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PILOT FLAKE-ICE PLANT

68

(CONTRACT NO. NA-82-FA-C-00030)

4970286

SMALL SCALE FISHERIES DEVELOPMENT PROJECT

MERINGGAI, INDONESIA

JOSEPH W. SLAVIN & ASSOCIATES
8203 EXCALIBUR COURT
ANNANDALE, VIRGINIA 22003

004548

OCTOBER 1983

FINAL REPORT

PREPARED FOR

U.S. DEPARTMENT OF COMMERCE, NOAA
NATIONAL MARINE FISHERIES SERVICE
PAGE BLDG. 2; 3300 WHITEHAVEN STREET, N.W.
WASHINGTON, D.C. 20235

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IN ACCORDANCE WITH
PARTICIPATING AGENCY SERVICE AGREEMENT
BETWEEN

THE AGENCY FOR INTERNATIONAL DEVELOPMENT

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AND

U.S. DEPARTMENT OF COMMERCE
NATIONAL MARINE FISHERIES SERVICE

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1.0 ABSTRACT

Technical assistance was provided in making a model fishery complex in the fishing village of Meringgai, Indonesia. Statistical information was collected on fish production and marketing. An 8-ton per 24 hours turbo flake-ice plant was installed and put into operation. The capacity of the plant appears to be sufficient to meet the ice requirements of the fishing community, fishing boats operating out of Meringgai, transit boats, auction hall wholesalers and retailers, and surrounding villages, at a price of 20 rupees per kilogram. Insulated boxes and good seafood handling techniques were introduced to fishermen, and wholesalers and retailers of seafood. The ice plant personnel received limited training in the care of ice, routine maintenance, and operation of the ice plant.

2.0 SCOPE OF PROJECT

This project began June 14, 1982, and was completed September 30, 1983. The purpose of this project was to provide technical services as a part of the small-scale fisheries development project for operation of a Pilot Flake-Ice Plant in Indonesia, and to provide short-term consulting services regarding the refrigeration, quality, and sanitation of fish and fishery products. The principal tasks included:

- Recruitment of specialist to fill the position of Pilot Flake-Ice Plant Technician.
- Collection of statistical information before and after installation of the ice plant to measure the benefits of the program.
- Special assistance to the government of Indonesia and ice plant contractor in installation of the ice plant, including organizing work, construction and manual labor, and hiring and supervision of Indonesian contractors.
- Short-term consulting services concerning the feasibility of installing an ice plant in Manna, Bengkula Province; developing a master plan for developing Meringgai into a model seafood complex; and helping improve the quality and refrigeration of fish.

The project site is Meringgai, Lampung, Indonesia, where AID is assisting the government of Indonesia (GOI) to construct and install a Pilot Flake-Ice Plant Facility to provide local fishermen and buyers with ice to improve the quality and extend their markets for fish. The ice plant project was developed as a result of a report, "Recommendations Concerning the Feasibility of a Proposed Assistance to Small Scale Fisheries Project to be

Developed by Indonesia," made by the University of Rhode Island in September 1978, as a part of Contract No. AID-ASIA-C-1334. In October, 1981, an 8-metric ton per 24-hours flake ice plant was ordered through Franklin Export Trading Company for this project.

The contract for technical assistance was awarded to Joseph W. Slavin and Associates in June 1982, and Mr. Billy G. Miles was hired to serve as flake-ice plant technician in August, 1982.

3.0 PRINCIPAL ACCOMPLISHMENTS

Progress made under this contract is outlined in quarterly Progress Reports, Numbers 1 to 4, and a 6-month progress report attached to this report and in the monthly reports from Billy Miles, the ice plant technician, which were made available to AID and NMFS. The principal events included the following:

- Visit to Indonesia in June 1982 to inspect site of the ice plant, discuss program objectives with AID, NMFS, and GOI officials, and carry out a feasibility study for establishment of an ice plant in Manna, Bengkulu Province. (See Travel Report for June 12 - 24, 1982, in Appendix).
- Retention of Miles to serve as Flake-ice plant technician. On August 22, Miles and his family arrived at their residence in Tanjung, Karang, to begin work on the project.
- Inspection of Flake-Ice Plant in accordance with purchase specifications prior to shipment to Indonesia on October 1, 1982. As a result of this inspection, several corrections were made in the shipment by the ice plant contractor. All of the parts were accounted for when the shipment arrived in Indonesia.
- Development of special report on feasibility for establishment of an ice plant in Manna, Bengkulu Province. This report recommended that detailed specifications and cost analysis be prepared for establishment of an ice plant in Manna. (See copy of the feasibility study in the Appendix.)
- Development of a Master Plan for developing Meringgai into a model seafood handling complex. Billy Miles developed a Master Plan for Meringgai, which was approved by the GOI and is being implemented by the

Indonesian government and AID. The plan was well-received by local fishermen and industry and is an important step in making Meringgai a model seafood complex. (See the attached field report, which describes Miles' plan).

- Collection and analysis of statistical information on distribution of fish from Meringgai before and after the ice plant operated. GOI cooperated in obtaining the required information. Information showed that all of the ice from the flake-ice plant was used by local fishermen, seafood buyers, and people in the fishing community of Meringgai. (For information on the distribution of fish and the use of ice, see Miles' field report).
- As a part of technical assistance services, seafood handling techniques in Medan, Sumatra, and East, West, and Central Java were inspected and appraised. To observe methods of handling and seafood quality, Miles visited auction halls, fishing ports, quality control laboratories, and cold storage facilities and processors of shrimp, fish, and frog legs. It was recommended that a quality control consultant be hired to provide assistance to that area. (See detailed report on the travel in the Appendix).
- Installation and operation of the pilot flake-ice facility. Since his arrival in Indonesia, Miles provided continuing assistance in fixing water supply piping and in taking steps to ensure satisfactory installation of the ice machine and improvements in the facility complex at Merringgai. The ice machine arrived in Indonesia in January 1983, and installation began in May 1983. The machine was operational on June 17, 1983. The contractor assisted the engineer from Crepaco in obtaining

supplies, making changes to the buildings and the Meringgai complex, organizing the labor to perform the construction, plumbing, and electrical services, and helping in actual construction and engineering work. (See attached report for detailed account of the work performed).

- Assistance was provided to GOI in training fishermen to operate the diesel engine and the ice machine. Boxes were constructed for transporting iced fish, and ice was sold to the fishermen and the community for use in catching and distribution of the fish.
- Special quality control seminars were held with people from the GOI. Discussions were held with Taylor Quinn of the U.S. Food and Drug Administration during a visit to Indonesia to inspect their plant inspection program.
- A detailed quality program was designed for the Meringgai Seafood Complex. GOI is implementing this program.

4.0 FIELD REPORT OF THE PILOT ICE PLANT MERINGGAI, LAMPUNG, INDONESIA

Prepared by:
Billy G. Miles, Flake-Ice Plant Technician
Joseph W. Slavin & Associates

4.01 ABSTRACT:

An 8-ton per 24 hours turbo flake-ice plant, insulated room, cooling tower, generator, and support facilities were installed at Meringgai, Indonesia. Problems, obstacles, and difficulties were encountered, but were resolved by the consultant, AID, and the Government of Indonesia. Ice can now be produced at an estimated rate of 300 kg per hour or 7 metric tons per 24 hours. The capacity of the plant appears to be sufficient to meet the ice requirements of the community, all fishing boats operating out of Meringgai, transit boats, wholesalers and retailers of seafood, the auction hall, and surrounding villages at a price of Rp 20 per kg, which is one half the price paid for ice before the installation of the ice plant. Everyone is purchasing ice, but a big question is how many boats will use ice? It is too early to evaluate any improvement in seafood quality. Insulated boxes and good seafood handling techniques were also introduced to the fishermen, auction hall, and wholesalers and retailers of seafood.

Ice plant personnel received training in the care of ice, routine maintenance, and operation of the ice plant.

A master plan was designed for the development of Meringgai into a model seafood complex for Indonesia.

A detailed quality control program was designed for the Meringgai seafood complex.

)2 RECOMMENDATIONS:

A. The ice plant personnel should receive sufficient training in refrigeration to be able to operate, maintain, and service the ice plant adequately.

B. The ice plant personnel should receive sufficient training to repair and maintain the generators, pumps, and diesel engines.

C. Someone should be trained to service and maintain the electrical systems.

D. The spare parts that Rene Laude and I listed should be purchased immediately in order to repair, without delay, the ice machines and systems. Many of these parts are not available in Indonesia.

E. A reliable local refrigeration service company should be located to assist in emergencies.

F. Technical assistance should be continued on a short-term consultancy basis to help the Government of Indonesia implement programs that were not completed owing to delays in the arrival and installation of the ice machine.

G. Technical assistance should be provided on a short-term consultancy basis to help the Government of Indonesia implement my master plan and quality control programs that were started for the Meringgai seafood complex, fishermen, and buyers of seafood.

H. An automatic chlorine gas system should be purchased to ensure proper chlorination of the water. The ice is being used for human consumption.

I. A 1,000-gallon storage tank shold be purchased for diesel fuel and connected directly to the generators to provide an adequate supply of clean fuel and control the diesel consumption.

J. A tube well should be drilled at Meringgai to ensure a good source of fresh water year-round.

K. Routine microbiological examinations of the ice should be performed monthly to monitor the quality of the ice.

L. A complete marketing program should be implemented.

4.03 INTRODUCTION AND DISCUSSION:

Meringgai Seafood Complex is located on reclaimed land on the Meringgai river at Labunan Meringgai, Lampung, Sumatra, Indonesia. When the consultant arrived in August 1982, the seafood complex consisted of an open auction hall which needed repairs and was in a very unsanitary state. The fishermen had no supply of fresh water. The fresh water system for the auction area consisted of one faucet locked up in an outbuilding and a pipe with a rag plug. The water was only used for what the people called cleaning, but was really adding a little water to the rest of the filth. Ducks and other animals dropped excreta everywhere throughout the complex. There were several other buildings that had been constructed for the flake-ice project, a small two-story building for the flake ice machine, two houses for personnel, and a generator building. Other buildings in the complex are a salt storage shed, a processing shed, ice shed, and some other small office buildings.

The river flows in front of the complex; a concrete bulkhead that runs the entire length of the complex makes a nice harbor and facility for loading and unloading boats. The flow of water in and out of the harbor was not sufficient to remove pollution from the harbor; therefore, it was full of debris and other waste, and had a very offensive odor. Dirt had silted in by the bulkhead until it was too shallow for the boats to come along-side.

The complex has two water systems; one for the flake-ice plant, and one for the auction hall area. Each system has its own water tank and pump. The source of the water for both systems is the same. Both systems pump water from the same point on the Kuala Meringgai river upstream from the complex. The water was not treated in any way to reduce bacterial levels. Laboratory analysis of the water revealed that it was not potable.

The seafood-handling practices by the fishermen and at the auction area were quite primitive. Very few of the choice fish and large shrimp were iced even slightly by the fishermen before reaching the auction area. Approximately 80% of the seafood that was landed and sold at Meringgai was never iced. The rest of the seafood was only slightly iced at a ratio of 20:1 - seafood to ice - by the purchaser after buying. Four to eight hours elasped from the time the seafood was caught until it was sold at the auction hall. Then another two to ten hours elapsed before it reached the market place and the consumer.

There were no good insulated boxes used for transporting the seafood from Meringgai. The primary containers for shipping fish and small shrimp were straw baskets and wooden boxed lined with banana leaves. The containers for shipping large shrimp were large blue plastic drums with or without a lid. The large shrimp were trucked or boated to Jakarta for further processing for the export market. All large shrimp that I have observed were in various stages of decomposition when I saw them at Meringgai. The quality had to be very poor, 8 to 10 hours later when, without proper icing, they reached Jakarta in an open truck. The large shrimp bring a premium price of Rp 3,000 to 4,000 per kg at Meringgai and Rp 7,000 to 8,000 per kg at Jakarta. The price of the fish and small shrimp triples from Meringgai to the markets, from Rp 500 to 1,500 per kg.

From the time the seafood was caught until it was consumed, very little was done to preserve its quality. On the boat it was exposed to the elements and the sunlight for several hours before reaching the harbor. At the harbor, buckets of water from the polluted harbor were poured over the seafood. The seafood was transported from the boats to the auction area in all types of containers that has been used indiscriminately for everything and never washed or sanitized. The seafood was then poured on the dirty floor of the auction hall among the ducks, animals, and people, and sold sometime later. The seafood was never washed with clean water or iced properly from the time it was caught until it was purchased by the consumer. Even with all the mishandling, the demands for seafood were so great that everything was sold, from very small decomposed minnows to large spoiled sharks.

I was asked to develop a plan to maintain the quality and increase the shelf life of the seafood by use of ice and an educational program. Therefore, I devised a master quality control plan for Meringgai seafood complex to be implemented step by step.

As each stage of the master plan is implemented a related educational program must be implemented to improve the quality of the seafood. Ice alone cannot solve the quality problems of the seafood. A complete quality control program is a necessity. As previously stated, the seafood is handled in a very primitive fashion on the fishing boats and at the auction hall. It will take a long time for the fishermen and other people to adapt to quality control procedures that I have recommended in my master plan.

The master plan was submitted to the Government of Indonesia for review and acceptance. Implementation began immediately after approval of the master plan by the Government of Indonesia. An education program began with seminars and demonstrations of cleaning and seafood handling techniques to improve sanitation and the quality of seafood landed at Meringgai. The big factors in improving overall conditions were the installation of pressure chlorinated water for the auction hall, the introduction of insulated boxes, and availability of ice at an affordable price.

4.04 PRE-ICE PLANT PROGRAM:

The pre-ice plant program included the following:

A. Collection of statistical information.

1. Meringgai has no ice plant.
2. Limited supply of ice is transported in from Jakarta and Teluk Betung.
3. Approximately 10% of the boats are using ice, but not a sufficient amount of ice to preserve the product. About 80% of the seafood that is caught is never iced.
4. Approximately 60 tons of product a month is landed at Meringgai.
5. Approximately 100 boats fish out of Meringgai.
   a. All boats less than 12 meters long with shallow draft.
   b. All boats motorized/with sail with either air-cooled gasoline or diesel engines.
6. Ice is primarily used for premium fish and large shrimp.
7. Very primitive insulated containers are being used.

8. The types of containers are straw baskets and wooden boxes lined and unlined with banana leaves.
9. Approximate price paid for ice for the last year was Rp 40 per kg.
10. Average amount of seafood landed a day at Meringgai is 2 tons.
11. Fishery department officials state that a minimum of 20% of the daily catch is lost by spoiling, which equals 800 lb per day. A more realistic figure for spoilage is 40% to 60%.
12. Freshwater system at the auction hall is not sufficient for cleaning and for the fishermen.
13. Seafood handling techniques are very primitive.
14. Quality control program is very limited.
15. Basic hygiene and sanitation is absent.
16. Fishing is only daytime.
17. Fishing is principally with nets.
18. Fishery has no management regulations.
19. All fishing is done within a short distance from Meringgai. Four-hour trips.
20. No regulations govern mesh size for net.
21. 60% of the seafood landed at Meringgai is salted or dried, therefore, doesn't require ice.

B. Preservation of seafood.

1. No special treatment (natural).
2. Dried without salt.
3. Dried with salt.
4. Smoked without salt.
5. Smoked with salt.
6. Ice.

C. Distribution of Meringgai seafood.

1. Distribution points:

Name of Point	Distance from Meringgai	Transportation Time
Palembang	525 km	10.0 hr
Kota Bumi	205	5.5
Sumberjaya	265	6.5
Metro	85	2.5
Tanjung Karang	80	1.5
Jakarta	500	9.0

2. Transportation to the distribution points.
   a. Open-bed truck
   b. Fishing boat
   c. Bus
   d. Mikrolet
   e. Oplet
   f. Becak
   g. Bicycle
   h. Cart

3. Type of seafood shipped to the distribution points.
   a. Dried without salt - fish and shrimp.
   b. Dried with salt - fish and shrimp.
   c. Fresh without ice - fish and shrimp.
   d. Fresh with ice - fish and shrimp.

4. Type of containers used to ship seafood to the distribution point.
   a. Wooden boxes with or without covers.
   b. Wooden boxes lined with banana leaves with or without covers.
   c. Straw baskets with or without covers.
   d. Straw baskets lined with banana leaves with or without covers.
   e. Plastic drums with or without covers.
5. Condition of the seafood when it reaches the distribution points.
   (a) A large percentage of the seafood is in various stages of decomposition when it is delivered to the distribution points, especially the seafood shipped fresh without ice. The moisture content of the dried fish is too high, and it is also in various stages of decomposition.
6. Marketing at the distribution points.
   a. Sold at the local markets.
      (1) Ice is not used at the local markets for the preservation of seafood regardless of the time taken to sell the seafood, 24 to 36 hours without ice.
   b. Hotels
   c. Restaurants
   d. Retailers
   e. Wholesalers for further distribution to small villages
   f. Processing plants - mainly large shrimp
   g. Individual consumers

7. Price differential from fishermen to consumer is approximately 300% for all products.

Product	Price/kg in Rp Fishermen	Price/Kg in Rp Consumers
Sardines	100	300
Small Shrimp	300	900
Large Shrimp	1,500 to 2,000	6,000
Large Fish	450 to 500	1,500
Dried Fish	100	300 to 500

8. Final destination of seafood products.
   a. Consumed by consumers in local Indonesian seafood dishes
      (1) Boiled with rice
      (2) Fried with rice
      (3) Raw with rice
   b. Further processed by processing plants for export

B. Preparation for the installation of the flake-ice machine.

1. Water system
   a. Repaired leaks.
   b. Installed valves.
   c. Redesigned and installed the primary filter system.
      (1) Additional pumps for the required volume of water
      (2) Pressure tank
      (3) Chlorination system
      (4) An additional reservoir designed and constructed
      (5) Dam designed to increase the water level of the river at the pump inlet so a constant level of water can be maintained all year

(6) Ice plant and auction hall's water systems connected together for a continuous water supply in case of a breakdown

(7) Faucets installed to provide water to the fishermen

2. Electrical system

a. Completed installation of the original generator

(1) The electrical connections repaired

(2) Fuel tank installed

(3) Pump procured to fill the fuel tank

(4) Set of jumper cables procured

(5) Purchased tools for maintenance of the generator

(6) Preventive maintenance schedule initiated for the generator

b. Installed the second generator

(1) Location

(2) Switching panel for the two generators

(3) Wire for installation

(4) Master electrical switch box

(5) Conduit, tubing, and connectors

(6) List of electrical tools

Pliers

Connectors

Tape

Meters

Screwdrivers

Other tools

3. Buildings

   a. Changed the design of the ice plant building to accommodate the ice machine

      (1) Sections of the roof and a section of the wall removed to permit the entry of the ice machine into the building

      (2) Hole cut in the second floor of the ice plant building for delivery shoot from the machine to the insulated room

   b. Modified the generator building to accommodate the second generator

4. Constructed an adequate road to the ice plant, which supported trucks and equipment needed to install the ice machine. The ice plant is in a swamp on reclaimed land.

5. Purchased supplies, tools, and equipment for installation, maintenance, and operating of the ice plant.

6. Recommended personnel and equipment for installation of the flake-ice machine.

   a. Plumber

   b. Electrician

   c. Laborers

   d. Crane to lift the ice machine

      (1) Size of crane

      (2) Capacity of roads and bridges to Meringgai

C. Recommended staffing pattern and duties for the flake-ice plant personnel.

   1. Manager or group leader

   2. Technician

   3. Secretary-treasurer

D. Designed insulated containers for seafood.

1. 50-kg capacity with removal divider
2. 500 kg with removal divider
3. 200-kg capacity with removal divider

E. Developed a 5-year master plan for the Meringgai seafood complex to serve as a model for other seafood complexes in Indonesia.

1. Proposed diagram of the facilities
2. Complete quality control programs
   a. Ice plant
   b. Auction hall
   c. Fishing boats
   d. Transporting
   e. Fishermen
   f. Grounds
3. Schedule for the implementation of the master plan

F. Technical assistance and training.

1. Flake-ice plant personnel
   a. How to install and repair a water system
   b. How to repair the electrical system
   c. Preventative maintenance
      (1) Water system
      (2) Electrical system
      (3) Buildings
      (4) Quality control
2. Fishermen, auction hall personnel, retailers and flake-ice plant personnel.
   a. Seminars at Meringgai on the proper handling of seafood
   b. Seminars at Meringgai where I explained the master plan for the Meringgai seafood complex

c. Seminars at Meringgai on the operation and distribution of ice

d. Seminars on the proper use of insulated containers

e. Demonstrations of procedures on how to clean auction hall

3. Seafood producers of Indonesia at Jakarta

a. Presented technical seminar on quality control of seafood for the U.S. market, sponsored by the commercial section of the American Embassy

G. Short-term consultancy services.

In a period of 10 days I visited landing areas, auction halls, ice plants, and cold storages (processing plants) with the Government of Indonesia officials to observe seafood handling techniques and quality control procedures in Medan, Sumatra, and East, West, and Central Java.

4.05 ARRIVAL OF THE ICE MACHINE AT MERINGGAI:

The following were the major activities concerning arrival of the ice machine.

A. The ice machine arrived at Meringgai on the morning of January 7, 1983, via two large open trucks in the rain.

B. Adequate road had not been constructed as recommended.

1. The first truck drove into the complex and sank to the bed in the mud.

2. Temporary road built of coconut logs and wooden planks.

C. The trucks were unloaded.

1. Coordinating the arrival of the trucks and the arrival of the crane.

2. Procurement of personnel to unload the trucks.
3. No instructions on how to unload the trucks.
4. Numbers on the invoices and the numbers on the crates as to the contents did not agree.
5. No pamphlets or instructions on how to lift and install the ice machine.
6. Rain and mud got deeper.

D. Items uncrated.
1. Opened all the containers and inventoried all the containers except for the generator container and the ice machine container.
2. The ice machine and generator containers partially opened looking for the instruction manual and lifting instructions. Neither items were detected.

E. Recrated the ice machine and the generator.

F. Removed section of the roof from the ice plant building.

G. Crane was unable to lift the ice machine in the packing crate to sufficient height for installation in the ice plant building.

H. The generator container and the ice machine container were covered with plastic and left sitting in the mud waiting lifting instructions and the arrival of the service engineer.

I. All other items were stored in the ice plant building.

J. All work at Meringgai has been temporarily delayed.
1. Insufficient funds to cover installation costs
2. Arrival of the service engineer from the U.S.
3. Procurement of additional equipment for the water system

1.06 INSTALLATION OF THE ICE MACHINE:

Following are the principal activities that occurred.

A. Funds were appropriated.

B. Constructed adequate road to the site.

C. Modified building to accommodate the ice machine and components.

D. Procured pumps and pressure tank.

E. Rene Laude, the engineer, and Joseph Slavin, consultant, arrived.

F. Developed plans and diagrams for installation of the ice machine and its components.

   1. Location
   2. Electrical
   3. Plumbing

G. Procured electrical and plumbing material, supplies, and equipment.

H. The crane and personnel arrived to lift the ice machine and the generator.

I. Uncrated the ice machine and the generator.

J. Detected shipping damage to the generator.

K. Placed the generator and the ice machine in their required locations with the crane.

L. Plumber and electrician arrived.

M. Installed the water system.

N. Installed the electrical system.

O. Constructed a water reservoir.

P. Constructed a pad and building for the new generator.

Q. Reconstructed the ice plant building.

R. Installed the cooling tower.

S. Installed the insulated room.

T. Repaired and installed the generator.

U. Installed control switches for the generators.

V. Detected shipping damage to the ice machine.

W. Laude and Slavin departed.

X. Slavin sent material from the U.S. to repair the damages to the ice machine.

Y. Laude returned.

Z. Repaired and installed the ice machine.

4.07 POST-ICE PLANT PROGRAM:

The post-ice plant program included the following.

A. Collection of statistical information.

1. Estimated daily production capacity is 7.2 metric tons of ice per day.
2. Average hourly production of ice is 300 kg.
3. Average amount of diesel consumed per hour is 15 liters.
4. Price per liter of diesel is Rp 200.
5. Cost of diesel per hour is Rp 3000- or Rp 10 per kg of ice.
6. Fixed and variable overhead is estimated at Rp 10 per kg of ice.
7. Calculated selling price for ice is Rp 20 per kg.
8. Average number of fishermen buying ice per day is 25.
9. Daily average amount of ice purchased by fishermen is 50% of the daily production.
10. Daily average number of seafood buyers purchasing ice is 10.
11. Daily average amount of ice purchased by the buyers of seafood is 25% of daily production.
12. Daily average number of persons from the Meringgai area purchasing ices is 50.

13. Daily average amount of ice purchased by the people of Meringgai is 12.5% of daily production.
14. Number of villages purchasing ice is 10.
15. Daily average amount of ice purchased by other villages is 12.5% of daily production.

B. Introduction and use of insulated boxes.

1. Received 20 insulated boxes.
2. Introduced the insulated boxes to the fishermen and buyers of seafood.
3. Instructions given on the proper use of the insulated boxes for icing of seafood.
4. Instructions given on the care, handling, and cleaning of the insulated boxes.
5. Insulated boxes can only be rented by the fishermen.
6. Daily rent is Rp 25.
7. Insulated boxes are being accepted and used by the fishermen.
8. Experiment performed on keeping ability of insulated boxes. An insulated box was filled with ice, and the ice lasted for 5 days.

C. Use of plastic trays.

1. Designed plastic trays for handling of seafood.
2. Introduced the plastic trays to the fishermen and buyers of seafood.
3. Instructions given on the proper use of the plastic trays for handling seafood.
4. Instructions given on the care, handling, and cleaning of the plastic trays.
5. Trays can be rented by fishermen and buyers for Rp 25 per day.
6. Additional trays of twice the capacity of the existing trays are needed.

D. Purchasers of ice.

1. Small children

   a. By the handfuls, cup, glass, gallon, bucket, small baskets, and plastic bags.

2. Other villages

   a. Same as the small children plus by baskets, trays, large plastic containers, truck loads, cart loads, insulated trucks, etc.

3. Fishermen

   a. 50-kg sacks, large 50-kg straw baskets, large plastic drums, large wooden boxes, and insulated boxes.

E. Methods of transporting the ice

1. Hand carrying
2. Hand carts
3. Ox carts
4. Bicycles
5. Becak
6. Oplet
7. Bus
8. Open truck
9. Insulated truck
10. All types of boats
11. Motor bike
12. Car

F. Distribution points (villages using ice produced at Meringgai).

Sumberraco, Smapam, R. Basa, Sribawano, Srinijays, Tiladas, Asahan, Metro, Sukadana, S. Sekanpung, Labuhan Ratu, TG Haji, Penet, Sumarne Penet, Nibung, S. Burung, Simpang, Jalakarya, Merek, Teluk Betung, Jepara, Ketapan.

G. Technical assistance and training

1. Flake-ice plant personnel

   a. How to operate and maintain the ice plant and its components

   b. How to manage the ice plant

   c. Staffing of the ice plant

   d. Storing and handling of ice

   e. Quality control

   f. How to use the power tools and other tools that were purchased

   g. Security and safety

H. Fishermen, auction hall personnel, retailers, wholesalers, and flake-ice plant personnel.

1. Seminars on how to handle seafood properly.

2. Seminars in which I explained the master plan for the Meringgai seafood complex.

3. Seminars on operations and the distribution of ice.

4. Seminar and demonstrations on how to use and care for insulated containers.

5. Demonstrations and seminars on how to clean the auction hall, ice plant, boats and the surrounding area.

I. Master plan implementation.

1. Quality control.

   a. Cleaning schedule and technique.

   b. Chlorinated pressure water system and how to use it.

   c. Ice and how to use it.

   d. Design of tables and sinks for the auction hall.

e. Installation of a sink and table at the auction hall for the fishermen to use to wash and sort their catch.

4.08 PROBLEMS AND PERSONAL COMMENTS:

A. Problems.

1. Funds
2. Delays in the arrival of the ice machine
3. Change in the brand and the model of the ice machine
4. Communications
5. Lack of skilled and experienced personnel
6. Shipping damages to the ice machine and generator
7. Insufficient supply of diesel oil to operate the plant

Some problems were experienced with delays in arrival of the ice machine, funding to purchase equipment, shipping damage to the ice machine and generator, insufficient supply of diesel oil to operate the plant and communications.

B. Personal comments.

This project had many obstacles to overcome with organization, coordination, and an adjustment period before all parties began to work as a team. It was a team effort that made the project a success.

4.09 MASTER PLAN FOR DEVELOPING MERINGGAI INTO A MODEL SEAFOOD HANDLING COMPLEX:

An overall quality control program must be developed and implemented for the seafood complex at Meringgai. The quality control program includes structural improvements, landscaping, and a complete educational program in the handling of seafood.

The structural and landscaping improvements are necessary to provide a facility that is adequate to handle large volumes of seafood, to maintain the quality of seafood, and to remove or prevent deterioration of the seafood. The facility must have sufficient ice, water, storage space, and a good sanitation program.

The educational program should cover the entire process from the time the seafood is caught until it is bought by the consumer. The program must cover all techniques that are used to increase the shelf life of the seafood that is produced. Examples of techniques that must be considered are:

1. Proper use of ice.
2. Insulated boxes for transporting and storage of seafood.
3. Proper cleaning of the boats
4. Handling seafood on the boats and ashore
5. Washing the seafood
6. Basic hygiene and sanitation
7. Keeping the seafood from becoming contaminated
8. Removal of unsanitary conditions at the auctionhall and surrounding area

General Recommendations for the Seafood Complex:

1. Remove all trash, refuse, garbage, animals, and ducks from the area. Place trash cans throughout the area with signs stating "KEEP THE AREA CLEAN". Also, build a fence around the complex with gates and cattle guard to keep the animals out of the complex. Trash, refuse and garbage attract flies which carry bacteria that might contaminate the seafood. The feces from the animals and the ducks may contain pathogenic bacteria. The animals and ducks <u>must</u> be removed from the area.

2. Clean out all existing drains and instll more drains to remove all waste water from the area. Withouit an adequate drainage system, water and waste accumulate in low areas, which may provide breeding sites for instects of bacteria, as well as food-born filth that could contaminate the seafood products.

3. Install a chlorinated pressure water system for cleaning and washing seafood products to reduce bacteria levels and remove filth and debris from the seafood. The best source of water would be a very deep-drilled 6-inch diameter tube well and a large sealed watertower.

4. Develop and implement a complete cleaning and sanitizing program for the area. This is necessary to remove and kill bacteria in the area where seafood is handled. The general procedure for cleaning and sanitizing is as follows:

   a. Remove all waste matter with water
   b. Apply detergent and scrub
   c. Rinse with water
   d. Apply chlorine solution, scrub, and rinse

A very helpful tool for cleaning and sanitizing is a high-pressure sprayer/washer. I suggest that one be purchased for the complex. All areas where seafood is handled should be thoroughly cleaned and sanitized daily and washed down every 2 hours during processing or as needed with pressure water.

5. Build concrete tables for the auction hall to keep seafood and ice off the floor. The floor is contaminated with bacteria and anything tha comes into contact with the floor wil become contaminated. Also the floor of the auction hall needs resurfacing for proper cleaning.

6. Build concrete sinds for washing seafood products before they go into the auction hall. The sinks would be eqwuipped with chlorinated pressure water connected by hoses with shower headsd to wash the seafood. Large drains must be provided to remove the waste immediately. Perforasted metal or plastic trays are needed to hold the seafood during washing. If the seafood products are properly washed, the bacterial levels can be reduced by 75%. This alone wll hlep increase the shelf life of the seafood. Washing removes dirt and other debris.
7. Buy metal or plastic trays to hold and to carry the seafood into the auction hall after it has been properly washed. The trays should be large enough to hold the seafood and suficient ice to keep the seafood at 4°C or below while it is in the auction hall.
8. Provide facilities to wash and sanitize the carrying trays and the perforated trays each time they are used.
9. Provide racks to hold the trays before and after they are washed and sanitized.
10. Provide facilities at the ice plant and at the auction hall for washing and sanitizing hands. Hands are a major source of contamination and must be kept clean and sanitized.
11. Fill and surface with concrete or black top the area around the ice plant and the auction hall. Slope the surfacing material properly to promote fast and adequate drainage.
12. Provide a wider concrete walkway betwen the ice plant and the auction hall and to the boats.
13. Provide carts for transporting and storing ice in the auction hall.

4. Allow no eating in the ice plant, except in the office, and not at all in the auction hall. Remove all vendors from the auction area to a designated area. The vendors must keep the area clean or be expelled from the complex.
5. Build concrete tables with sinks and chlorinated pressure water in designated areas for the fishermen's use, so they do not have to use the ground or sidewalks. The tables can be used by the seafood buyers for packing the seafood they purchase from the auction hall for shipment.
6. To keep it from decomposing insist that all seafood from Meringgai be transported in refrigerated trucks or in insulated boxes with sufficient ice.
7. Buy cleaning and sanitizing supplies and equipment.
   a. Brooms
   b. Scrub brushes
   c. Detergent
   d. Chlorine
   e. High-pressure sprayer/washer
8. Dredge out the harbor and channel so that the boats can come alongside the bulkhead to take on supplies and ice, and to unload their catch. If the harbor and channel were deeper, larger boats could use the seafood complex. The deeper harbor and channel would facilitate the removal of waste from the town thus improving all-around conditions.
9. Install a fuel pier at the complex on the ocean side of the auction hall, complete with fuel pumps, oil, and running water.
0. Build a fishing supply store wihin the complex, so that fishermen can buy fishing supplies there. Along

with this, provide a covered shed with racks for repairing the nets. This will remove the repair operations from the docks, walkways, and auction area.

21. Hire a person qualified in quality control to be director of quality control for the complex. He must have training in quality control, seafood handling, basic hygiene, and sanitation and have a working knowledge of bacteria control. He must have the governmental authority within the complex to enforce the quality control requirements. He will be directly responsible for the quality of seafood produced by the complex. He will perform quality control tests and maintain records of the tests and the operation of the complex.

22. Construct a zone for trucks to load seafood at the auction hall area and another for loading ice from the flake-ice plant.

23. Enlarge the generator house to hold two generators. Purchase another generator of the same type as the existing generator and provide switches to switch from one generator to the other. This is necessary to ensure that there is always electrical power. Use one generator for a week, then the other generator the next week. The inactive generator can be serviced and repaired. Two similar generators will use the same filters, injectors, etc.; thus the repair parts inventory will be at a minimum.

24. Build facilities for further processing. The facilities must contain basic needs for a processing plant as outlined by CODEX ALIMENTARIUS.

25. Build a home, office, and testing facilities for the director of quality control. The office and testing facilities must contain the quipment and supplies necessary to perform assigned duties.

26. Provide a dam on the freshwater river below the water pump and filtering system to ensure a continuous level and source of water. The water system needs a modern filter system, automatic chlorination system, and pressure pump.
27. Build a repair and supply shop so the fishermen can have their engines repaired and serviced, and buy repair parts inside the complex.
28. Provide an incinerator for waste disposal.
29. Provide a building for maintenance supplies and equipment necessary for the complex.
30. Sometime in the future provide a waste treatment plant.
31. Add a small fee to the sale of each item sold within the complex to pay personnel to maintain the complex and keep it clean. The director of quality control would directly supervise the cleaning personnel.

If all the items that have been discussed are implemented and if everyone concerned works together, Meringgai seafood complex can be a model seafood complex for Indonesia. There will be an increase in demands for Meringgai seafood in both the export and domestic markets, because the consumer will recognize the quality of Meringgai seafood and recommend and demand it. Meringgai seafood will bring a better price in the market.

4.10 IMPLEMENTATION OF THE MASTER PLAN:

The following is the way I would recommend the implementation on the master plan for Meringgai.

A. Immediate and continuous implementation

1. Educational program covering all techniques that increase the shelf-life of the seafood. Sufficient water, top priority, then 1,2,3,4,5,6,7,8

2. General recommendation for the seafood complex: 1,2,3,4,5,6,7,8,9,10,11,14,15,17,21

B. Next 3 months' implementation

1. General recommendations for the seafood complex: 12,23

C. Next year

1. General recommendation for the seafood complex: 13,22,26,31

D. Next 2 years' implementation

1. General recommendation for the seafood complex: 25

E. Future implementation

1. General recommendations for the complex: 16,17,18,19,20,24,27,28,29,30

4.11 RECOMMENDED SEAFOOD QUALITY PROGRAM FOR MERINGGAI

The purpose of a good quality control program is to produce a safe, wholesome product at a profit. Maintaining high quality in the product is vital to the Government of Indonesia, because the fishermen and other parties concerned must produce high-quality seafood with maximum shelf-life in order to compete for a fair share of the market.

Quality control involves all practices that assure the consumer a high-quality product. Daily quality control practices are needed to eliminate problems and to provide a product that will regain consumer acceptance.

Quality of a product can be judged in many ways, including uniformity of size, color, texture, weight, and other criteria. The most noticable and offensive indications of loss of quality is discoloration, off odors, and off flavors. These organoleptic quality changes include: a. enzymatic changes that occur naturally in the product, b. oxidation reaction such as rancidity

and melanosis (dark discoloration), and c. spoilage from growth of bacteria - the most important single factor causing quality deterioration.

Although a high bacterial count does not always indicate a poor quality product, generally the higher the count, the more rapid the spoilage. The ultimate numbers of bacteria on a food product, which will determine its shelf-life, can be controlled by eliminating possible sources of contamination so more bacteria will not be added to the product. Washing the product with chlorinated water will help reduce the number of bacteria, and keeping the product properly refrigerated to 4°C or below will slow growth of bacteria already present.

There are many sources of bacterial contamination from the time of harvest until the seafood is bought by the consumer.

When the seafood is taken from the water it has a certain bacterial population, which may be small or large depending on the conditions and time of harvesting. Seafood harvested from polluted waters have very high counts while those harvested from unpolluted waters have low bacterial counts. Other factors that contribute to bacterial contamination are when the nets are hauled, conditions aboard the boat, washing the product, proper icing at sea, and hygiene and sanitation of the fishermen.

The physical location of the unloading and auction area can influence the amount of contamination. Poorly drained and unkept areas are sources of bacterial contaminations. Odors, dust, and contaminated air can create problems, especially in areas with animal and duck populations. The construction of the unloading and auction area can add to the bacterial population of a product, if they are not properly constructed and kept clean. All surfaces should be constructed of materials that are easy to clean. The area should be large enough to handle the amount of seafood received, with adequate water for properly washing the product and

ice and storage facilities. The floors should be constructed of a hard, impermeable or nonporous material and should be sloped towards drains. The suggested slope is 1/4 inch per foot. One drain is needed for every 400 square feet of floor space. Drainage lines should be at least 4 inches in diameter. All drains should be treated periodically with chlorine (800 - 1000 ppm), which will greatly reduce the source of contamination.

Equipment is a source of bacterial contamination if it is not kept properly maintained and clean. If remains of seafood are left to decompose in nets, boats, insulated boxes, trays, baskets, other utensils, and the auction area, they will contribute to bacterial contamination of the product. All utensils, tanks, trays, tables, sinks, and insulated boxes should be of an easily cleanable, noncorrosive, and non-toxic material. Heavy permanent equipment should be installed at least 1 foot from walls and 1 foot or more off the floor to facilitate cleaning.

All water used should be potable and should be checked at least every 3 months by an approved laboratory for its quality. All water that is used for making ice should be potable. It is suggested that all water used be treated with chlorine and 10 ppm residual chlorine be available at all locations in the facilities.

Insects and rodents live in, around, and on filth. They harbor extremely large numbers of bacteria and are carriers of human diseases such as salmonella. Therefore, all measures possible should be taken to eliminate them from the facilities. The best way to get rid of them is to remove their sources of food and the filth and other debris where they live.

Humans are a source of bacterial contamination. Bacteria live on the skin, hair, teeth, and in the mouth, nose, and intestines. If anyone who comes into contact with seafood does not practice good personal hygiene and sanitation they may be significant source of bacterial contamination.

It is recommended that good basic personal hygiene and sanitation be practiced by all parties who come into contact with the seafood. That they try to wear clean clothes and wash hands when possible, especially after using the toilet. Persons handling the seafood products must be educated to recognize the need for observing good sanitary procedures. This is the most important single factor in preparing safe, wholesome products.

Another major source of bacterial contamination is from animals and fowl in the area. Bacteria live on their skin, hair, feathers, teeth and mouth, nose, and intestines. Throughout the area they also deposit their excreta, which contains harmful bacterial that contaminates everything they touch. Animals and fowl must be removed immediately from the facilities.

The water in the harbor is polluted with human, animal, and fowl excreta and other waste products. The bacterial count of the water is too numerous to count. Under no circumstances should harbor water be allowed to come into contact with seafood or anything that comes into contact with seafood. If anything needs to be washed, get the water from the freshwater faucet at the auction area. Never use the water from the harbor for anything.

The floor and sidewalks of the complex are contaminated with bacteria and filth; therefore, seafood should never come into direct contact with them. If the product touches them it must be rewashed to prevent contamination.

Adequate facilities as outlined in my master plan for Meringgai seafood complex are necessary before a complete quality control program can be implemented. The facilities must have a detailed cleaning and and sanitizing procedure and schedules for cleaning.

Cleaning and sanitizing creates a clean working atmosphere, reduces odors, and reduces contamination. The cleanup job should not be considered insignificant. The facilities should have

regular cleanup crews headed by a supervisor or other responsible individual. No matter what is to be cleaned or regardless of what cleaning agent or sanitizer is being used, the simple four-step operation described below should be used:

1. Rinse with pressurized cold water - remove all large particles.
2. Clean by adding detergent and scrubbing.
3. Rinse with pressurized cold water to remove detergent.
4. Sanitize with sanitizer.

If the sanitizer is corrosive to the equipment, rinse the equipment with cold pressurized water. High-pressure spray equipment is probably the most effective way of cleaning and rinsing. If high-pressure spray equipment cannot be purchased, a small pump can be used to provide pressure water for cleaning and a small-pressure garden sprayer can be used for applying the detergent and sanitizer. The type of detergent that should be used is a chlorinated alkaline type, because it is best for removing protein and fat. The recommended type of sanitizer is 50 ppm chlorine.

It is recommended that the followiong cleaning schedules be implemented at the auction area and at the ice plant.

1. Morning - each day before the seafood arrives, rinse down with pressurized cold water and apply sanitizer.
2. Middle of day - a complete cleaning and sanitizing operation should be done.
3. End of day - a complete and thorough cleaning and sanitizing of everything in the auction hall, flake-ice plant, and complex area, including drains, sinks, tables, trays, and other equipment.
4. Continuous - clean and sanitize various receptacles each time they are emptied.
5. Also, when waste needs to be removed, rinse down with pressure water.

Hand washing and hand sanitizing facilities are needed outside the toilets. Hands pick up bacteria from everything they touch. Everyone should be reminded to wash and sanitize their hands thoroughly after using the toilet and before handling the seafood.

RECOMMENDED PROCEDURE FOR ICING OF SEAFOOD

1. Use insulated boxes of appropriate size to hold seafood and sufficient ice for proper icing.
2. Clean and sanitize insulated boxes before using.
3. Insulated boxes must have sufficient drains to drain off the water as the ice thaws.
4. Place a layer of ice on the bottom of the insulated box.
5. Now the boxes are ready to receive the seafood.
6. After the seafood is removed from the nets or hooks, first wash it with seawater to remove debris, slime, and mud.
7. Gut and wash the fish again to remove blood and guts.
8. First wash the shrimp with seawater to remove debris and mud.
9. Then behead the shrimp, wash them in seawater, and treat with sodium bisulfate.
10. The shrimp and fish are now ready to be iced.
11. Place the seafood in the insulated boxes, with a layer of ice and a layer of seafood. Recommended ratio of ice to seafood is 2 ice to 1 seafood. Sufficient ice should be used to maintain an internal temperature of the seafood at 4°C or below until it reaches the auction area.
12. Add final layer of ice.
13. Close and secure the lid for transporting.
14. Cover the contained with light-colored cloth or other material to keep it out of the direct sunlight.

NOTE: Each fisherman should have two insulated boxes. One for ice and the other for fish and ice.

GENERAL RECOMMENDED PROCEDURE FOR HANDLING OF SEAFOOD BY THE FISHERMEN ABOARD THE BOATS AND AT THE AUCTION HALL

Before going to sea, the boats should be cleaned as much as possible, with special attention to areas that come into contact with the seafood. The boats should be free of all decomposed seafood. This includes removal of floor boards and cleaning out the bilges. If the bilges are to be used for storing seafood, they must be free of diesel and other petroleum distillates. If diesel or petroleum distillates come into contact with the seafood, the seafood becomes unfit for human use.

The recommended procedure for cleaning boats is as follows:

1. Remove nets from the boat. Remove remnants of seafood from them. Wash with clean water if possible.
2. Remove all other gear from the area to be washed.
3. Remove all remnants of seafood.
4. Wash with pressure water.
5. Add detergent and scrub with brush.
6. Rinse with water.
7. Sanitize with chlorine solution.

After the boat has been cleaned, the nets and other gear are returned carefully to their designated places on the boat so that they will not contaminate the boat.

Insulated boxes or an insulated hole should be used to store ice and fish. The insulated boxes or insulated hole should be kept as clean as possible. In transporting the ice to the boat, care should be taken not to contaminate the ice and the boat. Sufficient ice should be carried to ice seafood at a ratio of at least 1 to 1, but I recommend 2 to 1 ice to fish, or sufficient ice to keep the seafood at 4°C or below. Do not store boat supplies in the ice boxes used for icing seafood. Do not

store other things such as chickens and other meats in the seafood boxes, because they are contaminated with bacteria and will contaminate the catch. The insulated boxes should be equipped with drains for removing contaminated water from the seafood as the ice melts.

The length of time a fish net is set is also important in maintaining the quality of seafood. Dead fish should not be left in the net long enough for them to spoil before being brought aboard the boat. Seafood will spoil in a couple of hours in the hot ocean water.

After the fish have been brought aboard the boat and taken out of the net, they should be thoroughly washed with seawater. Then the seafood should be iced at a ratio of 2 to 1 (ice to seafood). It is also recommended that fish be gutted and washed again before icing. Shrimp should be beheaded, washed, and treated with sodium bisulfate before icing.

Remember the longer the seafood is dead before it is iced the more it decomposes the reduces its quality; therefore, harvest, wash, and ice the seafood as quickly as possible. Keep the insulated boxes and the fish hold covered to keep out the direct sunlight. Do not use dark colored material to cover them, because dark colors absorb heat and the ice will melt quickly.

When the fishing trip is over and the boat returns to the harbor, do not use water out of the harbor for anything. The water in the harbor is contaminated and wll cause your seafood to spoil if it is brought into contact with it. Use the water from the faucets on the dock to wash the seafood and wash the boats.

Unload the seafood into clean trays and transfer it to the auction hall.

When the seafood is unloaded, clean the boat and make preparations for the next fishing trip.

When the seafood reaches the auction hall, it is first put into clean perforated trays that are provided by the auction hall. Next it is placed on top of one of the sinks outside the auction hall and washed for several minutes under pressure water. The method of washing consists of turning on the shower head above the sink, then move the tray around under the running water, turn the seafood with your hands until it's washed throughly. After the washing, turn the water off and put the tray on the table next to the sink and add sufficient ice to keep the seafood properly iced while it is held for sale in the auction hall. The internal temperature should be 4°C or below at all times. Keep the trays of iced seafood on the tables in the auction hall, not on the floor, and wait for the product to be sold at the auction.

After the seafood is sold, the buyer will remove it from the auction hall to the area designated for repacking the product. The product is removed from the auction hall trays and placed in insulated boxes with sufficient ice to kep the product at 4°C or below until it reaches the consumer.

The seafood might need to be reiced again during transit. If the handling is done as recommended, the consumer should get a top quality product and all concerned should receive more money for their efforts.

Properly handled seafood will be fresh for 5 to 7 days.

The buyers will return the dirty trays to the designated areas at the auction hall for proper cleaning and sanitizing.

Cleaning procedure for the trays.

1. Remove all remnants of seafood.
2. Rinse with pressure water.
3. Add detergent and scrub with a brush.
4. Rinse with water.
5. Sanitize with chlorine solution.

6. Place the trays in designated areas for clean trays not on the floor or on the tables.

SPECIAL NOTE: The floor is contaminated with harmful bacteria; therefore the seafood, trays or ice should never come into contact with the floor. If the seafood is dropped on the floor it must be rewashed as outlined by the original procedure.

HAND-WASHING FACILITIES

All areas should be provided with facilities for washing and sanitizing the hands. The facilities should have a sink, water, detergent, and sanitizing solution. Each hand-washing facility should be provided with a sign stating, "NOTICE EMPLOYEES, FISHERMEN AND BUYERS; HANDS MUST BE WASHED BEFORE HANDLING THE PRODUCTS".

Hands pick up bacteria from every surface they touch. Fishermen and employees should be reminded to wash their hands thoroughly after using the toilet facilities and always before handling seafood.

4.12 Statistical Information

Table 1: AMOUNT OF TOTAL ICE AND SEAFOOD LANDED AT MERINGGAI

MONTH	TONS OF SEAFOOD	PRICE, RP	TONS OF ICE	PRICE, RP
1981				
September	44.11	13,732,980	29.00	1,044,000
October	42.05	11,980,775	29.00	+497,340
November	50.95	14,724,400	38.15	1,373,400
December	83.83	22,667,229	54.50	1,961,400
1982				
January	131.22	31,045,270	107.70	4,232,800
February	163.09	37,063,322	106.05	4,242,000
March	84.62	21,010,975	55.10	2,204,000
April	77.55	23,748,210	48.60	1,944,000
May	53.49	15,310,613	37.65	1,506,000
June	37.94	11,958,510	32.20	1,292,000
July	32.56	10,491,450	28.65	1,146,000
August	33.26	9,011,260	27.50	1,300,000
October	63.19	17,590,850	51.50	2,060,000
November	61.20	19,424,600	36.65	1,502,650
December	80.52	24,073,760	62.40	2,402,400
1983				
January	111.78	28,927,280	103.30	4,028,700
February	86.64	22,972,175	81.00	3,118,500
March	36.67	12,083,736	27.30	1,119,300
April	46.60	13,758,035	41.10	1,598,790
May	57.81	18,366,250	31.90	1,276,000
Total	1418.52	391,742,605	1058.70	41,087,280
Average per month	67.55	18,654,409	50.41	1,956,547

Average Price of ice per ton: Rp38,812.48

Average price of ice per kg Rp 42.78

TABLE 2 NUMBER OF BOATS USING ICE AT MERINGGAI, 1982

MONTH	NONENGINE BOATS	ENGINE BOATS	TOTAL	TONS OF ICE
January	569	1,567	2,136	107.70
February	644	1,401	2,045	106.05
March	514	1,156	1,670	55.10
April	593	1,289	1,891	48.60
May	299	1,060	1,359	37.65
June	345	759	1,104	32.30
July	228	610	838	28.65
August	263	729	992	30.95
September	225	704	929	27.50
October	435	927	1,362	51.50
November	522	1,164	1,686	36.65
December	433	1,646	2,079	62.40
TOTAL	5,070	13,021	19,091	625.05
1983				
January	342	1,642	1,984	103.30
February	234	1,179	1,415	81.30
March	200	721	921	27.30
April	191	968	1,161	41.10
May	69	1,485	1,554	31.90
June	32	1,023	1,155	18.20
TOTAL	1,070	7,018	8,190	312.80

TABLE 3. ICE PRODUCTION REPORT FOR JUNE 1983

DATE	HOURS OPERATED	Kg ICE SOLD	PRICE OF ICE, RP	LITERS OF DIESEL USED	PRICE OF DIESEL, RP	LITERS OF OIL USED	PRICE OF OIL, RP
June 17	13.00	gave away	gave away	195	32,175	16	25,000
18	17.45	850	17,000	265	46,375		
19	8.15	2,243	44,860	125	21,875		
20	14.00	3,438	68,760	210	36,750		
21	18.15	2,475	49,500	275	48,125		
22	24.00	8,349	166,980	360	79,200	5	8,750
23	22.00	3,745	74,840	330	57,750		
24	14.35	5,681	113,620	220	33,000		
25	18.00	2,210	44,200	270	43,200		
26	19.00	4,842	96,840	285	57,000		
27	24.00	4,210	84,200	360	61,200		
28	24.00	6,512	130,240	360	61,200		
29	18.00	4,029	80,550	270	54,000	16	26,000
30	10.00	1,170	23,400	150	23,250		
TOTAL		49,751	999,020		655,100	37	59,750

TABLE 4. ICE PRODUCTION REPORT FOR JULY 1983

DATE	HOURS PLANT OPERATED	KG ICE SOLD	PRICE OF ICE	LITERS OF DIESEL USED	PRICE OF DIESEL	LITERS OF OIL USED	PRICE OF OIL, RP	
July 1	12	3,000	4,561	91,220	180	31,500		
2	24	6,000	3,687	73,740	360	63,000		
3	21	5,200	4,179	83,580	322	56,350		
4	21	5,200	4,867	97,140	315	55,125		
5	8	1,950	3,888	77,760	120	21,000		
6	18	4,650	4,179	83,580	270	47,250		
7	12	3,000	2,966	59,320	180	31,500		
8	11	2,850	3,785	75,700	165	28,875	32	51,680
9	11	2,850	2,855	57,100	165	28,875	2	3,230
10	9	2,250	1,291	25,820	135	23,625		
11	0	0	451	8,300	0	0		
12	0	0	113	2,260	0	0		
13	5.15	1,350	242	4,840	80	1,400		
14	13	3,300	4,916	98,320	195	34,125		
15			5,110					
16			4,844					
17			3,830					
18			3,444					
19			3,988					
20			5,412					
21			4,652					
22			4,515					
23			4,222					

Approximately 50% of the ice sold to fishermen, 25% to wholesalers, and 25% to the surrounding communities.

Approximately 4 tons of ice is being sold a day.

TABLE 5. ICE PRODUCTION - COST AND PROFIT - JUNE 1982

DATE	COST OF PRODUCTION	PROFIT, RP
June 17	65,6000	-65,6000
18	53,000	-36,000
19	25,000	19,000
20	42,000	26,760
21	55,000	-5,500
22	72,000	94,980
23	76,000	-1,160
24	44,000	69,630
25	54,000	-10,000
26	57,000	39,000
27	72,000	12,200
28	72,000	58,240
29	79,600	980
30	30,000	-6,600
TOTAL	714,850	280,170

Calculated selling price for ice - Rp 20 per kg.
Price of diesel - Rp, 175 per liter.
Average price of oil - Rp 1,615 per liter.

TABLE 6. AMOUNT OF ICE USED FROM MAY 18, to JULY 14, 1983, BY THE THREE LARGEST FISHERMEN AND DEALERS OF SEAFOOD AND THE AMOUNT OF SEAFOOD SOLD.

NAME	MONTH	KG ICE FOR CATCHING	KG ICE FOR MARKETING	TOTAL KG ICE USED	KG OF SEAFOOD SOLD	RATIO ICE TO SEAFOOD
A	May	300	450	750	945	1:1.26
B	May	0	900	900	1,905	1:2.12
C	May	0	400	400	500	1:1.25
TOTAL	May	300	1,750	2,050	3,350	
A	June	1,200	1,467	2,667	1,830	1.45:1
B	June	1,200	1,865	3,065	1,710	1.79:1
C	June	0	2,260	2,260	1,675	1.35:1
TOTAL	June	2,400	5,592	7,992	5,215	
A	July	350	495	845	560	1.51:1
B	July	800	915	1,715	950	1.80:1
C	July	0	825	825	600	1.38:1
Total	July	1,150	2,235	3,385	2,110	

TABLE 7. SPECIES AND AMOUNT OF SEAFOOD CAUGHT AND SOLD FROM MAY 18, TO JULY 14, 1983, BY THE THREE LARGEST FISHERMEN AND DEALERS OF SEAFOOD (IN KG)

MONTH	POMFRET	MACKEREL	CATFISH	THREADFIN	SHRIMP	JACKS
MAY	870	835	705	440	195	
JUNE	1,364	2,049	300	705	697	75
JULY	365	894	0	150	1,391	

TABLE 8.
SEAFOOD LANDED AT MERINGGAI FOR THE PERIOD OF JUNE 1982, TO JUNE 1983

	JUNE		JULY		AUGUST		SEPTEMBER	
NAME	KG	PRICE, RP	KG	PRICE, RP	KG	PRICE, RP	KG	PRICE, RP
SHRIMP	4,127	2,933,900	3,182	1,535,600	5,617	3,178,550	3,289	1,856,250
LITTLE TUNA			46	23,000	1,343	650,000	1,227	445,800
SPANISH MACKEREL	2,101	1,228,100	1,716	992,950	2,738	1,750,875	1,195	702,700
JACKS	16	8,800			43	16,950	77	35,600
INDO-PACIFIC								
MAKEREL	130	75,000	6,910	3,187,750	3,225	1,480,150	3,414	1,577,300
THREADFINS	9	5,400	890	521,000	509	253,300	265	150,550
SILVER POMFRET	496	269,600	350	158,850	597	277,500	417	139,800
MULLET	1,127	564,650	1,772	721,350	849	371,550	297	306,600
OTHER	24,931	7,381,860	17,814	3,217,600	18,991	2,316,500	20,859	3,672,710
TOTAL	32,936	12,468,010	32,556	10,412,100	33,912	10,295,375	30,939	8,941,310

TABLE 8.
SEAFOOD LANDED AT MERINGGAI FOR THE PERIOD OF JUNE 1, 1982, TO JUNE 1983

NAME	OCTOBER KG	OCTOBER PRICE, RP	NOVEMBER KG	NOVEMBER PRICE, RP	DECEMBER KG	DECEMBER PRICE, RP	JANUARY KG	JANUARY PRICE, RP
SHRIMP	5,893	2,976,000	5,378	2,994,300	6,406	3,556,725	6,588	4,592,550
LITTLE TUNA	7,461	3,454,850	5,254	2,432,350	5,433	2,698,100	6,564	2,261,230
SPANISH MAKEREL	1,739	1,020,200	1,738	1,041,150	2,215	1,355,500	1,655	956,500
JACKS	638	245,100	292	126,350	637	286,050	1,687	521,850
INDO-PACIFIC MAKEREL	6,636	2,313,600	9,141	3,160,700	10,455	4,660,175	27,439	11,099,935
THREADFINS	2,208	1,281,900	2,141	1,172,175	2,491	1,321,175	1,656	844,500
SILVER POMFRET	958	515,800	782	474,750	395	215,515	165	10,255
MULLET	1,550	71,550	414	186,850	411	143,810	904	197,500
OTHER	36,105	4,572,850	36,064	7,925,375	52,079	9,836,700	65,123	8,402,960
TOTAL	63,188	17,590,850	36,205	19,424,600	80,522	24,073,760	111,731	28,927,280

TABLE 8.

SEAFOOD LANDED AT MERINGGAI FOR THE PERIOD OF JUNE 1, 1982, TO JUNE 1983

NAME	FEBRUARY KG	FEBRUARY PRICE, RP	MARCH KG	MARCH PRICE, RP	APRIL KG	APRIL PRICE, RP	MAY KG	MAY PRICE, RP
SHRIMP	6,265	4,007,735	4,556	2,628,100	1,175	350,950	2,328	1,746,000
LITTLE TUNA	1,563	483,425			137	54,800	730	293,000
SPANISH MACKEREL	486	236,200	583	315,170	2,378	1,208,575	3,385	2,031,000
JACKS	6,996	2,230,900	2,325	735,450	1,490	539,000	1,424	569,600
INDO-PACIFIC MACKEREL	17,083	7,329,015	6,660	2,785,350	4,496	1,900,575	1,598	799,000
THREADFINS	1,442	775,530	1,460	799,200	3,409	1,748,700	6,058	3,331,900
SILVER POMFRET			55	24,200	185	100,500	341	170,500
MULLET	254	102,800	546	218,400	647	298,425	1,561	702,450
OTHER	52,546	7,806,580	20,471	4,587,865	36,142	7,056,510	40,386	8,723,800
TOTAL	86,635	22,972,175	36,666	12,083,735	46,059	13,758,036	57,811	18,366,250

4.13 SPARE PARTS THAT NEED TO BE PURCHASED:

A. Large Generator SULLAIR

NUMBER	ITEM
1	Case, diesel fuel filters
1	Case, engine oil
1	Case, air cleaners
1	Injector
1	Starter
1	Alternator
1	Voltage regulator
1	Set, hoses
1	Complete overhaul kit
1	Complete valve kit

B. TURBO Machine (Carrier Compressor)

NUMBER	ITEM
1	Intake and exhaust valve set complete
1	Oil seal set
1	Case, oil filters
1	Case, dryers
1	Set, metal and ring springs
1	Packing set

C. Miscellaneous for the Above

Manual and instruction book for the Turbo machine and the Sullair generator

NUMBER	ITEM
1	Injector test pump
1	Torque wrench up to 350 foot pounds

D. For Diesel Generator

NUMBER	ITEM
1	Case, oil filters #6731 with gasket #18688
1	Case, air filters #9601
1	Case, fuel filters #2701E-9150
1	Case, engine oil
1	Injector

NUMBER	ITEM
1	Starter
1	Alternator
1	Voltage regulator
1	Set, hoses
1	Overhaul kit complete

E. Kobata Diesel Engine

NUMBER	ITEM
1	Overhaul kit complete
1	Case, oil
1	Set, rubber hoses

F. Kobata Self-Priming Pump

NUMBER	ITEM
1	Overhaul kit complete
1	Meter, 3-inch radiator type rubber tubing

G. Pumps

NUMBER	ITEM
1	Overhaul kit

H. Spare Electrical Fuses for All Equipment

I. Cooling tower

Fanbelt B-97

J. Refrigeration Parts

NUMBER	ITEM
3	R/S Sol. viv. coil - "DPS"
5	Sparlan Sol. V. Coil - "LS & ALD"
3	Water Sol. V. Voil "WS"
2	Sets, 5V Crusher motor belts (match set of 3)
1	Set, direct coupling flexible discs
3	Microswitches
1	Timer motor
8	Battery connectors

NUMBER	ITEM
1	Electric battery charger
1	Case, battery water (not acid)
	Complete set of drill bits 3/8-drive 1/16 to 3/4 inch
	Cleaning rags
	Acetone
	Assorted electric fuses
	Complete set of metric wrenches
	Complete set of metric sockets
	Ammeter
2	Stainless steel of plastic containers size: 1 meter by 1 meter by 1 meter
2	Tubes of silicone rubber
	Scrub brushes different sizes
	Buckets, assorted sizes
1	Tank of oxygen
1	Tank of acetylene
1	Large wall clock
	Copper tubing, 3 meters 1/4-inch
	Assorted 1/4-inch tubing and flair fittings
	3 meters each of the following with assorted tubing and flair connections: 3/16, 1/2, 5/8.
	Gasket material
	Assorted nuts, bolts, and washers
	Assorted metal screws
5 kg	Assorted nails
	Light fixtures and spare light bulbs
	Plastic bags for ice
4	Eight inch wheels and enough 1/2-inch angle iron to build a dolly cart
	Sandpaper, assorted grit
	Screwdrivers, assorted sizes
	PVC pipe - heavy wall - with connectors and elbows in the following sizes: 2 1/2, 2, 1 1/2, 1, 3/4 inch
	PVC pipe, 3/4-inch connectors, threaded male and female Metal screen

4.14 GOVERNMENT OF INDONESIA OFFICIALS:

The following is a list of government officials whom I met with during my stay in Indonesia.

Mr. Abduroahman, Director General of Fisheries
Mr. Adwinirwan Kamaludin, Chief of Fishery Service Central Java Province
Mr. Untung Whyono, Chief of Fishery Service, West Java Province
Mr. Muchtar Adbullah, East Java Province
Mr. Robinson Sihite, Lampung Province, Sumatra
Mr. Sudarman, Special Jogyakarta Province
Mr. Nana Rudayat, Jambi Provionce
Dr. S. Bandiono, Bengkulu Province
Ms. Eni Sutopo, Chief of Foreign Cooperation DGF
Mr. Yunus Bandi, Chief of Sub-Directorate Programme Planning, Directorate of Production Development DGF
Mr. Soleh Samsi, Chief Aquaculture, Sub-Directorate, Directorate of Production Development DGF
Mr. Asikin, Chief of Sub-Directorate of Fish Catch, Directorate of Production Development DGF
Mr. Suwito, Director of Living Aquatic Resources Development
Mr. Bambang Suboko, Chief of Fishery Service, N. Sumatra
Mr. Burhanuddin Lubis, Director of Production Development DGF
Dr. Djoko S., Chief of Budget Sub-Directorate, Directorate of Planning DGF
Dr. Djoko S., Chief of Budget Sub-Directorate, Directorate of Planning DGF
Mr. Poedii, Chief of Aquaculture Division Fishery Service, Central Java Provionce
Mr. Darsono, Chief of Aquaculture Division Fishery Service, West Java
Dr. Hendro Suwarno, Chief of Bureau of Foreign Corporation, Department of Agriculture GOI

4.15 SUMMARY:

Delays in delivery of the ice machine and components until January 1983, change of the brand of the ice machine, no money appropriated for installation of the ice machine, lack of skilled and experienced personnel, and repairs of the damages to the ice machine and generator during shipment from the U.S. to Meringgai, Indonesia, caused many problems and delays, all of which were resolved. The ice machine was installed and started producing ice in June 1983. Most of the provisions of the project were completed. Statistical information was collected before and after

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installation of the plant to evaluate the effect of the ice plant on the community. How many fishing boats will use ice is still a big question, but more seem to be using ice every day. The consultant did not have sufficient time after the installation of the ice plant and the termination of the assignment (1 1/2 months) to evaluate properly any increase in the number of boats using ice and the overall improvements in the quality of the seafood.

The ice machine can produce 7.2 metric tons of ice in a 24-hour day. This is sufficient ice for all the fishing boats operating in the Meringgai area, transit boats, wholesalers and retailers of seafood, the community, and surrounding villages.

There are three major limiting factors to be considered when trying to project the use of ice produced at Meringgai:

A. The decline in landings of seafood at Meringgai from the time the initial survey was made by the University of Rhode Island and the time the ice plant was installed.

B. Approximately 80% of all seafood landed at Meringgai is of the type that Indonesians traditionally do not ice.

C. The cost benefits for the use of ice.

The ice plant at Meringgai has had a great effect on the community, fishermen, buyers of seafood, and surrounding villages. It has provided them with a source of ice at a price they can afford (Rp 20 per kg). It has improved the quality of certain types of seafood and the everyday living conditions of the people of the community.

Technical assistance and training were provided to every aspect of the project by the consultant. Refrigeration training was provided by Rene Laude. The ice plant personnel still need technical training to operate and maintain the ice plant and support facilities.

The consultant designed and introduced new types of insulated boxes to the fishermen, who can rent them for Rp 25 per day.

The consultant presented many technical seminars on proper seafood handling and quality control. Demonstrations were given on cleaning procedures, icing seafood, using insulated boxes, repairing all systems of the facilities, and maintaining quality control.

When the ice plant was completed and producing ice at an affordable price, the fishermen and wholesalers began purchasing ice immediately and implementing the handling procedures that were recommended to them. This resulted in marked improvements in the quality of seafood landed and leaving Meringgai.

5.0 COMMENT AND DISCUSSION:

When this project was started in June 1982, it was assumed that the ice plant would be in operation at the end of the year, thereby providing sufficient time for training of fishermen in use of the ice and in measuring the benefits stemming from the use of ice. Because of the delay in shipment and installation of the ice machinery, it was not possible to give sufficient attention to this part of the project.

The ice machine installation, coordination with different parties supplying equipment, and making improvements in the water supply required considerable time and effort on the part of the Pilot Ice Plant Technician and the contractor. The high degree of interest in the project by AID, NMFS, and GOI officials made it possible to obtain additional resources when needed to obtain tools and other equipment to install the equipment. In future projects of this nature, a reserve fund should be established so funds are available for instant on-the-spot purchases.

Members of the community in Meringgai and local government officials showed great interest in the project. The community respected Miles and followed his leadership in installation of the ice plant and in special projects to improve the quality of seafood in Meringgai. The fact that all the ice produced by the plant is being fully used by the local community is a tribute to Miles' efforts.

GOI and AID should carefully study the results of this project because they could have considerable influence on improving the refrigeration and quality of fish in Indonesia. Operators of the ice plant, welders, and other technical people in the GOI should be trained on a continuing basis in Indonesia and in the U.S. at facilities of equipment manufacturers. Leading fishermen should also receive training in quality, because once they feel it is important, they will set an example for the rest of the community.

APPENDIX I

ILLUSTRATIONS

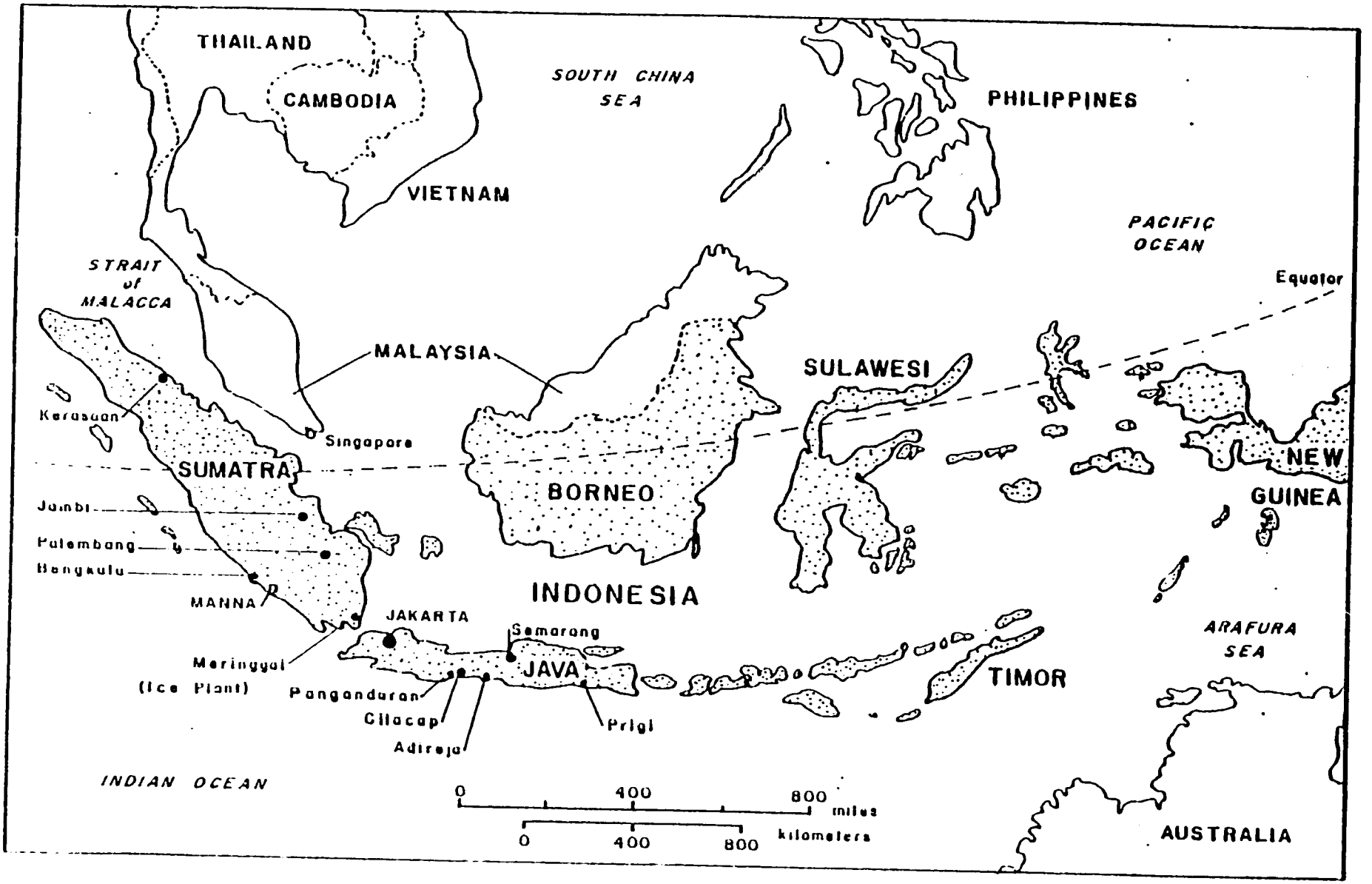


FIGURE 1. MERINGGAI AND SURROUNDING AREA

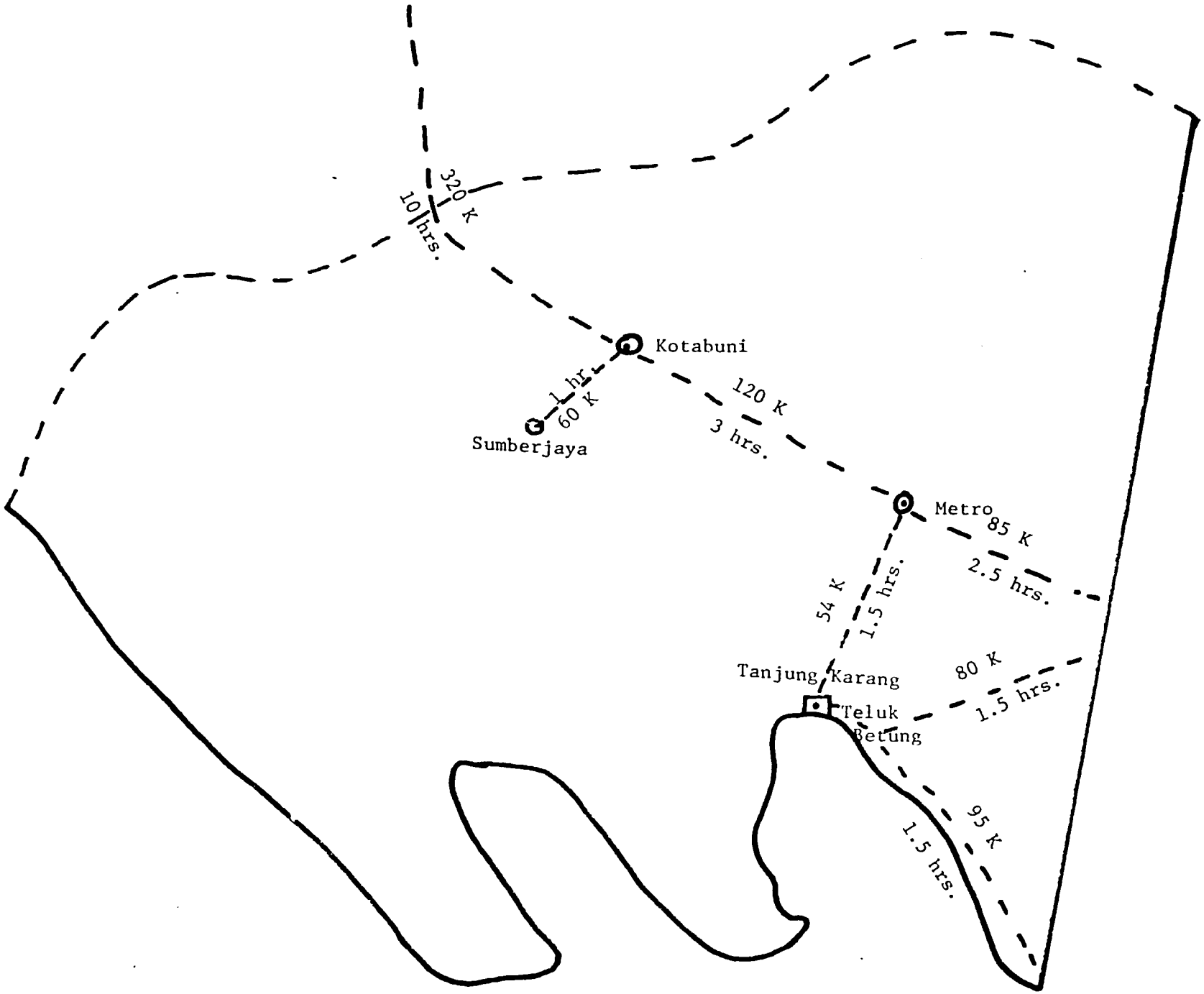
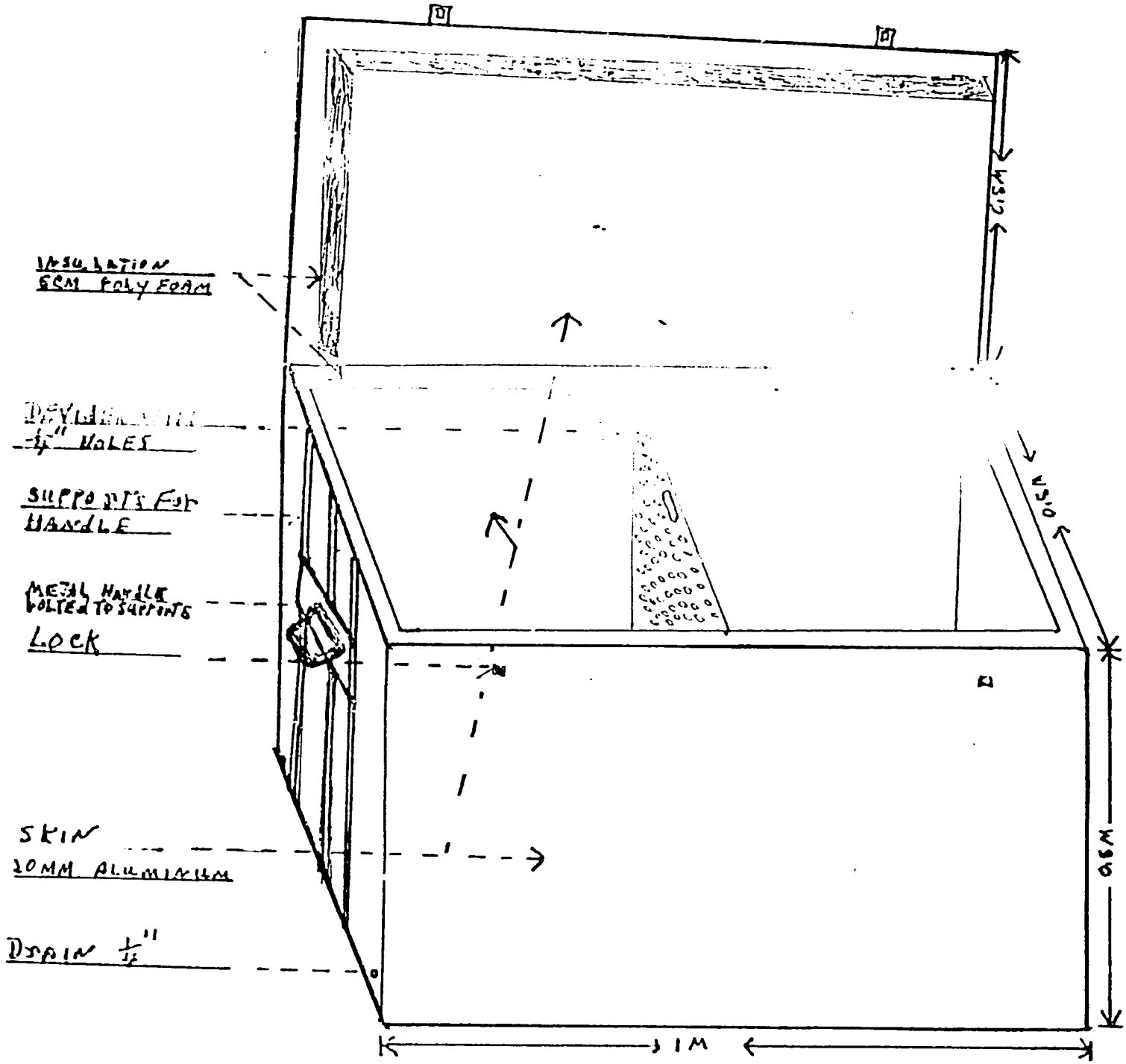


FIGURE 2. DISTRIBUTION POINTS FOR MARINGGAI SEAFOOD



INSULATED CONTAINER

FIGURE 3. INSULATED CONTAINER

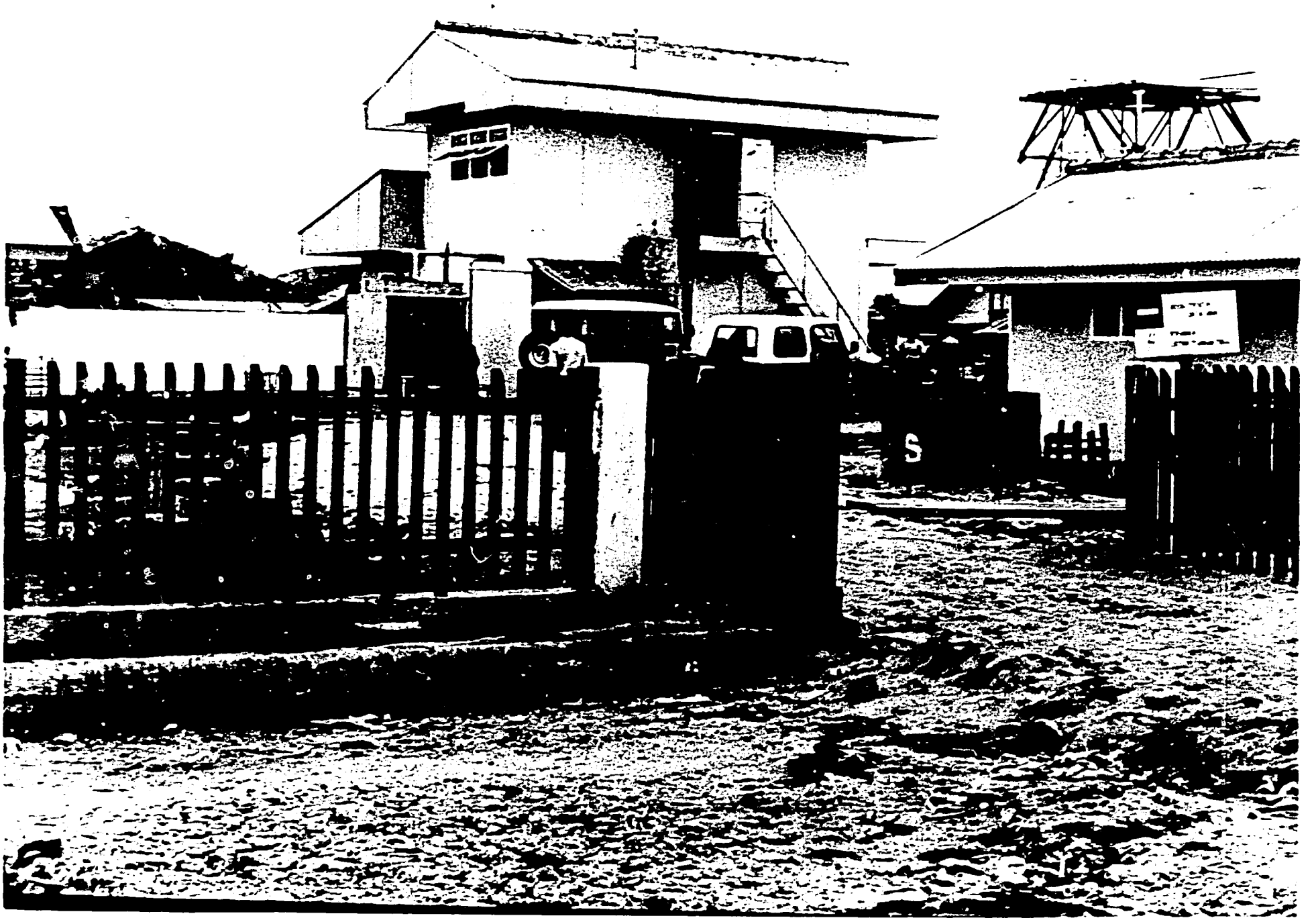


FIGURE 4. ICE PLANT

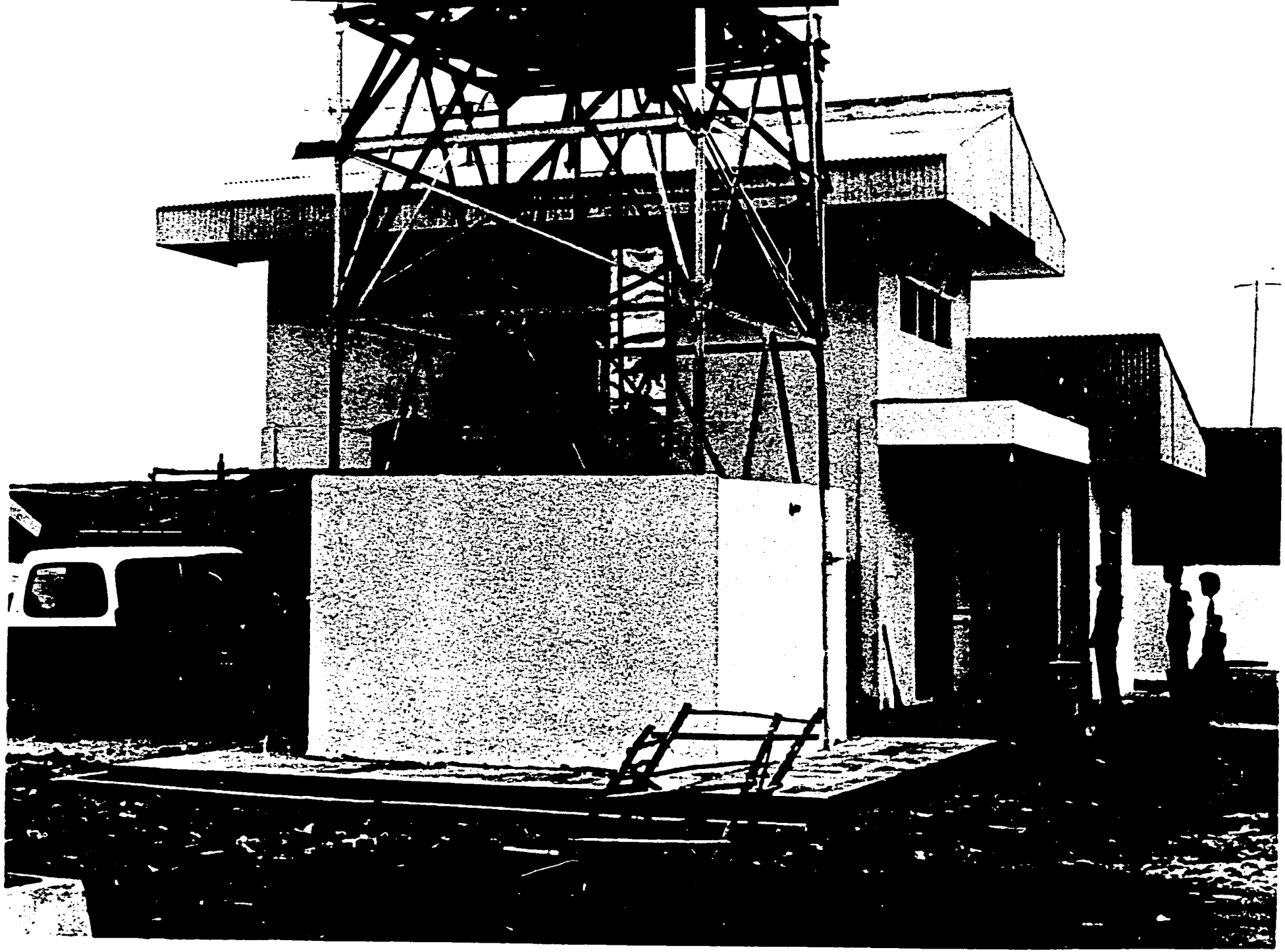
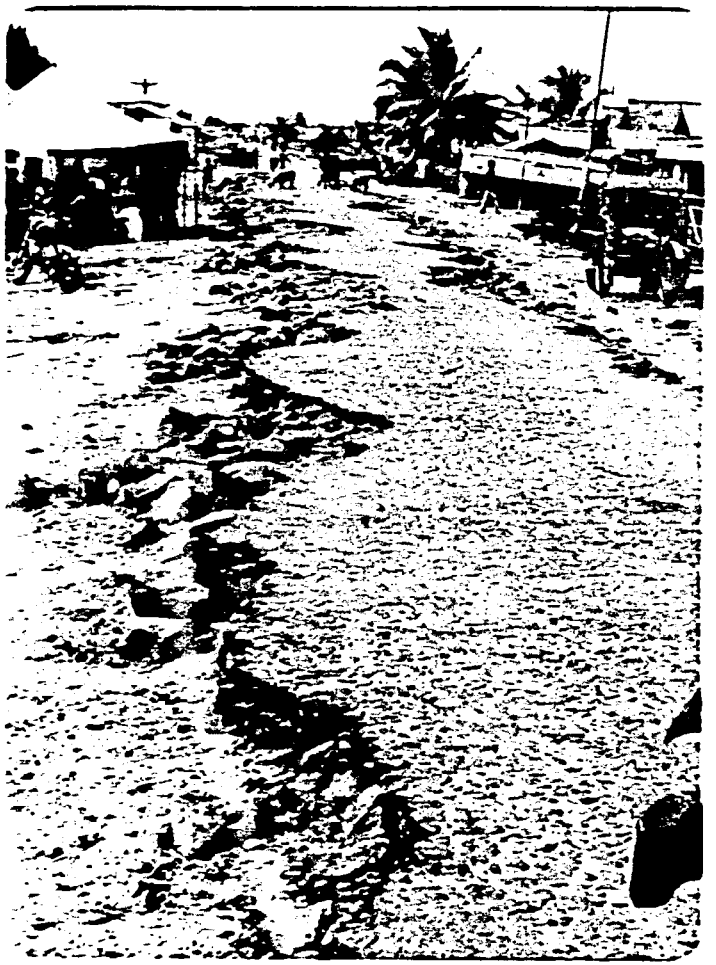
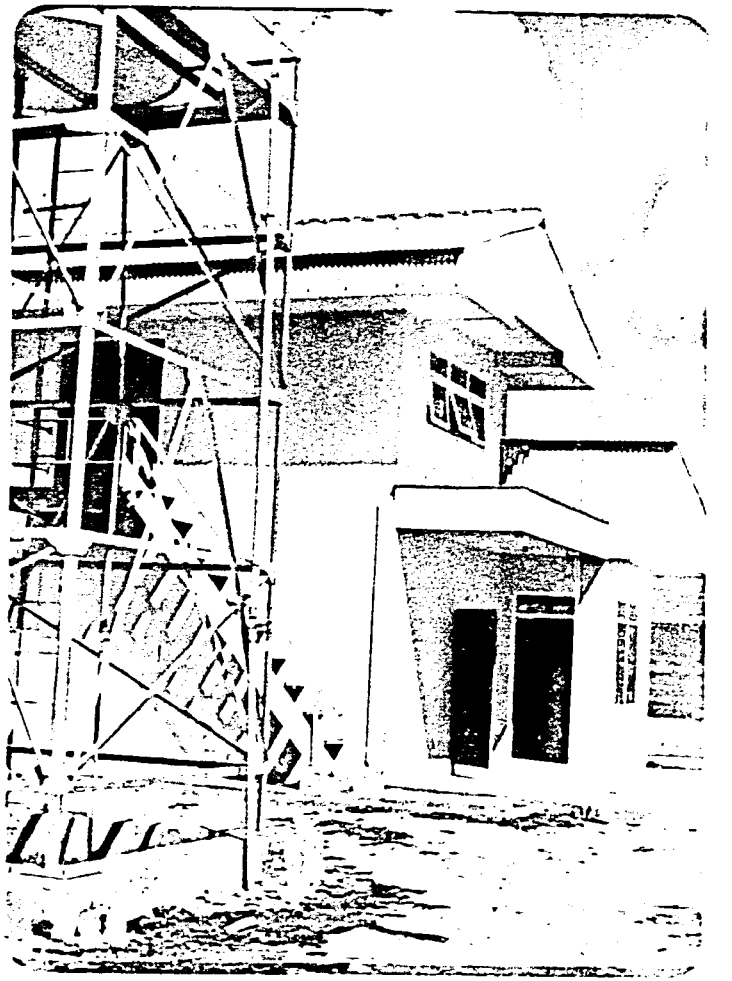


FIGURE 5. ICE PLANT SHOWING WATER STORAGE TANK

FIGURE 6. MERINGGAI IN SEPTEMBER 1982





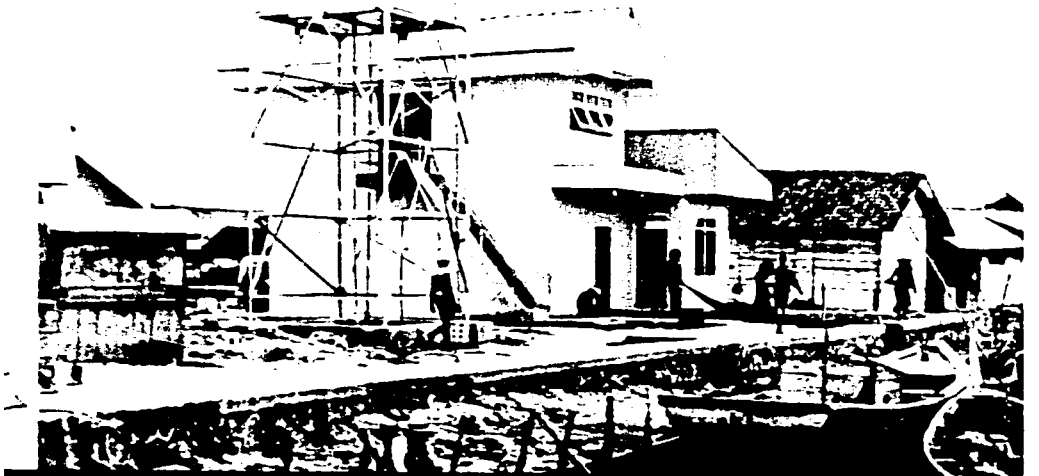
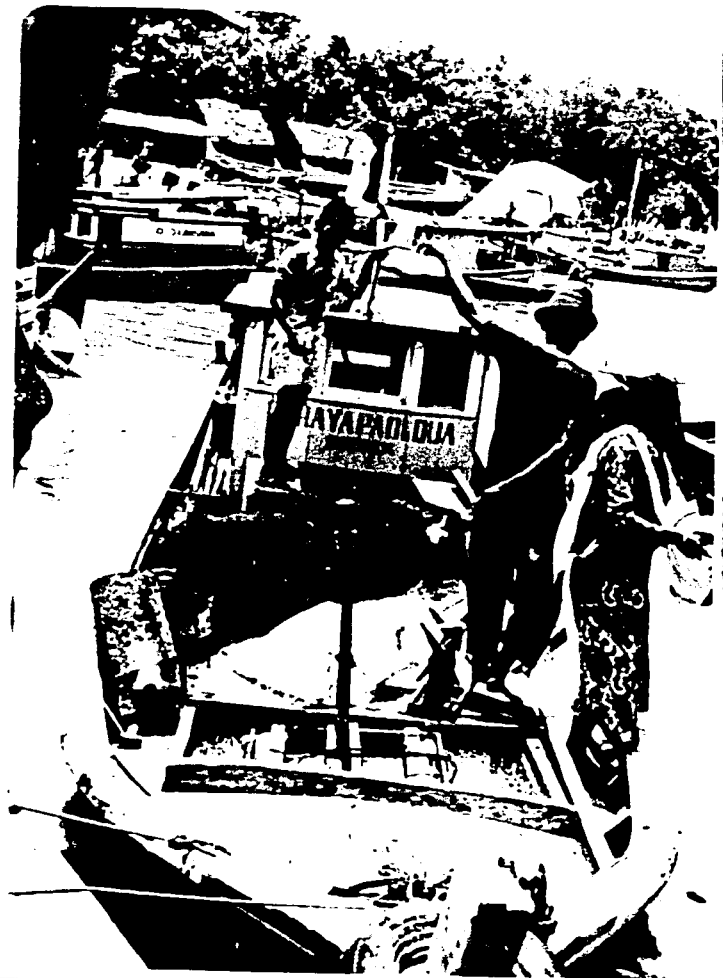
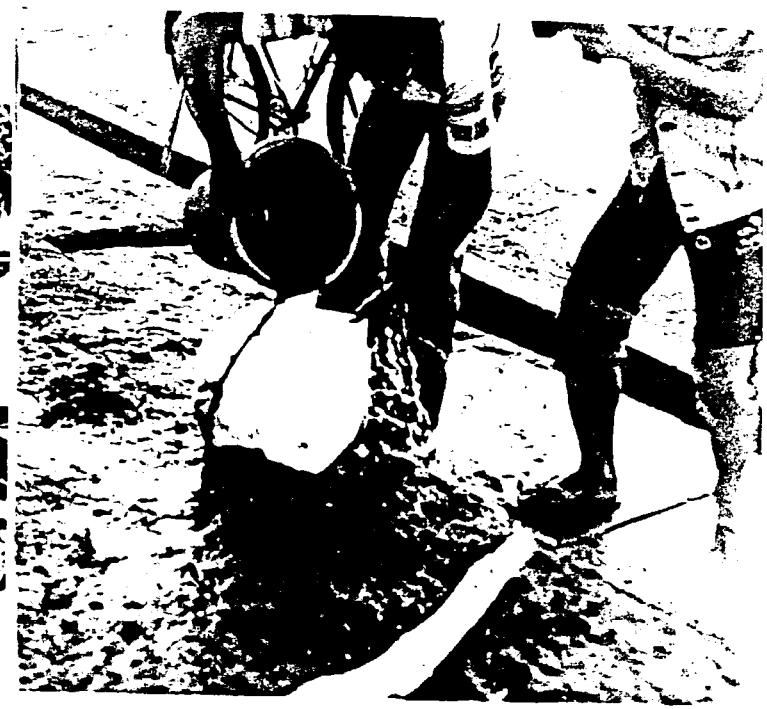


FIGURE 7. TRADITIONAL METHODS OF HANDLING FISH AND STORING ICE





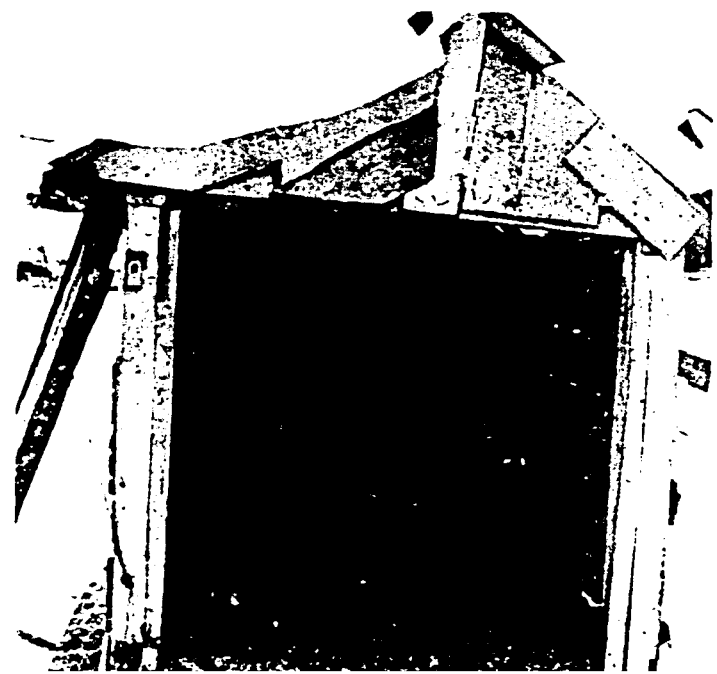
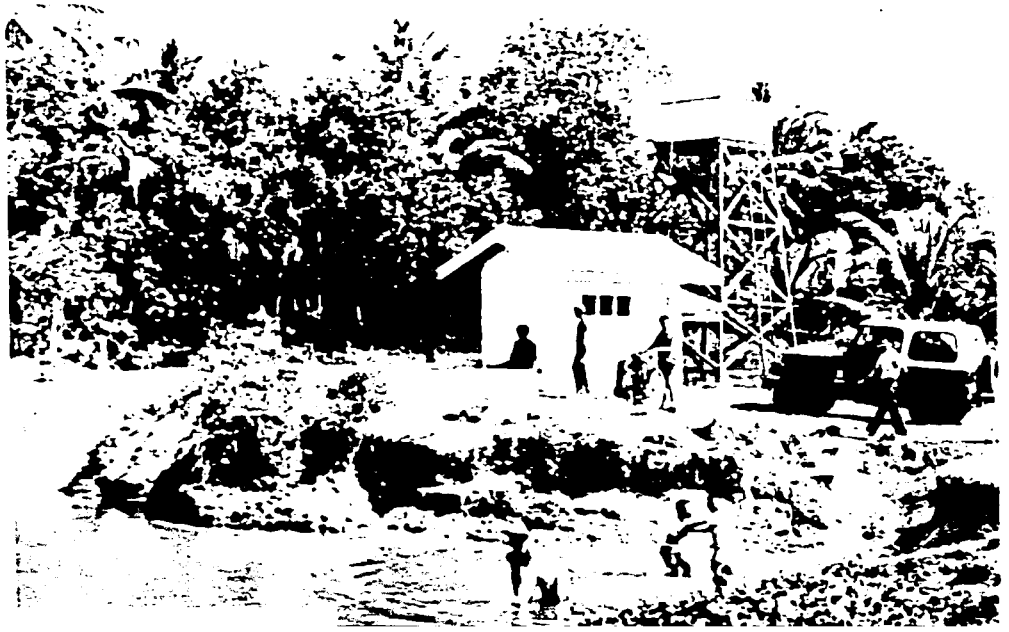


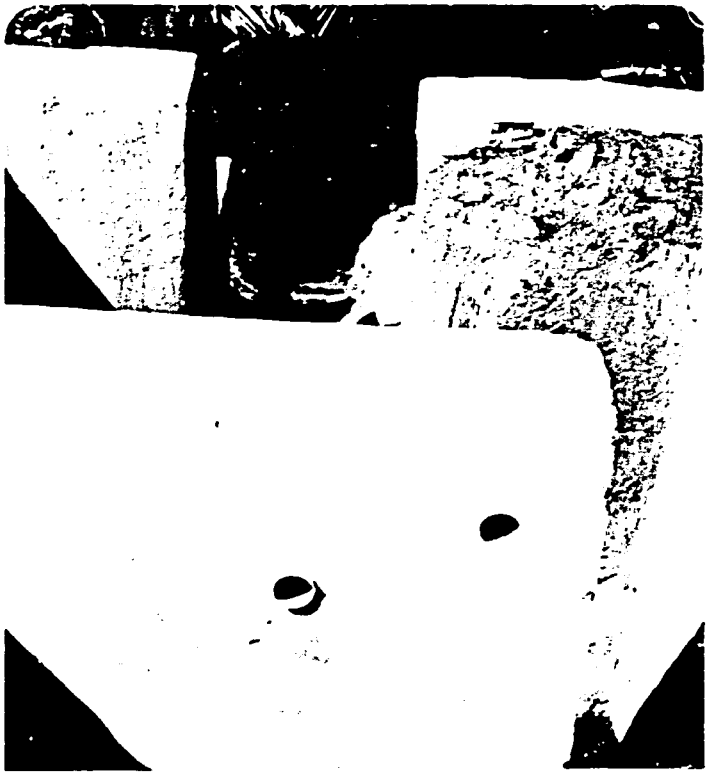
FIGURE 8. PUMP HOUSE, WATER PIPING, & ICE BOXES

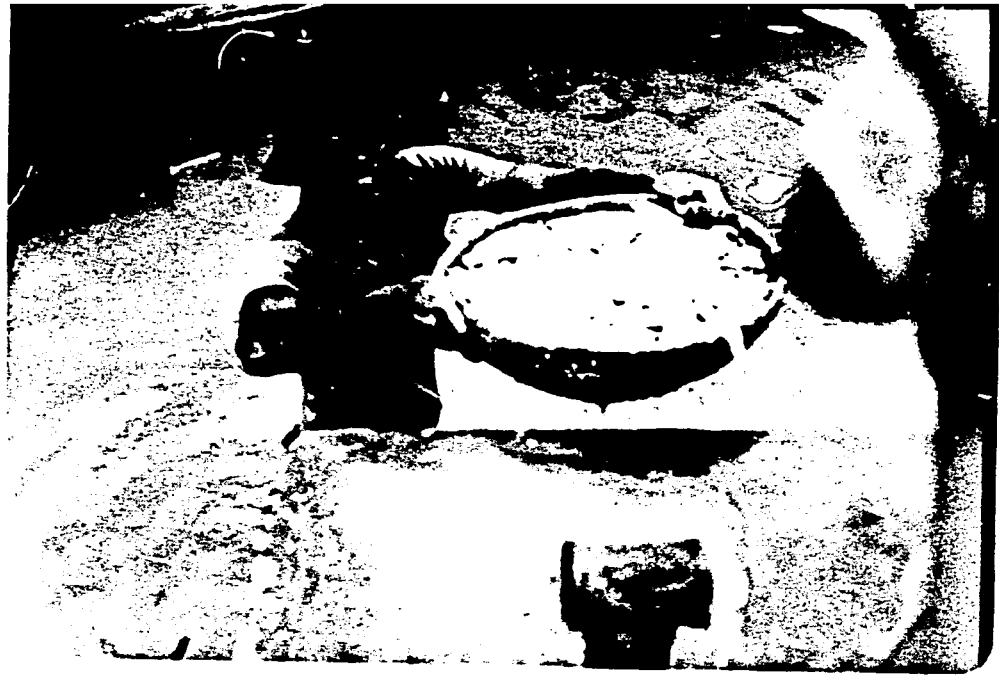
WATER SOURCE

PUMP HOUSE



INTAKE





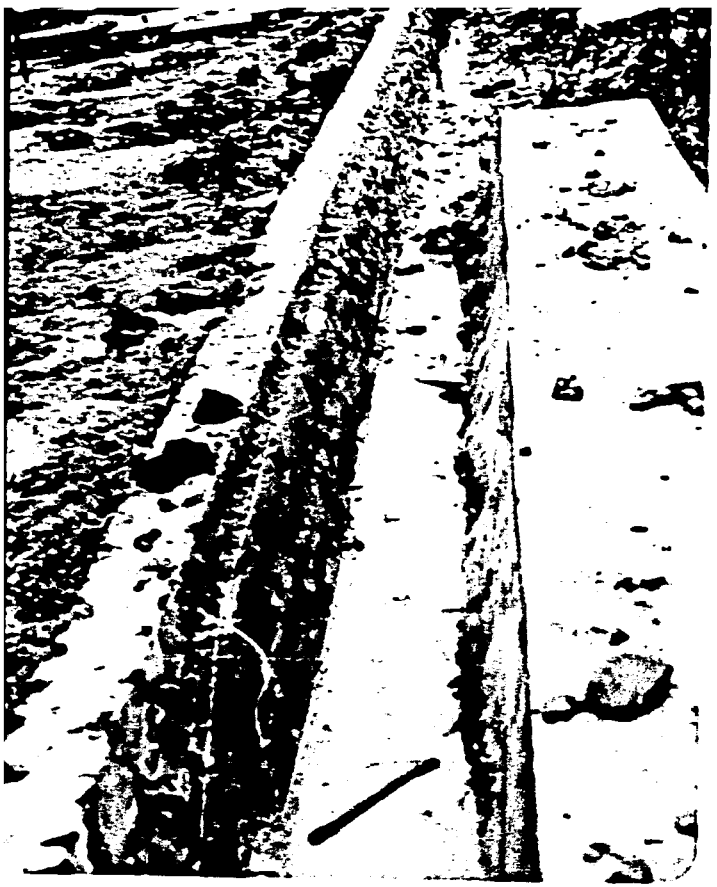
PRODUCT HANDELING AND WASHING
IN FRONT OF THE ICE PLANT

8 A

FIGURE 9. PACKING AND SHIPPING METHODS

FIGURE 10. CONDITION OF AUCTION HALL IN SEPTEMBER 1982

FIGURE 11. CONDITION OF SEAFOOD AT THE MARKET PLACE



DRAINAGE CONSTRUCTION

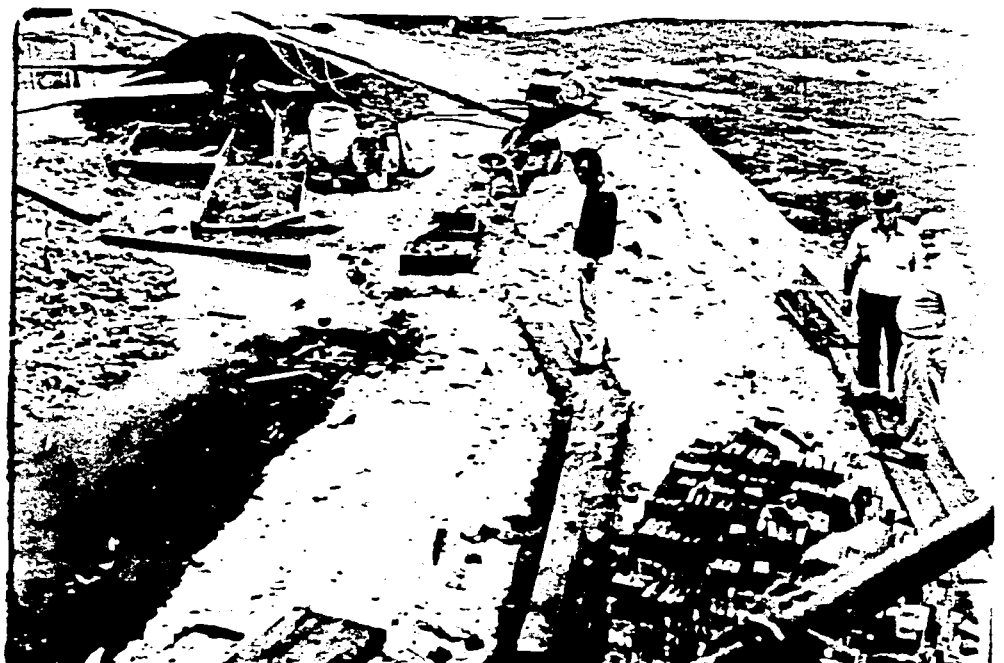
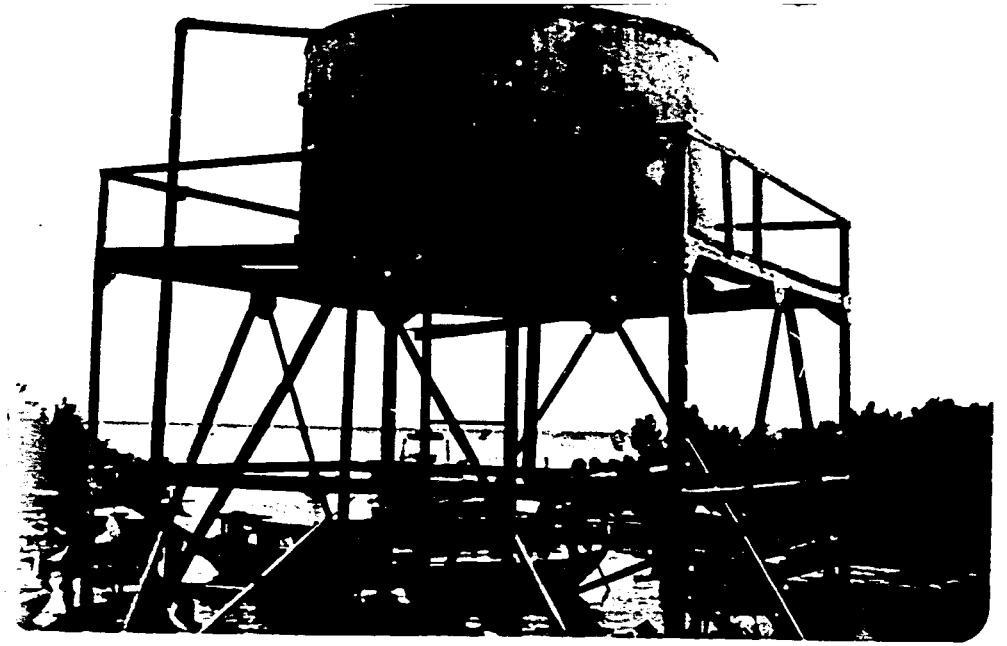


FIGURE 12. ARRIVAL OF ICE MACHINE AND EXISTING CONDITIONS

COOLING TOWER

FIGURE 13. INSTALLATION OF ICE MACHINE MAY 1983

PRESSURE WATER SYSTEM



BROKEN WATER TOWER AFTER FILLING

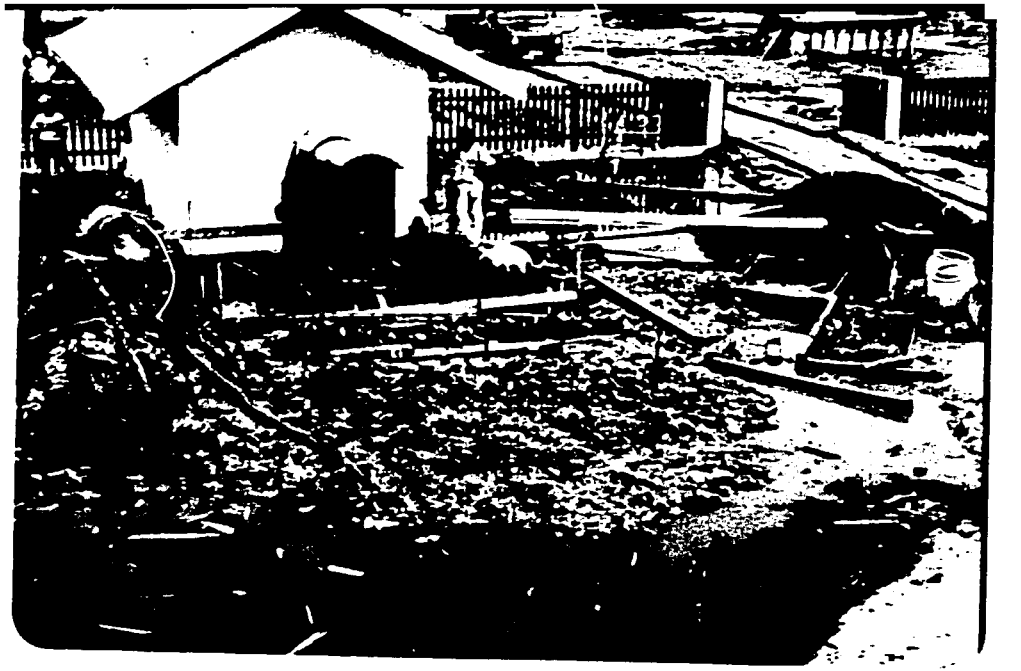
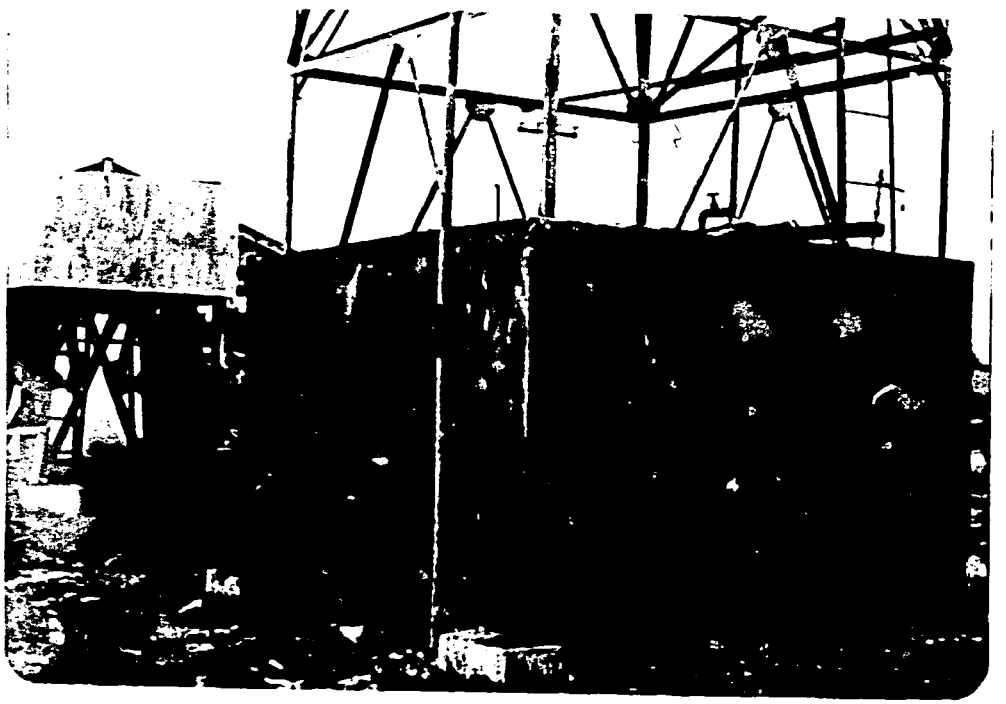


FIGURE 14. WATER TOWER REPAIR AND GENERATOR INSTALLATION



RESERVOIR AT BASE OF WATER TOWER

GENERATOR INSTALLATION

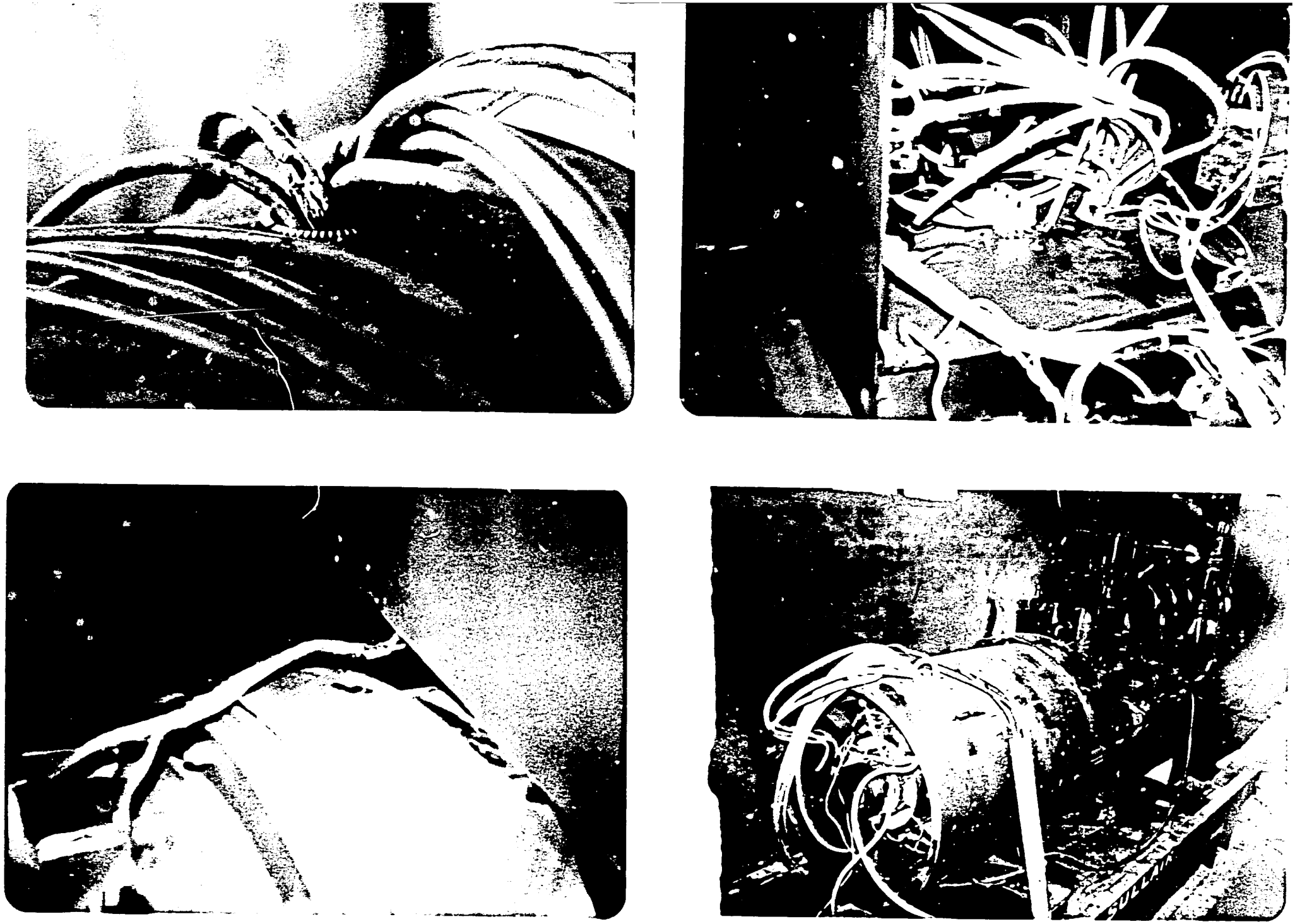


FIGURE 15. DAMAGE TO GENERATOR UPON ARRIVAL

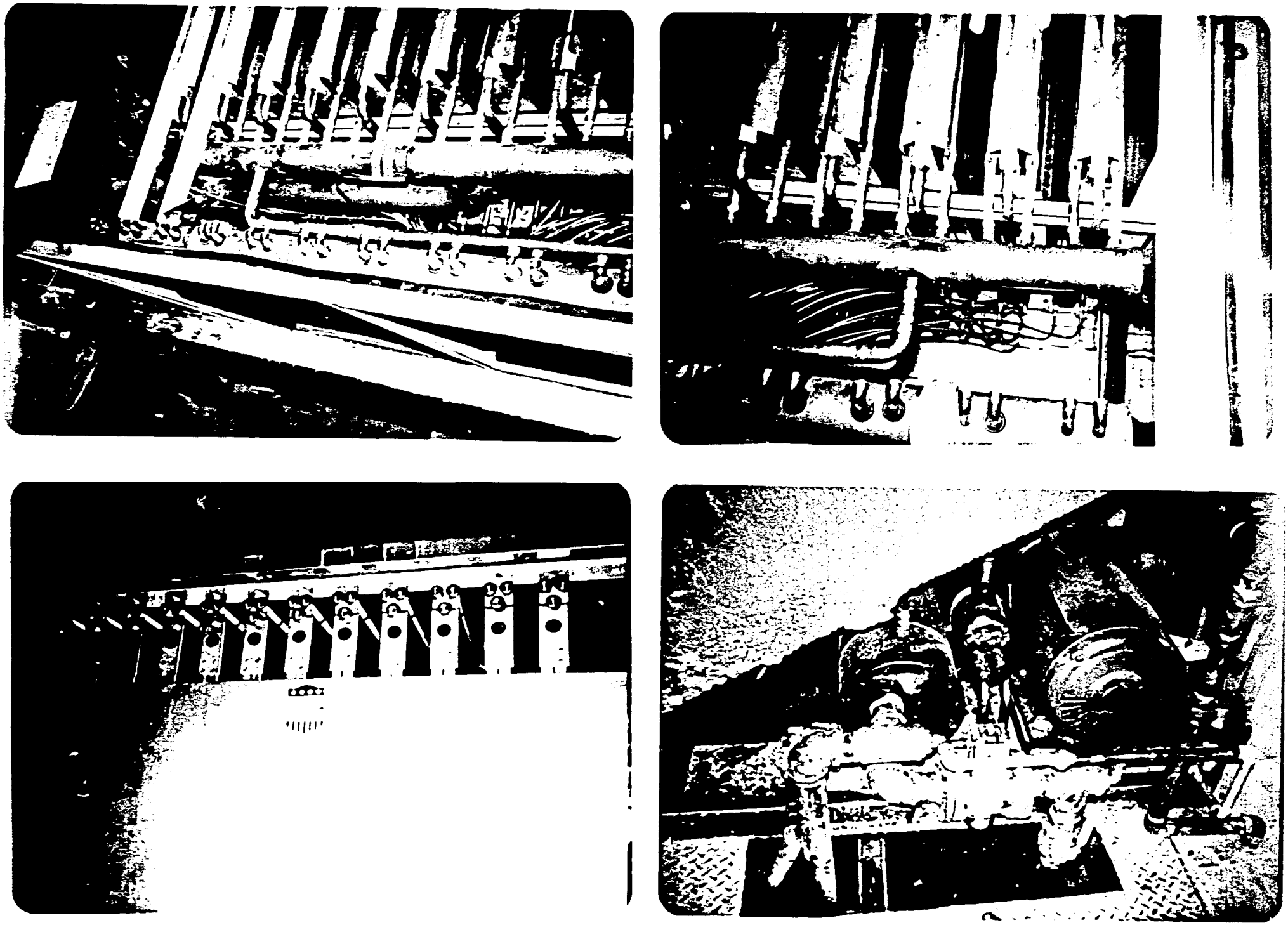


FIGURE 16. AREAS WHERE LEAKS OCCURRED IN ICE MACHINE

FIGURE 17. ELECTRICAL AND PLUMBING CONTRACTOR AT WORK

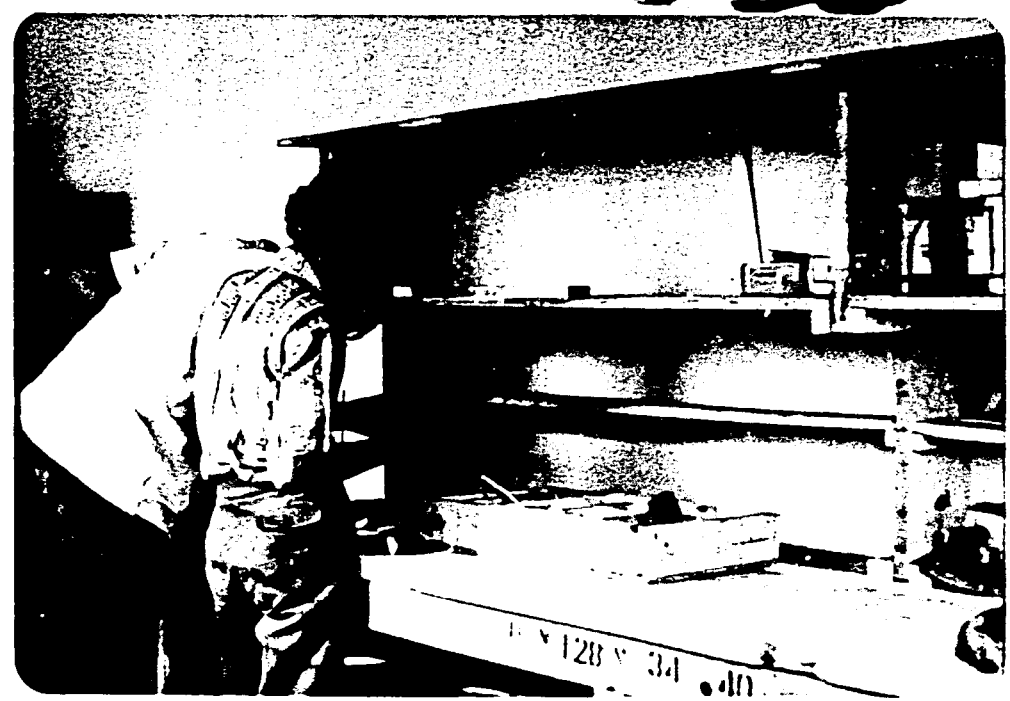


FIGURE 18. CREW OF ICE PLANT

CONSTRUCTION OF WORK SHOP

FIGURE 19. MANUFACTURE OF ICE JUNE 1983

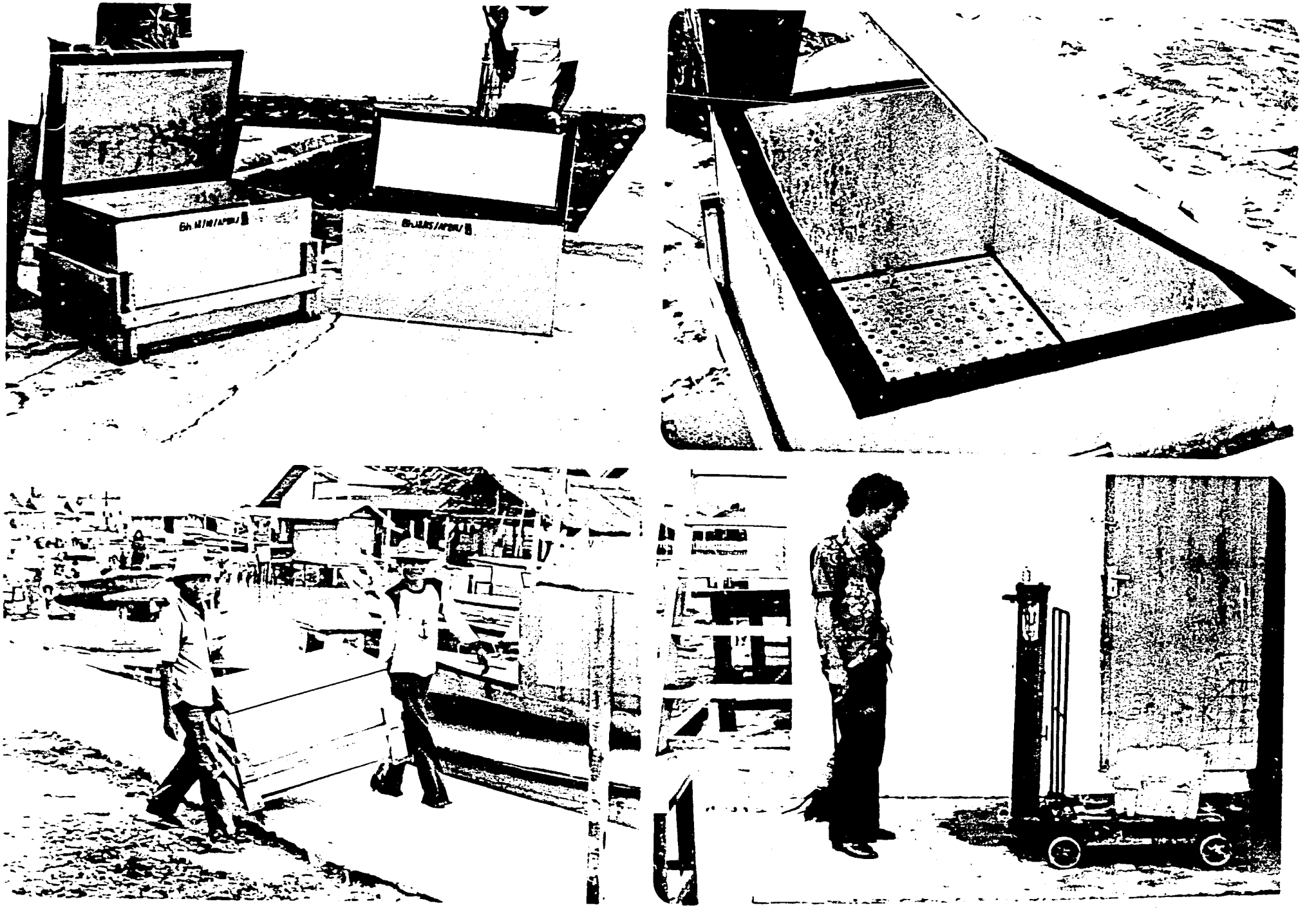


FIGURE 20. INSULATED BOXES FOR TRANSPORTING ICED FISH

APPENDIX II - OTHER REPORTS

A. Quarterly Progress and 6-Month Progress Reports

B. Travel Reports

C. Feasibility Study for Establishment of an Ice Plant in Manna, Benkulu Province

D. Tools and Spare Parts

Project Title - "Small Scale Fisheries Development in Indonesia (Contract No. NO-82-FA-C-00030)

Type of Report - Quarterly Progress

Period Covered - June, July, and August 1982

Report Submitted by - Joseph W. Slavin, President, Joseph W. Slavin & Associates.

Progress

The contract was awarded on June 3, 1982. On June 12, the contractor traveled to Indonesia to survey the ice plant building and site in Meringgai, review project objectives with AID officials, the fisheries project coordinator and representatives of the Government of Indonesia, and to provide short-term consultancy services on the need for ice plants in Bengkuly and Manna. Report of this travel is attached. A separate report will be provided on feasibility of establishing an ice plant in Manna.

- A project description and agreement was prepared for the Pilot-Flake Ice Plant technician. Mr. Billy Miles was interviewed by Dr. Tappan Banerjee, Project Coordinator, and Joe Slavin and hired to carry out on site aspects of the ice plant subproject in Meringgai. Miles, who has been a commercial fisherman, brings with him a background with the Food and Drug Administration in fisheries and consulting work on fisheries and quality control in Bangledesh, Beliz, and other areas. Billy, his wife, Sylvia, and daughter, Lynn will be leaving for Indonesia on August 18, 1982.

- Following inspection of the Meringgai site, discussions were held with Franklin Export Trading Co., Clement Malki Associates, the fisheries project officer, and the project coordinator to expedite shipment of the flake-ice plant. Joseph Slavin and Associates have been authorized by AID to inspect the ice plant and other auxiliary equipment to see that it complies with specifications prior to shipment to Indonesia. All technical issues have been resolved, and the flake-ice plant is scheduled to be shipped to Indonesia in mid-August after inspection is made. Clement Malki Associates is providing a chiller and details of piping--all which have been included in the amended purchase order.

Future Actions -

1. The ice plant technician is scheduled to be on duty in Indonesia on or about August 23, 1982. On August 16 and 17, he and his family are scheduled for AID indoctrination courses in Washington D.C. Airline tickets have been purchased to obtain reduced Apex fares.

2. Inspection of the ice plant equipment is scheduled prior to its shipment in mid-August.

3. A report on the feasibility of establishing an ice-plant in Manna is in preparation, including development of training program in ice plant operation and small-scale fisheries refrigeration and technology.

December 10, 1982

PROJECT TITLE: "SMALL SCALE FISHERIES DEVELOPMENT IN INDONESIA" (CONTRACT NO. NO-82-FAC-00030)

TYPE OF REPORT: QUARTERLY PROGRESS REPORT NO. 2

PERIOD COVERED: SEPTEMBER, OCTOBER, AND NOVEMBER 1982

REPORT SUBMITTED BY:

JOSEPH W. SLAVIN, PRESIDENT
JOSEPH W. SLAVIN AND ASSOCIATES
ANNANDALE, VIRGINIA 22003

PROGRESS

Mr. Billy Miles (the Ice Plant technician) and his family arrived in Indonesia on August 22, 1982. They were briefed in Jakarta by the project coordinator and AID staff before proceeding to the duty station at Tanjung Karang. Some housing difficulties have been experienced with water and electricity, but these are being resolved by the government of Indonesia and the project coordinator.

Miles developed a draft master plan for developing Meringgai into a model seafood handling complex. A copy of this program is attached. A meeting was held with GOI fisheries personnel and Tappan Banerjee, the project coordinator, to discuss the program which is now being studied by the GOI. Miles has met with Dr. Soekerino, Director of Quality Control for Fisheries to discuss quality control in Meringgai. He also visited with Taylor Quinn, head of enforcement for the U.S. Food and Drug Administration, Bureau of Foods, during the latter's trip to Indonesia concerning removal of Indonesia from the FDA black list. Visits have been made to auction halls at Teluk Betung and Kota Agung, which have sanitation problems and need proper handling of seafood. Miles gave a seminar on quality control and inspection to Indonesian representatives in Jakarta in November. I understand the seminar was very well received.

Information forms for a statistical report have been prepared and submitted to Mr. Sihite, the Indonesian fisheries regional representative in Meringgai, where they are being translated. Some statistical information has been obtained from the fishermen, people at the auction hall, and other individuals that speak a little English. Miles also visited Metro, a town where Meringgai fish are sold, to observe conditions and obtain information. Difficulty with the Indonesian language and delay in receiving translated statistical forms have been problems. The language problem will be resolved by having an interpreter accompany Miles on trips where language is a problem.

ICE PLANT

I inspected the ice machinery and associated equipment on October 1, 1982, at the warehouse in Maspeth, New York, prior to shipment. The difficulties outlined in my letter of October 5 have been corrected by the supplier

The ice plant has been shipped to Indonesia and is due to arrive in mid-December. Plans are to have the plant installed by February or March.

Miles has been working with the Indonesian government in repairing the water supply piping for the ice plant. The present piping, which runs about 4500 feet from the water supply to the plant, has a number of leaks that are being repaired. There are questions as to whether the pump now in place will deliver the required 30 gallons per minute of water to the ice plant. Detailed information on piping layout has been obtained from Miles, and the matter is being investigated with the supplier of the ice plant to minimize any delay once the contractor starts to install the plant. Some difficulties have been experienced in getting the necessary tools and equipment to repair leaks in the water supply, but the supplies have now been obtained.

FEASIBILITY STUDY ON ICE PLANT IN MANNA

An interim report on a Feasibility Study for the establishment of an ice plant in Manna, Bengkula Province, Indonesia, was prepared and submitted to the project coordinator, AID and the COTR. Attached

FUTURE ACTIONS

I plan to travel to Indonesia in early February to evaluate project progress and installation of the ice plant and take any follow-up actions that may be needed on the feasibility study for Manna and training in refrigeration and ice plant operation.

GENERAL COMMENTS

Some initial difficulties were experienced with housing and in getting cooperation. Several meetings were held with Indonesian government and AID officials, and problems have been resolved. A special review by project coordinator in Jakarta of various projects has been helpful.

April 2, 1983

PROJECT TITLE: "SMALL SCALE FISHERIES DEVELOPMENT IN INDONESIA" (CONTRACT NO. NO-82-FAC-00030)

TYPE OF REPORT: QUARTERLY PROGRESS REPORT NO. 3

PERIOD COVERED: DECEMBER 1982, JANUARY AND FEBRUARY 1983

REPORT SUBMITTED BY:

JOSEPH W. SLAVIN, PRESIDENT
JOSEPH W. SLAVIN AND ASSOCIATES
ANNANDALE, VIRGINIA 22003

PROGRESS

The project is behind schedule, because of delays in shipment and installation of the ice plant. The ice plant has arrived at the site in Meringgai in January 1983. Arrangements are being made to have the plant installed in April 1983. Crepaco, the sub-contractor, has designated an engineer to assist in the installation, and we plan to travel to the site as soon as word is received from the mission.

A 6-month progress report has been prepared by Billy G. Miles, Flake Ice Plant technician (copy attached). Statistical information on present harvesting and seafood distribution practices has been accumulated as a part of the pre-ice plant program. This information shows that fish landed at Meringgai are distributed to consumption areas over 500 km distant from the port. There is a general absence of basic hygiene and sanitation, and spoilage rates may be as high as 40 to 60 percent of the daily catch. Further details are included in the attached report.

The Ice Plant technician has been assisting the government of Indonesia in providing advice on improving seafood handling and sanitation practices. He has given lectures to the Indonesian government in quality control, developed a quality control program, and more recently, made an indoctrination tour to observe seafood handling techniques in Medan, Sumatra, and East-West and Central Java. A copy of Billy Miles trip report is attached.

This report shows a need for a quality control program as a part of the AID/GOI fisheries initiative.

The ice plant technician has spent considerable time in assistance for the ice plant installation. Leaks in the water supply piping for the ice plant have been repaired. Equipment and labor have been identified to ensure installation of the ice machine. A meeting was held with Prudence Fox, Fred Laney, and Anthony Bocelle, all of NMFS, Pete Williams, AID Washington Office, and Charles Larsen, AID Retired, to discuss the project, and Mrs. Fox's trip to Indonesia. Discussions have been held with Crepaco, Franklyn Export, and NMFS to coordinate future travel for installation of the ice plant.

FUTURE ACTIONS

I plan to travel to Indonesia in late April with the engineer from Crepaco to install the ice plant and take any follow-up actions that may be needed on the feasibility study for Manna and training in refrigeration and ice plant operation. It will not be possible to complete the project on June 15 as originally scheduled, because of delays in shipment and installation of the ice making equipment -- a factor beyond the control of this contractor since it is covered by another contract.

To satisfactorily complete the project and fulfill the contract objectives requires at least 6 months in demonstration and training of ice plant operation. A proposed termination date of December 15, 1983, would provide for the following schedule:

(1) April-May: Installation and testing of machine.

(2) June to December: Operation of technical assistance, instruction of fishermen in icing, and monitoring distribution of iced fish and evaluation of benefits.

(3) December: Preparation of final report.

This schedule will be discussed with the mission in April or May -- when I travel to Indonesia.

July 26, 1983

PROJECT TITLE: "SMALL SCALE FISHERIES DEVELOPMENT IN INDONESIA" (CONTRACT NO. NO-82-FAC-00030)

TYPE OF REPORT: QUARTERLY PROGRESS REPORT NO. 4

PERIOD COVERED: APRIL, MAY AND JUNE 1983

REPORT SUBMITTED BY:

JOSEPH W. SLAVIN, PRESIDENT
JOSEPH W. SLAVIN AND ASSOCIATES
ANNANDALE, VIRGINIA 22003

PROGRESS

The ice machine installation and repairs of leaks that occurred during shipment of the machine, were completed on June 17, 1983, and the unit is now operating satisfactorily. Mr. Rene Laude, engineer from Crepaco, the supplier of the ice machine and Joe Slavin traveled to Indonesia on May 5, 1983, and assisted Mr. Billy Miles in installation of the ice plant. We selected the electrical and plumbing contractors and organized, supervised, and carried out the work necessary to install the machine. The installation consisted of the following:

(1) Placing the ice machine in existing building and re-building the wall of the existing building.

(2) Cutting hole in floor of existing building and erecting a chute to accommodate the flow of ice from the machine to the storage room.

(3) Constructing a foundation and separate building for the new diesel generator, adjacent to the existing building.

(4) Constructing foundations for the cooling tower and water pumps and of a large reinforced concrete water sump below the existing water supply tank.

(5) Designing and installing piping for the water supply system which enables flexibility of obtaining water from the supply system to the auction hall, in case

of problems, and which provides a reservoir so water needs to be pumped from supply stream only twice a day.

(6) Assemblying and erecting a cooling tower and associated water piping, pumps and surge tank. Because American fittings were not compatible with those available in Indonesia, considerable welding had to be done by the Indonesian fisheries staff, which did an excellent job.

(7) Assembling and erecting the Bally insulated room for storage of ice.

(8) Procuring, designing, and installing electrical wires, starters, and other equipment including special design by engineer Laude of Y delta starter to protect the ice machine.

(9) Repairing leaks in the low pressure side of the ice machine that occurred as a result of shipment. Silver soldering materials were provided from the United States to accomplish these repairs.

(10) Testing and final operation of the machine on June 17, 1983.

The Chinese contractor selected for the plumbing and electrical work did an excellent job at a very reasonable cost. The Indonesian staff, particularly Mr. Tojhe, Mr. Suharto, and the two welders, were very helpful in the installation and worked very hard. Mr. Rene Laude was an excellent choice for the job, because he was able to improvise and do a lot of things on the spot to make the installation successful. Billy Miles, who organized things on a daily basis, certainly represented the Indonesian fishery officials well by seeing that all contractor costs were kept at a minimum. He clearly had the respect of the workers.

Since the ice plant has been operating, several difficulties have occurred which have been ocrrected by Mr. Miles. The timer wheel was broken, and there were problems in obtaining diesel fuel from the government.

Statistical information on Pre-Ice Plant Operation is being collected by GOI fishery officer in accordance with outline by Mr. Miles. During my visit I discussed this with Mr. Sihite, Fishery Officer for the region, and he assured me that the statistics will be provided.

Some information on the post-ice plant program is presented in the attached monthly report for June 1983. This shows that the estimated daily production of ice is about 7.2 metric tons per day at a cost (based on cost of diesel) of 10 RPS per kg of ice. The ice is being sold at 20 RPS per kg. The demand for ice is greater than the present production rate, with much ice being used by the local community in Meringgai for human consumption.

I met with Prudence Fox, Jim Herkelrath, and Anthony Bocelle of the National Marine Fisheries Service to discuss extension of the contract. An extension was approved until September 30, 1983, to allow completion of the final report.

Mr. Billy Miles will be departing Indonesia for the United States on August 6, 1983. Travel arrangements have been made, and he has completed arrangements for shipment of his household goods.

FUTURE ISSUES:

It is clear that some part time assistance will be required during the next 6-months to oversee and help manage the operation of the ice plant, serve as a focal point and assist in making any repairs to the system, organize training so the appropriate Indonesian fisheries people responsible for operation of the ice plant can obtain proper training, and to assist the fishermen in making effective use of the ice from the plant. We have discussed several alternatives with the National Marine Fisheries Service and AID officials and have located a qualified individual with mechanical and fishery skills who could provide these services and assist in other fishing-related projects in Indonesia.

I have discussed training of ice plant personnel with the Turbo Refrigeration Company, Denton, Texas, manufacturers of the ice machine. They indicated the most effective method of training is to have the people concerned with operation of the machine spend about 3 to 4 weeks at their plant in Texas, where they actually work on machines, analyzing problems and doing the repairs. The Turbo representative indicated that he will do this free of charge, and that it would be best to have two people from Indonesia participate in the program at the same time. The people should be mechanically inclined and should be able to weld piping. They need not be familiar with refrigeration, since they can learn this during the training.

We would suggest that any replacement for Mr. Billy Miles to oversee the plant operation and help organize the training, spend several weeks at the Turbo Refrigeration Company before going to Indonesia so he can effect any necessary repairs while on duty in Indonesia.

Date:

PROJECT TITLE: "SMALL SCALE FISHERIES DEVELOPMENT IN INDONESIA" (CONTRACT NO. NO-82-FAC-00030)

TYPE OF REPORT: SIX MONTH PROGRESS REPORT OF THE PILOT ICE PLANT MERINGGAI, LAMPUNG, INDONESIA

PERIOD COVERED: AUGUST 15, 1982, TO FEBRUARY 15, 1983

REPORT SUBMITTED BY:

BILLY G. MILES, FLAKE-ICE PLANT TECHNICIAN
JOSEPH W. SLAVIN AND ASSOCIATES
ANNANDALE, VIRGINIA 22003

INTRODUCTION:

U.S. AID is assisting the government of Indonesia in the Small Scale Fisheries development in Indonesia with several projects. The flake-ice plant project at Meringgai is one of these projects. The flake-ice plant project consists of the installation of an 8-ton per 24 hours flake-ice plant, the statistical evaluation of the impact of the flake-ice plant on the community, before and after installation, to provide ice to the fishing boats, to the buyers of seafood, and to the community at a reasonable price. And to give technical assistance and training when requested.

1.0 PRE-ICE PLANT PROGRAM:

A. Collection of statistical information.

1. No ice plant at Meringgai.
2. Limited supply of ice from Jakarta and Teluk Betung.
3. Approximately 10% of the boats are using ice but not enough ice to preserve the seafood. Approximately 80% of the seafood that is caught is never iced.
4. Approximately 60 tons of product is landed at Meringgai a month.

5. Approximately 100 boats fish out of Meringgai.
   a. All boats less than 12 meters long.
   b. Shallow draft.
   c. All boats motorized/with sail.
      (1) Air-cooled gasoline engine.
      (2) Diesel engines.
6. Ice primarily used for premium fish and large shrimp.
7. Very few primitive insulated containers are being used.
8. The type of containers being used are straw baskets and wooden boxes lined and unlined with banana leaves.
9. Approximate price paid for ice for the last year was 40 Rp/kg.
10. Average amount of seafood landed a day at Meringgai is 2 tons.
11. Fishery department officials state that a minimum of 20% or the daily catch is lost by spoilage, which equals 800 lbs per day. A more realistic figure for spoilage is 40% to 60%.
12. Freshwater system at the auction hall is not sufficient for cleaning and for the fishermen.
13. Very primitive seafood-handling techniques.
14. Very limited quality control programs.
15. Absence of basic hygiene and sanitation.
16. Daytime fishing only.
17. Principally net fishing operation.
18. No fishery management regulations.
19. All fishing is done within a short distance from Meranggai. Four-hour trips.
20. No regulations governing mesh size for nets.
21. 60% of the seafood landed at Meranggai is salted or dried, therefore, not requiring ice.

B. Preservation of seafood.

1. No special treatment (natural).
2. Dried without salt.
3. Dried with salt.
4. Smoked without salt.
5. Smoked with salt.
6. Ice.

C. Distribution of Meringgai seafood.

1. Distribution points:

Name of Distribution Point	Distance from Meringgai	Transportation Time
Plamembang	525 km	10.0 hr
Kota Bumi	205	5.5
Sumberjaya	265	6.5
Metro	85	2.5
Tanjung Karang	80	1.5
Jakarta	500	9.0

2. Transportation to the distribution points.

a. Open-bed truck
b. Fishing boat
c. Bus
d. Mekrolet
e. Oplet
f. Becek
g. Bicycle
h. Ox cart

3. Type of seafood shipped to the distribution points.

a. Dried without salt - shrimp and fish.
b. Dried with sale - shrimp and fish.
c. Fresh without ice - shrimp and fish.
d. Fresh with ice - shrimp and fish.

4. Type of containers used to ship seafood to the distribution points.

   a. Wooden boxes with or without covers.
   b. Wooden boxes lined with banana leaves with or without covers.
   c. Straw baskets with or without covers.
   d. Straw baskets lined with banana leaves with or without covers.
   e. Plastic drums with or without covers.
   f. Primitive insulated boxes with covers.

5. Condition of the seafood when it reaches the distribution points.

   A large percentage of the seafood is in various stages of decomposition when it is delivered to the distribution points, especially the seafood shipped fresh without ice. The moisture content of the dried fish is too high, and is also in various stages of decomposition.

6. Marketing at the distribution points.

   a. Sold at the local markets.

      (1) Ice is not used at the local markets for the preservation of seafood regardless of the time taken to sell the seafood, 24 to 36 hours without ice.

   b. Hotels
   c. Restaurants
   d. Retailers
   e. Wholesalers for further distribution to small villages
   f. Processing plants - mainly large shrimp
   g. Individual consumers

7. Price differential from fishermen to consumer is approximately 300% for all products.

Product	Price/kg in Rp Fishermen	Price/kg in Rp Consumers
Sardines	100	300
Small Shrimp	300	900
Large Shrimp	1,500 to 2,000	6,000
Large Fish	450 to 500	1,500
Dried Fish	100	300 to 500

8. Final destination of seafood products.
   a. Consumed by consumers in local Indonesian seafood dishes
      (1) Boiled with rice
      (2) Fried with rice
      (3) Raw with rice
   b. Further processed by processing plants for export

D. Preparation for the installation of the flake-ice machine.

1. Water system
   a. Repaired leaks.
   b. Installed valves.
   c. Redesigned and installed the primary filter system.
   d. Made recommendations for improving the water system.
      (1) Additional pumps for the required volume of water
      (2) Pressure tank
      (3) Secondary filter system
      (4) Chlorination system
      (5) Designed additional reservoir
      (6) Designed a dam to increase the water level of the river at the pump inlet for the water system so a constant level of water can be maintained all year.

(7) Connected the ice plant and auction hall's water systems together for a continuous water supply in case of a breakdown

(7) Installed faucets to provide water to the fishermen

2. Electrical system

a. Completed installation of the original generator

(1) Repaired the electrical connections

(2) Installed the fuel tank

(3) Procured a pump to fill the fuel tank

(4) Procured a set of jumper cables

(5) Recommended a list of tools for maintenance of the generator

(6) Recommended a preventive maintenance schedule for the generator

b. Recommended procurement material for the installation of the second generator.

(1) Location

(2) Switching panel for the two generators

(3) Wire for installation

(4) Master electrical switch box

(5) Small electrical switch box

(6) Conduit, tubing, and connectors

(7) List of electrical tools

(a) Pliers

(b) Connectors

(c) Tape

(d) Meters

(e) Screwdrivers

(f) Other tools

3. Buildings

a. Recommended changes in the design of the ice plant building to accommodate the ice machine

(1) Removing section of the roof and a section of the wall to permit the entry of the ice machine into the ice plant building

(2) Cutting a hole in the second floor of the ice plant building for delivery shoot from the machine to the insulated room

b. Recommended modification of the generator building to accommodate a second generator

4. Recommended construction of an adequate road to the ice plant, that could support trucks and equipment needed to install the ice machine. The ice plant is in a swamp on reclaimed land.

5. Helped prepare a list of supplies, tools and equipment for installation, maintenance, and operating of the ice plant.

6. Procured personnel and equipment to install the flake-ice machine.

(a) Plumber

(b) Electrician

(c) Laborers

(d) Crane to lift the ice machine

(1) Size of the crane

(2) Capacity of roads and bridges leading to Meranggai

E. Recommended staffing pattern and duties for the flake-ice plant personnel.

1. Manager or group leader
2. Technician
3. Secretary/treasurer

F. Designed insulated containers for seafood.

1. 50-kg capacity with removal divider
2. 100 kg with removal divider
3. 200-kg capacity with removal divider

G. Developed a 5-year master plan for the Meringgai seafood complex to develop it into a model for other future seafood complexes in Indonesia.

1. Proposed diagram of the facilities
2. Complete quality control programs
   a. Ice plant
   b. Auction hall
   c. Fishing boats
   d. Transporting
   e. Fishermen
   f. Grounds
3. Schedule for the implementation of the master plan.

H. Technical assistance and training.

1. Flake-ice plant personnel
   a. Installation and repair of water system
   b. Repair of the electrical system
   c. Preventive maintenance
      (1) Water system
      (2) Electrical system
      (3) Building
      (4) Quality control

2. Fishermen, auction hall personnel, retailers and flake-ice plant personnel.

   a. Seminars at Meringgai on the proper handling of seafood

   b. Seminars at Meringgai where I explained the master plan for the Meringgai seafood complex

   c. Seminars at Meringgai on the operation and distribution of ice

   d. Seminars at Meringgai on the proper use of insulated containers

   e. Demonstration of procedures on cleaning the auction hall

3. Seafood producers of Indonesia at Jakarta

   a. Presented technical seminar on quality control of seafood for the U.S. market, sponsored by the commercial section of the U.S. Embassy

I. Short-term consultancy services.

1. In a period of 10 days I visited landing areas, auction halls, ice plants, and cold storages (processing plants) with GOI officials to observe seafood handling techniques and quality control procedures in Medan, East, West, and Central Java.

II. A. Arrival of the Ice Plant at Meringgai:

1. The ice plant arrived at Meringgai on the morning of January 7, 1983, via two large open trucks in the rain.

2. Adequate road had not been constructed as recommended.

   a. The first truck drove into the complex and sank to the bed in the mud.

   b. Construction of a temporary road of coconut logs and wooden planks.

3. Unloading the trucks.
   a. Coordinating the arrival of the trucks and the arrival of the crane.
   b. Procurement of personnel to unload the trucks.
   c. No instructions on how to unload the trucks.
   d. Numbers on the invoices and the numbers on the crates as to the contents did not agree.
   e. No pamphlets or instructions on how to lift and install the ice machine.
   f. Rain and mud got deeper.
4. Uncrating of items.
   a. Opened all the containers and inventoried all the containers except the generator container and the ice machine container.
   b. The ice machine and generator containers partially opened looking for the instruction manual and lifting instructions. Neither item was detected.
5. Recrated the ice machine and the generator.
6. Removed sections of the roof from the ice plant building.
7. Crane unable to lift the ice machine in packing crate to sufficient height for installation in the ice plant building.
8. The generator container and the ice machine container were covered with plastic and left sitting in the mud waiting lifting instructions and the arrival of the service engineer.

9. All other items were stored in the ice plant building.

10. All work at Meringgai has been temporarily delayed.

    a. Insufficient funds to cover installation costs

    b. Arrival of the service engineer from the U.S.

    c. Procurement of additional equipment for the water system

III. A. Important issues that must be resolved immediately

1. Funds to cover installation expenses.

2. How to lift and install the ice machine

3. Prepare detailed specifications for the complete ice machine system with the specifications for connecting the various components together. Please provide a copy of these specifications to Mr. Miles.

4. The ice machine that was delivered to Meringgai delivers ice from the <u>side</u>. The building was designed and constructed for an ice machine that delivers ice from the bottom. A hole must be cut in the floor for a delivery chute from the ice machine to the insulated storage room and the existing hole covered.

5. The only crane that is available and can be transported to Meringgai <u>cannot</u> lift the ice machine to a sufficient height to clear the top of the wall. A sufficient areas of the side wall must be removed to permit entry of the ice machine. All walls are load bearing and this presents an additional problem.

6. Funds to repair the building after the installation of the ice machine.

IV. A. Problem areas

1. Funds
2. Delays in the arrival of the ice machine
3. Change in the brand and the model of the ice machine.
4. Communications.

V. A. Summary

The ice machine and the components have arrived at Meringgai. Installation of the ice machine will be further delayed depending on funds and modifications to make the building compatible with the ice machine.

VI. A. Personal comment

This project had many obstacles to overcome with organization, coordination, and an adjustment period before all parties began to work as a team. It is a team effort now. With proper funding, no other major problems are anticipated.

AN INDOCTRINATION TOUR TO OBSERVE SEAFOOD HANDLING TECHNIQUES IN MEDAN, SUMATRA, EAST, WEST, AND CENTRAL JAVA
FEBRUARY 4, 1983 through FEBRUARY 15, 1983

by

Billy G. Miles

February 4, 1983: 6:45AM, departed Tanjung Karang for Jakarta for a meeting with AID officials and Dr. Banerjee about my project.

February 7, 1983: 10:30AM, departed Jakarta for Medan, Sumatra, via GA 154 with two GOI officials, Mr. Sunarya, and Dr. Seakerno, to visit fishery landings, auction halls, cold storages, and the GOI quality control laboratory. We also visited several auction and landing complexes, but no seafood was observed. All areas visited appear to need a quality control program. Sanitation and hygiene is in a very primitive state and adds to the contamination of the seafood that is handled in those areas. We observed three types of wooden insulated boxes. We visited P. T. Amal Wahana, a shrimp processing facility and cold storage. We observed many violations of the GMP's (Good Manufacturing Practices). Examples of violations are: facilities are not adequately screened to prevent entrance of insects, rodents, and other animals; no handwashing or sanitizing facilities; floor used for the storage of product and processing equipment; housekeeping very poor, no pressure water for cleaning and washing the seafood product; etc.

February 8, 1983: Visited the quality control laboratory at Medan, Sumatra, and I was quite impressed with the facilities. The staff and facilities appear to be adequate to perform basic quality control analysis. More equipment and supplies are needed for complicated analysis.

We then met with Mr. Bambang Subouo, head of the fishery province fisheries service in North Sumatra. We discussed my visit and ways to improve the quality of seafood processed in his province. We also discussed the conditions that exist at the fish landing and auction hall and ways to improve the conditions at them. He appears to be very energetic person and businessman who wants the best for his province. He is willing to work hard to improve.

February 8, 1983: 12:15PM, departed Medan via GA 153 to Jakarta. Arrived Jakarta at 2:30PM and departed via AID car to Cirebon, Java. Spent the night at Cirebon.

February 9, 1983: 0800 departed Cirebon via AID car to Pekalangan. Arrived at Pekalangan at 11:30AM. We visited the quality control laboratory, which is in the development stages with only basic capabilities at the present time. We then went to the auction hall. We observed the seafood handling techniques. We were told that 100 to 150 tons of fish pass through the auction hall a day. The fish that I observed appear to be in good condition when unloaded from the boats. The boats appear to use sufficient ice to maintain the products. The general hygiene and sanitation practices in the

auction hall need to be improved, and plastic trays need to be properly cleaned daily. The main problems are no pressure water for adequate cleaning of the floor and the equipment. Seafood is shipped from the auction hall in wooden boxes lined with teak leaves. No insulated containers were observed.

Next we visited T. R. M. Cold Storage. No product was being processed at the time of our visit. The facilities are of adequate size to process shrimp, but we observed may GMP violations. With an adequate quality control assistance program, the product could be produced for the U.S. market. The facilities quality control laboratory appears to be adequate to monitor production. We had a very constructive meeting with Mr. Martowidagdo, the director, and Mr. Mulyadi, the director of marketing, about processing seafood and quality control that is necessary to market shrimp in the U.S.A. We also discussed the problems that must be overcome to market frozen seafood in Indonesia. They process frozen fish for the domestic market. Shrimp are sold to Japan and the United Kingdom.

At 2:30PM departed for Semarang via AID car. 18:00 arrived Semarang and went directly to the hotel.

February 10, 1983: 08:00, we visited P.T.C.E. Jamp and talked with Mr. T. Kital, Director, and Mr. Subchan. We discussed marketing their products in the U.S. and FDA entry requirements. Mr. Subchan gave us a tour of the facilities. The facilities are very nice. There are some minor violations

of the GMP's, and there are some bad handling practices which could be readily overcome by a good quality control program if they decide to market their products in the U.S. All of their production goes to Japan, about 70 tons per month. This is the best plant that I have visited in Indonesia. All products, raw material to finished product, looked good and no decomposition was detected by organoleptic examination. The plant's quality control laboratory appears to be adequate to monitor the products. Suggestions: 1. Keep the product and the processing equipment off the floor, 2. pressure water for washing of the product and cleaning, 3. treat the water supply with 10 ppm chlorine, 4. improve housekeeping.

Next we visited the GOI quality control laboratory at Semarang and talked with the laboratory staff. The laboratory is in the development stage. The staff appear to be adequate for routine quality control analysis when adequate supplies and equipment are provided.

February 11, 1983: 08:00, departed Semarang for Surabaya via AID car. On the way to Surabaya we visited the shrimp hatchery at Jepara, and observed seafood landing areas and traditional handling and traditional seafood processing along the way to Surabaya. At 6:00PM we arrived at Surabaya.

February 12, 1983: Visited the local fishery office and talked with Mr. Oblussirkur about seafood landing, ice plant, and quality control. He then accompanied us to two cold storage facilities, O.T. Trefood Indonesia and P.T. Sikar Bumi,

where we observed frog legs and shrimp processing. Both facilities are nice, but need assistance in food handling techniques and the development of quality control programs. Numerous violations of the GMP's were observed at both facilities. With a little technical assistance in quality control, both facilities could produce products for the U.S. market. The raw material that I observed at both facilities appeared to be a very good quality, and no decomposition was detected by organoleptic examinations. We discussed the many problems of procuring quality raw material and what must be done to get quality raw material. Most of the shrimp that is processed in Surabaya is from culture ponds. Therefore, good seafood handling techniques and insulated containers need to be introduced to the suppliers if the processing plant is to receive class one products. The fisheries extension personnel could train the suppliers in seafood handling techniques and the correct use of insultated containers. Several types of good insulated containers were observed at both plants.

3:00PM departed for Yogakarta; 9:30PM arrived Yojakarta.

February 13, 1983: Met with Dr. Robert McVey and discussed seafood handling techniques and the shrimp culture problems in the area where he works. We also discussed the lack of oxygen in the small ponds and possible means of oxygen exchange for the ponds.

February 14, 1983: 07:00, departed Yogokarta for Jakarta via AID car. Arrived Jakarta, 9:30PM.

February 15, 1983: Visited AID office and talked to Mr. Gage about my trip and my project. 12:30PM departed for the airport for Tanjung Karang.

Summary:

I have visited auction halls, fish landing facilities, quality control laboratories, and cold storage facilities (shrimp, fish, and frog leg processors and manufacturers of ice) in Medan, Sumatra, East, West, and Central Java. All areas have basically the same problems: 1. insufficient water for proper washing and cleaning, 2. no pressure washing products, 3. water system not chlorinated, 4. poor housekeeping practices, 5. poor hygiene and sanitation, 6. inadequate quality control programs, 7. lack of training in the cleaning and the techniques of how to clean, 8. many violations of the GMP's, and 9. poor quality seafood received by the processing plant. Good seafood handling practices must begin when the seafood is taken out of the water, all the way until it reaches the consumer, 10. products are contaminated in every stage of handling and processing, and 11. etc.

The processing facilities that I visited in Surabaya and Semarang with the proper assistance in quality control programs could produce seafood that should comply with the quality requirements for the world market if they receive quality raw material.

Recommendations:

1. Hire a quality control consultant to develop quality control programs for all areas of harvesting, transporting, and processing and to train GOI personnel in FDA type inspection techniques.
2. Give seminars in the proper seafood handling techniques, from the lowest man on the boat through the consumer.
3. Enforce the laws in regard to the quality of seafood. Have authority to reject adulterated seafood.

4. Provide proper staffing, equipment, and supplies for the quality control laboratories so they can monitor the seafood.

/s/ Billy G. Miles
February 20, 1983

B. TRAVEL REPORTS

Project Title - "Small Scale Fisheries Development in Indonesia (contract No. NO-82-FA-C-00030)"

Type of Report - Travel to Indonesia

Period Covered - June 12 - 24, 1982

Report Submitted by - Joseph W. Slavin, President
Joseph W. Slavin and Associates

Objective

Background - The purpose of the travel was to review the objectives of the flake-ice plant project with Mr. Charles Larsen, AID project officer, and Dr. Tappan Banerjee, Fisheries Coordinator, and AID officials; inspect the ice plant technician; evaluate the need for ice plants in fishing ports in Bengkulu and Manna; and report on findings to Government of Indonesia Fishery Officials.

Discussion - I arrived in Jakarta on June 14, still aching from shots received several days before. I was met at the airport by Tappan Banerjee and Charlie Larsen, who placed an itinerary in my hands (copy attached) and hustled me off to the domestic airport and Lampung and Meringgai. Mr. R. Asmara Jaya, a staff officer of the GOI Fisheries Directorate, was kind enough to accompany us during this and other trips during my visit.

In Lampung, we were assisted by local GOI Fishery officials. We visited the house for the ice plant technician and the office provided for him by GOI Regional Fisheries

Headquarter. The house is very complete with four bedrooms, (air conditioning in three rooms) living room, kitchen with refrigerator, furniture, quarters for maids, etc., garage, large dining room, and two toilets. In addition to the house, a jeep and driver are provided for travel on official business.

The office for the ice plant technician at Regional Fishery Headquarters is not completed. It will be built into an existing conference room and should be adequate.

Meringgai - We traveled next to Meringgai to visit the fishing and the site for the ice plant. Meringgai is a small fishing port on the Southeast Coast of the large island, just Northeast of Jakarta (see attached map). The objective of the GOI is to make Meringgai a model center for improving the sanitation and handling of fish.

The annual catch in Meringgai is reported to be between 10,000 and 12,000 tons. There is no local supply of ice. Ice has to be brought in from Jakarta or Lampung. The ice is primarily used for only shrimp and is quite costly; about 60 rupees/kg (4.3¢ per pound).

The fishing boats are small, 30 to 40 ft. long and usually make only 2-day trips. A wide range of species are landed consisting of shrimp, snapper, and reef type fishes, sharks, and anchovies. The fish are sold at an auction

place without the benefit of ice or washing with clean water.

An 8-ton capacity flake-ice plant has been ordered by AID to provide ice for the project. The building for the plant has been completed and the grounds are being filled with gravel and landscaped to make an attractive setting. The ice plant diesel generator and ice storage bin are being assembled in the United States and are scheduled for shipment in mid-August.

The source of water for the ice plant is about 1400 meters distant from the plant building. The water supply flow was measured and found to be about 1.8 gallons per minute. This is adequate for making ice, but not sufficient for cooling the ice machine refrigeration condensor (45 gallons per minute required) or providing a source of clean water for use at the auction. The GOI agreed to test the water quality and provide enough capacity to accomplish the necessary cooling and water for cleaning.

When the building was constructed, detailed information on the size of the ice machine was not available. The building will accommodate the ice machine satisfactorily. It also has a compressor room and an office for use of the ice plant technician.

The GOI Fisheries Department is quite interested in a total program to improve fish

quality. The regional fisheries office is developing some insulated boxes to transport fish. The boxes would be used on the vessel, with ice, and also to transport the fish to neighboring communities. The program developed for the ice plant technician places emphasis on collecting data on existing operations, improving sanitation and quality through use of clean water and ice, training, and measuring benefits of improved quality. A more detailed description is found in Description of Duties for Pilot-Flake Ice Plant Technician, attached to this report.

Bengkulu

On June 17 I departed for Bengkulu with Tappan Banerjee and Sa'ud from the embassy. In Bengkulu we were met by GOI Fishery officials who were very kind to transport us to the fishing port to visit a local ice plant and to later travel to Manna. Mr. R. Asmara Jaya provided some very helpful fishery statistics on production of fish in Bengkulu Province. The total production in 1980 of saltwater fish was 3,248 tons, valued at 1.1 million rupees ($1,719) about 68 percent of the fish are landed in Bengkulu port. Interestingly enough, only about 35% of the landings were reported to be consumed in Bengkulu Province; the rest are consumed outside the province.

The major species landed are shipped jack, blue fin, Spanish mackerel, shark, red snapper, and sea perch--which make up the bulk of the landings. The landings of fish in Bengkulu

Province have increased from about 2300 tons in 1973 to the 1980 level of 3249 tons.

We visited Bengkulu fish port and the auction. A modern port complex is being constructed, which reportedly has provision for an ice plant. In 1980, there were about 846 fishing boats operating out of Bengkulu of which 172 are mechanized. Of those mechanized about 120 have inboard engines and 52 have outboards.

Ice is not generally used on the boats, but several of the large vessels have places for storage of block ice. There are three ice plants in Bengkulu Province. They all manufacture block ice. The plants produce about 13 tons of ice per day, which is about 50 percent of their total "theoretical" capacity. Ice costs about 60 rupees/kilo (4.3 cents/lb.)

There is no formal auction hall in Bengkulu, and one should be provided as total part of the modern port complex with adequate fish unloading and icing facilities. Completion of the port complex is sometime off, perhaps 3 to 5 years. The price of fish is not inexpensive, and there is a desire on the part of the fishermen to use ice to extend the market for their catch and obtain higher value. For example, shark sell for about 500 rupees/kilo (35 cents per lb.); silver pomfret (butterfish) 700 rupees/kilo (49 cents per lb.).

Some statistics gathered by the GOI Fisheries Department indicate the consumption of fish in Bengkulu Province has increased from about 6 kg per person in 1973 to 7.2 kg per person in 1980. The goal is to substantially increase fish consumption. Some information on fish margins indicate the mark up between fishermen and retailer could vary from 10 to 50 percent depending on the particular species involved.

Manna

On June 18, we traveled to Manna, about 4 hours from Bengkulu by car over a narrow, twisting road. Manna is a small fishing port located south of Bengkulu. In Manna, we visited the local GOI Fisheries officer and were very kindly invited to the wedding of his daughter. We were very fortunate indeed to be able to attend the ceremonies and extend our best wishes and a small remembrance to the bride and groom and their parents.

The port of Manna is in a lovely setting with coconut trees, beautiful clear water, and a rich landscape. An auction hall is under construction, and there are plans to build a dock and provide a modern fishery complex. Manna, because of its unique location and relative newness, offers an excellent site for a model fish handling center.

The landings of fish in Manna have varied between 300 and 450 tons between 1974 and 1981. The number of fishermen has almost

doubled during this period from 560 in 1974 to 1100 in 1981. There has been a very significant increase in mechanized vessels doubling from 36 in 1981 to 75 in 1982. The major species are skipjack, silver pomfret, shark, jacks, banna shrimp, and pacific mackerel. Gill nets are the primary gear used.

There is no local supply of ice in Manna. Ice is brought in from a neighboring province, Palengbang, which is 90 kilometers away. There is a need for an ice plant in Manna to provide a supply of ice for use on the vessels and in transporting the fish to the market. The details are presented in a separate report on the Feasibility of Establishing an Ice Plant in Manna, by Joseph W. Slavin and Associates.

After returning from Manna, I met with AID officials and officials of the GOI to brief them on the trips and my findings and future actions.

The fishery officials of the GOI who I met with were:

Mr. Burkanuddin Lubis MSL
Director of Production Development
Ms. Enny Sutopo
Chief of Foreign Cooperation
Directorate of Planning
Mr. Suwito
Chief of Subdirectorate
of Planning
Director of Production
Development

Observations and Findings - There is a good environment in Indonesia for taking concrete steps to improve the quality and increase benefits to fishermen and consumer. The fishery officials and AID officials are working very closely together to accomplish this. The model ice plant at Meringgai is a major step in the program.

There is concern on the part of AID/GOI officials, because the ice plant has taken so long to arrive. The technical problems on the ice plant have been resolved, and the plant is scheduled to be shipped in mid August.

The technician's qualifications for the ice plant were reviewed with GOI officials and since then, Mr. Billy Miles has been hired. He is due to arrive in Indonesia on or about August 22, 1982.

A program should be started immediately upon arrival of the ice plant technician to set a theme of improved sanitation and quality at Meringgai. This will include using clean water to wash down the auction hall and wearing clothes that will set forth a quality image. Provision has been made for this in plan of work for the ice plant technician.

There is a good justification for an ice plant in Manna, with its unique location, and the construction of an auction hall and dock.

Manna makes an ideal place for a model fishing complex stressing improved quality and sanitation.

There is a high degree of interest on the part of GOI fishery officials working with the AID Fisheries Program and in using U.S. expertise and technology in fisheries development. I found the GOI officials to be very cooperative and interested in increasing fish production and quality.

ICE PLANT SUB-PROJECT MERINGGAI

Itinerary for Joseph Slavin

15 - 22 June 1982

15 June	Arrive 12:15 Halim Airport Jakarta	
	2:45	Depart Jakarta for Tanjung Karang - Teluk Betung with Banerjee, Larsen, and DGF Staff
	3:45	Arrive Tanjung Karang
15 June	Visit consultant housing, meet Provincial Fisheries Service Officials.	
16 June	7:30	Leave Tanjung Karang ice plant site.
	9:30	Arrive ice plant site at Meringgai and inspect market place, fish landing site and ice plant building.
	11:30	Leave Meringgai
	1:30	Arrive Tanjung Karang, Lunch
	3:45	Leave Tanjung Karang airport for Jakarta.
	Kartika Plaza Hotel - Tel. 321968	
17 June	7:00	Leave for Bengkulu with Banerjee, Sa'ud, and DGF staff.
	8:00	Arrive Bengkulu
18 June	On Duty Bengkulu	
19 June	10:00	Leave Bengkulu for Jakarta
	11:00	Arrive Jakarta
	7:00PM	Dinner at Banerjee's House
	Sahid Jaya Hotel Tel. 584157 & 587031	
20 June	Open	
21 June	9:00	Meeting Mr. Lubis, Director for Production, DGF and staff.
	12:00	Lunch, Banerjee and Larsen
	Afternoon meeting USAID Staff	
22 June	Departure	

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C. FEASIBILITY STUFY FOR ESTABLISHMENT OF AN ICE PLANT IN MANNA, BENKULU PROVINCE

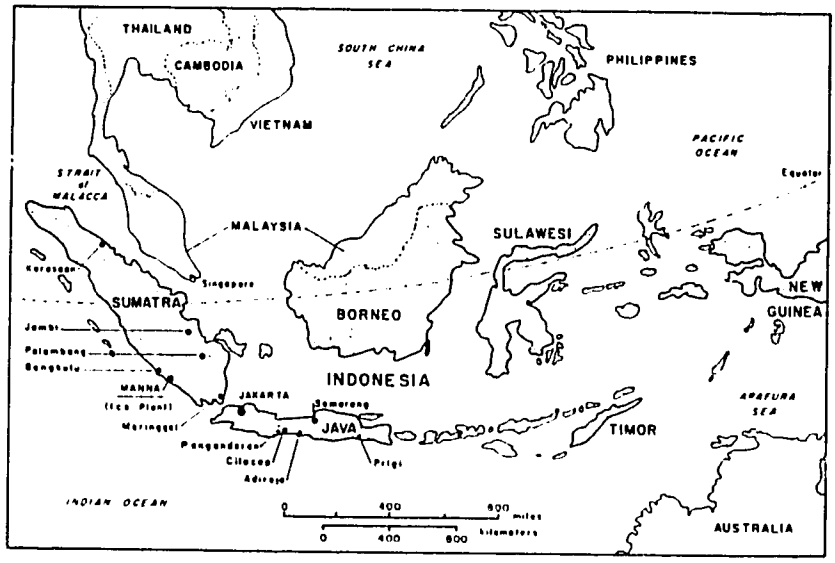
FEASIBILITY STUDY

FOR THE ESTABLISHMENT OF AN ICE PLANT

IN

MANNA, BENGKULU PROVINCE

INDONESIA



Contract No. NA-82-FA-C-00030

Submitted to

Agency for International Development
Washington, D.C.

by

Joseph W. Slavin & Associates
Annandale, Virginia

October 1982

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EXECUTIVE SUMMARY

With its new auction hall and plan for harbor and fishing fleet expansion, Manna offers a good site for an ice plant. The proposed plant is designed to become an integral part of a total fisheries complex whose objective is improving quality of seafoods, extending markets and enhancing the financial status of the fisheries industry.

Once the market becomes accustomed to iced fish, the lack of ice due to equipment breakdown could seriously lower the price of fish to the fishermen. Therefore, it is proposed that the ice plant be a 3-ton capacity with a stand-by unit to insure continued operation at all times.

Preliminary financial analysis shows that this type of ice plant installed in Manna, excluding expenditures to cover Technical/Managerial Assistance during the first year of operation, would be profitable.

This estimate is based on the assumption that costs for land acquisition, site improvement and water connection are covered by a public agency.

The schedule for a proposed plan of action is presented in Figure 5.

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INTRODUCTION

This report contains a preliminary analysis of the technical and economic feasibility of establishing an ice plant in Manna, Bengkulu Province, Indonesia.

For the preparation of this report, Joseph W. Slavin, President of Joseph W. Slavin and Associates, visited Manna on June 18, 1982. He was accompanied by Dr. Tappan Banerjee, AID Fisheries Coordinator, Mr. Sa'udi Mohamad, Embassy Staff, Mr. R. Asmala Jaya, Staff Officer of the Government of Indonesia (GOI) Fisheries Directorate and GOI Fisheries personnel from Bengkulu Province and Manna. Statistical information was obtained from GOI Fisheries personnel and other officers both in the Unites States and in Indonesia. Discussions were held in the United States with manufacturers of ice making and refrigeration equipment and technical bulletins on ice manufacture and the icing of fish were reviewed.

Overall objectives of this report are:

1) To assess the need for and provide recommendations that will assist the government of Indonesia in deciding whether an ice plant should be located at the fishing port of Manna.

2) To analyze economic and technical data concerning the type of ice plant that could effectively be used.

3) To assess the suitability of the site and prepare a conceptual drawing of the proposed plant.

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DEMAND ANALYSIS

The Fishing Port

Manna is a small fishing port located on the southwest coast of the island of Sumatra, northwest from Jakarta, on the Indian Ocean (see Figure 1). The port is about 100 kilometers from Bengkulu, or 4 to 5 hours by car over a narrow winding road. The port is presently under construction. An auction hall is being built and there are plans to construct a new dock for fishing boats and to widen the road going to the dock.

Information on the site is shown in Figure 2, including the proposed location of the ice plant. The site is very open and is beautiful with green grass and coconut trees, with space for expansion.

There is a good supply of running water for ice and adequate space for a fish handling complex with ice plant. Electricity is not available, but there is sufficient space for a diesel driven-electric generating unit to provide electrical energy.

The Fishing Industry

Production of fish and shellfish in the port of Manna over the past 7 years is shown in Table 1.

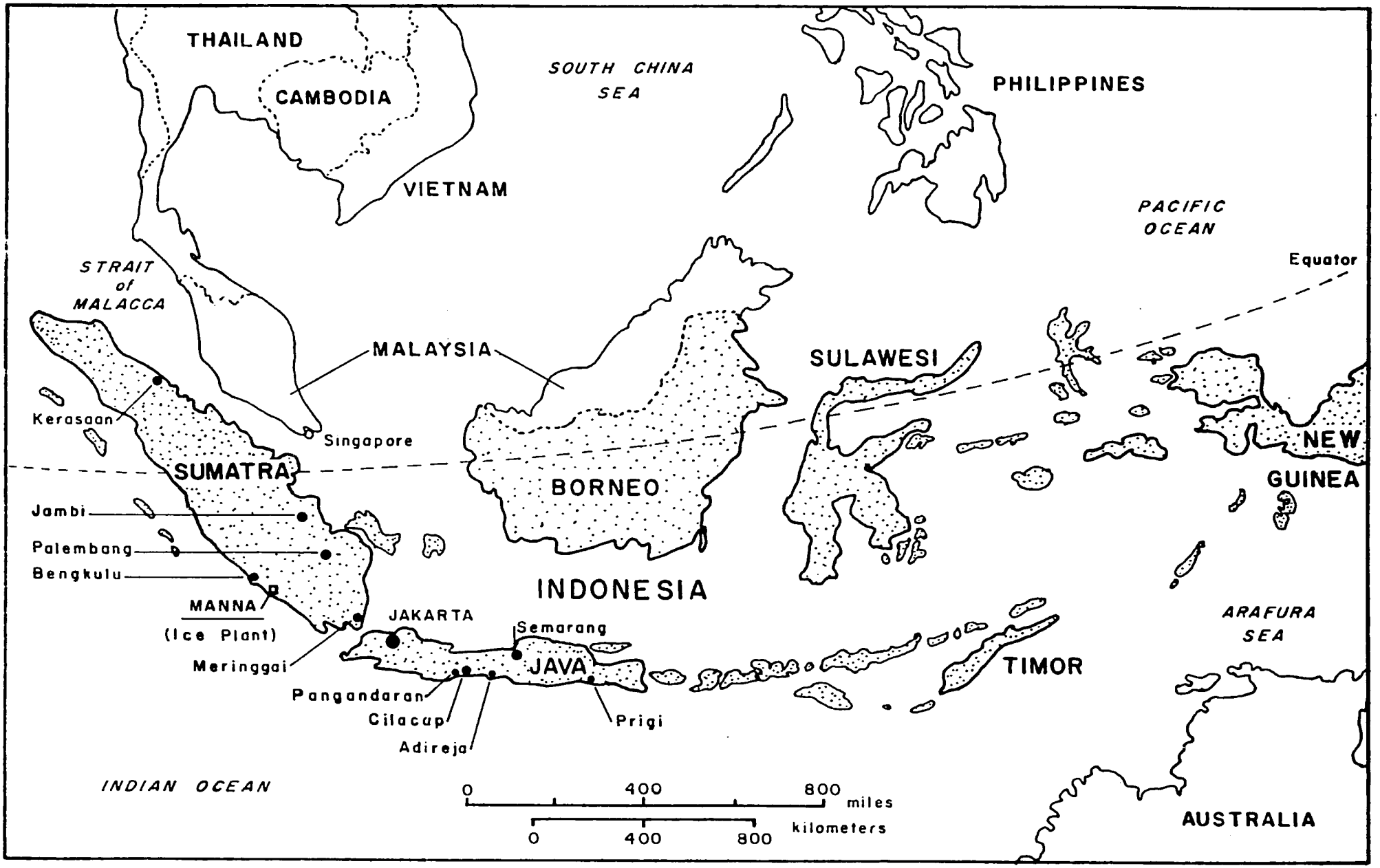

FIGURE I MANNA AND SURROUNDING AREA

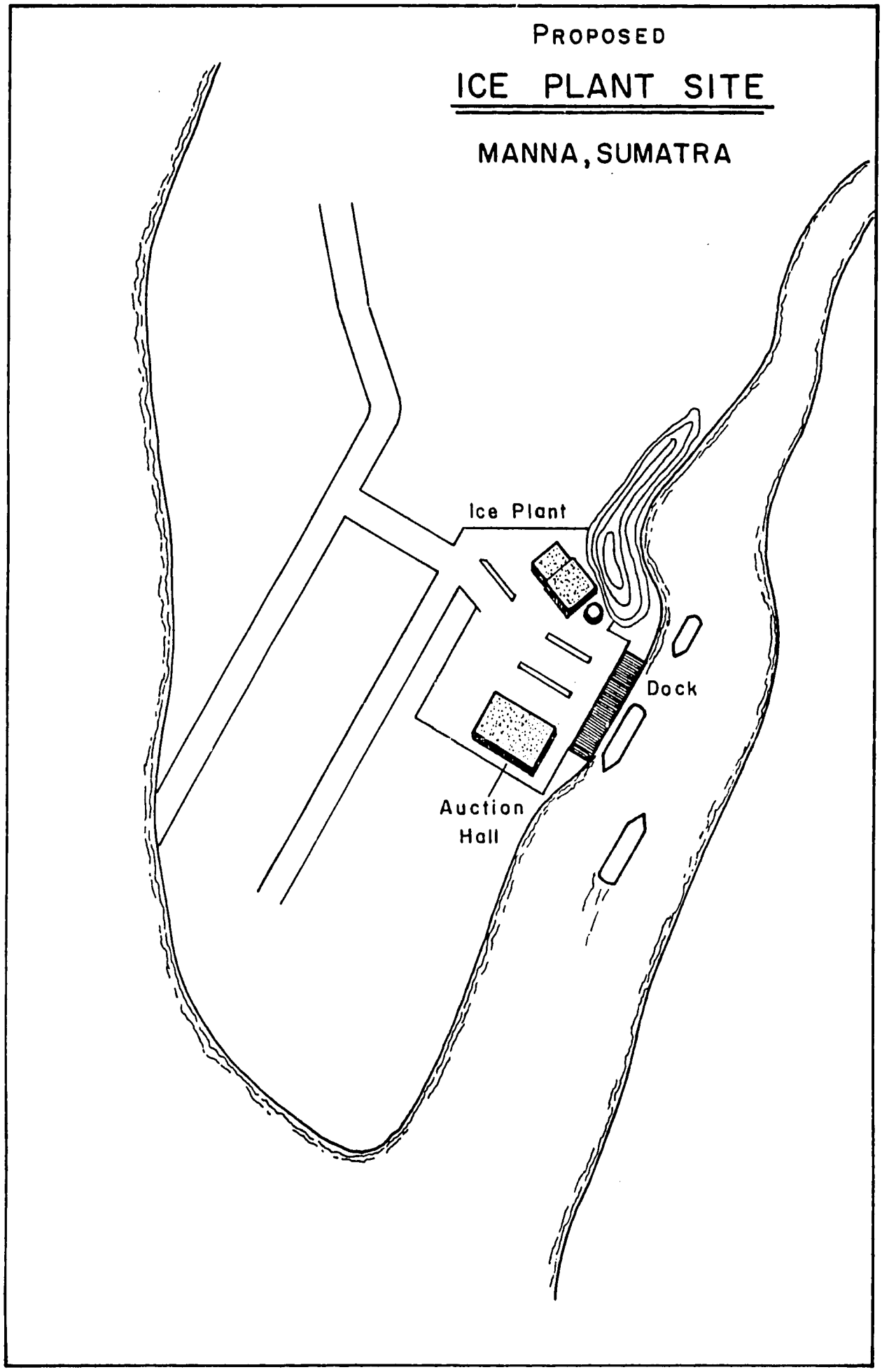

FIGURE 2

PROPOSED SITE OF ICE PLANT

Table 1: Landings of Fish and Shellfish in Manna

Year	Quantity (Metric Tons)
1974	445.7
1975	307.7
1976	382.0
1977	331.0
1978	333.0
1979	266.4
1980	257.1
1981	318.5

The decline in landings between 1974 and 1980 was believed to be due to heavy trawl fishing which affected the quantity of fish available to the in-shore fleet. Administrative restrictions on trawling have been imposed by the Government of Indonesia to protect the stocks and landings have increased by 24% between 1980 and 1981. GOI Fisheries Officers estimate that there is now considerable room for expansion, up to at least 400 MT per year.

The major species landed are skipjack tuna, silver pomfret, sharks, jacks, bannana shrimp and Pacific mackerel. Gill nets are the principle fishing gear employed. The peak season for fishing is in April and May when production of fish and shellfish averages 3 to 4 tons per day. Many of the fishermen come from West Sumatra. As can be seen from Tables 2 and 3, the number of fishermen has increased in recent years along with the number of mechanized fishing boats.

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Table 2: Full and Part Time Fishermen

Year	Total Number of Fishermen	Number of Full Time Fishermen
1974	560	250
1981	1100	341

The non-mechanized boats are less than one ton capacity and the mechanized boats vary from one to five tons capacity.

Table 3: Number of Fishing Boats

Year	Without Engine	Mechanized
1974	30	0
1981	21	36

NOTE: It is expected the number of mechanized fishing boats in 1982 will be at least double that of 1981.

The Market

The market for fish landed at Manna is not well defined. GOI Regional officials indicate that almost 100 percent of Manna landings are marketed within the Manna district.

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The ice is expensive at a cost of Rp 120 to 150 per kilo or $0.08 to $0.10 per pound. Exvessel prices of the fish are relatively high. A sample of exvessel prices were noted from discussions with GOI fishery officials and are reported in Table 4.

Table 4: Selected Exvessel Prices

Species	Exvessel Prices
Silver pomfert	Rp 700/kg ($0.48/lb.)
Shark	Rp 400-500/kg ($0.27-$0.34/lb.)
Bannana shrimp	Rp 1100/kg ($0.75/lb.)
Pacific mackerel	Rp 1500-2000/kg ($1.02-$1.36/lb.)

NOTES: 1 kg = 2.205 lbs.; 1 Rp = $0.0015

Indications are that price at final point of sale to consumers in stores or restaurants is double or triple the exvessel or auction price. Statistical information on losses experienced because of lack of ice was not directly available in Manna. However, through United States experience, we know that when seafood is held at constant 32^0F (0^0C), the shelf life of most fresh fish is extended to near its theoretical limit of 15 days and the spoilage rate is generally reduced from 10% to about 3%. It is clear that without ice the market penetration is reduced and there are substantial losses in quality as well.

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Market Potential

This preliminary analysis of the fisheries and the market in Manna indicates that the fish are quite valuable and the fishery is positioned for growth. However, the market scope is restricted because of the lack of ice. It is therefore assumed that, with ice, the consumer demand will be better satisfied and the industry will receive a fuller value for the catch.

We estimate that if ice is produced in Manna and it is sold at 4 cents per pound (as against 8 to 10 cents per pound for the ice now imported from the neighboring community), during the first year of existence of the plant market demand can rapidly reach 637 tons and then grow at an assumed rate of 10% per year for the following four years.

Even though some fish will never be iced and some fish will soon be either salted or dried, it is believed that these are fairly conservative estimates. The estimate of 637 tons is reached using a 1:1 ratio of ice to fish twice, first on the fishing vessels and then on land. One can in fact foresee that in order to extend the shelf life of the fish landed, a portion of the fish will have to be re-iced more than twice before it is finally sold to the consumer. In addition, the consumer might also want to buy some ice to protect his purchase. Furthermore, once the ice plant is established, one can foresee other enterprises making a demand for the ice. Finally, neighboring communities might also tap this source of ice.

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As for the expected growth rate for the ensuing years, we have seen from Table 1 that landings have increased by 24% between 1980 and 1981. Hence the assumed 10% growth rate must also be considered as conservative.

Detailed estimates for quantities and total revenue from the sale of ice for five consecutive years are given in Table 5.

Table 5: Five Year Ice Sales and Revenue Estimate

Year	1	2	3	4	5
Sales (MT)	637	701	771	848	933
Revenue ($)	61,795	66,121	70,749	75,701	81,001

NOTES: 1 MT = 2204.6 lb; 1:1 parts of ice to fish (twice); 1 lb. of ice valued at 4 cents; sales growth rate: 10% per year; inflation rate: 7% per year.

COST ANALYSIS

Ice Plant and Refrigeration Equipment

An ice plant in Manna should be of sufficient capacity to handle landings of fish and shellfish during peak periods of

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production of 3 to 4 tons per day. The ice would be used for boxing fish on the vessel and for distributing fish to market. With the boats used in the Manna fishery, boxing is preferred. In tropical climates at least one part ice should be used with one part fish.

At a ratio of one part ice to one part fish, an ice plant with a minimum capacity of 3 tons of ice per day is required. In addition to the need for adequate capacity, operational integrity of the ice plant is of major importance. One needs to build a "fail-safe" system. This requirement is particularly important in Manna which is rather remotely located from major equipment suppliers. An equipment breakdown without immediate repair or replacement could result in loss of ice making capability and reduction of price to the fishermen, thereby setting back the GOI fishery program.

For these reasons we believe that two separate ice making units, each with its own high side refrigeration compressor and equipment, are preferred over a single larger unit. We therefore recommend that two 3-ton ice making units each with an adequately sized compressor, water cooled evaporative condenser and auxiliary equipment be employed. The diesel driven electric generating units should also be used in tandem with each unit capable of producing 16 kilowatt hours of electrical energy.

The types of ice that can be produced in commercial plants consist of flake ice, tube ice or block ice. Flake ice is preferred over tube and block ice because it flows freely around the fish and will not puncture or damage the fish. With boxed fish,

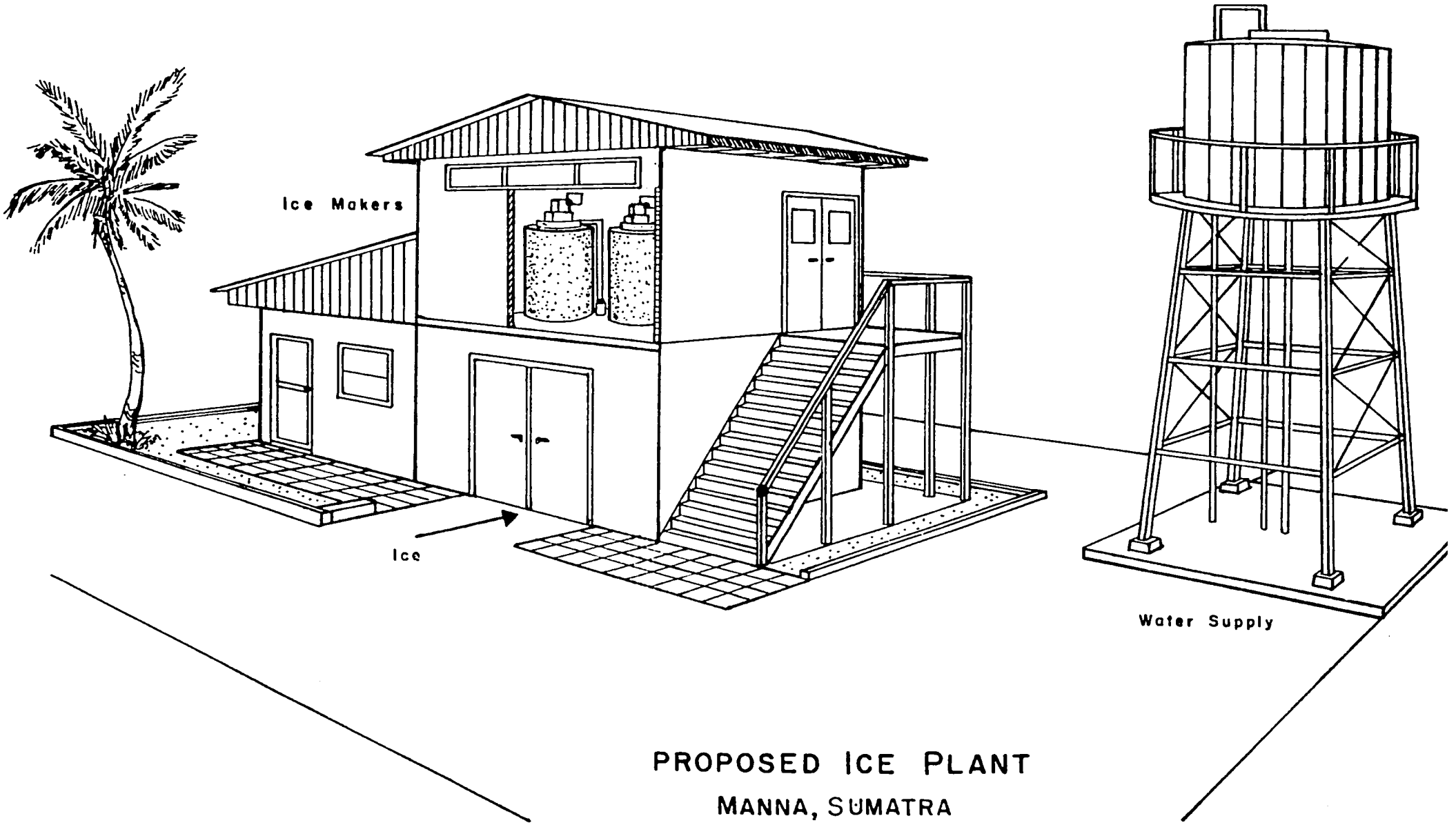
flake ice has advantages which permit maximum cooling, ease of handling and minimum damage to the fish. The drum type flake ice machine similar to that manufactured by Howe is recommended because of the proven maintenance free features of the rotating drum and the machine.

We believe it is desirable to use Refrigerant 717 (Ammonia) instead of Refrigerant 12 or 22 which are the freon refrigerants. Ammonia systems are simple, can be repaired easily, and ammonia refrigerant is readily available in Indonesia at a very reasonable cost. (The US equivalent for this cost is less than $100.)

The water capacity required for manufacture of the ice is 3 gallons per minute for each 3 ton unit or a total capacity of 6 gallons per minute. In addition a water flow of 30 gallons per minute is required for cooling off evaporative condensers for each unit. Cost and specifications of the ice making equipment are attached to this report as Exhibit B and C, respectively.

The arrangement of the ice plant and storage bin is shown in Figures 3 and 4. The storage bin should be designed to hold 5 times the maximum daily production. Thus a storage of about 30 tons or a space of about 90 cubic meters is required. (Once the bin is full, the ice maker is automatically shut off.) The space should be insulated with six-inches of cork insulation and lined on the inside with a smooth flexible coating material designed especially for coating cork insulation.

As can be seen from Exhibit B, Capital Expenditure requirements are estimated to be $141,698. This estimate does not include land acquisition and site preparation costs, nor costs for



PROPOSED ICE PLANT

MANNA, SUMATRA

(Cut-away Section into Ice Maker Room)

FIGURE 3

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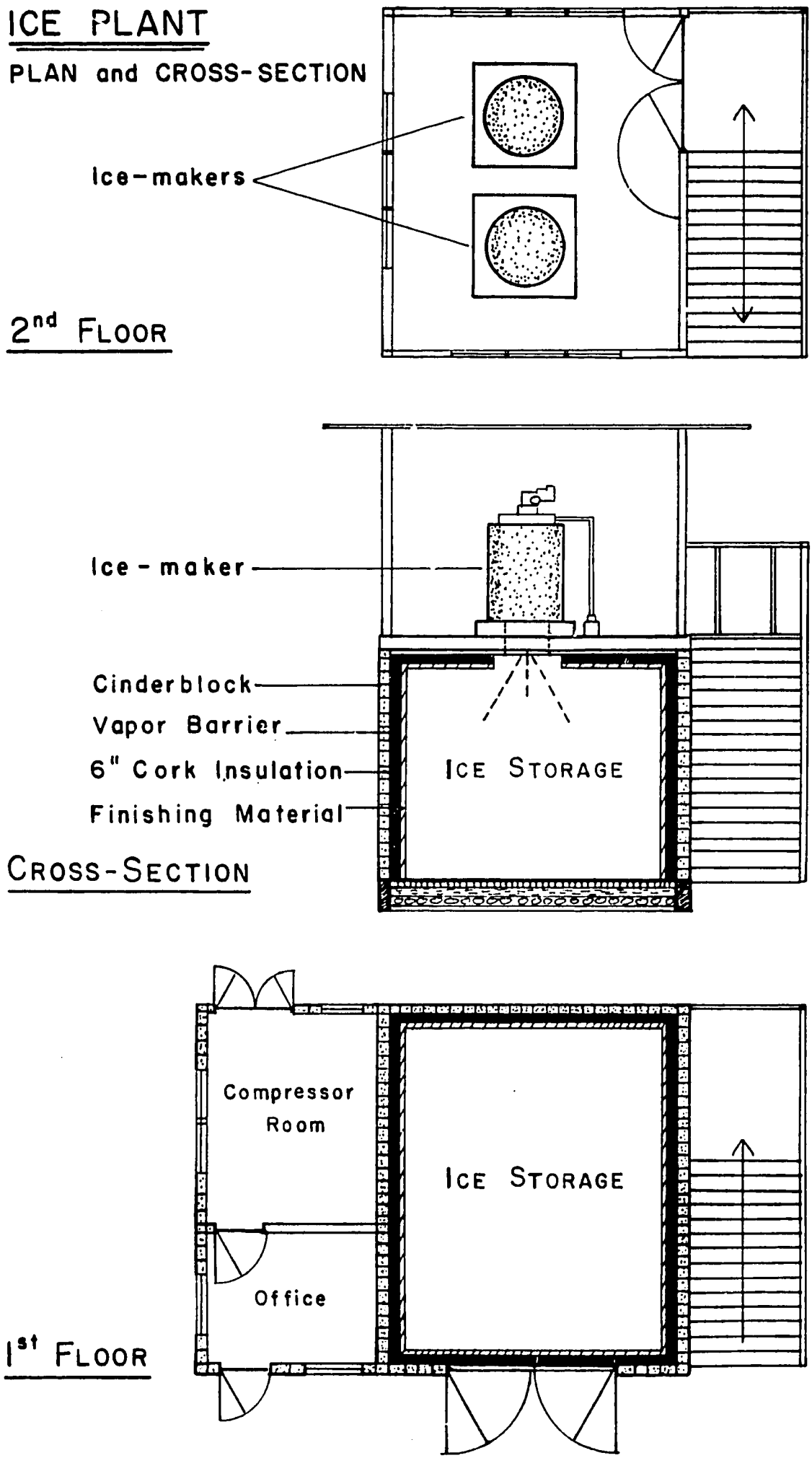

FIGURE 4

CROSS-SECTIONAL VIEW OF ICE PLANT

connection to the water supply. The determination of these costs depends not only on further engineering studies, but also on legal and administrative arrangements.

Other Costs

Other costs and relative assumptions on which these costs are estimated are given below.

Labor costs. It is assumed that one manager will be able to run the entire technical and administrative operation. It is recommended that during the first year of operation one experienced operator be hired, but that this person at the same time train a future permanent manager. On these assumptions, first year labor costs are assumed to be $48,000. During the second year of operation these costs can be reduced to $14,400 and grow thereafter at an estimated 7% per year. (This is the inflation rate that has been experienced in Indonesia in the most recent years.)

Water costs. It is assumed that water costs will be either nil or negligible. A stream runs very near the proposed site for the facility. It is recommended, however, that engineering and chemical studies be carried out.

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Depreciation and interest costs. It is assumed that, even if the plant will eventually be publicly owned, the governing authority will set aside a depreciation schedule and that there will be an interest charge to be paid.

Taxes. Because of the foregoing considerations, no allowance has been made at this stage for any form of tax payments.

FINANCIAL ANALYSIS

Due to the lack of data concerning land acquisition, site improvement and connection to water supply, no elaborate financial analysis is warranted at this stage of the report. But a Pro Forma Income Statemnt, projected five years into the future, has been prepared and is attached as Exhibit A.

Under the assumptions detailed in this Exhibit, a loss of $37,924 is estimated to occur during the first year of operation. Thereafter, a profit is expected to be obtained and is projected to grow to $21,186 per year by the fifth year of operation.

The given assumptions are believed to be realistic enough and elastic enough to tolerate even substantial adjustments in the estimates and not impair the feasibility of the project.

CONCLUSIONS AND RECOMMENDATIONS

With its new auction hall and plans for port and fishing fleet expansion, Manna offers a good site for an ice plant. This plant represents an integral part of the GOI program to improve the quality of seafoods, expand the market and enhance the status of the local fisheries industry.

The technology of such a plant is well established.

The present analysis is based on the assumption that the plant is constructed as a "turn-key" operation composed of a 3-ton ice flaker, ancillary equipment and a stand-by unit to insure continued operation at all times.

A preliminary financial analysis shows that, excluding (a) land costs, (b) site improvement costs, including connection to water supply, and (c) first year managerial and technical assistance costs, the plant would begin to show a small profit with the second year of operation. Cost calculations and assumptions on which these calculations are based can be found in Exhibit A.

It is recommended that engineering and chemical studies be prepared concerning the proposed water supply.

It is also recommended that detailed specifications and complete cost analysis be prepared in accordance with a plan of action whose outline is presented in Figure 5.

It is envisaged that the establishment of an ice plant in Manna will become a pilot project which, through continuing technical and financial analysis, can provide invaluable information about the future development of the fisheries of Indonesia.

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Figure 5

SCHEDULE FOR THE PROPOSED PLAN OF ACTION

1.	Review of present report by GOI	Oct. - Dec. 1982
2.	Engineering and chemical analysis of water supply system	Jan. 1983
3.	Preparation of detailed specifications	Jan. - Feb. 1983
4.	Preparation of detailed cost estimates	Jan. - Feb. 1983
5.	Determination of financing alternatives	March - April 1983
6.	Final technical and financial analysis	March - April 1983
7.	Review and approval by GOI	May - June 1983
8.	Issuance of bids	June 1983
9.	Selection of contractors	August 1983
10.	Construction of plant	Sept. - Nov. 1983
11.	Installation of equipment	Dec. 1983
12.	Operation of plant	Dec. 1983
13.	Training of manager	Dec. 83 - Dec. 84
14.	Analysis of financial data	Dec. 83 - Dec. 84
15.	Preparation of final report	Jan. - April 1984

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EXHIBIT A
PRO FORMA INCOME STATEMENT
(Five Year Plan)

Sales[1]	$61,795	$66,121	$70,749	$75,701	$81,001
Salaries					
T.A./Manager[2]	30,000				
Fringe[3]	6,000				
Trainee/Manager	10,000	12,000	12,840	13,739	14,701
Fringe	2,000	2,400	2,568	2,748	2,940
Depreciation[4]	14,860	14,860	14,860	14,860	14,860
Interest[5]	19,878	16,571	12,732	8,276	3,103
Fuel[6]	12,230	13,453	14,799	16,279	17,907
Maintenance[7]	4,251	4,549	4.867	5,208	5,572
Office Supplies[8]	500	550	605	665	732
Total Expenses	$99,719	$64,383	$63,271	$61,775	$59,815
PROFIT (LOSS)[9]	($37,924)	$1,738	$7,478	$13,926	$21,186

NOTES:

1. 381,5 MT (fish langings) x (1:1 ice/fish, twice) x 2,204.6 lbs. x $0.04 cents lb.; yearly growth rate, 10%; inflation rate, 7%.

2. There are various alternatives to decide upon concerning this item.

3. Estimated at 20% of salary.

4. Straight line depreciation, with 20% of value as residue; 15 year life for building and 5 year life for equipment.

5. Assuming a loan to cover entire capital cost, at 15% per annum.

6. With one system running for 24 hrs per day, for 212 days a year and consuming 4 gals. of fuel per hr. Fuel consumption growing at 10% per year. Cost of fuel starting at 60 cents per gal. and growing at 7% per year.

7. Estimated at 3% of capital cost and growing at 7% per year.

8. Estimated to grow at 10% per year.

9. With cost of land and site improvement assumed by a public agency.

EXHIBIT B

CAPITAL EXPENDITURE: BUILDING AND ICE MAKER EQUIPMENT

Building		$73,238.00
2 Rapid Freeze Ice Flakers with associated equipment (F.O.B. Chicago, USA)		33,060.00
2 16 kw diesel generator units (F.O.B. Chicago, USA)		18,000.00
Shipping Charges		10,000.00
Installation		
One Technician		
14 days @ $300 per day	4,200	
travel	1,800	
food and lodging	1,400	
		7,400.00
		=======.==
TOTAL		$141,698.00

NOTE: Total cost does not include land costs, site improvement, and connection to water supply.

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EXHIBIT C

SPECIFICATIONS

FOR

BUILDING AND ICE MAKER EQUIPMENT

Building
(in meters)

Ice maker room: 7 1/2 x 7 x 3

Storage room: 7 1/2 x 7 x 3

Compressor and generator room: 5 x 5 x 3

Office: 2 1/2 x 5 x 3

Ice Maker

Two individual refrigeration systems consisting of or equivalent to:

- Howe Rapid Freeze Ice Flaker
  Model 30 EA-1000
  Capacity: 3 tons per day for use with R-717 (Refrigerant)
  1/3 h.p. pump for water supply

- H-532 Compressor Unit for R-717 Refrigerant (Ammonia)
  30 h.p. electric motor with pump for water cooling
  Model AEC 19 Evaporative Condenser and connecting controls
  Valves and piping

Diesel generator unit

- Two 16 killowatt diesel generator units with common electrical switchboard and load transfer switches

Storage bin

- As shown in Figure 4, lined with 6 inches of cork insulation, concrete floor with sufficient drainage.

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D. LIST OF TOOLS

D. Tools and Spare Parts

TOOLS PURCHASED

FOR THE PROJECT

I. All items listed are from the Sears Special Catalogue "Craftsman Power and Hand Tools", designated GT".

Item	Page	Quant.	Description	Cat. No.	Weight lbs./oz.	Cum. Wght.	Cost	Cumulative Cost
1	125	1	143 piece standard tool set.	9 GT 46381C	28 / 0	28/ -	$249.00	$ 249.00
2	113	1	"Microtork" Torque Wrench.	9 GT 44477	2 / 6	30/ 6	44.99	293.99
3	34	1	10" Steel Pipe Wrench.	9 GT 55676	1 /11	32/ 1	11.99	305.98
4	34	1	14" Steel Pipe Wrench, cap. 2".	9 GT 55677	3 / 5	35/ 6	14.99	320.97
5	34	1	18" Steel Pipe Wrench, cap. 3".	9 GT 55678	5 / 5	40/11	19.99	340.96
6	34	1	Reversing Pipe Wrench, 4" O.D. capacity.	9 GT 55713	1 /12	42/7	16.99	357.95
7	112	1	8" Adjustable End Wrench, 7/8" capacity	9 GT 44603	- / 4	42/11	10.99	369.94
8	112	1	12" Adjustable End Wrench, 1 5/16" capacity.	9 GT 44605	1 /12	44/ 4	18.99	387.93
9	106	1	Hack Saw, Standard cutting, 10" or 12".	9 GT 3562	1 /12	46/ -	6.99	394.92
10	106	1	Hack Saw Blades, 24 teeth per inch, 10" length, 5 per pack.	9 GT 65853	- / 5	46/ 5	1.79	396.71
11	114	1	3 Piece Pliers Set, 9 1/2" arc, 8" long nose, 8" std. pliers.	9 GT 45278	2 / 1	48/ 6	21.99	418.70
12	115	1	5 Piece Locking Pliers Set, 2 straight, 2 double curve, 1 long nose.	9 GT 45352	3 /10	52/ -	24.99	443.69
13	114	1	Wide-jaw Diagonal Cutting Pliers.	9 GT 45072	- / 4	52/ 4	9.99	453.68
14	114	1	Linesman Pliers.	9 GT 45092	1 / -	53/ 4	13.99	467.67
15	34	1	11 Piece, 2 1/2 x 2 1/2 inch. Pipe threading Set.	9 GT 53910	4/	57/	143.99	611.66
16	34	1	Taper Style Kromedge Pipe Tap Set.	9 GT 52009	2 / 2	69/ 2	34.99	646.65

Item	Page	Quant.	Description	Cat. No.	Weight lbs./oz.	Cum. Wght.	Cost	Cumulative Cost
17	34	1	9 Piece Flaring Tool Set.	9 GT 5538	4 / 2	73/ 4	26.99	673.64
18	30	1	Steel lock tape with std. and metric scales, 12 feet.	9 GT 39224	- / 7	73/11	7.99	681.63
19	30	1	Steel lock tape, 25 feet.	9 GT 39332	- /10	74/ 5	11.99	693.62
20	30	1	24" level for testing plumb, rise, or level.	9 GT 39928	1/ 8	75/13	17.89	711.51
21	30	1	Aluminum Rafter Square, 24" x 2"	9 GT 39644C	- /15	76/12	19.99	731.50
22	31	1	Saw, Taper-ground, bevel-filed.	9 GT 36194C	1 /13	78/ 9	20.99	752.49
23	32	1	Hammer with solid steel handle.	9 GT 3825	1 /11	80/ 4	14.99	767.48
24	32	1	Ball-pien hammer, fiber glass handle.	9 GT 38475	2 / 2	82/ 6	13.99	781.47
25	32	1	Heavy-duty hammer, 2 1/2 lb. head, hickory handle.	9 GT 36829	2 /15	85/ 5	13.99	795.46
26	53	1	Five piece chisel set, wood, 1/4, 1/2, 3/4, 1, 1 1/4 in..	9 GT.36829	2 / 1	87/ 6	24.99	820.45
27	53	1	Four piece all steel chisel set, 1/2, 3/4, 1, 1 1/4 in..	9 GT 36864	1 /12	89/ 2	20.99	841.44
28	33	1	Heavy duty bench vise, opens to 4 inches, 3 1/2 inch jaws.	9 GT 5180C	16 / -	105/ 2	39.99	881.43
29	107	1	File, flat.	9 GT 31254	- / 6	105/ 8	3.19	884.62
30	107	1	File, bastard.	9 GT 31255	- /11	106/ 3	4.19	881.81
31	31	1	Bench plane, cast iron sides, 2 inch wide steel blade.	9 GT 37064	3 /14	110/ 1	39.99	928.80
32	31	1	Replacement blade for plane.	9 GT 37066	- / 4	110/ 5	8.99	937.79
33	106	1	Hack saw, standard cutting, 10" or 12".	9 GT 3562	1 /12	112/ 1	6.99	944.78

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Item	Page	Quant	Description	Cat. No.	Weight lbs./oz.	Cum. Wght	Cost	Cumulative Cost
34	106	1	Hack saw blades, package of 5.	9 GT 65854	- / 5	112/ 6	1.99	946.77
35	105	1	Steel wrecking bar.	9 GT 65981C	4 / 8	116/14	9.99	956.76
36	19	1	Ten piece screw extractor and bit set.	9 GT 20616	- / 8	117/ 6	13.99	970.75
37	115	2	Refillable WD-40 sprayers, 1 pt. capacity.	9 GT 55783	- /12	118/ 2	4.48	975.23
38	115	2	WD-40 all purpose lubricant, for above sprayers, 2 gals.	9 GT 55783	16/ 4	134/ 6	19.48	994.71
~~39~~	~~47~~	~~1~~	~~Rotary scale, snap-around volt-ohm-ammeter with pointer lock.~~	9 GT 5918	- /15	135/-5	~~104.99~~	~~1,099.70~~
40	49	1	100 piece standard electrical repair kit, incl. 9 1/2" tool.	9 GT 6088	1 / 3	136/ 8	14.99	1,114.69
41	53	1	200 watt soldering iron, hard-wood handle, 5/8" tip.	9 GT 53832	2 / 1	138/ 9	29.99	1,144.68
42	53	1	Replacement tip for soldering above, (9 GT 53832).	9 GT 53835	- /12	139/ 5	5.99	1,150.67
43	53	2	Rosin core solder	9 GT 8052	2 / 6	141/11	21.98	1,172.65
44	16	1	3/8" Variable speed, reversible, drill with 1/3 hp. motor.	9 GT 1051	4 / 5	146/-	59.99	1,232.64
45	17	1	15 piece drill bit set.	9 GT 6809	- / 8	146/ 8	22.99	1,255.63
46	17	1	Four piece, carbide tipped, masonry drill bit set.	9 GT 67389	- /10	147/ 2	9.99	1,265.62
47	17	1	1/4" x 13" carbide tipped masonry bit.	9 GT 67096	- / 4	147/ 6	4.99	1,270.61
48	17	1	1/2" x 13" carbide tipped masonry bit.	9 GT 67099	- / 7	147/13	6.99	1,277.60
49	18	1	Chuck key for 3/8" drill.	9 GT 2149	- / 1	147/14	1.99	1,279.59
50	20	1	Drill-operated drill bit sharpener.	9 GT 6680	2 / 7	150/ 5	19.99	1,299.58

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Item	Page	Quant.	Description	Cat. No.	Weight lbs./oz.	Cum. Wght.	Cost	Cumulative Cost
51	88	2	Flexible mask impact goggles. (Price each = $2.69)	9 GT 1859	- / 4	150/ 9	5.38	1,304.96
52	88	2	Protective eye guards. (Price each = $1.99)	9 GT 18645	- / 4	150/13	3.98	1,308.94
53	19	1	Sander, polisher, buffer set.	9 GT 26272	1 / 6	152/ 3	8.99	1,317.93
54	19	1	Crimped wire-wheel brush, fine.	9 GT 64902	- / 6	152/ 9	3.79	1,321.72
55	19	1	Crimped wire-wheel brush, coarse.	9 GT 64903	- / 6	152/15	3.69	1,325.41
56	22	1	9", 1 1/2 HP., disc sander/ grinder.	9 GT 1058	14/12	167/11	149.99	1,475.40
57	22	1	9" grinding wheel.	9 GT 64102	2 / 2	169/13	8.49	1,483.89
58	22	1	Sanding discs, 80/fine.	9 GT 25287	1 /10	171/ 7	12.19	1,496.08
59	22	1	Sanding discs, 50/medium.	9 GT 25288	1 /15	173/ 6	12.89	1,508.97
60	22	1	Sanding discs, 36/coarse.	9 GT 25289	2 / 2	175/ 8	13.59	1,522.57
61	83	1	Bench grinder, light duty, 5x1/2 inch wheels	9 GT 1911	10/-	185/ 8	44.99	1,567.56
62	82	1	5 inch wire wheel, fine	9 GT 64189	-/10	186/ 2	4.49	1,572.05
63	82	1	5 inch wire wheel, coarse	9 GT 64819	-/11	186/13	4.29	1,576.34
64	86	1	Welder, 20 to 70 AMP	9 GT 20143L	44/-	228/13	99.99	1,676.33
65	87	1	Heavy duty helmet	9 GT 1322	1/13	230/10	18.99	1,695.39
66	87	2	No. 10 Replacement Filter Lens (1.99 x 2 = 3.98)	9 GT 13277	-/2	230/12	3.98	1,699.37
67	87	1	Chipping Hammer	9 GT 20715	1/-	231/12	7.89	1,707.26

Item	Page	Quant.	Description	Cat. No.	Weight lbs./oz.	Cum. Wght.	Cost	Cumulative Cost
68	85	1	Single-stage Ocy-acetylene torch outfit	9 GT 5432	12/12	244/ 8	189.99	1,897.25
69	85	1	Welding tip, No. 3, Capacity 1/32 to 1/16 inch	9 GT 54432	-/4	244/12	6.39	1,903.64
70	85	1	Welding tip No. 7, Capacity 1/8 to 1/4 inch	9 GT 54434	-/4	245/ -	6.39	1,910.03
71	85	1	Cutting tip No. 1, Capacity 1/2 to 1 inch	9 GT 54436	-/3	245/ 3	8.69	1,918.72
72	85	1	Cutting tip No. 2, Capacity 1 to 2 inch	9 GT 54437	-/3	245/ 6	8.69	1,927.41
73	85	1	Tip cleaners, set of 12	9 GT 5424	-/1	245/ 7	3.69	1,931.10
74	85	1	Spark lighter	9 GT 5440	-/4	245/11	99	1,932.09
75	85	1	Rubber twin welding hose, 20' long	9 GY 54271	5/2	250/13	22.89	1,954.98
76	142	1	Tool chest with two drawers 20 1/2" x 8 1/2" x 9 1/2"	9 GT 65334C	16/-	266/13	42.99	1,997.97
77	142	1	Tool bag, cotton canvas, 24" x 14"	9 GT 4511	4/2	270/15	29.99	2,027.96

II. All items listed are from the Sears "Fall/Winter/1982" Catalogue. Designated "H"

Item	Page	Quant.	Description	Cat. No.	Weight lbs./oz.	Cum. Wght.	Cost	Cumulative Cost
1	1080	2	4 Gal. sprayer, stainless steel tank (73.99 x 2 = 147.98)	71 H 1512	23/8	23/ 8	147.98	147.98
2	1070	2	Watering system, incl. hose, cart, nozzle, timer (69.96 x 2 = 139.92)	9 H 89603C	56/-	79/ 8	139.92	287.90
3	1070	2	Heavy duty rubberhose, 25' (12.99 x 2 = 25.98)	9 H 79414	8/8	88/ -	25.98	313.88
4	1070	1	Heavy duty rubber hose, 100'	9 H 79413C	17/-	105/ -	45.99	359.87
5	1070	3	7 Piece Quick-connector kit (7.99 x 3 = 26.97)	9 H 69394	3/-	108/ -	23.97	383.84
6	1070	1	Hose nozzle	9 H 69576	-/14	108/14	10./99	394.83
7	996	1	Indoor/outdoor cable, No. 12 3 strand, 20 AMP. CAP., 50 feet	34 H 48932	7/10	116/ 8	27.99	422.82
8	996	4	Surface mount handy box (4 for $ 3.16)	34 H 5388	2/-	118/ 8	3.16	425.98
9	996	4	Double outlet cover	34 H 5390	-/4	118/12	1.56	427.54
10	997	4	Outlet, heavy duty, brown (4 for $ 7.16)	34 H 5925	1/-	119/12	7.16	434.70
11	997	1	Extension cord, 25', 3 wire	34 H 5824	2/8	122/ 4	9.99	444.69
12	737	1	Grease gun and grease, ten 14 1/2 oz. cartridges	28 H 4960	12/15	135/ 3	21.99	466.68