the ridge height of 7m is rather high in proportion to the 15m of the shorter side of the proposed building. The ridge height is so high for the scale of the building that a steel frame structure is favoured for construction of the building with a simple structure.

· Public lavatory

The public lavatory shall be made of concrete blocks because spacious wall faces in comparison with the space can be obtained. Foundations and collar beams shall be made of RC.

3) Partial detail plan

· Main building

a. Roof

The roof, high and spacious, shall be made of corrugated steel sheets so that execution of the work can be easy and the term of work can be shortened. To reduce accumulated heat under the roof and to place accent on the exterior of the roof, fixed type louvers shall be applied, and semitransparent resin sheets for natural lighting shall be used partly.

b. Floor

In order to make the floor water-resistant, antiabrasive, hygienic and nonskid, ceramic tile finish shall be applied to the floor.

· Public lavatory

a. Roof

To secure unity in materials a corrugated steel sheet whose single body can meet the shorter side of the building shall be used.

b. Wall

Resin paint shall be coated on mortar finished with a metallic trowel.

c. Floor

Clinker tile shall be used in consideration of washing and antiabrasiveness.

(3) Equipment Plan

- Electric equipment

a. Fish market

illumination	2.5KW
outlet	1.0KW
power source of cold store	7.0KW

b. Public lavatory

illumination	0.4KW

- Water supply/drainage equipment

a. Fish market

tap of marketing stall and for floor washing	37p/s in total
gutter and grease trap	36m

b. Public lavatory

closet bowl	10 sets
stall urinal	6 sets
basin	6 sets

(4) Castries Fish Market

Two plastic fish boxes for each marketing stall, totalling 72, shall be supplied.

Dimensions 563(L) x 360(W) x 200(H)mm

4 - 3 - 3 Fishing Craft and Fishing Gear

(1) Fishing craft

1) Factor of design

① No. 1 Transition Vessel

- Dimensions and Hull

The dimensions of the existing canoes are 9.80 x 1.70 x 0.88m for the large type, 7.50 x 1.30 x 0.65m for the small type. No. 1 Transition Vessel shall basically be made of FRP with the same dimensions, but to increase initial stability the hull shall have a square chine and a width of about 1.90m, some 20cm wider than the existing canoes. The existing canoes are about 8.50m long on the average, and the shorter the length is, the easier the work of pulling them up on a beach. A length o f about 7.50m, however, will be sufficient to carry some one ton of fish when the vessel is 1.90m in width. On the other hand, though a wider breadth can give better work efficiency on board, the sea kindliness of the bow part is liable to be reduced. Therefore, the hull shall have a higher sheer and an improved flaring forward, and its shape shall be similar to the FRP craft which were built at Martinique and which have seen long service in St. Lucia. Also because of being an open boat without sufficient reserve buoyancy, voide spaces shall be provided in consideration of safety at sea.

- Main engine

An inboard diesel engine is desirable from an economical point of view, but an outboard motor shall be provided because of the impossibility of installing an inboard diesel engine in a limited space similar to the existing FRP canoe and of the higher initial cost of an inboard out-drive motor. As to the horsepower of the outboard motor, it is considered that 25PS will be quite enough for fishing operations, but an outboard motor of 40PS which has part interchangeability with the existing canoes shall be used because it is very difficult to have fishermen who are getting used to higher power bring down the speed of their same size boats on their own initiatives. It would be necessary that some legal measures such as abolishing the gas rebate system and limitation on engine power be taken to educate fishermen to save fuel expenses and to encourage them to perform economical operation by using low-power outboard.

・ Outfitting

Since the FRP vessel which is wider in breadth than the existing canoe has good stability, an insulated fish box capable of carrying ice and fish shall be supplied. Bottom boards shall be placed to increase operational efficiency. One simple sail, an anchor and life jackets for emergencies and for safety at sea shall be provided. Keel making and metal fittings suitable for pulling up must also be prepared.

② No. II Transition Vessel

・ Dimensions and Hull

The Vessels operate gill-net fishing, long-lining, and trolling mainly, and fishing gear will be cast from the stern and be hauled from the starboard. Accordingly, from the standpoint of work efficiency on board, the longer the deck is, the better. However, it has been determined that the length of the Vessels be similar to that of the existing canoes on the following basis.

a. The hull must have a design familiar to fishermen in St. Lucia, not being much removed from the existing canoes, so that they can handle it easily.
b. The size and type of the Vessels must be limited so that they can be pulled up on a rampway at a sand beach because of the lack of adequate infrastructure in St. Lucia.
c. The record of performance of fishing craft conducting similar fishing operations in neighboring countries was examined.

Deciding that the capacity of fish holds should be about $2m^3$ and the length of the engine room capable of installing the main engine and hydraulic apparatus is about 2m, the length between perpendiculars will become about 7.3m approximately, similar to the existing canoes in the overall length. However, to increase stability the breadth at the water line shall be 2m odd on $L/B \fallingdotseq 3.5$

・ Engine and Electrical Equipment

An inboard diesel engine with the minimum power necessary shall be installed. On the basis of the Vessel Operation Schedule, the maximum speed shall be designed to be 10 knots for the 7.9M Type Vessel and 12 knots for the 8.7M Type Vessel.

Required electric power shall be supplied by DC-24V batteries charged from a charger attached to the main engine.

To decide the required horsepower, firstly, the displacement of the Vessel

was calculated as follows;

hull and outfittings	1.50t
main engine and propelling system	0.27t
hydraulic apparatus	0.20t
fishing gear (on the average)	0.25t
fuel oil	0.30t
crew and miscellaneous	0.28t
displacement under normal conditions $\triangle$	2.80t

$\triangle^{1/3} = 1.4095$

Length at the water line $L_{WL} = 7.10m$

$\sqrt{L_{WL}} = 2.665$

$(0.1 \times L_{WL})^{3.5} = 0.3016$

Secondly, propelling efficiency was calculated on the above values.

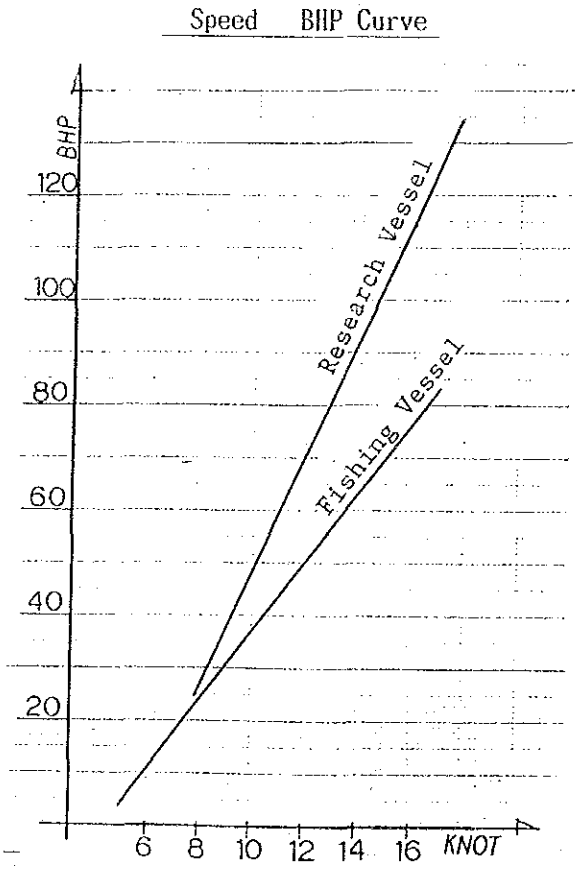
speed V (knot)	6	8	10	12	14
$V/\sqrt{L_{WL}}$	2.25	3.00	3.75	4.50	5.25
$L_{WL}/\triangle^{1/3}$	5.04	5.04	5.04	5.04	5.04
$BHP/(0.1 \times L_{WL})^{3.5}$	34.60	80.40	123.80	166.30	209.30
BHP	10.50	24.20	37.30	50.20	63.10

From the above values, a Speed - BHP Curve can be obtained as below;

On this Curve a horsepower corresponding to a speed of 10 knots indicates a little under 40PS.

Accordingly, the required horsepower of the Vessels shall be 40PS, but it must be noted that cruising speed will be reduced to a little less than 9 knots because the economical horsepower of a high speed engine is in general 85-90% of its rated horsepower.

Rolling capacity of hydraulic apparatus is estimated to be 200kg x 40m/min maximum on



the basis of the specifications of the fishing gear.
Thus the required effective horsepower(EHP) to be transferred from the main engine is calculated as follows;

$$EHP = \frac{200kg \times 40m/min}{75 \times 60} = 1.78PS$$

Assuming that the mechanical efficiency of the hydraulic apparatus system driven by the machinery is 60%,

$$1.78PS \div 0.6 \fallingdotseq 3.0PS$$

This means that the hydraulic apparatus can work even when the Vessels are being propelled by the main engine.
The No. II Transition Vessels for patrolling require a longer cruising radius. To meet this requirement the Vessels must be given a speed of 12 knots.
In this case the required horsepower shall be 50PS on the above Curve, and the economical horsepower is calculated as follows;

$$50PS \div 0.85 \fallingdotseq 58.8PS$$

So it has been decided that the horsepower of the main engine of the No. II Transition Vessels for patrolling is to be 60PS.

· Outfitting and Fishing Equipment

The Vessels aim mainly at demonstration of new technology to improve the profitability of the fisheries business. Therefore outfittings and fishing equipment capable of undertaking multipurpose operations shall be provided. Also, hydraulic fishing machinery driven by the main engine shall be installed to make multipurpose operations easy as well as to eliminate labor.
In order to locate new fishing grounds and to improve fishing technology, a fish finder shall be provided on board each Vessel.
Fish holds shall be insulated to maintain the freshness of fish caught and a transceiver for communication between the Vessel and the base shall be supplied to coordinate fishing activities through all the fishing grounds of St. Lucia.

③ Research Vessel

· Dimensions and Hull

The Vessel shall be constructed with not a widely different length from the

existing wooden canoes. Since this Vessel, like the demonstration vessels, must carry out experimental operations for research, insulated fish holds with a capacity of more than $2m^3$ shall be provided under the deck. The engine room requires about 3m in length to install a main engine and other machinery. To meet the requirements of a research vessel and considering the necessity of preparing wireless and nautical instruments, a sheltered wheelhouse shall be constructed on the deck above the engine room, and an enclosed awning sheet provided with some folding cots for naps shall be prepared behind the wheelhouse. Based on this plan the deck will require more than 10m in length and the overall length will reach about 12m. Having dimensions too large for pulling it up on a rampway without danger and also a projecting part such as the transmitter of a fish finder on the bottom, the Vessel shall have no special bottom structure and outfittings for pulling it up. The maintenance of the Vessel is to be conducted fully by utilizing a dock facility for leisure boats at Castries.

- Engine and Electric Equipment

An inboard diesel engine, like a demonstration vessel, shall be installed, and a hydraulic pump shall be driven by the main engine. The speed of the Vessel requires a 15 knot maximum to meet the requirements of patrolling and rescuing operations. In this case, the required rated horsepower of a main engine indicates approximately 120PS according to the previous Speed - BHP Curve. However, since the displacement of the Vessel is supposed to be increased in fact to some degree due to additional loads of various measuring and/or experimental instruments, a cruising speed at an economical horse-power will be reduced to about 13 knots.

Two groups of batteries serve the Vessel with the required electric power. One group charged from a charger attached to the main engine is for illumination on board and another group charged from another charger driven by the main engine is for wireless and nautical instruments.

- Outfitting and Fishing Equipment

Outfitting shall be done basically in the same way as for the demonstration vessels, but capacities of the fishing gear and fish finder shall be improved to some degree. A sea water thermometer and a set of wireless telephones to communicate with a base on shore shall be provided for scientists.

2) Basic Design

① No. I Transition Vessel

Main Particulars

Type and Materials	Canoe Type Open Boat, FRP	
Inspection	Inspection for export (JG)	
Dimensions	7.60(L) x 1.87(B) x 0.75(D)m approximately	
Main engine	Outboard motor, 40PS	1 set
Outfitting	Insulated fish box	1 set
	Dunnage board	1 set
	Keel and metal fittings for hauling	1 set
	Sail and Removable Mast for emergencies	1 set
	Anchor with Anchor Rope	1 set
	Life jacket	3 p/s

② No. II Transition Vessel

Main Particulars

Type and Materials	Flush-decked Type Boat, FRP	
Inspection	Inspection for export (JG)	
Dimensions	about 8.70/7.30(L) x 2.06(B) x 0.73(D)m	1 boat
	7.90/7.30(L) x 2.06(B) x 0.73(D)m	3 boats
Fish Hold	about 2m^3 (including bait tanks)	
Fuel Oil	about 330 liters for 1 boat	
	about 220 liters for 3 boats	
Design Speed	12 knot max for 1 boat	
	10 knot max for 3 boats	
Crew	3 (4 max)	

Engine and Electric Equipment

Main Engine	Four Cycle High Speed Diesel Engine
	34PS (38PS max) for 3 boats
	Four Cycle High Speed Diesel Engine
	60PS (65PS max) for 1 boat
Hydraulic Unit	Main Engine Driving Type Hydraulic Pump Unit
	(with Electromagnetic Clutch)
Battery	120AH one group (with a Charger attached to
	Main Engine)
Navigation lamp and	DC24V. One waterproof portable lamp shall be

Illumination	supplied to each boat.	

Outfitting and Equipment

Outfitting	Aft Awning Sheet	1 set
	Steering gear (hydraulic or wire cable type)	1 set
	Keel and metal fittings for hauling	1 set
	Spanker and Spanker Mast and Spanker Boom (movable type)	1 set
Fishing Equipment	Hydraulic Mini-Roller (linehauler & net roller)	1 set
	Fishing reel (manual)	2 p/s
	Fishing rod stanchion	2 p/s
Others	Magnetic compass (with a box)	1 p/
	Transceiver (battery use)	1 pair
	Fish Finder (portable type)	1 p/
	Life jacket	4 p/s
	Life buoy with Life line	2 p/s
	Fender	2 p/s

③ Research Vessel

Main Particulars

Type and Materials	Flush-decked Type Boat, FRP
Inspection	Inspection for export (JG)
Dimensions max	about 11.80(L) x 3.25(B) x 1.58(D)m
	about 10.80(L) x 2.74(B) x 0.92(D)m
Fish Hold	about 3.0m³ (including bait tanks)
Fuel Oil	about 1,000 liters
Design Speed	15 knot max
Crew	4

Engine and Electric Equipment

Main Engine	Four Cycle High Speed Diesel Engine 125PS (140PS max)	1 set
Hydraulic Unit	Main Engine Driving Type Hydraulic Pump Unit	1 set
Battery	150AH - 2 groups (with 2 Chargers)	

Navigation lamp and Illumination	DC24V. One waterproof portable lamp shall be supplied.	

Outfitting and Equipment

Outfitting	Aft Awning Sheet	1 set
	Hydraulic Steering Gear	1 set
	Spanker, Spanker Mast, and Spanker boom (moveable type)	1 set
Fishing Equipment	Hydraulic Line-hauler/Net-roller	1 set
	Hydraulic Warping-end drum	2 set
	Fishing reel (manual)	4 p/s
Wireless/Nautical Instrument	Magnetic compass	1 set
	Radar (36 mile)	1 set
	Fish Finder	1 set
	SSB Wireless Telephone	1 pair
	Electric Sea Water Thermometer	1 set
Others	Three-way roller	1 p/
	Anchor with Anchor Rope	1 set
	Mooring rope	1 set
	Folding cot	4 p/s
	Life jacket	6 p/s
	Life buoy with Life line	2 sets
	Fire extinguisher	2 p/s
	Fender	4 p/s

(2) Fishing Gear

1) Drift gillnet

Target fish: The larger fishes such as albacore, swordfish, kingfish, dolphin, and skipjack.

Details

① Netting materials must be stronger than the ones used in Japan so that breakage of netting by the larger netted fishes can be kept to a minimum.

② Nylon-multi shall be used for netting instead of Nylon-monofilament which would occupy almost twice as large a space as Nylon-multi netting when it was spread on deck for operation.

③ Webbing and Specifications (per strip)

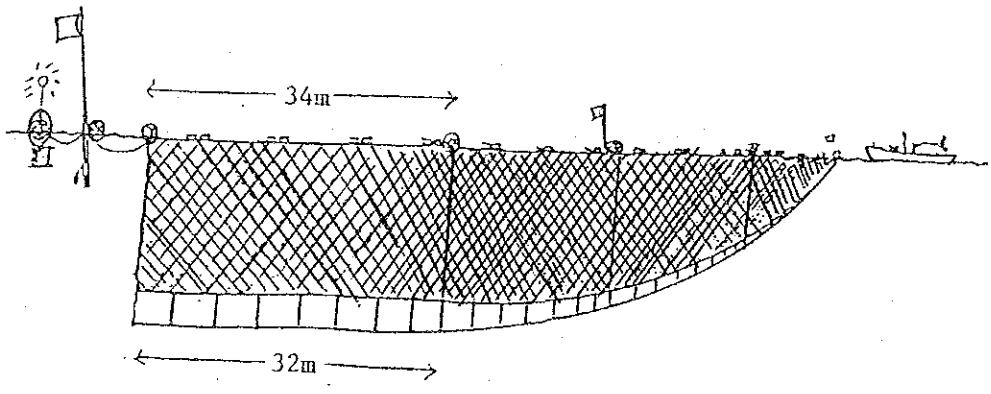
Main netstrip	Nylon-multi twine	
	mesh size:	180mm
	size at drifting:	about 5m x 34m
Top	headrope:	synthetic fiber rope, dia 6mm, length 34.7m, double, floatage 220g, flat float
Foot	footrope:	70g/m synthetic fiber rope with a lead line, length 32.7m, double
Float	plastic float:	dia 300mm 1 p/

④ Accessory (per boat)

Light buoy		2 p/s
Flagpole	6m	2 p/s (provided by the St. Lucian side)

⑤ Quantity

30 strips per boat



2) Long line

Target fish: Tuna, swordfish, albacore, kingfish, and dolphin.

Details

① Composition (per set)

Trunk line	synthetic fiber rope	5.7mm dia,	270m
Branch line	synthetic fiber rope	3.9mm dia,	20m
	sekiyama wire 8m ┐		
	wire leader 3m ┘	total 11m	5 p/s
Fishing hook			5 p/s
Floating line	synthetic fiber rope	5.7mm dia,	15m
Float	plastic balls	300mm dia,	1 p/

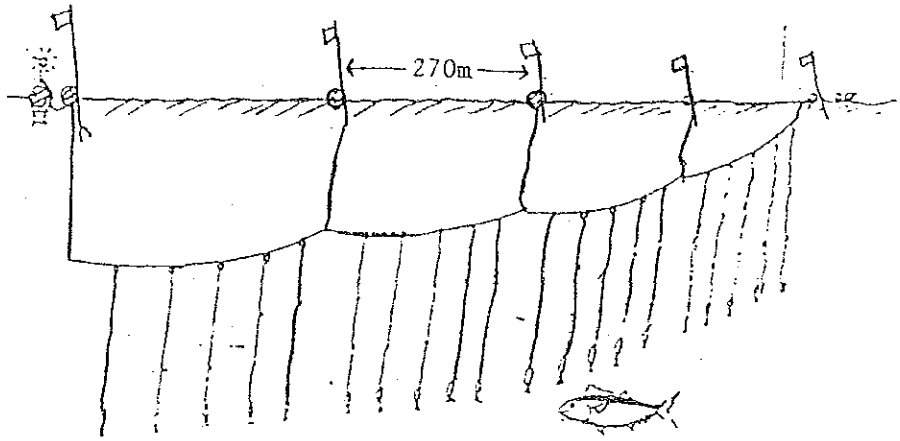
② Accessory

Light buoy 2 p/s

Flagpole 6m, 2 p/s (provided by the St. Lucian side)

③ Quantity

20 sets per boat



3) Trolling line

Target fish: Skipjack, albacore, kingfish, dolphin, and, barracuda.

Details

① Composition (per boat)

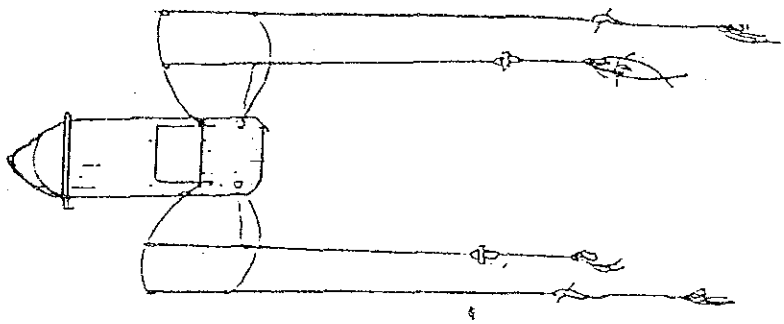
Trolling rod	fiberglass rod	7m	
Hand line	synthetic fiber rope	5mm dia,	
		5m	2 p/s
		3m	2 p/s

Shock absorber	8mm dia,	2m	4 p/s
Lead (for prevention of	entwining)	80g,	4 p/s
Trolling line	Nylon No. 30	50m, 30m	2 p/s each
Special floating board	HIKOKI		2 p/s
	ROCKET		2 p/s
Wire leader	4m		2 p/s
Nylon leader	5m		2 p/s
Lure			4 p/s
Fishing hook			4 p/s

② In cases where skipjack are caught plentifully, other 2 sets shall be added.

③ Quantity

Two trolling rods and 4 trolling lines with accessories shall be supplied to each boat.



4) Bottom gillnet

Target fish: Grouper, snapper, jack, and butterfish.

Details

① Though target fishes are expected as mentioned above, the kind and size of them are not well understood yet. Therefore, three types of gillnet shall be provided.

② To make handling of the nets to be set on the bottom easy, the size of the nets shall be made smaller than the drift gillnet.

③ Webbing and Specifications (per strip)

Main netstrip Nylon 210 denier

mesh size: 3 types

size at setting: about 2.5m x 25m

Top	headrope:	synthetic fiber rope, dia 6mm, length 26m, double
	floatage:	80g
Foot	footrope:	synthetic fiber rope, dia 6mm, length 25m, double
	lead sinker:	37.5g

④ Accessory (per boat)

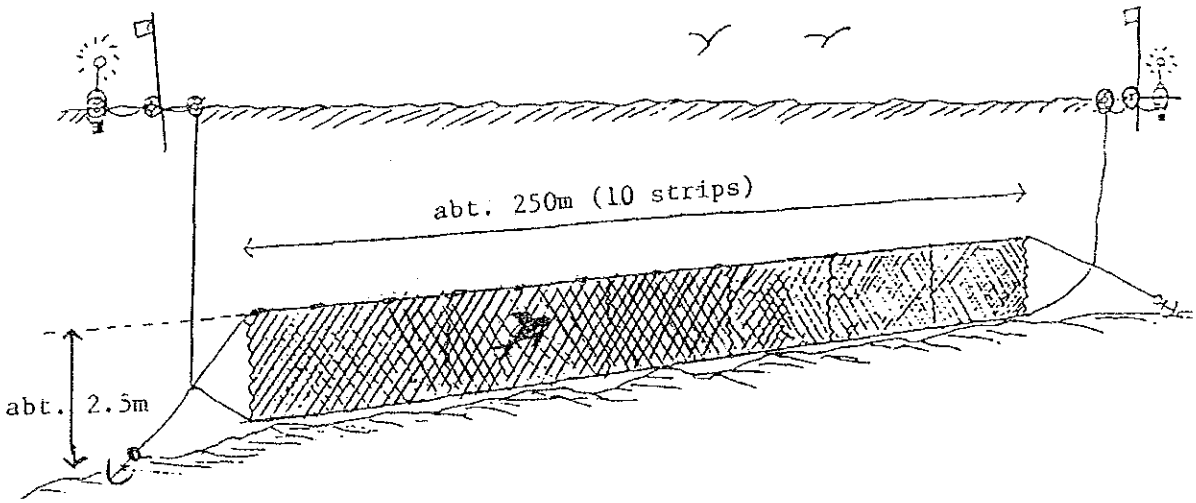
Light buoy		2 p/s
Flagpole	6m, 2 p/s (provided by the St. Lucian side)	
Anchor	iron 15kg	2 p/s
Float	plastic ball: dia 300mm	4 p/s
Floating line	synthetic fiber rope: dia 12mm, 200m	

⑤ Quantity

for the Research Vessel - three types of net, 10 strips each

for the 4 No. II Transition Vessels - two types of net, 10 strips each, total 80 strips

Grand Total 110 strips



5) Drift long line

Target fish: Kingfish, dolphin, yellowtail, jack, and mackerel.

Details

① Composition (each set)

Buoy	wooden case, dia (top) 47cm, height 24cm, dia (bottom) 40cm	
Floating line	synthetic fiber rope, dia 6mm	5m

Connecting line	synthetic fiber rope,	dia 6mm	45m
Trunk line	synthetic fiber rope,	dia 3mm	100m
Trunk twine	Nylon-monofilament	2m	16 p/s
Branch twine	Nylon-monofilament	80cm	15 p/s
Swivel			1 p/
Forked swivel			15 p/s
Snap			1 p/
Sinker	iron 1kg		1 p/
Fishing hook	MUTSUBARI No. 23		15 p/s

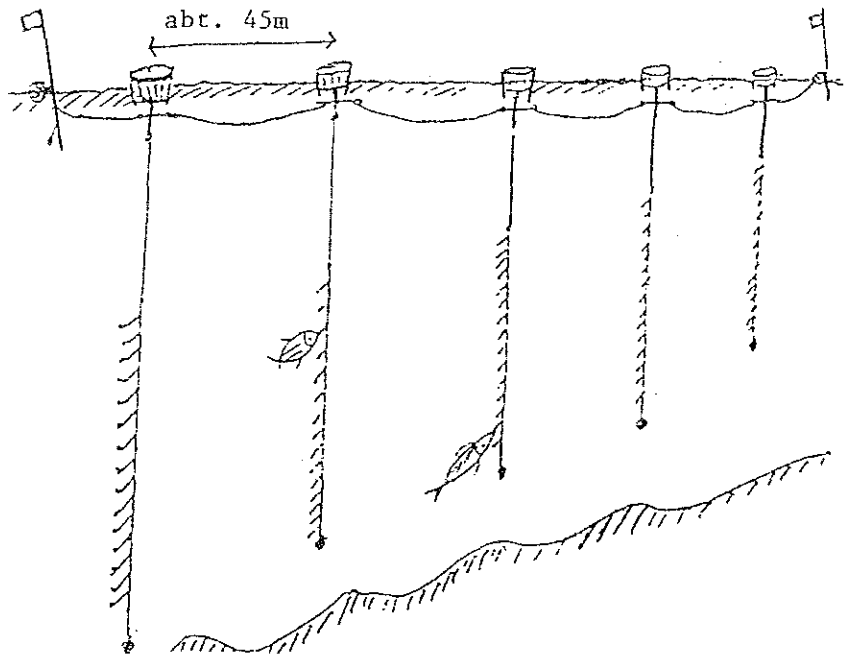
② Accessory

Flagpole	6m, 2 p/s (provided by the St. Lucian side)	
Float	plastic ball, dia 300mm	4 p/s

③ Quantity

for the Research Vessel 30 sets

for the 4 No. II Transition Vessels - 20 sets each, total 80 sets



6) Bottom long line

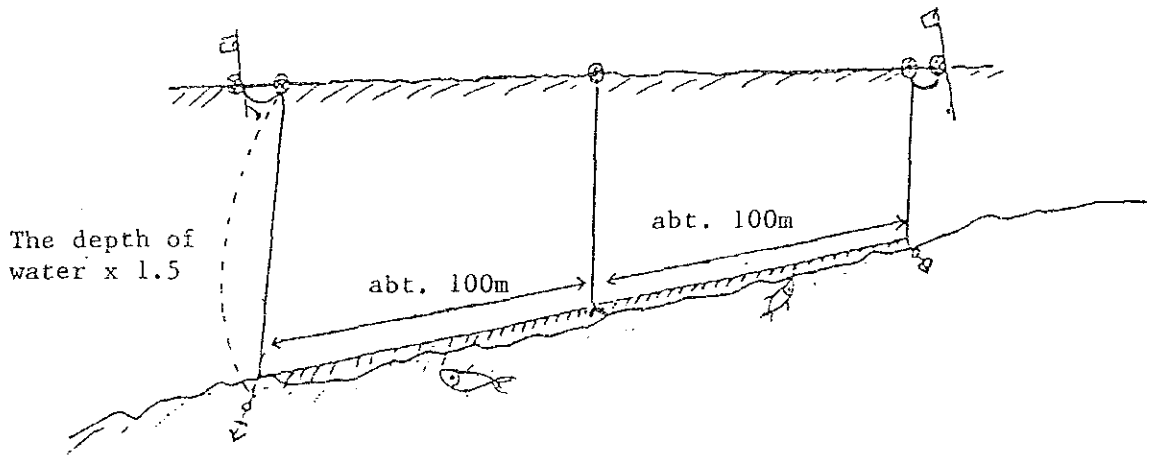
Target fish: Grouper, snapper, and jack.

Details

① Composition (each set)

Trunk line	synthetic fiber rope	200m
Branch line	synthetic fiber rope of 1.4m length	

		plus fishing gut of 0.4m length 40 p/s
	Fishing hook	TAIBARI No. 18 40 p/s
	Plastic basket	dia 50cm, height 15cm, attaching with a rubber hook rack around 1 p/
	Sinker	iron, 1kg, 2 p/s
②	Accessory	
	Flagpole	6m, 2 p/s (provided by the St. Lucian side)
	Float	plastic ball, dia 300mm, 10 p/s (the plastic balls for long lining shall be applied.)
	Anchor	15kg, 2 p/s (iron anchors for bottom gillnetting shall be used)
	Light buoy	2 p/s (light buoys for bottom gillnetting shall be used)
	Floating line	synthetic fiber rope, dia 12mm, length 200m 2 p/s
	Anchor rope	synthetic fiber rope, dia 12mm, length 50m 2 p/s
③	Quantity	12 sets



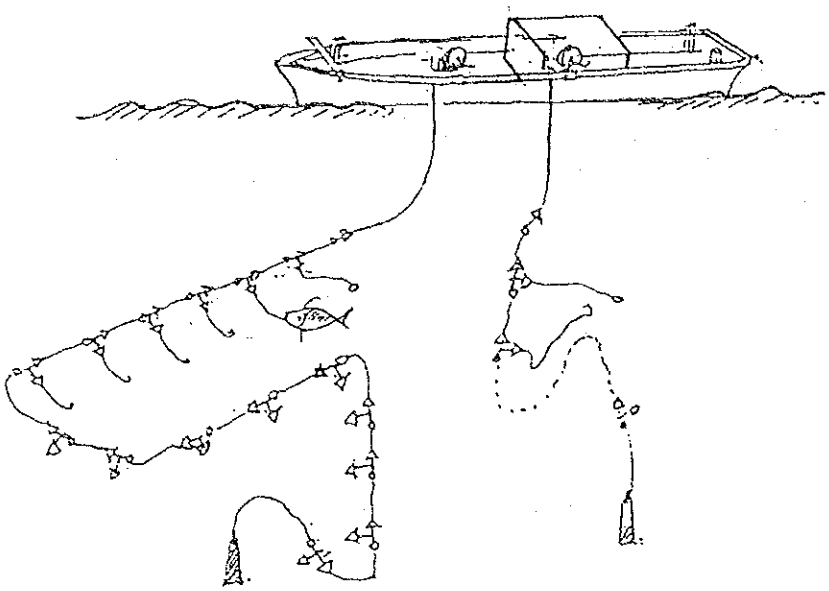
7) Hand line

Target fish: Kingfish, dolphin, barracuda, jack, and macherel.

Details

① Fish gut with a length of 300m is used as a trunk line, which is wound around a hand reel. Branch twines for drift long lining are used.

② Five sets per boat shall be supplied.



8) Pot

Target fish: Lobster and demersal fish.

Details

① Pot Frame: iron bar, dia 6mm, 90 x 40 x 40cm
Net: synthetic fiber netting
Trap: funnel-shaped, dia 130mm

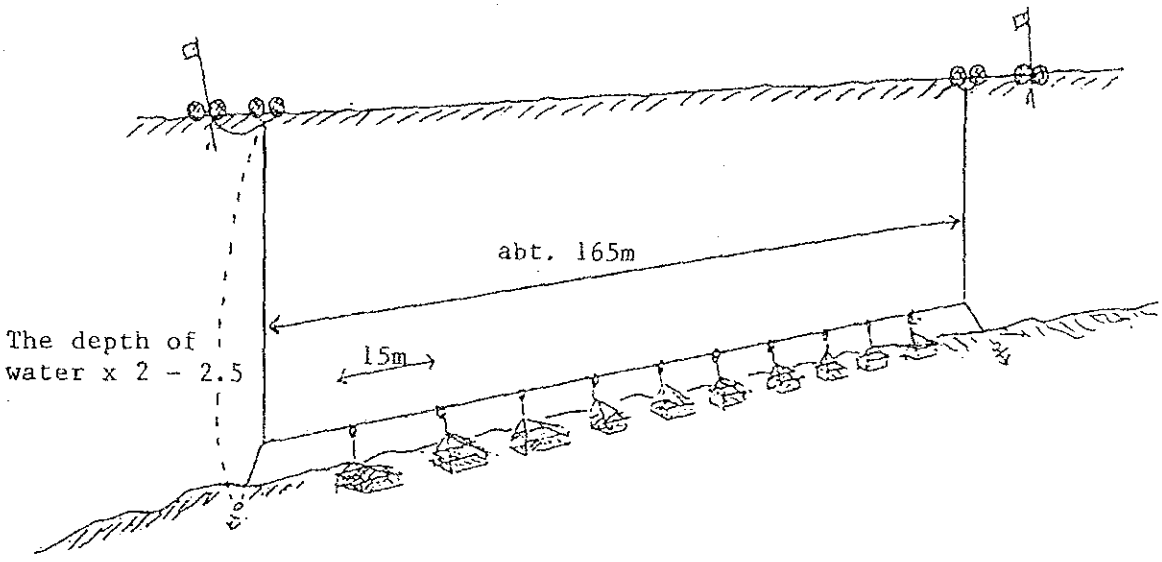
② Bait Mackerel, sardine, etc.

③ Accessory (per set)

Flagpole	6m, 2 p/s (provided by the St. Lucian side)
Trunk line	dia 6mm, length 165m (connecting line of the drift long line shall be used)
Floating line	dia 12mm, length 200m (floating line of the bottom gillnet shall be used)
Buoy	plastic ball, dia 300mm, 10 p/s (plastic balls for long lining shall be used)
Anchor	15kg, 2 p/s (anchors of the bottom gillnet shall be used)
Light buoy	2 p/s (light buoys of the bottom gillnet shall be used)

④ Quantity

20 pots per boat.



4－3－4　Basic Design Plan

The following basic design plans shall be provided.

(1) Infrastructure

- Layout plan

Gros Islet	1
Bannanes	1
Anse la Raye	1
Choiseul	1
Laborie	1
Micoud	1

- Building plan

Fish market	1
Locker for fishermen	1
Toilet and washroom facilities	1
Workshop	1
Distribution centre	1

(2) Castries Fish Market

· Plot plan	1
· Layout plan	1
· Elevation/Section	1

(3) Fishing craft

· No. I Transition Vessel	1
· No. II Transition Vessel (7.9M Type and 8.7M Type)	1
· Research Vessel	1

FISHERIES INFRASTRUCTURE IMPROVEMENT PLAN