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(R) EVALUATION STUDY FOR THE SETTING-UP OF SUITABLE DECENTRALIZED SMALL- OR MEDIUM-CAPACITY COCONUT PROCESSING PLANTS*

SI/CKI/78/803

COOK ISLANDS

Terminal report

Prepared for the Government of the Cook Islands
by the United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

Based on the work of Pedro C. Catanaoan,
expert in coconut processing

United Nations Industrial Development Organization
Vienna

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Explanatory notes

References to dollars ($) are to New Zealand dollars, unless otherwise stated.

The following abbreviations have been used in this report:

DCFRR	Discounted cash flow rate of return
psig	pounds per square inch gauge

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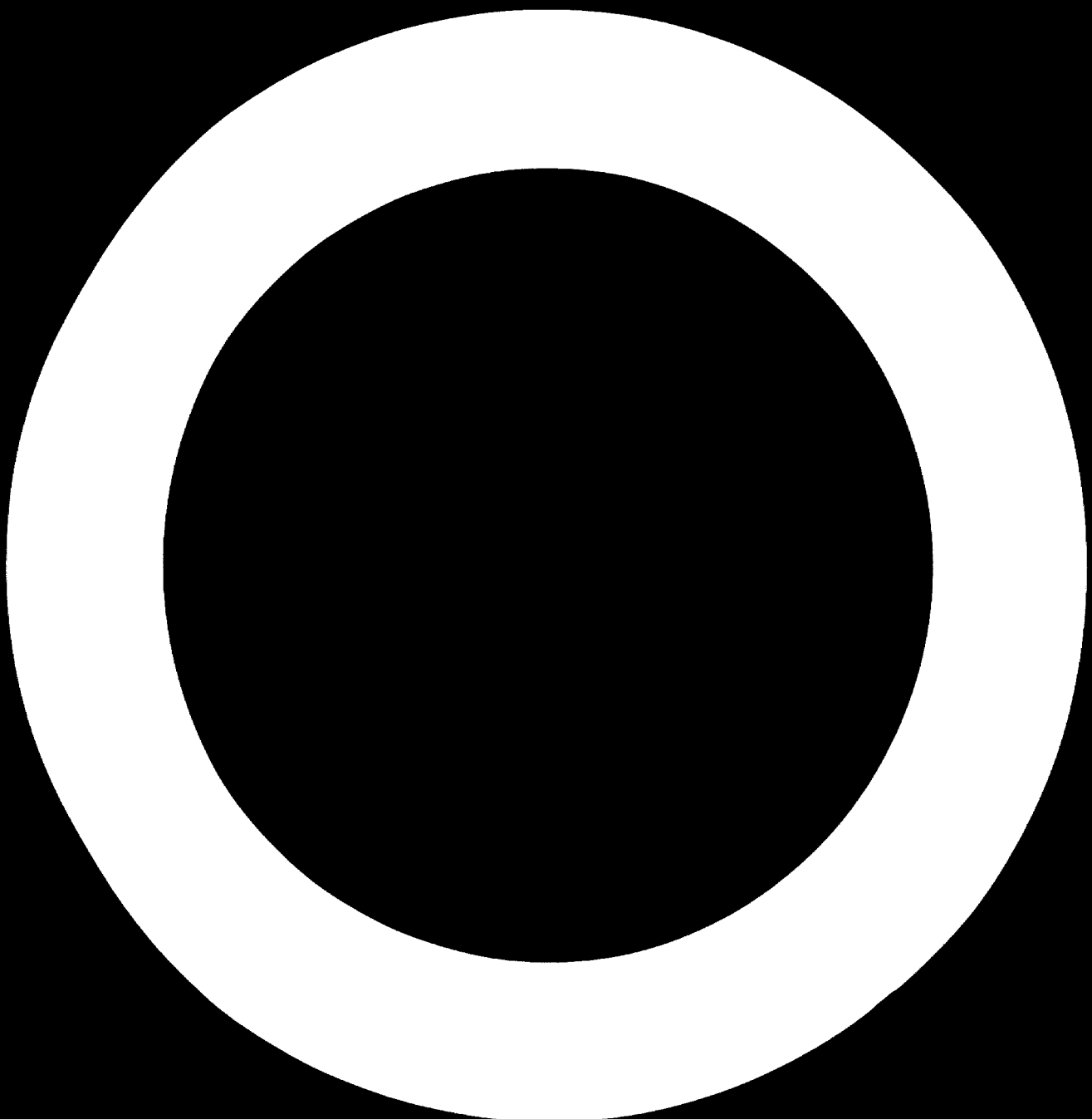
ABSTRACT

The project entitled "Evaluation study for the setting-up of suitable decentralized small- and medium-capacity coconut processing plants" (SI/CKI/78/803) arose from a request submitted in May 1978 by the Government of the Cook Islands to the United Nations Development Programme (UNDP) for assistance in the development of the coconut production and processing sector. The request was approved in June 1978 and the United Nations Industrial Development Organization (UNIDO) was appointed executing agency. The UNDP contribution to the project was $US 11,000 and the expert in coconut processing took up his two-month assignment on 31 October 1978.

According to his job description the expert was to evaluate the possibility of setting up small-scale coconut processing plants in the northern group of islands. Since he found that the conditions prevailing in these islands did not warrant the establishment of such plants, his terms of reference were, in agreement with the Government, expanded to include the whole of the Cook Islands.

After a careful assessment of the overall situation of the coconut production and processing sector the expert made the following main recommendations: a long-range coconut plantation rehabilitation and replanting programme should be started; the present system of crop assurance by opening and closing the motus should be revised; and the coconut collecting and copra making should be better organized. For the proposed integrated copra processing project he recommends undertaking a feasibility study and conducting a survey for sources of financing.



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I. INTRODUCTION

1. Project background

The project entitled "Evaluation study for the set-up of suitable decentralized small- and medium-capacity coconut processing plants" (SI/CKI 77/803) arose from a request submitted in May 1977 by the Government of the Cook Islands to the United Nations Development Programme (UNDP) for assistance in the development of the coconut production and processing sector. The request was approved in June 1978 and the United Nations Industrial Development Organization (UNIDO) was appointed executing agency. The UNDP contribution to the project was $US 11,000 and the expert in coconut processing took up his two-month assignment on 31 October 1978.

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2. The geography of the Cook Islands

The Cook Islands, consisting of 15 Islands scattered over 851,000 square miles of the South Pacific, are bounded on the east and west by the 156th and 167th meridians of west longitude and on the north and south by the 8th and 23rd parallel of south latitude. The total land area is approximately 92 square miles (59,300 acres).

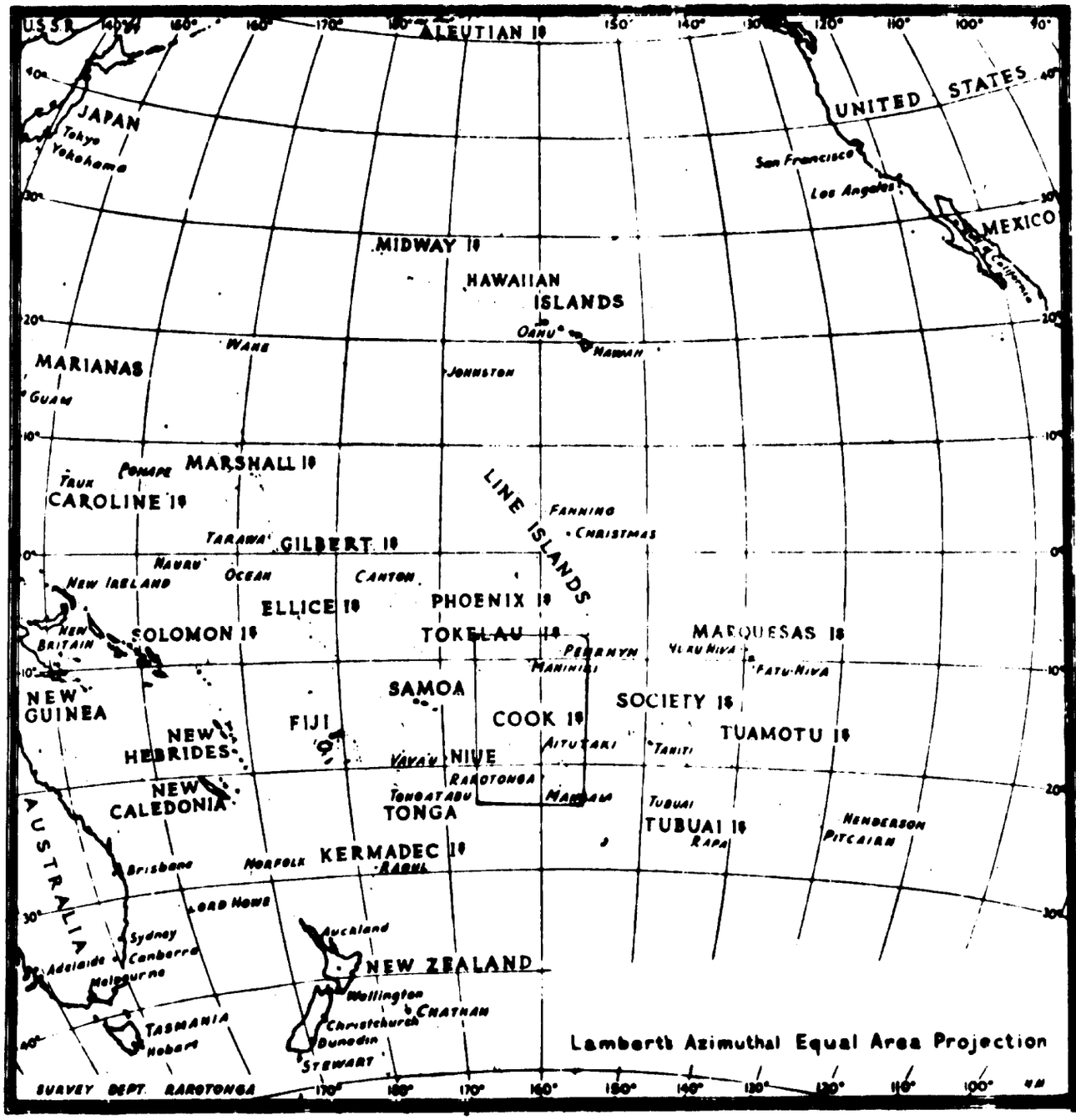
The Cook Islands are divided into two main Groups:

a) Southern Group: Rarotonga (capital), Aitutaki, Atiu, Mangaia, Manuae, Mauke, Mitiaro, and Takutea.

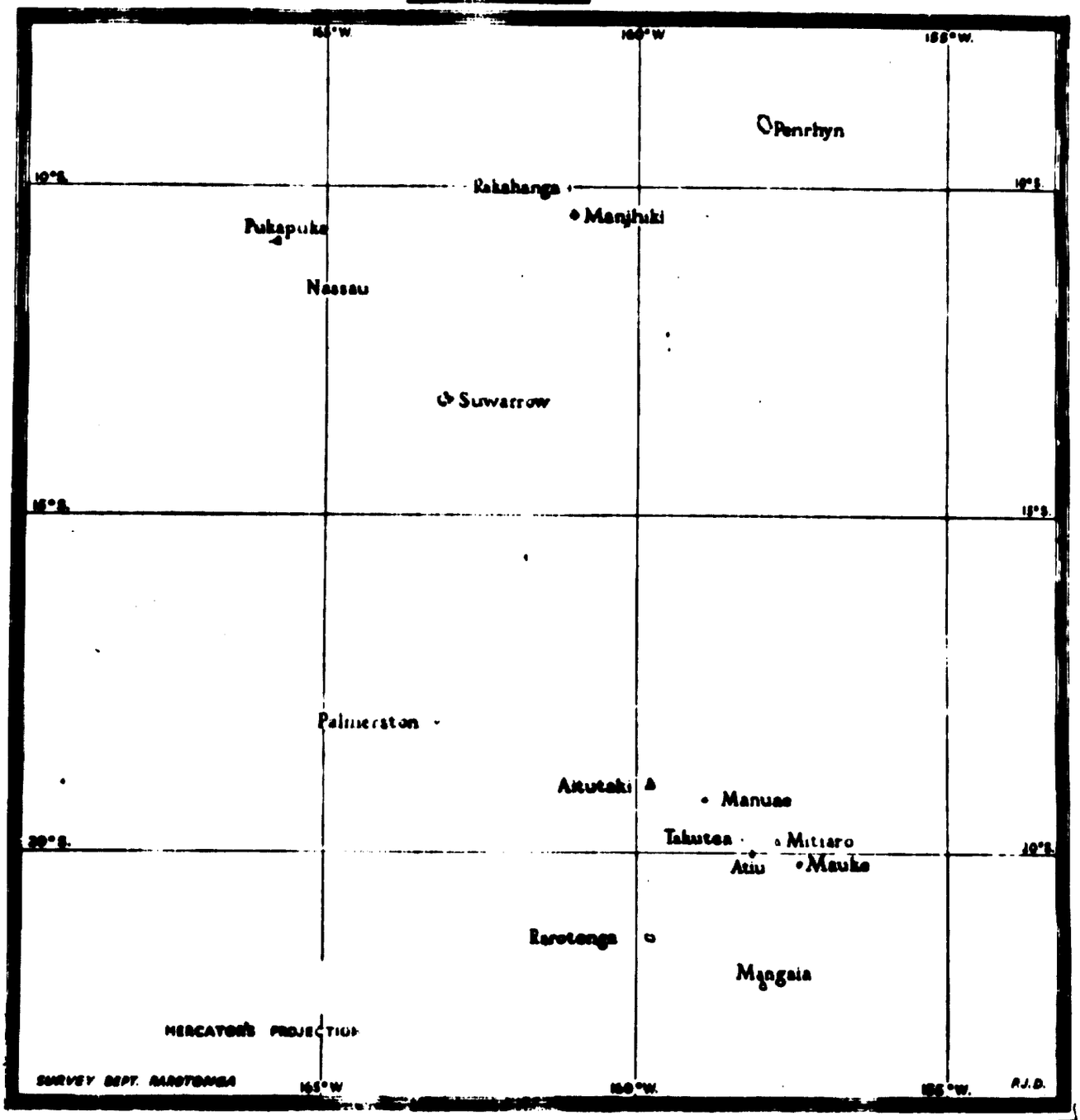
b) Northern Group: Penrhyn, Manihiki, Rakahanga, Pukapuka, Palmerston, Nassau, and Suwarrow.

The distance of the different Islands from the capital, Rarotonga, are as follows: Aitutaki 140 miles, Atui 116 miles, Mangaia 110 miles, Manuae 124 miles, Mauke 150 miles, Mitiaro 142 miles, Takutea 118 miles, Penrhyn 737 miles, Manihiki 650 miles, Rakahanga 674 miles, Pukapuka 715 miles, Palmerston 270 miles, Nassau 673 miles and Suwarrow 513 miles.

COOK ISLANDS AND THE PACIFIC



COOK ISLANDS



3. Climate

The Cook Islands have a mild tropical climate. Rarotonga on the Southern Group has an average rainfall of 83 inches, a maximum temperature of 92°F and a minimum temperature of 48°F. Penrhyn of the Northern Group has an average rainfall of 95 inches, a maximum temperature of 96°F and a minimum temperature of 65°F.

4. Government

Until August 4, 1965, the Cook Islands was a territory administered by New Zealand. Then on, it became a self-governing nation. The New Zealand Government has continued to give financial aid to the Cook Islands Government through grants for social services and ordinary administrative expenditure, plus grants and loans for capital works and economic development. Free trade exists between the two governments.

5. Population and Land Area[1/]

The populations and land areas of the different Islands of the Cook Islands are as follows:

Islands	Population (1976)	Land Area (acres)
Rarotonga	9,364	16,600
Aitutaki	2,420	4,460

1/ Source of data: Cook Islands Directory and Guide Book

Islands	Population (1976)	Land Area (acres)
Mengeie	1,630	12,800
Atiu	1,312	6,655
Mauke	710	4,550
Mitiaro	305	5,500
Manuae	-	1,525
Takutea	-	300
Menihiki	263	1,345
Pukapuka	786	1,250
Penrhyn	531	2,430
Pelmerston	53	500
Rekahanga	283	1,000
Nassau	113	300
Suwarrow	1	100
T o t a l	17,770	59,315

6. **The People**

The people of the Cook Islands are Polynesians and are called Cook Island Maoris. They are related to the New Zealand Maoris and the Tahitiens.

Most of the people speak and understand English but they normally converse in their own language. The different islands have their own dialect but the common language is Rarotongan.

Because of their frequent contacts with people from New Zealand, Australia, and other westernized countries, many people, specially in Rarotonga and Aitutaki have adopted some western ways of living. In the outer islands, however, many still maintain their culture and customs. The people are, generally, happy, friendly, and easy-going.

7. Agriculture and Economy

The Islands of the Southern Group are, mainly, high islands with fertile soil suitable for citrus, pineapples, taro, bananas, and vegetables. The Northern Group islands primarily consist of low coral atolls, almost totally planted with coconut trees.

Agricultural land use in the different Islands have been estimated to be as follows:2/

	Area Planted, Acres				
Islands	Taro	Citrus	Banana	Pineapple	Coconuts
Rarotonga	140	660	25	-	400
Aitutaki	30	160	55	-	350
Mangaia	40	-	-	100	600
Atiu	60	100	-	115	550
Mauke	10	45	-	-	250

2/ Source of data: Statistical Working Paper 2, Ministry of Agriculture, Marine Scientific and Industrial Research, Cook Islands.

Islands	Area Planted, Acres				
	Taro	Citrus	Banana	Pineapple	Coconuts
Mitiaro	25	1	-	-	350
Manuae	-	-	-	-	1,370
Takutea	-	-	-	-	270
Northern Gp.	5	-	-	-	4,500
Total	310	966	80	215	8,640

The Cook Islands economy is mainly supported by production of services. About 75% of the total national income is generated by the services sector, and the rest from production of tangible goods. Provisional estimates of Gross Domestic Product (GDP) in current producers' prices for 1977 are as follows: 3/

Sectors	Value in $1,000
1. Agriculture and livestock	2,404.1
2. Fishing and Pearlshell	456.2
3. Manufacturing	740.0
4. Electricity, water and Quarry	80.0
5. Construction	560.4
6. Wholesale, Retail Trade, Hotels, and Restaurants	3,109.9
7. Stampaalea and Coinage	2,091.8
8. Tranaport and Communication	1,413.2
9. Finance and Business Services	300.0

3/ Source of data: Gross Domestic Product Estimates of the Cook Islands, 1976 and 1977, Ministry of Planning and External Affairs, Cook Islands.

Sectors	Value in $1,000
10. Real Estate and Ownership dwellings	396.8
11. Public Administration and Public Community Services	4,279.6
12. Private Community Services	529.9

Provisional Total GDP at Market Prices = $16,371.8

8. Trade

In 1977, the total imports to Cook Islands, consisting of: foods, animals, beverages and tobacco, animal and vegetable fats, chemicals, manufactured goods, machinery and equipment, amounted to $17,497,100. In the same year, the total exports consisting of: fresh fruits and nuts, preserved fruits and fruit preparations, canned fruits, vegetables, roots and tubers, coffee beans, copra, crude vegetable and animal materials, clothing, footwear, wood-carvings, and shell-craft, amounted to $2,386,200.

Exports to New Zealand amounted to 2.35 million dollars, while the imports from New Zealand amounted to 11.6 million, in 1977.

9. Transportation and Communication

The New Zealand Shipping Co. operates shipping services between Cook Islands and New Zealand, fortnightly. Inter-island shipping is served every 6-8 weeks by Silk and Boyd Shipping Co. The Kyowa Shipping Co. of Japan serves the Japan-Cook Islands route every two (2) months.

The International Airport at Rarotonga was opened for international services in 1973. Local air travel is served by the Cook Islands Airways and the Air Rarotonga.

Almost all the Islands have facilities for radio communication, postal service, and telegraphic service. Radio Rarotonga maintains direct communication with Wellington, Apia, and Suva.

10. Power and Water Supply

A new Electric Power Plant has recently been installed in Rarotonga. The plant has a maximum generating capacity of 5.4 megawatts. Power is supplied at 415 volts and 50 cycles for the 3-phase line, and 240 volts on the single-phase line. The maximum demand recorded was 2.2 megawatts or about 40% of the plant's generating capacity.

Rarotonga draws its water supply from 5 elevated water intakes around the Island. The estimated water supply capacity is 14,780 cu.m. per day. The present demand is approximately 7,000 cu.m. per day or about 50% of supply capacity.

II. COPRA MAKING IN THE NORTHERN GROUP ISLANDS (MANIHIKI, RAKAHANGA, AND PENRHYN)

1. Opening of the Motu.

The Islands are composed of several small islands of different sizes, called motus. The villages or settlements are located in one or two of the largest motus.

Coconuts in the village motus are mainly used for food and feeds. Coconuts in the outer motus are for copra making. Harvesting of coconnuts in the village motus can be done anytime, but harvesting in the outer motus is prohibited unless the motu is opened for harvesting by the Island Council. The harvest period normally lasts from one to two weeks, after which the motu is closed. After the motu is closed, all activity in the motu stop. The motus are subdivided into lots, each lot owned by a family.

Copra making actually starts with the opening of the motu. As soon as the motu is opened, able-bodied members of the families leave the village, by a motor boat across the lagoon, to gather nuts from their respective lots. The boats are locally-made and are powered by outboard motors of varying sizes from 4 to 30 hp. Once in the motu, the families stay until harvesting and hauling of their nuts is completed.

2. Collecting, Husking, and Transporting of Nuts

Only fallen nuts are harvested for copra making. Picking and heaping of nuts are done with the use of a picking stick. This consists of a wooden rod about 2 ft. long and a small nail spiked vertically at the picking end. To pick a nut, the picker drives the nail into the nut's husk throws it onto the heap. The nuts are heaped in numbers convenient for the worker.

Dehusking of coconuts is done with the use of a dehusking "point". The tool is generally made from a short iron pipe, about 1-inch in diameter and 30 inches long, and pointed at both ends. To start, the point is driven firmly into the ground near the coconut heap. To dehusk, the worker pushes the nut against the point and then twists it in a clock-wise turn to pry off part of the husk at a time. The husked nuts are packed in gunny sacks for easier handling and carrying to the boat.

3. Transporting the nuts to the Village

Copra drying is done in the villages. The husked nuts in gunnies are carried on shoulder to the boat, and are transported across the lagoon to the village in the boat. At the other shore, the nuts are brought to the drying area in wheelborrows, a tractor-pulled trailer, or a truck.

4. Copra Drying, Storage and Weighing

Drying of copra is done by one or both of the following methods: sun drying or kiln drying. During the dry months, drying is usually done by sun-drying because this method is considered cheaper and easier. Kiln drying is resorted to when sun-drying is not possible or when there is a rush for copra making.

For sun-drying, an elevated platform about 8 ft. wide and 16 ft long, elevated about 3 ft above the ground, is used. The floor is of wood slats fastened close to each other and overlain with a half-inch wire mesh.

The kiln dryer, called a one-man dryer, can handle about 800 nuts and can be operated by one man. The dryer is about 6 ft wide, 12 ft long, and 8 ft high. A floor about 18 inches from the top of the dryer, and made of loosely arranged wood slats overlain with ½-inch wire mesh, holds the coconuts to be dried. On the ground under the platform, centrally located lengthwise, is the heating duct made of 4 steel drums connected end-to-end. The drum extends through the ends of the dryer, one end is fully opened, while other end is partly opened by a hole about 6 inches at the upper side of the circular end. Fuel, coconut shells, coconut husks, or firewood, are burned inside the drum through the open end while the smoke exits through the hole at the other end. The sides of the dryer are covered with flattened steel drums. The top is roofed with galvanized iron sheet or flattened drums to protect the copra from the rain and to conserve the heat in the dryer. Air, heated by contact with the surface of the hot drums, rises through and dry the copra.

Before drying, the coconuts are cut into two by hitting the "back" of the nut with a "bolo" (a big knife). If sun-drying

is used the nut halves are laid on the drying platform with meat up, in single layer. After a sunny day or two, the meat loosens from the shell and is scooped with a scooping knife. After the batch is completely scooped, the copra is further dried on the same sun-drying platform or in a kiln-dryer.

If the kiln-dryer is used, the half-nuts are laid on the floor of the dryer, the first layer meat-up and the rest meat-down. The nuts are stacked to thickness of about 18 inches. This arrangement prevents "burning" of the bottom layer and a more unifrom drying of all the layers. With continuous and uniform firing, the copra can be dried in about 16 hours.

When drying is done, the batch is allowed to cool and the copra scooped out of the shell in small pieces, the copra is finally packed in gunny sacks.

In most of the villages, a village copra shed is provided by the government to store all copra produced. The sacks are identified by "tag numbers" assigned to each producer. A few days before the boats arrival, the copra is weighed by the Copra Officer assigned to the Island. The Copra Officer is also in charge of checking the quality of the copra and recording the weights of copra belonging to each producer. He also issues gunnies for the copra and distributes copra payments from the Marketing Board.

5. Transporting the Copra to Rarotonga

Almost all copra is shipped to Rarotonga and stored in the Marketing Board's copra shed before it is trans-shipped to New Zealand. Every 6 to 8 weeks, a boat (Mataora or Manuvai) visits the Northern Islands to bring cargo and passengers, and to pick passengers, copre, and other cargo.

Only the Omoka village in Penrhyn has a good harbour. At Omoke, the copra is loaded directly from the wharf. At Tetautua (Penrhyn), Rakahanga, and Manihiki, copra has to be boeted from the shore to the ship. During the months of November to February, loading in Manihiki and Rekehanga can be difficult due to choppy reef weters.

6. The Primery Produce Merketing Board

Merketing of ell copra from the Cook Islands ie underteken end managed by the Marketing Board. The Board determines the prices of copra to be paid to the producers. Prices are normally fixed on quarterly basis.

III. STATUS OF THE COCONUT INDUSTRY

1. Coconut Production

The totel land area planted to coconute ie approximately 8,640 acres, about 14.5% of the totel land erea of Cook Islande. About 4,500 acres belong to the Northern Group. No statistics on coconut productionare availeble

but a reasonable production figure can be estimated by assuming a coconut tree density of 60 trees per acre and a nut yield of 40 nuts per tree per year. With these assumptions, the coconut production is 20.7 million, with a probable value of 20 to 25 million nuts per year.

2. Coconut Usage

To many people of the Cook Islands, coconuts are a food source. Young coconuts are eaten as snacks or dessert, while the water serves a beverage or drinking water. The cream, squeezed from grated mature nuts and spiced with onions or chili, is a favorite sauce for fish and meat preparations. The cream is also used in the making of native cakes and bread. The embryo (called coconut apple) of sprouted nuts is food. Cooking oil is made from mature nuts by cooking the cream. Coconuts are also used as feeds for pigs and chicken.

It is estimated that the per capita domestic consumption is about 2 nuts per person per day. With a population of about 18,000, the annual consumption is 13 million nuts, about 65% of production.

Coconuts left from domestic consumption are usually made into copra. Due to various problems in copra making in the Islands, a considerable quantity of coconuts are left out un-utilised.

3. Copra Making

Copra making in the Cook Islands is, largely, a family or individual activity. Centralized copra making has been tried in Aitutaki and Manuae.

Copra production during the last 5 years varied from 600 tons to 1,600 tons per year and the quantity more or less follows the price trend. It is evident that the copra production potential of the country has been not fully exploited. The major reasons for this are: shortage of manpower for copra making, and the low income from copra making due to low prices and high production costs. Copra production has been erratic from year to year. When the price of copra drops to uneconomic level, people shift to other sources of income or just stop making copra. Limiting access to the motus has apparently contributed to low copra production since the producers are not allowed sufficient time to gather their nuts and maintain the plantations.

Assuming a plantation density of 60 trees per acre, an average nut yield of 40 nuts per tree per year, 4,500 nuts per ton of copra, and an average per-capita food-nut consumption of 2 nuts per person per day, the estimated copra production potential for the whole Cook Islands ranges from 1,500 to 2,500 tons per year (see annex II).

4. Status of Coconut Plantations

Coconut plantations in the motu are, generally, poorly maintained. Thick debris under the coconuts have provided habitat for rodents which feed on coconuts. Heavy undergrowth and overcrowding with very old trees as well as young unwanted trees are depriving the economic trees of the soil nutrients needed for fruit bearing. Termites are reported to be affecting coconuts in Pukapuka, Nassau, and Manihiki. About 70% of the fruit-bearing trees are approaching senility. Evidence of sustained replanting is very meager. Gradual decline of coconut production is expected due to retirement of old trees which dominate the plantations and the starvation of productive trees by overcrowding.

IV. INDUSTRY OUTLOOK

1. Copra Market

All copra from the Cook Islands is exported to Abels Co. in New Zealand. Abels has been paying reasonable prices. However, it is probable that Abels will phase out its copra milling operations as soon as the copra processing plant of Western Samoa starts operations in 1980. Western Samoa supplies about 60% of Abels' copra requirement.

The closure of the copra market in New Zealand poses a problem to the coconut industry of Cook Islands. The quantity of copra produced, about 100 tons a month, can not justify shipment to Europe (the U.S.does not import copra).

An option to export the copra to Western Samoa appears to be an alternative, but this may be a temporary solution to the copra market problem. Western Samoa has started replanting in 1966 and has replanted about 10,000 acres since then. When its mill will start operations in 1980, most of the new coconut trees will be fruit-bearing. With this boost in coconut production, Western Samoa may be able to produce sufficient copra to meet the needs of its copra mill.

2. Need for Processing-Constraints

Unless the copra market problem is solved, it is imperative that Cook Islands should process its coconuts into exportable products to make up for copra exports. The phasing out of Abels' copra milling operations is an opportunity open for oil milling operations in Cook Islands. Coconut oil from the Islands can fill the market void left by Abels. Duty-free entry of Cook Island's products into the New Zealand market should be exploited.

Industrial processing of coconuts in the Cook Islands, however, has many constraints. Limited coconut production, low and erratic copra supply, and high production costs make the formulation of a viable coconut industrial project difficult. With only 1,500 tons of copra per year or 6 tons per day, for the whole Cook Islands, extended vertical integra-

tions and the proper choice of marketable products which have high added-value effect are necessary to make up for low production volume.

V. OPTIONS FOR COCONUT PROCESSING

1. Small-scale Copra Mills

The idea of small which will produce oil and copra cake appears to be an attractive proposition because it will make available to the Islands a material for animal feeds and would possibly increase the gross returns to the people. With the cakes retained the Islands, savings in freight costs will be achieved. This proposal assumes that a livestock industry, large enough to buy all the copra cake, exists in the Islands. The desirability of small mills in the Islands should be based on the livestock production program of the country.

Plant costs and costs of operations of small mills are relatively high compared to large-capacity plants. Small expellers in the market have low efficiencies and require more power and labor per unit capacity. Fragmenting the coconut industry into small industrial units will pose serious problems of management, maintenance, and manpower shortage.

A small-scale coconut processing plant at the Ponape Agricultural and Trade School in the Caroline Islands can be a model for feasible operations. This project is viable only because it processes coconuts into soap and edible oil which it sells locally at very high prices. A similar situation does not occur in the Islands since their populations are not large enough to provide the needed market base. Similar small operations in the Philippines have failed.

2. Regional Medium-scale Industrial plants

A medium-scale processing plant to be located in one of the Islands to process all copra from the Northern Group is not technically feasible. There is no transportation linking the Islands. Even if such transport is available the transport cost will be insurmountable due to the distances between the Islands. The feasibility of such transport operation is also doubtful since the volume of cargo between the Islands is small.

3. Desiccated Coconut Production

Of the traditional coconut industries, desiccated coconut production offers the highest added-value effect. The price of desiccated coconut is about thrice the price of copra. Desiccated coconut is produced by small-scale plants in Sri-Lanka. Western Samoa has operated a small coconut desiccating plant but has closed it several years ago due to quality control problems.

A desiccated coconut production operations has been proposed for Aitutaki.

In deciding to undertake such project, the following factors have to be considered:

1. Desiccated coconut operations is labor-intensive.
2. Coconuts should be harvested from the top of the tree, since fallen nuts are not suitable.
3. The operations require large quantity of water.
4. Quality control is very critical since it is a raw food (eaten without cooking).
5. Extreme sanitary conditions have to be maintained since bacterial growth is a serious processing problem.
6. The industry uses whole husked nuts as raw material.

Before deciding on such a project, the volume of the New Zealand market should evaluated.

4. Coconut Flour

Cook Islands imported about $700 thousand worth of cereal and cereal preparations in 1977. It can be presumed that a bigger bulk of these is wheat flour. Flour made by pulverizing expeller cake from food-grade copra can be admixed with wheat flour in varying proportions without affecting the baking properties of the flour. Additions of 10 to 30% have been found to be suitable for most bakery

products. Coconut flour is high in nutrition and it imparts a flavor possibly acceptable to the people of Cook Islands.

Coconut flour production can be integrated into desiccated coconut production or maybe a separate operation. The copra centrals in Aitutaki and Manuae can be utilized to produce food-grade copra for this purpose.

5. Coconut Fiber Products

Coconut husks can be processed to produce fibers. These fibers can be made into various finished products like doormats, carpets, ropes, nets, and bags. They are also used in upholstery.

The Federal Republic of Germany imports coconut fibers and gets its supply from Sri Lanka and the Philippines. The profitability of fiber exports is low because of transport costs. Markets for these products in more proximity to New Zealand and Australia may be explored.

6. Coconut Shell Products

There are two industrial products from coconut shell: charcoal and shell flour. Shell charcoal is a raw material used in producing activated carbon. Japan imports considerable quantities of coconut shell charcoal. Australia also imports coconut shell charcoal.

Coconut shell flour is produced by pulverizing coconut shell to at least 200-mesh. The product is used as a builder for plywood adhesive. A market for this product in New Zealand should be explored.

7. Canned Coconut Milk (cream)

Canned coconut milk has a market in New Zealand, Hawaii, California, and other places where there is a population of Polynesians and Asians. Coconut cream canning plants exist in Western Samoa and the Philippines. This industry is a possible small-scale operation in Cook Islands.

The product is made by grating or grinding fresh mature coconut meat and pressing out the cream. The extracted cream is filtered, pasteurized, and homogenized before canning.

8. Centralized Copra Milling Operations

A copra Mill with a capacity of 1,500 tons a year to process all the copra from the Islands seems to be an ideal industry. This plant shall produce crude coconut oil to be exported to New Zealand to fill the market left by Abels and at the same time provide copra meal, some of which may be exported but still have a feeds material which may be used for the livestock industry. This is the simplest industry to replace the copra exports.

This type of operation has, however, two short comings:

1. Normal copra supply is way below 1,500 tons a year. Viability of the project depends on sufficient and steady raw material inflow.

2. Added value for simple oil milling operations is low due to highly competitive operations from large coconut oil mills in the Philippines.

Limited milling operations of this capacity is hardly viable in the Cook Islands considering high production costs in the country.

9. Integrated Copra Production, Milling, Oil Refining

Considering the present erratic copra supply and the need to effect a high added value to make the industry viable, it appears that the national coconut industry that would be both suitable and highly beneficial to the Cook Islands would be an integrated plant which will undertake the full stretch of integrated operations consisting of: copra making in the different islands, and a copra mill and oil refinery in Rarotonga.

The main bulk of the edible oil will be exported as a high-price product to New Zealand and about 10% can fill the local market for cooking oil. Similarly, the copra cake will be used partly for local livestock feeds, and the rest will be

exported to New Zealand. The duty-free market and Cook Islands special relations with New Zealand should be explored.

The Integrated Plant shall constitute the primary coconut industry for Cook Islands.

10. Secondary Coconut Industries

By maximizing copra production in the Northern Group, it is possible to produce enough copra to meet the raw material need of the Integrated plant. This will open an opportunity for secondary industries in the Southern Group. Such industries may include: desiccated coconut processing, production of coconut flour, canned coconut cream manufacturing, and products from the coconut water.

11. Tertiary Coconut Industries

With the high cost of petroleum fuels, the most advantageous use of coconut shells and coconut husks is as fuel for the industries. The raw material value of coconut shell as a raw material for charcoal making is about $15 per ton, as a fuel it is $50.

If excess coconut shell and husks can be achieved after having met the fuel requirements, tertiary industries such as the production of charcoal, shell flour and fiber products can be undertaken.

VI. DETAILS OF INTEGRATED COPRA PROCESSING PROJECT

1. Copra Centrals

The project calls for four copra centrals, each with a capacity of 2 tons of copra per day. Proposed locations of these Centrals will be Penrhyn, Rakahanga, Manihiki, and Pukapuka. Company operations will include: collecting of nuts, dehusking, hauling, copra drying, bagging, storage, and shipping. Equipment consist of a large copra dryer, a dumb-barge with tow-boat, a small tractor with trailer, storage for copra, and tools for dehusking, breaking, scooping and bagging.

Drying will be fueled by coconut husks, shells and dried coconut branches. About 20% of the shell shall be saved for boiler fuel in the Oil Mill and Refinery Plant.

It is projected that the 4 Centrals should supply at least 75% of the copra needs of the Project.

2. Oil Mill

The copra mill will have an installed capacity of 10 tons of copra per day. Projected normal milling rate will be 6 tons per day (1,500 tons per year). Excess capacity will provide for raw material supply and demand surges, and for future expansion of capacity.

The equipment includes: expellers for double pressing, copra grinder, copra cooker, oil screening tank, filters, conveyors, pumps, storage tank for coconut oil, copra bin, and cake bin.

3. Oil Refinery

The oil refinery shall have an installed capacity of 7 tons per day but the projected capacity is 3.6 tons per day of edible oil (900 tons a year). This will fit into the projected and future capacity of the oil mill.

The equipment includes: a neutralizer-bleacher, a deodorizer-cooler, filter presses, vacuum equipment, pumps, and storage tanks.

4. Steam Plant

The installed capacity of the steam boiler and feed water treatment plant shall be 2,000 pounds of steam per hour at a pressure of 175 psig. The plant will be operated at about 50% capacity under projected production rates. A fire-tube, solid fired steam boiler will be suitable. Coconut shell will be used as fuel.

5. Power supply

Power supply will be tapped from the Rarotonga Power Supply System. Power requirement shall be about 500,000 kilowatt-hours per year.

6. Water Supply

Water for drinking and boiler feed water shall be tapped from the Rarotonga Water Supply System. A deep well pump will supply water for processing. Annual water requirements shall be approximately 2 million gallons.

7. Transportation

A 5-ton diesel truck will be needed for hauling copra from the harbour to the plant, hauling edible oil and expeller cake from the plant to the harbour, and for other miscellaneous jobs. The Manager shall be provided with a service car.

8. Supplementary Copra Supply

To supplement copra supply from the Copra Centrals, copra will be procured directly from copra producers in the Southern Group islands. The Company shall provide the gunnies and pay for foreign but the seller shall deliver the copra to the Plant.

9. Financial Feasibility

A preliminary financial study of the project gave the following indications:

DCFRR on total inveatment (10 years)- 17%+

Cash flow - positive from first to 10th year

Nat profit on salea - about 8%

Debt Service Ratio - about 1.8

10. Project Cost

The estimated investment requirement for the Project is approximately $620,000, distributed as follows:

Machinery, buildings and site	$430,000
Working Capital	130,000
Project Management	60,000

11. Projected Sales

The project annual sales revenues shall be $875,000 against a raw materials and supplies cost of about $342,000 a year.

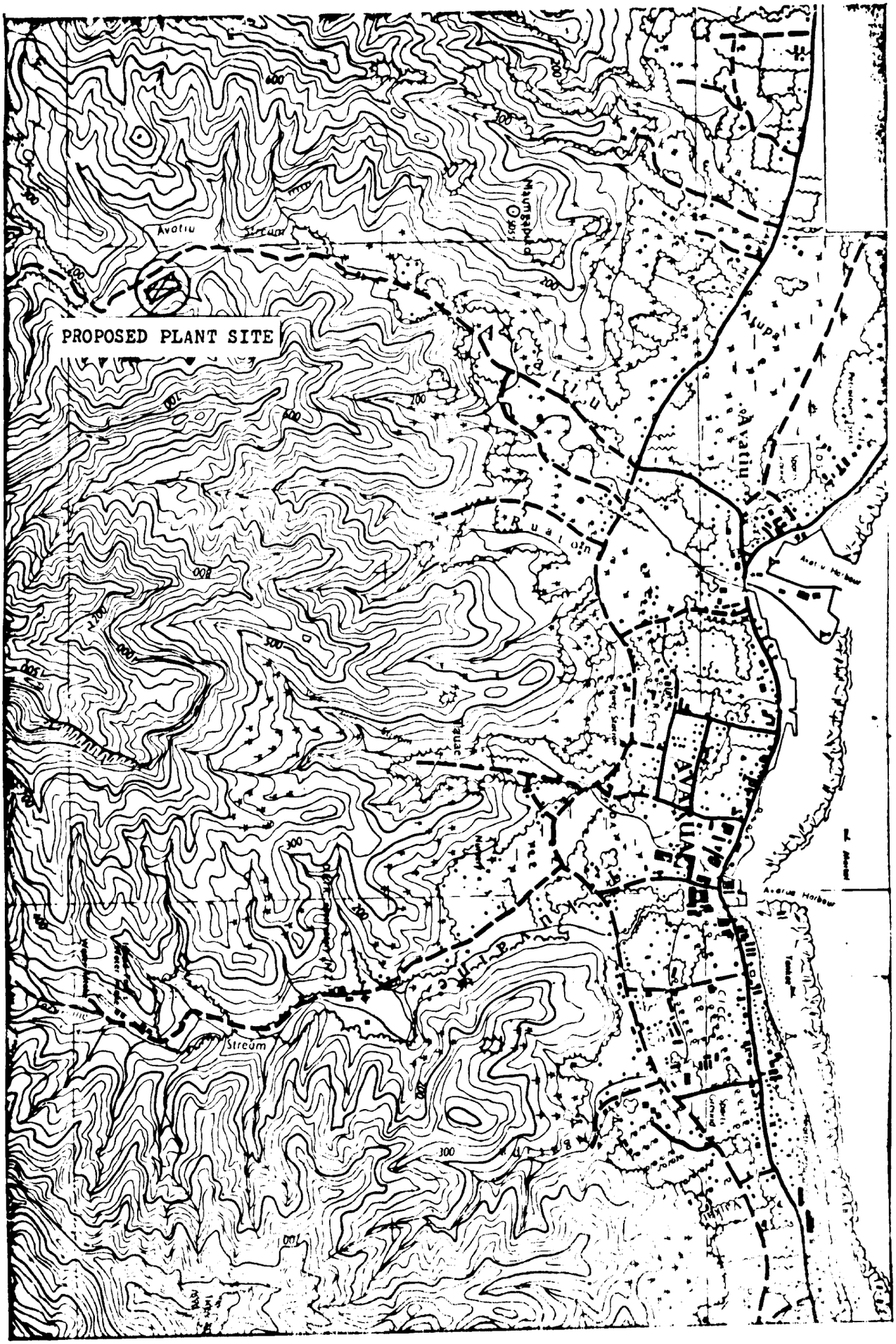
12. Salaries and Wages

The yearly salaries and wages amount to about $184,000 with salaries ranging from $1,500 to $12,000 a year.

13. Plant Location

The proposed plant location is Rarotonga. Rarotonga is strategically located between raw materials sources and the market. Rarotonga also has the largest local market base for the products and the necessary infrastructure for the Project's operations.

As an alternative, Aitutaki may be considered for the plant location. Aitutaki has suitable roads and sufficient power supply to meet the Project's power needs. Process and cooling water can be supplied from a deep well, while domestic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water requirements can be tapped from the public water supply system.

The disadvantage of Aitutaki as the Plant's location is its poor harbour facilities. However, it has the advantage of having its own copra production (estimated at about 200 tons per year) and its proximity to the copra-producing islands of the Southern Group. The significance of changing the location from Rarotonga to Aitutaki, on the viability of the project, will be minimal.

The government's livestock development program in the Southern Group Islands would favor Aitutaki as the Plant location.

VII. CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions

a) Cook Ielands still has sufficient coconut production to meet the peoples' food requirements, and to produce at leest 1,500 tons of copra per year.

b) There ia a need to rehabilitate end replant the coconut plantations to make up for losa of coconut production due to senility.

c) There ie a need to improve the meintenence of coconut plantations in the motus to improve coconut productivity.

d) There ia a need to improve copra making systems to reduce menpower requirements, reduce cost of production, end increase production.

e) There is e need to esteblish a coconut processing industry to increaee the economic returns from the coconut industry and to solve a possible market problem for copra.

2. Recommendations

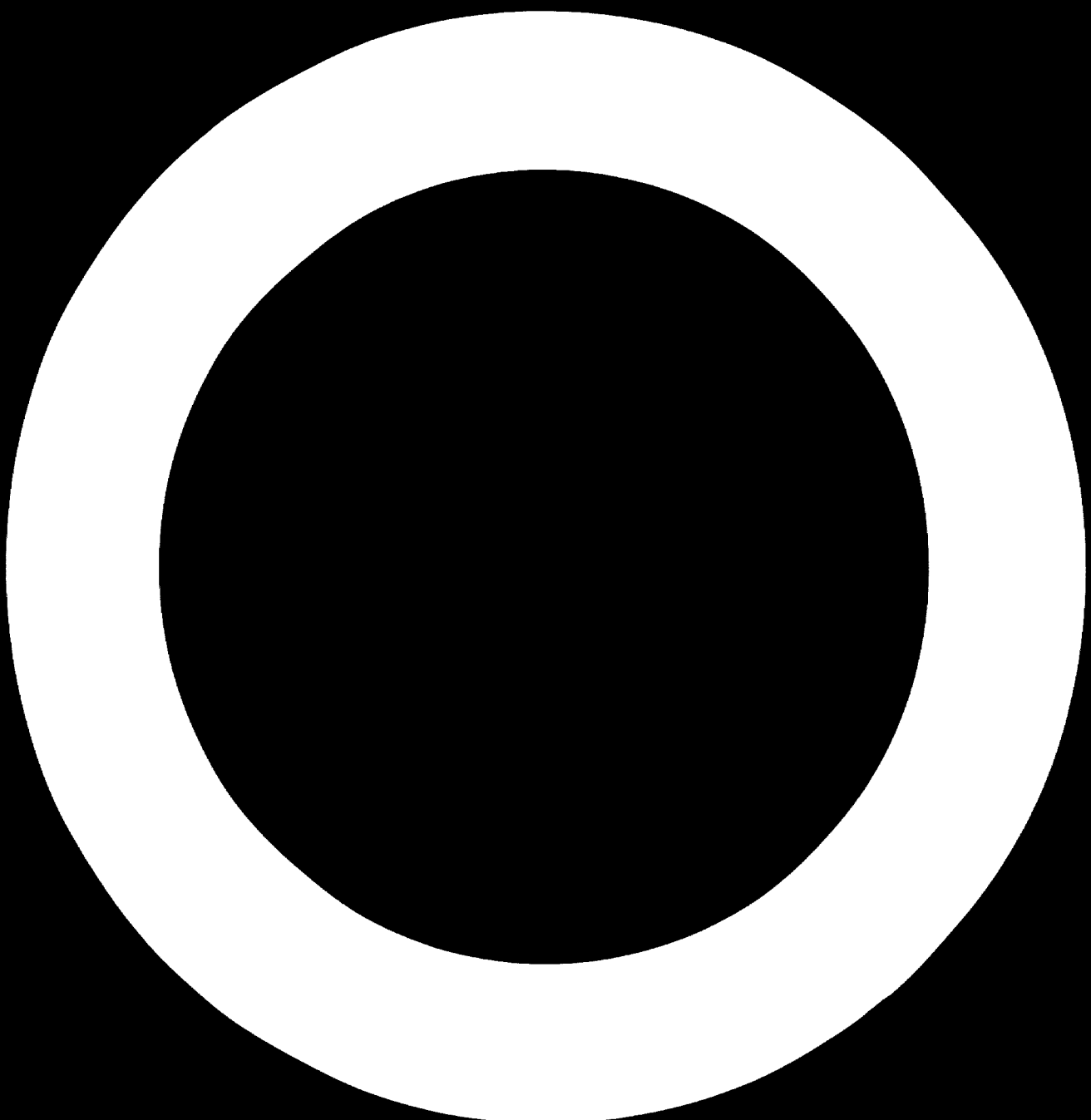
a) Start a long-range coconut plantation rehabilitation and replanting program.

b) Revise the present crop-assurance system of motu opening and closing system to a crop-sharing

by land-area basis, to allow for free entry of landowners into the motus to work in their plantations.

c) Organise coconut gathering and centralise copra making.

d) Undertake a pre-implementation feasibility study of the proposed Integrated Copra Processing Project, and conduct a survey for sources of financing.



Annex I

JOB DESCRIPTION

SI/CKI/78/803/11-01/31.7.C

Post title: Expert in Coconut Processing

Duration: Two months

Date required: As soon as possible

Duty station: Cook Islands

Purpose of project: To prepare an evaluation study for the setting up of suitable de-centralized small or medium capacity coconut processing plants in the Northern Cook Islands

Duties: The expert will specifically be expected to:

1. Study the overall situation of the coconut production and processing sector in view of its technical and economic efficiency. Outline, if appropriate, ways and means for organizational and managerial improvement;

2. Examine the coconut production sector and in this connexion, study the methods applied in the field of harvesting, defibration, cracking and meat separation from the technical, economic and logistics point of view;

3. Study the methods used for the production of copra and comment on their usefulness, from the view point of the raw material supplies, drying operations and copra utilization;

4. Review the domestic market situation and assess the types, quality, quantity and the most suitable price structure of coconut products in demand;

5. Comment on the feasibility of the establishment of small or medium capacity decentralized coconut processing plants for the production of coconut products in demand of the market based on the results of the studies referred to above;

6. Define the basic techno-economic data of such coconut processing factories, identify the type of products to be produced from coconut raw materials and outline the labour requirements, the training needed and all other techno-economic data, that have a bearing on the factories efficient production. Estimate the costs involved and determine whether or not comprehensive techno-economic feasibility calculations have to be undertaken, as an essential follow-up activity;

7. Issue specific recommendations for further action and prepare the framework of a practical plan of operation for the consideration of the authorities.

The expert will also be expected to prepare a final report setting out the findings of his mission, and his recommendations to the Government on further action which might be taken.

Qualifications: Coconut processing technologist with knowledge in industrial economy and industrial planning

Language: English

Background information: The Pacific Islands, particularly the Northern Cook Islands have a remarkable coconut potential. A considerable number of the population depend on coconut production and copra drying which is the main source of their income. The Government therefore, wishes to expand the domestic coconut industry by entering into secondary processing operations that are suitably based on the traditional activities of the population. The setting up of appropriate decentralized small and medium capacity coconut processing plants is envisaged to produce a variety of coconut products for domestic consumption and, if feasible, also for exports.

UNIDO assistance has been requested to study the situation and recommend those types of coconut processing factories for establishment which are most beneficial for the country's population and national economy.

Annex I

JOB DESCRIPTION

SI/CKI/78/803/11-01/31.7.C

Post title: Expert in Coconut Processing

Duration: Two months

Date required: As soon as possible

Duty station: Cook Islands

Purpose of project: To prepare an evaluation study for the setting up of suitable de-centralized small or medium capacity coconut processing plants in the Northern Cook Islands

Duties: The expert will specifically be expected to:

1. Study the overall situation of the coconut production and processing sector in view of its technical and economic efficiency. Outline, if appropriate, ways and means for organizational and managerial improvement;

2. Examine the coconut production sector and in this connexion, study the methods applied in the field of harvesting, defibration, cracking and meat separation from the technical, economic and logistics point of view;

3. Study the methods used for the production of copra and comment on their usefulness from the view point of the raw material supplies, drying operations and copra utilization;

4. Review the domestic market situation and assess the types, quality, quantity and the most suitable price structure of coconut products in demand;

5. Comment on the feasibility of the establishment of small or medium capacity decentralized coconut processing plants for the production of coconut products in demand of the market based on the results of the studies referred to above;

6. Define the basic techno-economic data of such coconut processing factories, identify the type of products to be produced from coconut raw materials and outline the labour requirements, the training needed and all other techno-economic data, that have a bearing in the factories efficient production. Estimate the costs involved and determine whether or not comprehensive techno-economic feasibility calculations have to be undertaken, as an essential follow-up activity;

7. Issue specific recommendations for further action and prepare the framework of a practical plan of operation for the consideration of the authorities.

The expert will also be expected to prepare a final report setting out the findings of his mission, and his recommendations to the Government on further action which might be taken.

Qualifications: Coconut processing technologist with knowledge in industrial economy and industrial planning

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UNIDO assistance has been requested to study the situation and recommend those types of coconut processing factories for establishment which are most beneficial for the country's population and national economy.

Annex II

ESTIMATES OF COPRA PRODUCTION POTENTIAL IN THE COOK ISLANDS
(Raratonga Excluded)

Formulae

1. Nut Production = Acreage x Trees per Acre x Nuts per Tree
2. Net Popra Production Potential =

   Gross Copra Production Potential - Food Nuts Consumption
3. Tons Copra = $\frac{\text{Number of Nuts}}{\text{Nuts per ton Copra}}$

Assumptions

1. Average number of bearing trees per acre = 60
2. Average nut yield per tree per year = 40
3. Average number of nuts required per ton of copra = 4,500
4. Average per-capita food-nuts consumption per day

   Northern Group = 3 nuts

   Southern Group (excl. Aitutaki) = 2 nuts

   Aitutaki = ½ nut

Average gross copra production per acre per year

$$= \frac{60 \times 40}{4{,}500} = 0.53 \text{ Tons}$$

Average per-capita food-nuts consumption per year (in copra terms)

Northern Group	$\frac{3 \times 365 \text{ days}}{4{,}500}$	= 0.24 Tons
Southern Group	$\frac{2 \times 365 \text{ days}}{4{,}500}$	= 0.16 Tons
Aitutaki	$\frac{\frac{1}{2} \times 365 \text{ days}}{4{,}500}$	= 0.04 Tons

Calculated Net Copra Production Potentials, Tons per Year

Northern Group	Acreage	x 0.53	Population	x 0.24	NET
Manihiki	855	453	263	63	390
Rakahanga	720	381	283	68	313
Penrhyn	1550	821	531	127	694
Puka - Nass	992	525	899	216	309
Palmerston	320	169	53	13	156
Suwarrow	64	34	0	0	0
Total for Nortnern Group					1706

Southern Group	Acreage	x 0.53	Population	x 0.16	NET
Mangaia	600	318	1630	261	57
Atiu	550	291	1310	210	81
Mauke	250	132	710	114	18
Mitiaro	350	185	305	49	136
Manuaa	1370	726	0	0	726
Takutea	270	143	0	0	143
Aitutaki	350	185	2420	97[a]	88
Total for Southarn Group					1249
Calculatad Total Nat Copra Production Potantial					2955

Considaring socio-aconomic factors that may affact actual copra production, it can be assumed that the copra production potential for tha whola Cook Islands rangas from 1,500 to 2,500 tons per yaar.

Comparison of Copra Production Estimates for different Islands

Island	Maximum Historical Production	Inquiry Guesstimates	Calculated Net Production
Manihiki*	423	400	390
Rakahanga*	332	300	313
Penrhyn	322	500 .	694
Puka - Nasa	205	200	309
Palmerston	43	-	156
Aitutaki	177	200	88
Mauke	33	-	18
Mitiaro	7	-	136
Manuae	109	400	726

* Note the close correlation of the 3 values obtained for Manihiki and Rakahanga. Unlike the other Islands, the people in Manihiki and Rakahanga are almost totally dependent on copra making for money income. They also have the highest per-capita food-nut consumption. Low production in the other Islands can be attributed to manpower shortage or lack of interest in copra making due to the presence of other income resources.

Annex III

INDICATIVE FINANCIAL FEASIBILITY STUDY
(All Values in NZ$)

1. Estimate of Project Cost

Machinery & Equipment		$164,000
Oil Mill	$77,000	
Oil Refinery	45,000	
Steam Plant	42,000	
Handling & Installation		19,700
Copra Centrals		56,000
Buildings		69,000
Factory	48,000	
Administration	15,000	
Sheds	5,000	
Site Preparation		24,000
Office Equipment & Furniture		7,500
Miscellaneous Equipment		6,000
Motor Vehicles		26,000
Sub-Total		$372,200
Contingency, 15%		55,800
Total		$328,000
Project Management		60,000
Working Capital		116,000
Contingency, 10%		11,600
Total Working Capital		$127,600
Total Project Cost		$615,600

2. Investment Services

Equity, 30%	$185,600
Loans, 70%	430,000
Total, 100%	$615,600

3. Annual Production Schedules

Throughputs at 100% Performance

Copra Centrals

Input	3,700 T husked nuts
Output	1,100 T Copra
Copra Purchases	400 T copra

Oil Mill

Input	1,500 T Copra
Output	930 T Crude Oil
	525 T Expeller Cake

Oil Refinery

Input	930 T Crude Oil
Output	900 T Edible Oil

Operations Schedules

First year	250 days x 3 shifts
Second year	250 days x 3 shifts

Performance

First year	90%
Second year	100%

4. Financial Plan

	Equity	Loan	Total
First Pre-Optg. yr.			
Project Management	$ 30,000	$ -	$ 30,000
Down Payment (50%)	44,000	170,000	214,000
Sub-total	$ 74,000	$170,000	$244,000
Second Pre-optg. yr.			
Project Management	$ 30,000	$ -	$ 30,000
Balance of Payments	14,000	200,000	214,000
Working Capital	41,500	-	41,500
Sub-total	$ 85,500	$200,000	$285,500
First Optg. yr.			
Working Capital	$ 26,100	$ 60,000	$ 86,100
TOTAL	$185,600	$430,000	$615,600

5. Assumed Loan Terms

Interest Rates — 8¼ per annum
Interest payments for the first three (3) years to be capitalized and added to the loan principal at the end of the 3rd year of loan.

Repayment Schedule — 12 years with 3 years grace period on amortization, payable in 9 equal annual installments starting with the 4th year of loan.

6. **Dividends**

Dividend to be paid starting the 2nd year of operations, at the rate of 35% on net profit after income tax.

7. **Interests and Amortization Schedules** ($'000)

Year	Draw Down	Amort.	Int.	Prin.	Balance
2	170	-	-	-	170
1	200	-	15	-	385
0	60	-	33	-	478
1	-	-	41	-	519
2	-	85	44	41	478
3	-	85	41	44	434
4	-	85	37	48	386
5	-	85	33	52	334
6	-	85	28	57	277
7	-	85	24	61	216
8	-	85	18	67	149
9	-	85	13	72	77
10	-	84	7	77	0

8. **Sales Revenues**	First year	2nd Year
Edible oil sales, MT	810	900
Price, $/MT (incl. dr)	920	920
Value, $/Yr	745,200	828,000

8. Sales Revenues	First Year	2nd year
Expeller Cake Sale, MT	470	525
Price, $/MT (incl. bags)	90	90
Value, $/YR	42,300	47,250
Total Annual Sales	$787,500	$875,250

9. Cost of Raw Materials	First Year	2nd Year
Nuts, MT/Yr (husked)	$ 3,300	$ 3,700
Price, $/MT	30	30
Value, $/YR	99,000	111,000
Copra, MT/Yr (Producer's)	360	400
Price, $/MT	250	250
Value, $/Yr	90,000	100,000
Total Raw Materials Costs	$189,900	$211,000

10. Cost of Supplies	First Year	2nd Year
Steel drums (44 gal)	$ 4,500	$ 5,000
Price, $/unit	18	18
Value, $/Yr	81,000	90,000
Gunnies, pcs/Yr	50,000	56,000
Price, $/unit	0.50	0.50
Value, $/yr.	25,000	28,000

10. Cost of Supplies (cont.)

	First Year	2nd Year
Gasoline, gal/Yr	$ 3,600	$ 4,000
Price, $/gal	2.00	2.00
Value, $/Yr.	7,200	8,000
Diesel Fuel, gal/yr	600	600
Price, $/gal	1.00	1.00
Value, $/Yr	600	600
Lubricant, gal/Yr	36	36
Price, $/gal	5	5
Value, $/yr	180	200
Chemicals, T/Yr	6.2	6.8
Price, $/MT	305	305
Value, $/Yr	1,900	2,100
Filter Cloth, yrd/yr	175	175
Price, $/yd	4	4
Value, $/yr	700	700
Miscellaneous Supplies	1,000	1,000
Total Costs of Supplies	$ 117,680	$130,580

11. Schedules of Salaries & Wages

Position	Rates	FIRST YEAR Months Days	Annual Salary	Total Salary	SECOND YEAR Months Days	Annual Salary	Total Salary
ADMINISTRATION							
1- Manager	$1,000	12	12,000	12,000	12	12,000	12,000
1- Engineer	600	12	7,200	7,200	12	7,200	7,200
1- Accountant	600	12	7,200	7,200	12	7,200	7,200
1-Clerk	300	12	3,600	3,600	12	3,600	3,600
1- Utility	300	12	3,600	3,600	12	3,600	3,600
Sub-total				$33,600			$33,600
Plus 15%				5,040			5,040
Total				$38,640			$38,640
SUPERVISION							
1- Chemist	$ 500	12	6,000	$ 6,000	12	6,000	$ 6,000
2- Foremen (P)	400	12	4,800	9,600	12	4,800	9,600
2- Foremen (C)	400	12	4,800	19,200	12	4,800	19,200
Sub-total				$34,800			$34,800
Plus 15%				5,220			5,220
Total				$40,020			$40,020
PRODUCTION							
6- Operators	$ 9	250	2,250	$13,500	9	2,250	$13,500
1- Weigher	9	250	2,250	2,250	9	2,250	2,250

11. Schedules of Salaries & wages

Position	Rates	FIRST YEAR Months Days	Annual Salary	Total Salary	SECOND YEAR Months Days	Annual Salary	Total Salary
PRODUCTION (cont.)							
3 - C-Tenders	$7/day	250	1,750	$ 5,750	7	1,750	$ 5,750
1 - Drum Filler	8/day	250	2,000	2,000	8	2,000	2,000
1- Bagger	8/day	250	2,000	2,000	8	2,000	2,000
1 - B-Tender	8/day	250	2,000	2,000	8	2,000	2,000
3- Utility	6/day	250	1,500	4,500	6	1,500	4,500
32 - C-Workers	6/day	250	1,500	48,000	6	1,500	48,000
Sub-Total				$84,000			$84,000
Plus 15%				12,600			12,600
Total				$96,600			$96,600
MAINTENANCE							
2 - M-Men	$9/day	250	2,250	$ 4,500	9	2,250	$ 4,500
1 - Driver	12/day	250	3,000	3,000	12	3,000	3,000
Sub-total				$ 7,500			$ 7,500
Plus 15%				1,130			1,130
Total				$ 8,630			$ 8,630

12. Maintenance Cost

	First Year	Second Year
Production		
Labor	$ 8,630	$ 8,630
Materials	2,530	2,530
Total	$11,160	$11,160
Administration		
Labor (charge to production)		
Materials	$ 1,060	$ 1,060
Total	$ 1,060	$ 1,060

13. Power & Water Costs

Production	$49,860	$49,860
Administration	2,500	2,500

14. Freight & Handling Costs

Freight Cost		
Copra at $26/MT	$35,100	$39,000
Shell at $26/MT	7,020	7,800
Sub-total	$42,100	$46,800
Handling Costs		
Edible Oil @ $1.50	$ 1,220	$ 1,350
Cake, @ $1.50/MT	710	790
	$ 1,930	$ 2,140
Total Freight & Handling	$44,050	48,940

15. Depreciation Cost

	Life Years	Depreciation Yr 1-5	Depreciation Yr 6-15
Production			
Machinery & Equipment	15	11,000	11,000
Factory Building	15	3,200	3,200
Copra Central	5	10,800	-
Sheds	15	330	-
Total		25,330	14,530
Administration			
Office Building	15	1,100	1,100
Office Equipment	5	1,500	-
Site Development	15	1,600	1,600
Motor Vehicles	5	5,200	-
Misc. Equipment	5	1,200	-
Total		10,600	2,700

16. Insurance Premiums

	Rates	Amount
Production		
Machinery and Equipment	1%	1,640

16. **Insurance Premiums** (cont.)

	Rates	Amount
Production (cont.)		
Factory Building	1%	480
Copra Centrals	2%	1,080
Sheds	1%	50
Total		3,250
Administration		
Office Building	1%	160
Office Equipment	5%	380
Site Development	1%	240
Motor Vehicles	5%	1,300
Misc. Equipment	5%	300
Total		2,380

17. **Power Water and Fuel Consumption**

Annual Power Consumption = 422,000 kw-hr (400,000)

Annual Steam Consumption = 1,760 MT

Shell Fuel Consumption at 6 tons steam per ton Fuel (Assuming 7000 BTU per pound) = 300 MT

Annual Water Consumption = 20 million gal

18. Conversion Used (Assuming high quality copra)

One (1) ton of copra processed will produced

0.60 ton of Edible oil

0.35 ton of Expeller Cake

19. Other Information Used in Financial Study

Fringe Benefits & payroll overhead = 15% of basic

Levy of Edible oil = $40 per MT

Freight Cost (Interisland) = $26 per MT

Power rates = $0.10 per Kw-hr

Water rates = $0.50 per 1000 gallons

Maintenance supplies = 10% of Depreciation

Amortization period for Pre-operating expenses = 10 years

Income Tax = 10 years holiday

Export tax on Products = free

Import tax on machinery, equipment and supplies = free

Tariff duties on products in New Zealand = free

Economic Life of Project = 15 years

20. Pricing Formulae Used in the Study

Price of coconuts is as is where is, but nuts will be husked before weighing. Price will be based on weight of husked nuts but Company will pick husk and transport the nuts.

20. Pricing Formulae Used in the Study (cont.)

Cost per MT = ½ (FOB - PC - D - L)

FOB - FOB price Rarotonga

PC - Production Cost ($140/MT copra)

D - Deductions ($52/MT copra)

L - Levy ($25/MT copra)

Price of Nuts used in study =

½ (330 - 140 - 52 - 25) = $28.25

Price applied in study is $30 per MT nuts (husked)

Price of Copra (ex-island shed). Company will supply gunnies and pay for freight.

Price per MT = FOB - D - L

Price of Copra used in study =

330 - 52 - 25 = $253 per MT copra

Price applied in study = $250 per MT

Price of Edible oil (FOB Rarotonga). Price includes drums. =

Price per MT = (FOB x 1.65) + 275 + 105

1.65 = Crude oil to copra price ratio

$275 = Refining cost

$105 = Cost of drum containers (5.4)

Price of Edible Oil used in Study =

(330 x 1.65) + 275 + 105 = $924.50

Price applied in Study = $920/MT Edible Oil

(Landed Cost of Edible Oil is = $0.80/lb.)

21. Estimate of Cost of Producing 1 ton of Copra

Picking, heaping, dehusking, and hauling	$ .48.00
Charge for using gunnies	5.00
Transporting across lagoon and carting	21.00
Drying, scooping, and bagging of copra	48.00
Cost of firewood	5.00
Cartage, boating, and loading to ship	8.00
Overhead to producer (repairs, depreciation, interests, etc.)	6.00
Total cost of producing 1 MT copra	$140.00

This cost of production (PC) of $140 is used in the pricing formulas for coconuts and copra.

22. Deductions (D) used in the formula used for Calculating Prices of Nuts and Copra

Freight from Islands to Rarotonga (Avatiu)	$26.00
Cost of gunnies and twins supplied to producer	14.00
Cost of handling copra at Avatiu Harbour	6.00
Miscellaneous and overhead costs to Marketing Board (or Company)	6.00
Total deductions per MT copra	$52.00

23. Discounted Cash Flow Rate of Return on Total Investment

($'000)

Year	(-)	(+)	Net	Discount Factor @ 17%	NPV
-2	244	-	-244	0.855	-209
-1	286	-	-286	0.730	-209
1	86	71	- 15	0,675	- 9
2	-	153	153	0.533	82
3	-	153	153	0.456	70
4	-	153	153	0.390	60
5	-	153	153	0.333	51
6	-	152	152	0.285	43
7	-	152	152	0.243	37
8	-	152	152	0.208	32
9	-	152	152	0.178	27
10	-	152	152	0.152	23
WC	-	130	130	0.130	17

DCFRR = 17%

(-) 427
(+) 442

PROJECT INCOME STATEMENT
($'000)

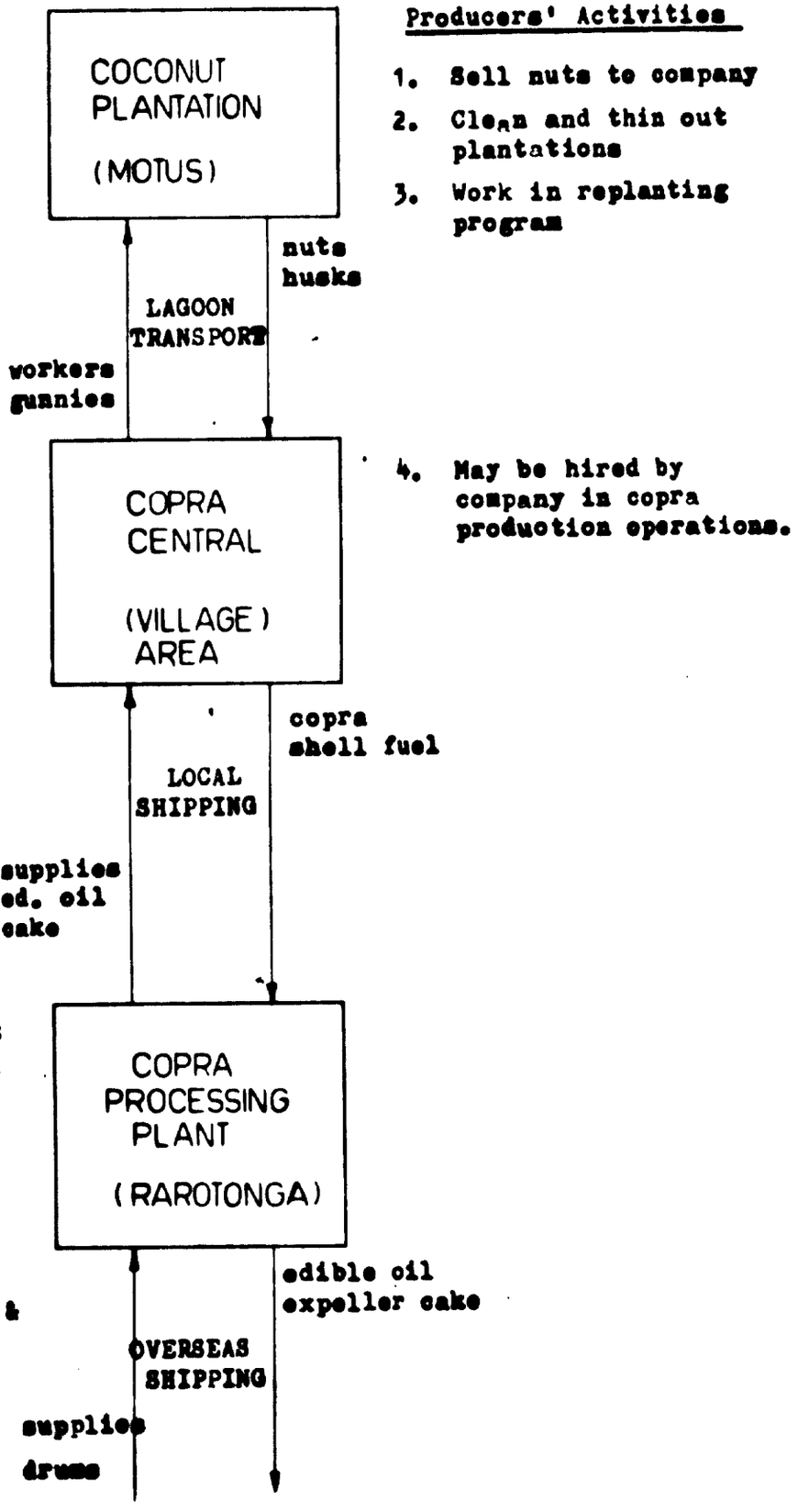
			OPERATING PERIOD									
	2	1	1	2	3	4	5	6	7	8	9	10
GROSS REVENUE												
Edible Oil	-	-	745	828	828	828	828	828	828	828	828	828
Expeller Cake	-	-	42	47	47	47	47	47	47	47	47	47
Sub-Total	-	-	787	875	875	875	875	875	875	875	875	875
VARIABLE COSTS												
Production Cost												
Raw Materials	-	-	190	211	211	211	211	211	211	211	211	211
Direct Labor	-	-	96	96	96	96	96	96	96	96	96	96
Utilities	-	-	110	111	111	111	111	111	111	111	111	111
Fuel & Water	-	-	50	50	50	50	50	50	50	50	50	50
Freight & Handling	-	-	44	49	49	49	49	49	49	49	49	49
Rentals	-	-	5	5	5	5	5	5	5	5	5	5
Miscellaneous	-	-	5	5	5	5	5	5	5	5	5	5
Sub-Total	-	-	500	547	547	547	547	547	547	547	547	547
FIXED COSTS												
Production Cost												
Direct Labor	-	-	40	40	40	40	40	40	40	40	40	40
Factory Overheads												
Depreciation	-	-	25	25	25	25	25	15	15	15	15	15
Repair & Maint.	-	-	11	11	11	11	11	11	11	11	11	11
Miscellaneous	-	-	3	3	3	3	3	3	3	3	3	3
Sub-Total	-	-	39	39	39	39	39	29	29	29	29	29
Admin Cost												
Salaries	-	-	39	39	39	39	39	39	39	39	39	39
Depreciation	-	-	11	11	11	11	11	3	3	3	3	3
Office Supplies	-	-	2	2	2	2	2	2	2	2	2	2
Insurance	-	-	6	6	6	6	6	6	6	6	6	6
Professional Fees	-	-	12	12	12	12	12	12	12	12	12	12
Travel & Rep.	-	-	2	2	2	2	2	2	2	2	2	2
Repair & Maint.	-	-	1	1	1	1	1	1	1	1	1	1
Depart. of Pre-opty. Expenses	-	-	6	6	6	6	6	6	6	6	6	6
Admin. Overhead	-	-	18	18	18	18	18	18	18	18	18	18
Miscellaneous	-	-	5	5	5	5	5	5	5	5	5	5
Sub-Total	-	-	102	102	102	102	102	94	94	94	94	94
GROSS PROFIT	-	-	98	147	147	147	147	165	165	165	165	165
Int. Exp. (6 mo.)	-	-	35	-	-	-	-	-	-	-	-	-
Revolving Fund Levy	-	-	33	36	36	36	36	34	36	36	36	36
Income Tax	-	-	-	44	41	37	33	28	24	18	13	7
Net Profit	-	-	29									
After Tax	-	-	64	67	70	74	78	101	105	111	116	122
Dividends (45%)	-	-	-	23	25	26	27	35	37	39	41	43

PROJECT CASH FLOW STATEMENT
(1'000)

	OPERATING PERIOD											
SOURCE OF INCOME	2	1	1	2	3	4	5	6	7	8	9	10
Net Income	-	-	29	67	70	74	78	101	105	111	116	122
Add Back: Depreciation	-	-	36	36	36	36	46	47	47	47	47	47
Interest	-	-	-	44	41	37	33	28	23	18	13	7
Amort. of Pre-Optg. Exp.	-	-	6	6	6	6	5	6	6	6	6	2
Total Internal Resources	-	-	71	153	153	153	153	182	182	182	182	178
RESOURCES												
Loan	170	200	60	-	-	-	-	-	-	-	-	-
Equity Contribution	74	86	26	-	-	-	-	-	-	-	-	-
Total Cash Contribution	244	286	86	-	-	-	-	-	-	-	-	-
Total Funds	244	286	157	153	153	153	153	182	182	182	182	178
APPLICATION OF FUNDS												
Project Cost												
Fixed Assets	214	214	-	-	-	-	-	-	-	-	-	-
Project Management	30	30	-	-	-	-	-	-	-	-	-	-
Dividends	-	-	-	23	25	26	27	35	37	39	41	44
Amortization of Loan	-	-	-	85	85	85	85	85	85	85	85	85
Sub-Total	244	244	-	108	110	111	112	120	122	124	126	129
Working Capital	-	42	86	-	-	-	-	-	-	-	-	-
Total Disbursements	244	286	86	108	110	111	112	120	122	124	126	129
NET CASH FLOW/PERIOD	-	-	-	45	43	42	41	62	60	58	56	49
CASH BALANCE BEGINNING	-	-	-	71	116	159	201	242	304	364	422	478
CASH BALANCE ENDING	-	-	71	116	159	201	242	304	364	422	478	527
DEBT SERVICE RATIO	-	-	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8

Annex IV

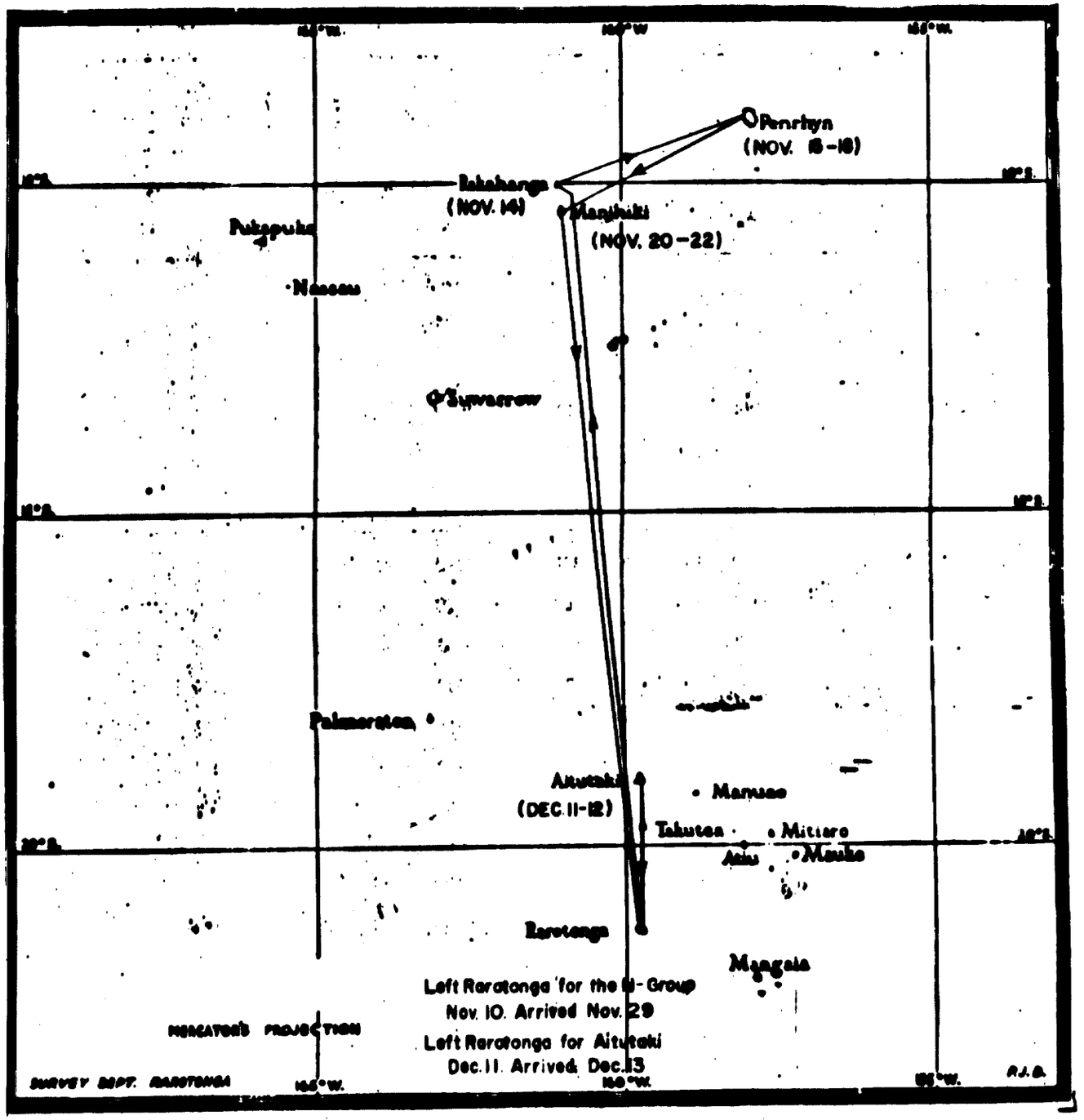
PROPOSED OPERATIONS CHART FOR THE NORTHERN GROUP



Annex V

CONSULTANT'S TIME SCHEDULE AND TRAVEL ROUTE

Oct	31	Departure Manila
Nov	1	Arrival Suva
	2	Briefing at UNDP (Suva)
	2	Departure Suva
	3	Arrival Rarotonga, Cook Islands (4:00 pm)
	4	Briefing with Mr. J A Gosselin, Secretary for Planning and External Affairs
	5	Preparation of work outline and schedules
	6	Briefing with Government Offices
	7- 10	Data gathering
	10- 29	Trip to the Northern Group Islands (Manihiki, Rakahanga, and Penrhyn)
Nov	30- Dec 4	Preparation of Report rough draft
Dec	5	Distribution of Report draft to members of the Project Study Group
	5- 6	Gathering of additional data
	7	Discussion of Study draft with Study Group
	8- 10	Revision and typing of Preliminary Report Draft
	11- 13	Trip to Aitutaki (Southern Group)
	13	Duplicating of Report final draft
	14	Presentation of Consultant's Preliminary Report to the members of the Project Study Group
	15	Briefing with the Premier and the Cabinet
	18	Departure Rarotonga
	19- 20	Debriefing at UNDP Suva
	21	Departure Suva
	22	Arrival Manila (5:00 pm)
	23- 31	Preparation of Consultant's Report to the [illegible]
Jan	4	Submission of Consultant's Report to [illegible]



CONSULTANT'S TRAVEL ROUTE IN COOK ISLANDS

Travel to the Northern Group was by boat (19 days)

Travel to Aitutaki (Southern Group) was by plane (2 days)

Annex VI

MEMBERS OF THE PROJECT STUDY GROUP (COOK ISLANDS)

1.	Mr. J.A. Gosselin	- Secretary, Ministry of Planning and External Affairs
2.	Mr. T. Pierre	- Acting Secretary, Ministry of Planning and External Affairs
3.	Mr. J. Liew	- Senior Planning Officer, Ministry of Planning and External Affairs
4.	Mr. M. Turepu	- Secretary, Ministry of Agriculture and Fisheries
5.	Mr. T. Raui	- Economist, Department of Agriculture
6.	Mr. K. Turepu	- Staff, Department of Agriculture
7.	Mr. R. MacDonald	- Director, Commerce and Industry
8.	Mr. P. Tutaka	- Director of Customs
9.	Mr. U. Bergstrom	- General Manager, National Development Corporation
10.	Mr. T. Pua	- Projects Officer, Cook Islands Development Bank
11.	Mr. P. Joseph	- Assistant Manager, Primary Produce Marketing Board

Annex VII

UNDP PERSONNEL WITH WHOM STUDY WAS DISCUSSED

1.	Mr. B.R. Devajajan	- Resident Representative (Manila)
2.	Mr. G. Van Doosselaere	- Senior Industrial Development Field Adviser (Manila)
3.	Mr. C. Goss	- Assistant Regional Representative (Suva)
4.	Mr. S. Dello-Strologo	- Senior Industrial Development Field Adviser (Suva)
5.	Mr. G. Blumenfeld	- Senior Agricultural Adviser (Suva)
6.	Mr. H. de Vries	- FAO Programme Officer (Suva)

Annex VIII

INFORMATION RESOURCE PERSONS (COOK ISLANDS)

1.	Mr. D.S. Hunter	- Statistics Officer, Central Planning Bureau
2.	Mr. P. Turner	- Director of Planning, Ministry of Planning and External Affairs
3.	Mr. R. Boyens	- General Manager, Primary Produce Marketing Board
4.	Mr. S.C. Fisher	- Secretary, Department of Electric Supply; Engineer-in-Charge, Electric Power Supply, Raratonga
5.	Mr. T. Videnov	- WHO Sanitary Engineer, Environmental Health Advisory Services Project
6.	Mr. J.D. Kenning	- Office Manager, Eastern Associates Ltd. (Representatives for Kyowa Shipping Co.)
7.	Mr. M. Simiona	- Chief Administration Officer, Aitutaki
8.	Mr. B. French	- Chief Clerk, Aitutaki
9.	Mr. J. Jessie	- Copra Officer, Aitutaki
10.	Mr. M. Kavana	- Public Works Officer, Aitutaki
11.	Mr. W. Benetito	- Chief Administration Officer, Penrhyn
12.	Mr. A. Varau	- Copra Officer, Penrhyn
13.	Mr. T. Makira	- Copra Officer, Rakahanga
14.	Mr. T. Ripata	- Copra Officer, Manihiki
15.	Mr. S.T. Joseph	- Copra Producer, Penrhyn

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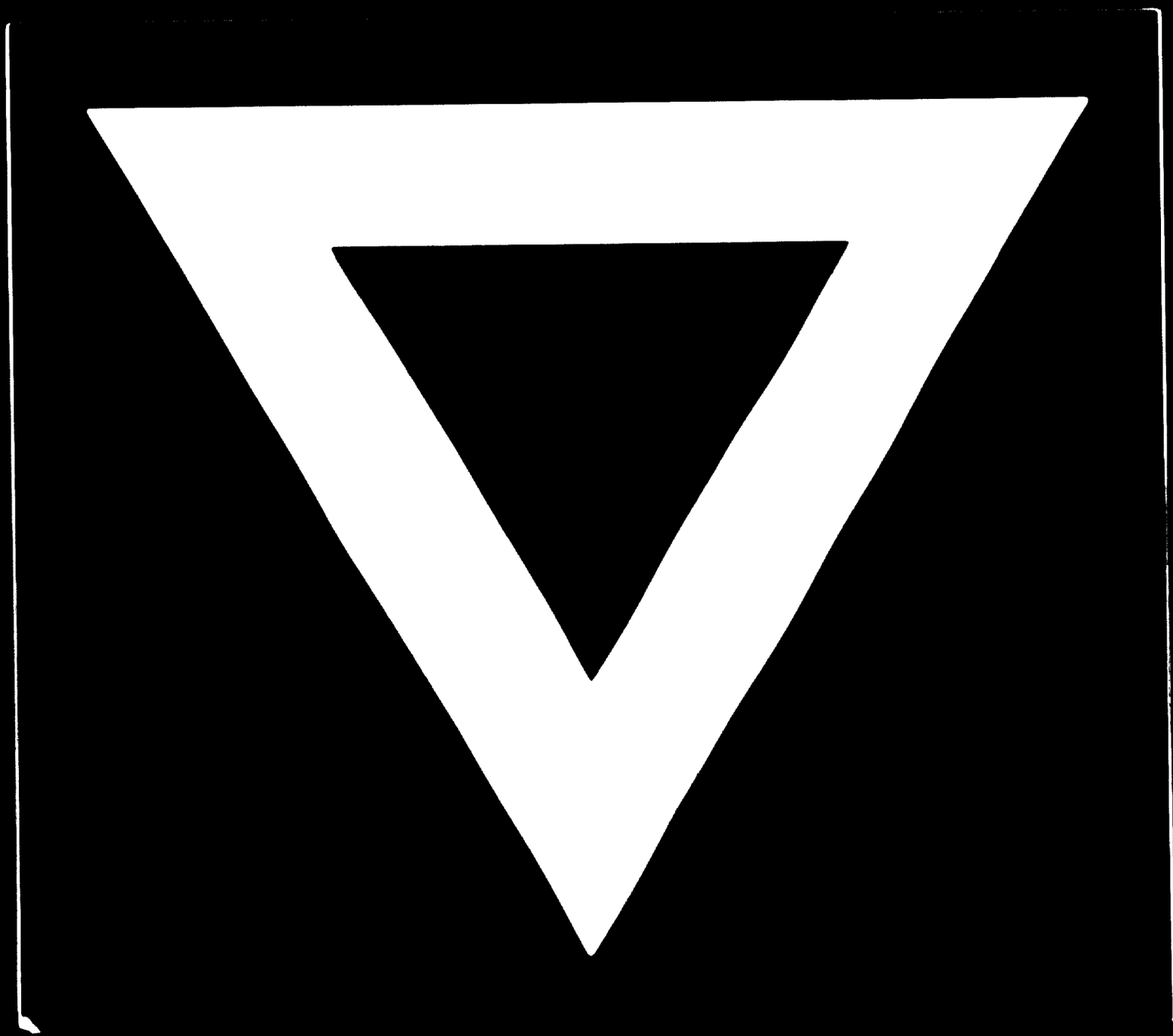

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