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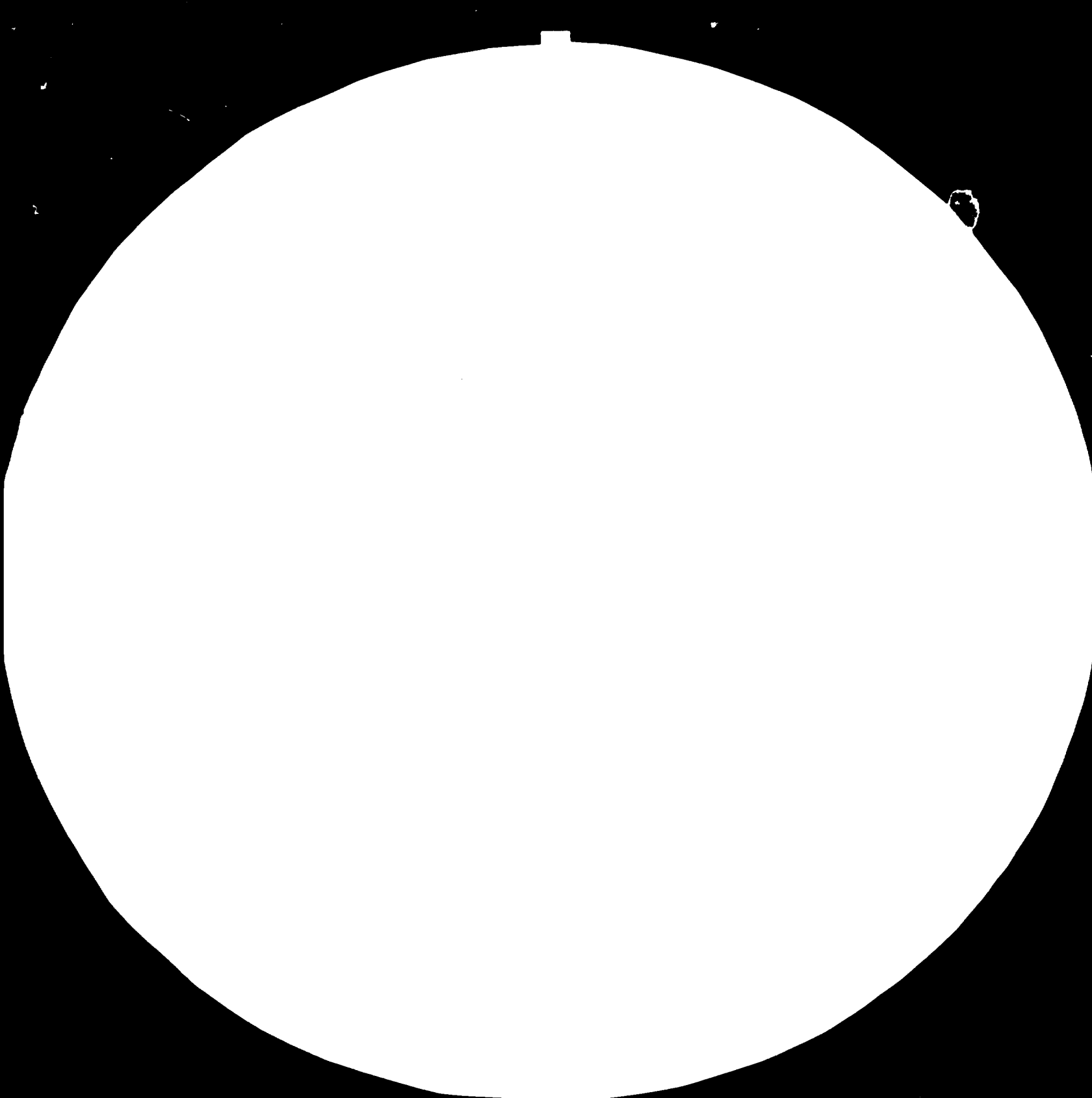
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## MICROCOPY RESOLUTION TEST CHART

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UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION

A STUDY OF THE COCONUT PROCESSING INDUSTRY IN COLOMBIA\*

US/GLO/80/005

Based on the work of P. C. Catanaoan  
UNIDO Consultant

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ABSTRACT

Title of project: A study of the coconut processing industry in Colombia  
US/GLO/80/005/11-02/31.7.C.

Purpose: To review the situation of the country's coconut industry with regard to all aspects of coconut processing, involving all products. Based on study results, evaluate existing coconut industry development schemes and outline additional coconut industry development projects, if applicable.

Findings: The coconut industry in Colombia is underdeveloped, its development plans are relatively of low profile.  
  
The industry has potentials for being a major contributor to the economy of the country, but its development is faced with several problems.  
  
A twelve-year, low-risk development programme is recommended.

Currency: All costs and prices in this study are, unless otherwise specified, in Colombian Pesos (C\$ or \$)  
Conversion used is 1 US\$ = 80 \$

\* The boundaries shown on the maps do not imply official endorsement or acceptance by the United Nations.

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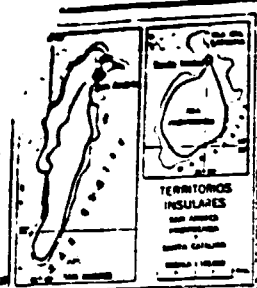
### INTRODUCTION

Realizing the importance of the coconut industry from both the view point of rural development and the supply of local markets of a variety of products and as an export industry as well, special attention is being paid by the authorities of the Government of Colombia to the development of the coconut industry.


UNIDO, on the other hand, within the framework of its Coconut Processing Industry Evaluation Service, is in the position to make available relevant documentation and information on all coconut processing operations.

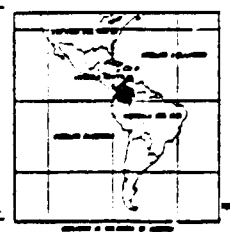
It is within this context that the Government of Colombia has requested for Coconut Processing Technology Documents, and for relevant UNIDO expert services to carry out an assessment of the country's coconut industry sector and evaluate existing development projects and programmes and also advise on appropriate development.

In response to a request from the Government of Colombia UNIDO sent a Coconut Processing Expert to undertake the study of the coconut industry for a period of two months. The results of the study are contained in the following report.



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## I. PURPOSE AND METHODOLOGY

### A. Purpose of the Project

The purpose of the project is to review the situation of the country's coconut industry with regard to all aspects of coconut processing involving all coconut products. Based on the study results, evaluate existing coconut industry development schemes and outline additional coconut industry development projects, if applicable.

In co-operation with the authorities, the expert is expected to carry out the following duties:

1. Review the present situation of Colombia's coconut industry with regard to coconut production and processing operations and products produced.
2. Review and evaluate existing coconut industry development projects and comment on their suitability and techno-economic feasibility.
3. Based on the assessments, specify additional coconut industry projects, if any, for consideration of the authorities.
4. Make available to the authorities, the UNIDO Coconut Processing Technology Information Documents on various coconut products and processes, and to discuss and explain them, if required.
5. Advise the authorities on all aspects of coconut processing operations with regard to all products involved, inclusive coconut meat, coconut fibres and coconut shells.

### B. Methodology Used in the Study

Considering the time limitation and the extent of the study, the following methodology for the study was considered appropriate.

1. Review previous studies and literature on the coconut industry in Colombia, and other related information.
2. Interview with Government officials and other persons involved in the industry for additional information on the coconut industry and coconut development programmes and projects.

3. Visit the coconut-processing areas and processing plants to assess the situations of infrastructure, transport facilities, industrial utilities and other requirements for feasibility evaluation and to evaluate the capabilities of existing processing plants.
4. From the above assessments and informations, evaluate what and where coconut processing industries may be feasible and what are the problems of the coconut industry.
5. Propose a programme for the development of the coconut industry, and prepare pre-feasibility studies for pertinent projects, if possible.

## II. THE COUNTRY

### A. Geography and Climate

Colombia is the most northernly of the South American countries. It is located between latitudes  $12^{\circ} 30'$  North and  $4^{\circ} 13'$  South and between longitudes  $66^{\circ} 51'$  East and  $70^{\circ} 01'$  West. Along its northern shore is the Atlantic Ocean and on the West is the Pacific Ocean. Inland, it is bounded by Ecuador, Brazil, Venezuela, Peru and Panama.

Although located in the torrid zone, Colombia has varied climates depending on altitude. Regions with altitudes lower than 1,000 meters above sea level have warm tropical climate. The coastal areas have temperatures between  $24^{\circ}$  and  $28^{\circ}$ C. Regions with altitudes between 1,000 and 2,000 meters have temperate climate and temperatures between  $17^{\circ}$  and  $24^{\circ}$  C. The cold regions which have temperatures between  $8^{\circ}$  and  $17^{\circ}$  have altitudes between 2,000 and 3,500 meters. The capital city, Bogota, is 2,600 meters above sea level and has an average temperature of  $14^{\circ}$ C. Mountain tops over 4,800 meters have perennial snows. The rainfalls also varies widely with regions, from 330 millimeters in Uribia (Guaajira) to 10,000 mm in the forest regions of Choco (Aguillon).

The varied climate allows the cultivation of various crops. coconuts grow along the coastal areas along the Pacific and Atlantic. Cacao, bananas, tobacco, cotton, rice, corn, and sugar are produced in the lowlands. Coffee is the major crop in the temperate regions, while wheat and barley are cultivated in the cold regions.

## B. Population and Economy

Colombia has a population of about 27.5 million and a population growth rate of about 3.4 per cent. Bogota has a population of about 4.5 million. The majority of the Colombians are descended from a racial mixtures of Caucasians, Indians and Negros which constitute about 58 per cent of the population. The rest of the population consist of whites 20 per cent, mulatos 14 per cent, negros 4 per cent, zambos 3 per cent and indios 1 per cent. Urban population is about 64 per cent. The national language is Spanish and the majority religion is Roman Catholic.

During the last decade the economy of Colombia has undergone a steady transformation from agricultural and rural to that of urban and industrial economy. The Government has formulated strategies aimed at improving the living conditions in the country side by giving priorities to agricultural development, improving nutrition, promotion of exports, urban planning and industrial development in the rural areas.

The major exports of Colombia are coffee, petroleum products, cotton, rice and sugar. Its main imports are consumer goods, raw materials and capital goods. The sectoral contribution to the Gross Domestic Product in 1977 were as follows: agriculture 26.2 per cent, manufacturing 21.9 per cent, commerce 17.5 per cent, transportation 4.4 per cent and others 30 per cent.

Like many developing countries over the world, the economy of Colombia is suffering from recession, growing rate of unemployment, and foreign exchange problems. The Government has recognized the potentials of the coconut industry in the solutions of some of its economic and social problems.

## III. THE EDIBLE FATS AND OILS INDUSTRY

### A. Production and Consumption

The main sources of edible oil in Colombia are: African palm, cotton seeds, soybeans, corn, sesame seeds, and animal fats. The national production of fats and oils are shown in Table 1.

Table 1 - National Production of Edible Fats and Oils

(thousands of metric tons)

<u>Year</u>	<u>Sesame</u>	<u>Cottonseed</u>	<u>Soybean</u>	<u>Corn</u>	<u>Palm Oil</u>	<u>Animal</u>	<u>Total</u>
1969	7.0	34.2	18.2	1.2	16.5	11.8	80.5
1970	8.6	34.2	22.8	1.2	25.0	12.0	103.9
1971	15.1	30.1	17.4	1.4	33.6	12.5	110.1
1972	13.6	39.4	18.1	1.4	38.5	13.0	124
1973	8.9	31.7	16.8	1.3	40.2	13.2	112.1
1974	8.4	39.9	19.7	1.4	47.2	15.4	132
1975	9.6	35.9	27.6	1.3	47.4	18.5	140.3
1976	9.5	35.3	12.0	1.4	46.1	24.1	128.5
1977	6.0	42.4	15.2	1.4	48.2	25.3	138.4
1978	6.7	28.3	20.0	1.5	61.9	26.0	144.4
1979	7.3	40.7	17.6	1.5	62.7	27.1	156.0

Source: Ministry of Agriculture statistics.

The total consumption of fats and oils in 1978 was about 246,000 tons of which about 41 per cent or 102,000 tons were imported. Consumption in 1992 has been projected at 445,000 tons with an expected importation of 210,000 tons. Importation of edible fats and oils in 1983 is estimated at at least, 150,000 tons. Consumption of edible fats and oils are shown on Table 2.

Table 2 - Consumption of Edible Fats and Oils

(metric tons)

<u>Year</u>	<u>Production</u>	<u>Importation</u>	<u>Total</u>
1969	89,500	41,043	130,543
1970	103,900	24,382	128,284
1971	110,100	54,735	164,835
1972	124,000	26,836	150,836
1973	112,100	33,583	145,683
1974	132,000	54,522	186,522
1975	140,300	37,800	178,100
1976	128,500	86,500	215,000
1977	138,400	86,700	225,100
1978	144,400	102,000	246,400
1979	156,900	84,400	241,300

Source: Ministry of Agriculture statistics.

## B. Processing

There are several vegetable oil extraction and processing plants in the country. The plants are generally designed to process various kinds of oil seeds and oils. Most of the plants are operating at under-capacity due to shortage of raw materials. Some of the plants have stopped operations. Llorech Grasas operates a modern plant in Cali which has a raw material processing capacity of 400 tons per day. At present, it is operating at about 70 per cent capacity due to lack of raw materials. Lloreda Grasas operates another plant with a capacity of 150 tons per day in Barranquilla.

## IV. THE COCONUT INDUSTRY

### A. Coconut Production

Coconut agriculture is a minor industry in Colombia. Coconut production was primarily intended for home use and to earn cash needs by selling whole nuts in the market. Coconut milk is a popular ingredient in the Colombian diet. Husked nuts are sold in the public markets and groceries and a significant percentage become spoiled before they can be sold.

Most of the coconut plantations lie along the Pacific and Atlantic coast and in the island of San Andres.<sup>1/</sup> New plantations are, however, being developed in Monteria about 40 kilometers away from the sea. The total area planted to coconuts is estimated at 15,100 hectares: 7,000 hectares in the Atlantic area, 6,000 hectares in the Pacific area and 2,100 hectares in San Andres. It is estimated that about 270,000 hectares of land are available and suitable for coconuts.

The old plantations in the Pacific area are planted with Alto Pacifico (Pacific Tall) variety while in the Atlantic area and San Andres plantations are generally of the Alto Caribe (Caribbean Tall) variety. New plantations are mostly planted with the Enano Malayo (Malayan Dwarf). Preference for this variety is due to its early fruiting age, high nut productivity, and apparent resistance to "red ring" disease.

<sup>1/</sup> Refer to Figure 1.

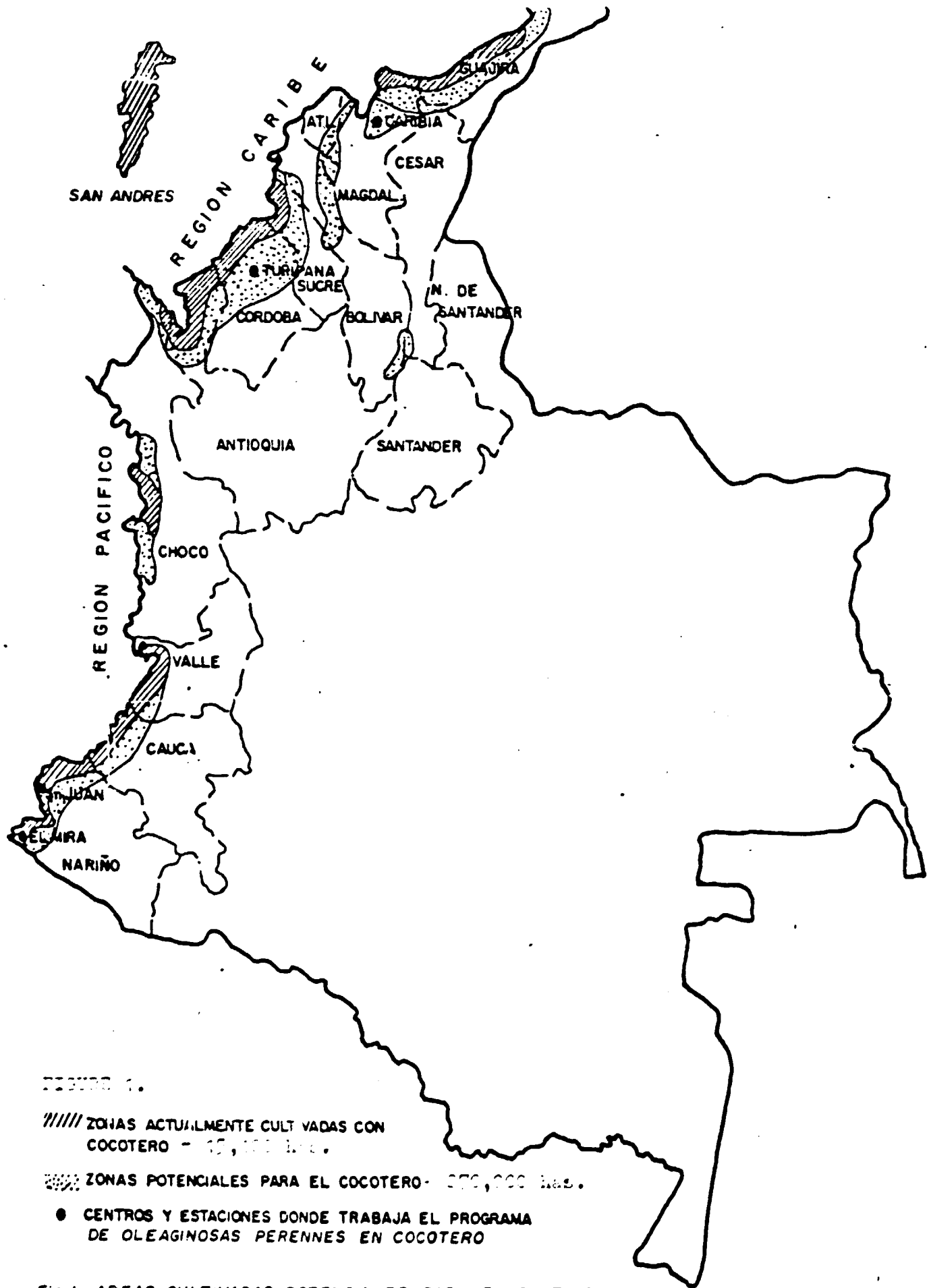


FIGURA 1.

////// ZONAS ACTUALMENTE CULTIVADAS CON COCOTERO - 15,000 HAs.

▨ ZONAS POTENCIALES PARA EL COCOTERO - 200,000 HAs.

● CENTROS Y ESTACIONES DONDE TRABAJA EL PROGRAMA DE OLEAGINOSAS PERENNES EN COCOTERO

Fig 1- AREAS CULTIVADAS-POTENCIALES PARA EL CULTIVO DEL COCOTERO

Unofficial estimates indicate an annual coconut production of about 109 million nuts per year, of which San Andres produces about 10.5 million, Atlantic area 33.6 million and Pacific area 65 million. The same source estimates the total nut consumption at 177 million, distributed as follows: San Andres 2 million, Atlantic area 75 million, and about 100 million nuts in the Pacific area. The above figures show a national shortage of about 70 million nuts a year, but a surplus for the island of San Andres of 8.5 million.<sup>1/</sup>

The prices of nuts vary widely from farm to market. Farm prices are as low as six pesos per nut, while coconuts are sold as high as sixty pesos each in groceries in Bogota. High transport costs and cost to make-up for high spoilage losses, account for the high prices in the city.

#### B. Processing

Copra is not produced in Colombia but there is a growing interest in copra making. In compliance to a request from the Coconut Industry Study Group, the expert designed, supervised construction, and demonstrated the operation of a model copra dryer at the ICA El Mira Research Station in Tumaco.<sup>2/</sup> Copra milling and coconut oil processing are non-existent. However, some of the existing oil processing plants such as the Lloreda Grasas plants, have capabilities for copra and coconut oil processing. The plants which extract oil from sesame seeds and cottonseed can be converted for copra processing by adding equipment for copra grinding. All of the vegetable oil refineries can also refine coconut oil.

There are small-scale plants for producing desiccated coconut in Tumaco, Medellin and Barranquilla. The existence of coconut oil laundry soaps, coconut preserves and other special coconut products reveal that there are other small-scale processing plants. Time did not allow a complete survey of the industry.

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<sup>1/</sup> Refer to Annex A for details of information.

<sup>2/</sup> Refer to Annex B for details of copra dryer project.

V. COCONUT INDUSTRY DEVELOPMENT PLANS AND PROJECTS

A. Coconut Production

The shortage of coconut supply for domestic consumption and the increasing importation of vegetable oils have stimulated keen interest in the development of coconut plantations. New coconut plantations are being developed in Monteria and other places in the Atlantic and Pacific areas. The Federacion Colombiana de Cultivadores de Cocotero was organized to promote coconut production. A fund was created by Government for the rehabilitation or replacement of coconut plantations destroyed by "red ring" along the Pacific Coast through the Instituto Colombiano de la Reforma Agraria (INCOFA). The Instituto Colombiano Agropecuario (ICA) is undertaking research on the development and testing of various coconut varieties and on the control of various coconut pests and diseases.

B. Processing

There are plans to produce copra in areas where there are seasonal surpluses of coconuts such as in Monteria, Tumaco and Guapi. The Corporacion Autonoma Regional del Cauca (CVC) plans to set-up a small-scale desiccated coconut plant in Buenaventura. A processing plant for the production of sweetened coconut chips for the European market and coconut fibre products for the domestic market has been recommended for the island of San Andres.

VI. PROBLEMS IN THE DEVELOPMENT OF THE COCONUT INDUSTRY

The proposed development of the coconut industry faces several problems. The solutions to these problems should be found prior to launching a large-scale development programme. The problems are:

1. Viability of coconut production and processing considering costs and prices in the country:
2. Plant diseases and pests:
3. Deficiency of transportation facilities in the coconut producing areas:



4. Need for technically trained manpower for agriculture and industry;
5. Need for low-interests and easy-terms financing to support the development stage of the industry;
6. Need to develop systems to reduce the cost of plantation development and farm maintenance.

Based on pre-feasibility evaluations, the viable prices of coconuts are 12 pesos per nut in the Atlantic and 8 pesos in the Pacific area.<sup>1/</sup> The equivalent copra prices are C\$ 81,000 from the Atlantic area and C\$ 56,000 per metric ton from the Pacific area. At the time of the study, to be competitive with other vegetable oil raw materials, copra should be priced at about C\$ 45,000 per ton. However, backward calculations from retail prices of refined vegetable oil indicate that a copra price of C\$ 56,000 per ton may be viable for oil millers. The wide gap between calculated farm prices for copra and the expected buying price of copra by processors spells a doubtful viability of coconut production unless the costs and prices change or can be changed.

More than 3,000 hectares of coconuts have been destroyed completely by the "red-ring" disease in the Pacific coast during the last five years. A new disease, similar to *Phytophthora*, has been discovered by ICA. Like the "red-ring", the new disease kill a tree in two to three months after the first symptom appears. "Porroca" or little-leaf disease is a problem in the Atlantic coast. Rats and a small spider, called *Roña*, are pest problems in the island of San Andres.

Land transportation is hardly available in the coastal areas. People travel by boats and canoes by sea and along rivers. The vessels are driven either by small engines, sail, or by paddles. Water transportation would be the only feasible means of transporting coconuts and copra in most of the coconut areas. Riding on donkeys is a common means of travel in Cordova and other Atlantic coast communities.

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<sup>1/</sup> Refer to Annex D for pre-feasibility studies.

The ICA has two main research stations: the Turinana Research Station in Monteria, and the El Mira Research Station in Turaco. Through more than a decade of work on coconuts, the institutions has developed not only the appropriate farm technologies, but also farm technicians which the country would need for the development of its coconut industry. However, in a massive coconut planting programme, the local technicians will be inadequate to provide the trained manpower needs. Hence, there will be a need to train more local technicians and also foreign technicians with different experience and expertise to supplement local capabilities.

Due to the absence of a coconut processing industry in the country, there is a dearth of local technicians for coconut processing. Technicians from existing oil processing plants can be tapped for the coconut processing industries but this will not be adequate. There will be then a need to import foreign technicians at the initial phases of the industrial development programme.

The banks' lending interest rates range from 21 per cent to 28 per cent per annum. For sometime, there has been a stalemate in investment in the coconut industry. The bankers have been complaining that there are no borrowers while the farmers are reluctant to borrow at existing loan terms. There is a general feeling of uncertainty in the viability of coconut production. Unable to appreciate the economic potentials of the coconut industry, efforts to promote its development have been limited.

Cost estimates for development, maintenance and production have been prepared by ICA, FEDECOCOS, Bango Ganadero and other institutions. Estimates by FEDECOCOS and ICA are as follows:

In the Atlantic Coast Area

Land preparation and planting - C\$101,000 per hectare.  
Maintenance for 4 years - C\$ 61,000 per hectare per year.  
Production costs, from 6th year - C\$ 61,000 per hectare per year.

In the Pacific Coast Area

Land preparation and planting - C\$ 94,000 per hectare.  
Maintenance for 4 years - C\$ per hectare per year:

2nd year	- 31,900
3rd year	- 34,000
4th year	- 38,000
5th year	- 43,200

Production costs from 6th year - C\$ 43,200 per hectare per year.

Based on the above costs, the calculated prices of coconuts will be too high for viable copra production.<sup>1/</sup>

The following schemes are suggested to reduce farm development costs:

1. Reduction of interest rates. Available soft-loans and grant from foreign sources should be explored:
2. Judicious choice of land to reduce cost of land preparation and fertilization:
3. Use of machinery for clearing and preparing land. This may require the setting-up of an equipment and machinery pool in strategic locations:
4. Optimization of fertilizer and chemicals usage to avoid unnecessary excesses:
5. Better credit supervision by banks to insure proper use of investments.

#### VII. OPPORTUNITIES FOR THE COCONUT INDUSTRY

Colombia has a unique advantage of geographical location for coconut production. The tropical climate and the sandy loam soils along the coasts are generally suitable for coconut agriculture. It is estimated that about 270,000 hectares are still available and suitable for coconut plantings. With this hectarage in coconut production, Colombia has a potential of producing about 5 billion nuts per year, three times its needs.

The country needs about 70 to 100 million nuts to fill the shortage for domestic consumption of nuts. Assuming a price of C\$15 per nut, this will amount to a sale of about C\$ 1 billion per year. Colombia imports about 150,000 ton of edible oils per year. Valued at C\$60,000 per ton, the value of imported edible oils is about C\$9 billion per year. These are the local market opportunities for the coconut industry. In addition to the local market potentials, Colombia enjoys the proximity to the United States market, the biggest market for coconut products.

<sup>1/</sup> Refer to Annex C for copra price calculations.

### VIII. RECOMMENDATIONS

With due consideration of the opportunities as well as the problems in the development of the coconut industry, it is recommended that a 12-year minimum-risk development programme be pursued starting 1984. The proposed programme shall be divided into three phases, as follows:

Phase I - A six-year exploratory period which shall have the following objectives:

1. To resolve the problem of the most suitable coconut variety, considering economic yields and resistance to diseases:
2. To develop systems of controlling diseases and pests to manageable levels at minimum cost:
3. To improve the methods of farm development and production in order to reduce costs to viable levels:
4. To train manpower for agricultural production and industrial processing; and
5. To study and develop markets for coconut products.

Specific activities during the period shall be as follows:

1. Development of commercial test-farms in the proposed planting areas, each with an area of about 20 hectares. The test-farms shall stimulate a pre-planned scheme of land development, planting, maintenance and production and shall be used simultaneously as pilot farms to evaluate coconut varieties, methods for disease and pest controls, and for the designing of low-cost development and production systems. Two hundred test farms, evenly spread over the coconut development area, with a total area of 4,000 hectares are proposed. The estimated total investment will approximately be C\$ 800 million. The test-farms shall be owned by private persons but the project shall be monitored by the ICA, FEDECOCOS and the banks.
2. Establishment of the following small-scale model industrial plants in present high coconut production areas:
  - a) An integrated coconut processing plant in San Andres;
  - b) A small-scale desiccated coconut plant in Buenaventura; and
  - c) A small-scale oil mill and refinery in Tumaco.

3. Setting-up of pilot projects for the production of coconut fiber products. This project shall be used for training, products development and market studies:
4. Market survey for coconut shell charcoal and other shell products. Study the feasibility of an activated carbon plant using coconut shell charcoal considering the requirements of local industries.
5. Trial production of copra under subsidized pricing.

If possible, Phase I should be funded by grants and/or soft-loans which may be available from foreign institutions and development banks.

Phase II - A one-year Evaluation period to:

1. Evaluate results during the exploratory period:
2. To make necessary adjustments and improvements on the previous plans:
3. To make further decisions on the coconut development programme.

Phase III - A five-year Expansion Programme

If the decision made during the evaluation period is to expand development of the coconut industry, the following subsequent programme is proposed:

1. A five-year full-scale planting programme at a rate of about 10,000 hectares per year starting with the most suitable areas. A total of 50,000 hectares will be planted in five years to supply about 80,000 tons of oil per year (50 per cent of importation) after ten years:
2. Accelerated copra production and processing of coconut oil to reduce edible oil importation. Towards the end of the period, new oil mills and refineries may be established, if existing plants prove to be inadequate:
3. Expansion of processing of high-value products: desiccated coconut, coconut cream, and sweetened coconut by constructing new plants, depending on market demand:
4. Commercial scale production of by-products: fiber products, charcoal and activated carbon whichever will be feasible.

Phase III B - A two-year retrenchment programme

If the decision during the evaluation period is to suspend the programme, the existing coconut industry should concentrate on production of high-value products and maintain viable processing operations. A two-year retrenchment programme is recommended as follows:

1. Continue operating the three model plants in San Andres, Buenaventura, and Tumaco if viable. Expand them if the market warrants:
2. Establish new viable processing plants to utilize nut production from the 4,000 hectares test-farms:
3. Develop new coconut plantations as necessary.

IX. EXTERNAL ASSISTANCE

Considering the economic importance and the magnitude of investment involved in the coconut development programme, the following hirings are recommended:

1. One coconut farm development and management expert for one year, subject to renewal:
2. One coconut pest and disease control expert for one year:
3. One coconut processing consultant for the planning, construction, and initial operations of the model processing plants in San Andres, Buenaventura and Tumaco:
4. Hiring of a fiber products expert for six months.

ANNEX A - FIELD SURVEY INFORMATION REPORT

Presented during the meeting of the Coconut Industry Study Group at the UNDP Conference Room, Bogota, 24 June 1983 by P. C. Catanaoan.

Duration of Survey: 8 to 21 June 1983 (inclusive)

Places visited: Isla de San Andres, Costa Cordoba, Arboletes, San Juan de Uraba, Palmira, Cali, Guapi and Tumaco.

Institutions contacted: Turibana Research Station (ICA Monteria), El Mira Research Station, Tumaco (ICA Palmira), Centro Internacional de Agricultura Tropical (CIAT), Instituto Colombiano de la Reforma Agraria (INCOGRA) in Guapi, Corporation Autonoma Regional del Cauca (CVC) in Cali, Lloreda Grasas S.A. in Cali, and INDUCOCO in Tumaco.

Coconut plantations visited: Plantations in Isla de San Andres, Cristo Rey, Monteria, Cerete, Arboletes, San Juan, Guapi and Tumaco, including the ICA coconut experimental farm at the El Mira Research Station.

Sources of information:

Mr. Cayetano Marsiglia, Presedente, FEDECCOCS

Mr. Guillermo Vallejo, Coordinador, Programa de Oleaginosas Perenas, ICA Palmira

Mr. Domingo Sanches Secretario de Agricultura, San Andres

Ing. Jose R. Hurtado ICA Monteria

Dr. Fernando Mora Information Officer, CIAT

Ms. Carmen C. Silva Programa Desarrollo, Buenaventura, CVC

Dr. R. A. Neira Ph.D. Control de Calida, Investigacion y Desarrollo Lloreda Grasas

Mr. Fco. Javier Zapata Gerente, INDUCOCO

INCOGRA Guapi Asistentes

Mr. Luis Ghisaya Coconut planter, Monteria

ICA publications:

Programa Nacional de Oleaginosas Perenes. 1981.

Informe Anual de Progreso 1980 - 1981, Program Oleaginosas Perenes.

Encuentro Tecnológico - Cultivos Productores de Aceites y Grasas Comestibles.

Diagnostico del Cultivo del Cocotero, Isla de San Andres, 1980.

A. Information and Observations

San Andres

1. Coconut Industry Status

Area planted to coconuts:	2,100 hectares
Coconut variety:	Alto Caribe 70 %, Malayo 30 %
Average productivity:	5,100 nuts per hectare per year
Annual nut production:	10.5 million
Annual nut consumption:	2 million
Annual nut surplus:	8.5 million
Potential annual copra production:	1,700 tons
Physical condition of trees:	
Ages: less than ten years	5 %
ten to thirty years	85 %
over thirty years	10 %
Productive trees	85 %
Diseased trees	2 %
Land available for new plantings	no estimate

2. Infrastructure and utilities

Roads:	good roads all over the island
Trucking:	deficient
Water supply:	deep wells and sea water
Power supply:	2,300 kw available
Shipping:	regular routes to Panama, Costa Rica, Cartagena

3. Proposed industrial products

Sweetened coconut chips and desiccated coconut;  
Coconut fiber products;  
Coconut shell charcoal;  
Refined coconut oil.



Atlantic Coast Area

1. Coconut industry status

Area planted to coconuts:	old 6,000 hectares new 1,000 hectares
Coconut varieties:	Coastal area - Alto Caribe Inland - Enano Malayo
Productive trees:	about 80 % (5,600 hectares)
Productivity:	6,000 nuts per hectare per year
Estimated annual nut production:	33.6 million
Estimated annual nut consumption:	75 million
Estimated annual nut shortage:	41.4 million
Land available for new plantings:	Inland - 100,000 hectares Coastal - 40,000 hectares
Coconut diseases:	"Porroca" or little leaf disease.

2. Infrastructure and utilities (only Monteria was visited)

Roads:	Within Monteria - good and extensive Monteria to coastal areas - poor but manageable Monteria to inland farms - bad
Trucking:	- limited
Water supply:	- from deep wells and river
Power supply:	- available. Hydro power in 1985

3. Existing coconut processing plants

Small-scale desiccated coconut plants in Medellin and Barranquilla.

4. Proposed industrial products

Coastal farms: copra  
Refined coconut oil and animal feeds  
Desiccated coconut

Pacific Coast Area

1. Coconut industry status

Area planted to coconuts:	6,000 hectares
Coconut varieties:	old plantations - Alto Pacifico new plantations - Enano Malayo
Productive trees:	90 per cent
Estimated nut production per year:	65 million
Estimated nut consumption per year:	100 million
Estimated nut shortage per year:	35 million

Productivity: about 9,000 nuts per hectare per year  
Land available for new plantings: Inland 100,000 hectares  
Coastal 30,000 hectares  
Coconut diseases: "red ring" disease destroyed about  
3,000 hectares during the last 5 years.

## 2. Infrastructure and utilities

Roads: Cali - Buenaventura: good  
Cali - Tumaco: dust roads  
Coastal - no roads, water transportation only  
Power supply: available in Cali, Palmira, Buenaventura  
Water supply: mostly deep wells

## 3. Proposed industrial products

Coastal farms - copra  
Buenaventura - desiccated coconut  
Tumaco - refined oil and animal feeds

## 4. Existing coconut processing plants

Small-scale desiccated coconut plant in Tumaco.  
Lloreda Grasas has equipment for copra and oil processing.

## Overall Colombia

Total land area planted to coconuts: 14,100 hectares  
Estimated total nut production per year: 109.7 million  
Estimated nut consumption per year: 177 million  
Estimated nut shortage per year: 67.7 million  
Land available for new plantings: 270,000 hectares

## Existing coconut processing plants

Small-scale desiccated coconut plants.  
Plant processing various oil seeds (Lloreda Grasas).

## Major coconut diseases

San Andres - Porroca  
Atlantic Coast area - Porroca  
Pacific Coast area - red-ring.

Proposed new industrial products

Refined coconut oil and animal feeds:

Desiccated coconut and sweetened coconut chips:

Coconut fiber products:

Coconut shell products:

Copra.

B. Other Information

From Lloreda Grasas

The firm is located in Cali. The plant has equipment for extracting oil from various oil seeds and copra but has not processed copra due to absence of raw materials. The plant can refine all kinds of vegetable oil including coconut oil. The plant has a milling capacity of 400 tons per day but is operating at about 75 per cent capacity due to shortage of raw materials. Lloreda Grasas has another plant in Barranquilla with a capacity of 150 tons per day.

From CVC

The Corporacion Autonoma Regional de Cauca (CVC) is a government institution charged with the development of the Pacific Coast Region. It has prepared a development plan for Buenaventura, which includes plans for coconut production and processing. It proposes to set-up a small-scale desiccated coconut plant in Buenaventura. CVC desires to co-ordinate its plans with the national programme for coconut development.

From ICA

The Instituto Colombiano Agropecuario (ICA) is doing agricultural research on coconuts. They have developed technologies for cultivating the "Enano Malayo" in their coconut experimental farms. It has also tested the suitability of Enano Malayo in inland farms as far as 40 miles from the sea. ICA has identified the cause of the "red-ring disease and has devised systems of controlling the disease. The institution is requesting for technical assistance and opportunities for foreign training. A model copra dryer has been set-up at the ICA El Mira Research Station.

From CIAT

The Centro International de Agricultura Tropica (CIAT) is located in Palmira. The institution has on-going research on various agricultural food crops but has not done work on coconuts yet. It cannot expand its research programme due to lack of funds.

From INCORA (Guapi)

The Instituto Colombiano de la Reforma Agraria (INCORA) in Guapi is financing planting and replanting of coconuts in the "red ring" devastated areas in and around Guapi. It has, so far, financed about 4,000 hectares with 3,000 hectares as replantings.

From INDUCOCO

INDUCOCO operates a small desiccated coconut plant in Tumaco and has another plant in Medellin. The firm is requesting technical assistance to improve processing techniques and expand production.

From other sources

There are several oil-seed and vegetable oil processing plants in Colombia. Practically all of them are operating below capacity due to lack of raw materials. A few have stopped operations.

ANNEX B - REPORT ON SPECIAL TRIP TO CALI

Duration of trip: 30 June to 11 July 1983

As requested by members of the Coconut Industry Study Group, a special trip was made to Cali to discuss copra pricing with Lloreda Grasas and to Tumaco to build a pilot copra dryer at the El Mira ICA Research Station.

- 30 June Arrived in Cali. Discussed copra pricing with Ing. Antonio Merino, Plant Manager of Lloreda Grasas. His opinion was that the copra should be priced so that the extracted oil will have a price competitive with other vegetable oils and at about C\$ 60,000 per ton. He suggested that I make the price calculations. Went with Mr. Guillermo Vallejo to the CVC headquarters to discuss with CVC staff the financial feasibility of the proposed desiccated coconut project in Buenaventura. Visited some metal fabrication shops to evaluate their capability to fabricate some of the equipment for the desiccated coconut plant.
- 4 July Arrived in Tumaco. Purchased materials for the copra dryer.
- 5 - 6 July Construction of copra dryer (16 hours)
- 6 July Conducted nut weighing tests.  
Result of test:  
Nut variety - 100 per cent Enano Malayo, picked at random from a lot of about 7,000  
Number of nut weighed - 200
- | <u>Part of Fruit</u> | <u>Total Wt.</u> | <u>Ave. Weight</u> | <u>Percentage</u> |
|----------------------|------------------|--------------------|-------------------|
| Whole fruits         | 193.7 kg         | 0.9685 kg          | 100.0             |
| Husks                | 52.55            | 0.2627             | 27.12             |
| Water                | 41.45            | 0.2072             | 21.40             |
| Shells               | 28.50            | 0.1425             | 14.71             |
| Kernels              | 71.20            | 0.3560             | 36.76             |
| Nuts (w/o husks)     | 141.15           | 0.7057             | 72.88             |
- 6, 7, 8 July Demonstrated copra making by sun-drying.

7 to 8 July  
(through night)

Made copra using pilot dryer.

Copra-drying data

Number of nuts (half-load) - 1,120 (Enano Malayo)

Drying time - 18 hours

Average drying temperature - 160°F

Fuel used - coconut husks (about 1/2 of husks)  
no coconut shell was used.

Weight of copra - 187 kg

Equivalent number of nuts per ton copra - 6,000

7, 8 July

Conducted laboratory tests.

Results of test:

Moisture content of kernel - 54.36 %

Dried kernel (copra) by difference - 44.64 %

Equivalent number of nuts to make 1 ton copra  
(7 per cent moisture) - 5,900

Oil content of copra - 63.24 %

9, 10 July

In Cali. Preparation of reports.

11 July

Submitted copra samples to Lloreda Grasas for tests.

Went to Buenaventura to see proposed site of desic-

cated coconut plant and inquire on power and water supply.

Arrived in Bogota at 6.00 p.m.

ANNEX C - EVALUATION OF COCONUT AND COPRA PRICES

1. Based on price of nuts and cost of copra making.

Proposed prices of nuts (650 grams per nut, w/o husks)

Atlantic Coast - C\$ 12 per nut  
Pacific Coast - C\$ 8

Calculation of copra prices:

Atlantic Coast:

Cost of 6,000 nuts à \$ 12	\$ 72,000
Cost of copra making per ton	8,000
Transport and handling costs	1,000
Mill-gate price of copra	\$ 81,000 per ton.

Pacific Coast:

Cost of 6,000 nuts à \$8	\$ 48,000
Cost of copra making, per ton	8,000
Transport and handling costs	1,000
Mill-gate price of copra	\$ 57,000

2. Based on crude coconut oil price of C\$ 65,000 per metric ton

Copra required for 1 ton of oil	1.64 tons
Weight of copra meal	0.607
Price of copra meal	\$ 18,000 per ton
Milling cost	\$ 3,200 per ton
Oil recovery	61 %
Meal recovery	37 %

Calculation based on 1 ton of oil:

Revenue from 1 ton of oil	\$ 65,000
Revenue from 0.607 tons meal	11,000
Total revenues	\$ 76,000
Less: Milling costs (1.64 T)	5,300
Value of copra (1.64 tons)	70,700
Price of copra, per ton	\$ 43,100

3. Based on retail price of refined vegetable oil

Weight of oil in bottle (3,000 cc)	2.73 kg
Retail price, per bottle	\$ 387.50
Less: bottling cost	45.00
Cost of oil content	342.50
Less: Mark-up of 20 %	68.50
Ex-factory price of oil (contents)	\$ 274.50
Ex-factory price per kg of oil	\$ 100.26 or
Ex-factory price per ton oil	\$100,000
Less: cost of refining, per ton	9,500
Cost of crude oil refined (1.04 tons)	90,500
Cost per ton crude oil	86,500
Add: revenue from copra meal	
1.64 x 0.37 x \$ 18,000	10,900
Total revenues from milling	\$ 97,400
Less: milling cost per ton copra	5,300
Cost of copra milled (1.64 tons)	92,100
Price per ton of copra	56,100

4. Conclusions

- a) Copra production can be viable in the Pacific coast area if the mill-gate price is \$ 57,000 per ton. The cost of copra production in the Atlantic area should be reduced by 30 per cent to be viable.
- b) Oil millers have to pay a premium price for copra to support the coconut industry, unless the production cost of coconuts can be reduced.



ANNEX D - FINANCIAL FEASIBILITY PROFILE OF A VIABLE SMALL COCONUT  
FARM IN COLOMBIA (1983)

Basic Assumptions

- |  |                                 |                    |
|--|---------------------------------|--------------------|
| 1. Area of farm:                               | 20 hectares                     |                    |
| 2. Variety of coconut to be planted:           | Malayan Dwarf                   |                    |
| 3. Tree density:                               | 220 trees per hectare           |                    |
| 4. Productivity:                               |                                 |                    |
| <u>Year</u>                                    | <u>One hectare</u>              | <u>20 hectares</u> |
| 1 - 4  | neglegible                      |                    |
| 5  | 2,700                           | 54,000             |
| 6  | 9,000                           | 180,000            |
| 7  | 12,000                          | 240,000            |
| 8  | 18,000                          | 360,000            |
| 9  | 20,000                          | 400,000            |
| 10-15  | 20,000                          | 400,000            |
| 5. Average weight per nut:                     | 650 - 700 grams                 |                    |
| 6. Proposed price per nut:                     | C\$ 8.00                        |                    |
| 7. Cost of land preparation and planting       | C\$ 94,000 per hectare          |                    |
| 8. Period of preparation and planting:         | one year                        |                    |
| 9. Cost of maintenance: 2nd to 5th year:       | C\$32,000 per hectare per year  |                    |
| 10. Cost of production starting with 6th year: | C\$ 38,000 per hectare per year |                    |

Investment for 20 hectares C\$ 000

- |                                   |          |
|-----------------------------------|----------|
| 1. Land preparation and planting: | \$ 1,880 |
| 2. Maintenance cost for 4 years:  | 2,560    |
| Total Investment                  | \$ 4,440 |

Investment Services

- |        |      |          |
|--------|------|----------|
| Loan   | 65 % | \$ 2,886 |
| Equity | 35 % | 1,554    |
| Total: |      | \$ 4,440 |

Financing Terms

- Interest rate: 19.5 per cent on
- Repayment: 15 years with 5 years grace period  
Loan to be paid in ten equal annual installments starting with year six.  
Interests during grace period to be added to loan.

DISCOUNTED CASH FLOW RATE OF RETURN ON INVESTMENT ANALYSIS

YEAR	BORROWINGS	RESOURCES	NET	DISCOUNT FACTOR- 20%	PRESENT VALUE
1	1,880	-	-1,880	0.883	-1,566
2	640	-	-640	.694	-444
3	640	-	-640	.579	-371
4	640	-	-640	.482	-308
5	640	-328	-968	.402	-389
6		680	680	.325	228
7		1,160	1,160	.279	324
8		2,120	2,120	.233	494
9		2,440	2,440	.194	473
10		2,440	2,440	.162	395
11		1,989	1,989	.135	269
12		1,965	1,965	.112	220
13		1,937	1,937	.093	180
14		1,904	1,904	.078	148
15		1,864	1,864	.065	121
	Value of Improvements		5,000	.065	325
					-3,078
					+3,177
	DCFRR ON TOTAL INVESTMENT-			20%	
	DCFRR on Equity			60%	

Taxes

Year 1 - 10

Tax free

From year 11

25 % on net profit

Financial Plan (\$000)

	EQUITY	LOAN	TOTAL
Year-1	658	1,220	1,880
2	224	416	640
3	224	416	640
4	224	416	640
5	224	416	640
TOTAL	1,554	2,886	4,440

SCHEDULE OF AMORTIZATIONS AND INTERESTS (\$000)

Year	Drawdown	Amortization	Interests	Principal	Balance
1	1,220	-	-	-	1,220
2	416	-	238	-	1,876
3	416	-	366	-	2,658
4	416	-	518	-	3,592
5	416	-	700	-	4,708
6	-	1,115	918	197	4,511
7	-	1,115	880	235	4,276
8	-	1,115	834	281	3,995
9	-	1,115	779	336	3,659
10	-	1,115	714	401	3,258
11	-	1,115	635	480	2,778
12	-	1,115	542	573	2,205
13	-	1,115	430	685	1,520
14	-	1,115	296	819	701
15	-	837	136	701	0

ANNUAL SALES (\$000)

YEAR	Number of nuts	Unit Price \$	Total Sales
5	54,000	8	432
6	180,000	8	1,440
7	240,000	8	1,920
8	360,000	8	2,880
9	400,000	8	3,200
10	400,000	8	3,200
11	400,000	8	3,200
12	400,000	8	3,200
13	400,000	8	3,200
14	400,000	8	3,200
15	400,000	8	3,200

VALUE OF IMPROVEMENTS

A value of \$250,000 per hectare is assigned to the improvements on the land at the end of 15 years.

FINANCIAL FEASIBILITY PROFILE OF A VIABLE  
20-HECTARE FARM IN COLOMBIA 1983 all in \$8000

A	1	2	3	4	5	6	7	8	9	10	11	12
<b>INCOME STATEMENT</b>												
SALES	-	-	-	-	432	1,440	1,920	2,880	3,200	3,200	3,200	3,200
COST OF PRODUCTION	-	-	-	-	760	760	760	760	760	760	760	760
GROSS PROFIT	-	-	-	-	-328	680	1,160	2,120	2,440	2,440	2,440	2,440
INTERESTS	-	238	366	518	700	918	880	834	779	714	635	542
PROFIT BEFORE TAX	-	-238	-366	-518	-1,018	-238	280	1,286	1,661	1,726	1,809	1,989
TAXES	-	-	-	-	-	-	-	-	-	-	451	475
NET PROFIT	-	-238	-366	-518	-1,208	-238	280	1,286	1,661	1,726	1,354	1,423
<b>B. PROJECTED CASH FLOW STATEMENT</b>												
<b>SOURCES OF INCOME</b>												
Net Profit	-	-238	-366	-518	-1,028	-238	280	1,286	1,661	1,726	1,354	1,423
Add Back: Interests	-	238	366	518	700	918	880	824	779	714	635	542
TOTAL INTERNAL RESOURCES	-	0	0	0	-328	680	1,160	2,120	2,440	2,440	1,989	1,965
<b>BORROWINGS</b>												
Loan	1,220	416	416	416	419	-	-	-	-	-	-	-
Equity	658	224	224	224	224	-	-	-	-	-	-	-
TOTAL BORROWINGS	1,880	640	640	640	640	-	-	-	-	-	-	-
TOTAL FUNDS	1,880	640	640	640	312	680	1,160	2,120	2,440	2,440	1,989	1,965
<b>APPLICATION OF FUNDS</b>												
Development Cost	1,880	-	-	-	-	-	-	-	-	-	-	-
Maintenance Costs	-	640	640	640	640	-	-	-	-	-	-	-
Amortisation of Loan	-	-	-	-	-	1,115	1,115	1,115	1,115	1,115	1,115	1,115
TOTAL DISBURSEMENTS	1,880	640	640	640	640	1,115	1,115	1,115	1,115	1,115	1,115	1,115
CASH INFLOW / OUTFLOW	0	0	0	0	0	-435	45	1,005	1,325	1,325	874	850
CASH: BEGINNING	-	-	-	-	-	-435	-435	-390	615	1,940	3,265	4,139
ENDING	0	0	0	0	0	-435	-390	615	1,940	3,265	4,139	4,989
DEBT SERVICE RATIO	-	-	-	-	-	0.61	1.0	1.9	2.1	2.1	1.7	1.7

ANNEX E - A SMALL-SCALE DESICCATED COCONUT PROJECT FOR BUENAVENTURA,  
COLOMBIA, 1983

The establishment of a desiccated coconut plant in Buenaventura is a project of Corporacion Autonoma Regional Del Cauca (CVC). The plant will be equipped with modern facilities to produce desiccated coconut that will meet the strict specifications in the United States market.

The proposed project shall have a capacity to produce one ton of desiccated coconut per eight-hour operation. If operated 24 hours or 3 shifts, the production shall be three tons per day. The nuts requirement shall be about 9,000 nuts per 8-hour operation based on an average nut weight of 650 grams (the average weight of manila nuts).

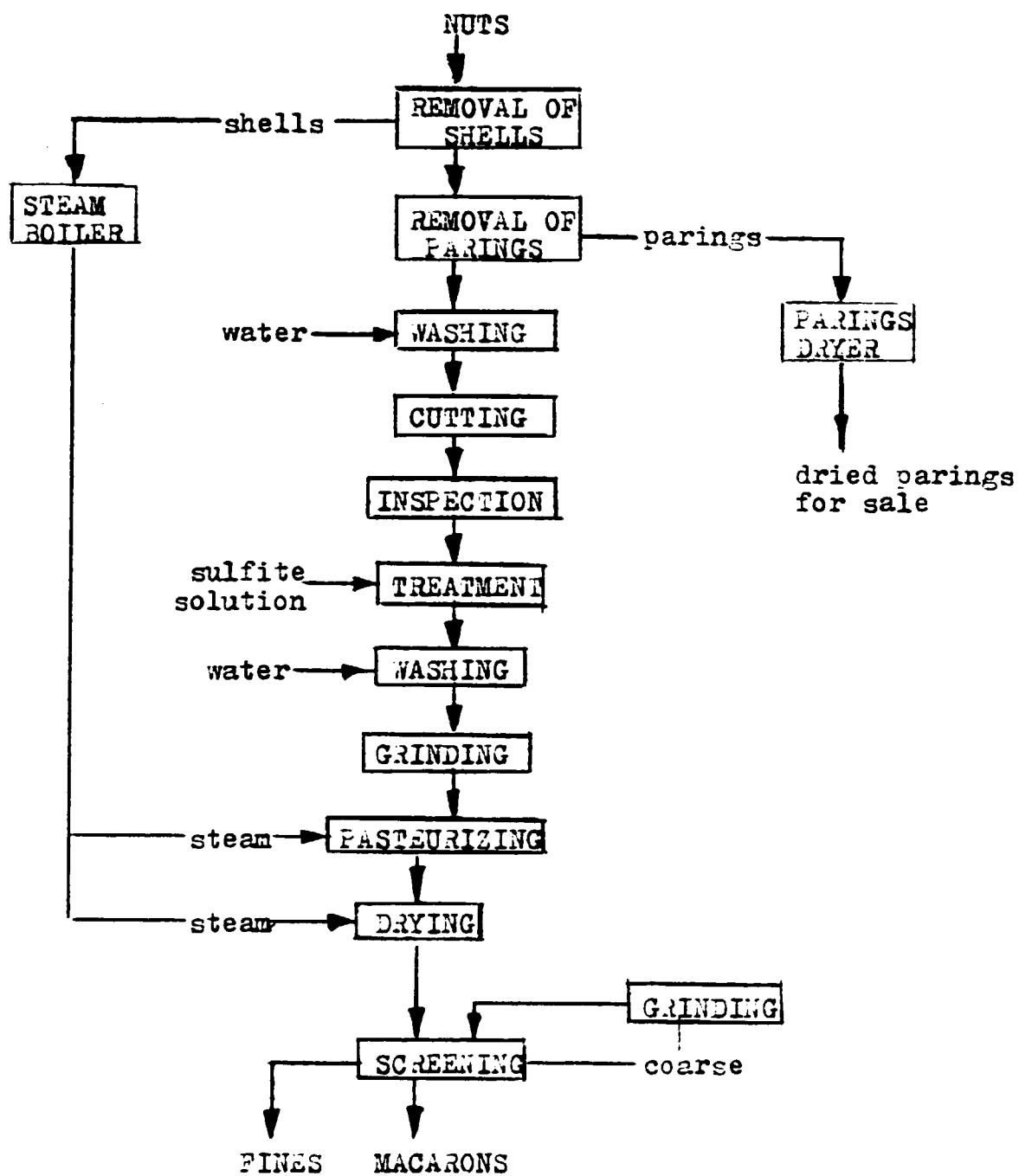
The first two years of production are intended for the local market. Starting with the third year, the production will be increased for the export market.

The estimated plant cost is \$14 million and the total investment is \$ 17.5 million, including working capital and pre-operating expenses. Based on a financial pre-feasibility study of the project, the desiccated coconut project for Buenaventura will be viable.

The proper implementation of the project will require the following:

1. Designing of the plant, including equipment, buildings, site preparation, water-treatment system and other necessary facilities;
2. Preparation of a feasibility study which will be necessary for loan application from banks;
3. Organization for implementation of the project.

A pre-operating expense budget of \$ 0.5 million has been indicated in the pre-feasibility study.



MATERIALS FLOW DIAGRAM OF A  
DESICCATED COCONUT PLANT

Financial Feasibility Profile of a Small-scale Desiccated Coconut Plant  
for Buenaventura

Estimate of project cost

1. <u>Fixed Capital Investment (\$000) Colombian</u>	
Machinery and equipment	3,200
Peshelling and paring bench	
Washing basins	
Auger cutter	
Sterilizer	
Grinder	
Dryer, semi-continuous type	
Screener	
Bagger	
Platform scales	
Plastic sealer	
Bag closer	
Parings dryer (batch-type)	
Water pump	
Steam boiler (using coconut shell fuel)	
Miscellaneous equipment	
Engineering and installation 20 per cent	640
Buildings	5,850
Site Development	1,500
Vehicles	2,600
TOTAL	13,790
Land	210
TOTAL FIXED CAPITAL INVESTMENT	14,000
2. <u>Working Capital (\$000)</u>	3,000
3 days' nut supply	
7 days' nut production	
1 week salary	
Reserve for 1 week supplies	
3. <u>Pre-operating Expenses</u>	500
TOTAL INVESTMENT	17,500
<u>Investment Services</u>	
Equity 30 per cent	5,500
Loan 70 per cent	12,000
TOTAL	17,500

<u>Financial Plan (\$000)</u>	Equity	Loan	Total
Pre-operating year (1)			
Pre-operating expenses	500	-	500
Fixed Investment	5,000	9,000	14,000
First operating year (2)			
Working capital		3,000	3,000
TOTALS	5,500	12,000	17,500

Loan Terms

Interest rate - 22 per cent on balance. Interests during grace period to be added to loan.

Repayment schedule - 10 years with 2 years grace period.  
to be paid in 8 equal installments starting with the third year.

Interests and Amortizations Schedule (\$000)

Year	Draw-down	Amortization	Interest	Principal	Balance
1	9,000	-	-	-	9,000
2	3,000		1,980	-	13,980
3		3,900	3,080	820	13,160
4		3,900	2,890	1,010	12,150
5		3,900	2,670	1,230	10,920
6		3,900	2,400	1,500	9,420
7		3,900	2,070	1,830	7,590
8		3,900	1,670	2,230	5,360
9		3,900	1,180	2,720	2,640
10		3,220	580	2,640	0

**TAXES** - 25% on net profit

Production Data

DCN production per - hour shift - 1,000 kg

Nuts requirement per 8-hour shift - 5,800 kg or roughly  
at 650 grams per nut - 9,050 manila nuts

Weight of dried parings - 290 kg per 8 hours.

Production Schedule

Year 1	No production
Year 2	150 days x 8 hours (1 shift per day)
3	260 x 8 (1 shift)
4	260 x 16 (2 shifts)
5	260 x 24 (3 shifts)



SALES REVENUES (\$000)	Year 2	Year 3	Year 4	Year 5
DCN Sales, mt	150	260	520	780
Price \$000/mt	150	150	140 <sup>x</sup>	135 <sup>x</sup>
Value \$000	22,500	39,500	72,800	105,300
Dried Farings, mt	43.5	75.4	150.8	226.2
Price \$000/mt	32	32	32	32
Value \$000	1,390	2,410	4,820	7,230
<b>TOTAL SALES \$000</b>	<b>23,890</b>	<b>41,410</b>	<b>77,620</b>	<b>112,520</b>

RAW MATERIALS COST	Year 2	Year 3	Year 4	Year 5
Nuts (000)	1,360	2,350	4,710	7,060
Price \$	12	12	12	12
Value \$000	16,320	28,200	56,520	84,720

SUPPLIES	Year 2	Year 3	Year 4	Year 5
Kraft Paper Bags with Polyeth. Liner	3,000	5,200	10,400	15,600
Price \$	65	65	65	65
Value \$000	195	338	676	1,014
Sacks for parings	870	1,508	3,016	4,524
Price \$	30	30	30	30
Value \$000	26	45	90	136
Miscellaneous supplies and chemicals \$000	150	200	250	300
<b>TOTAL SUPPLIES \$000</b>	<b>371</b>	<b>583</b>	<b>1,016</b>	<b>1,450</b>

POWER	Year 2	Year 3	Year 4	Year 5
Kilowatt-hrs.	33,600	58,240	116,480	174,720
Price \$	4	4	4	4
Value \$000	134	233	466	699

**SCHEDULE OF SALARIES AND WAGES**

Year 2

Indirect Labor

Position	Number	Rate	No. of mos. or days	Unit Annual Salary	Total An- nual Salary
Manger	1	60,000	12 mos.	720,000	720,000
Technician	1	40,000	12	480,000	480,000
Clerk	1	18,000	12	216,000	216,000
<b>TOTALS</b>	<b>3</b>			<b>\$000</b>	<b>1,416</b>

<sup>x</sup> Average unit price reduced due to exportation

**Direct Labor**

Sheller	9	500 per day	150	75,000	675,000
Parers	9	500	150	75,000	675,000
Cutter Operator	1	400	150	60,000	60,000
Washers	2	400	150	60,000	120,000
Grinder Optr	1	400	150	60,000	60,000
Dryers Optr	2	400	150	60,000	120,000
Screeener Optr	1	400	150	60,000	60,000
Baggers	2	400	150	60,000	120,000
Utilityman	2	400	150	60,000	120,000
Haulers	1	400	150	60,000	60,000
Driver-Mechanics	2	600	150	90,000	180,000
<b>TOTALS</b>	<b>32</b>			<b>\$000</b>	<b>2,250</b>

**Year 3**

**Indirect Labor**

Manager	1	60,000	12	720,000	720,000
Technician	1	40,000	12	480,000	480,000
Clerk	1	18,000	12	216,000	216,000
<b>TOTALS</b>	<b>3</b>			<b>\$000</b>	<b>1,416</b>

**Direct Labor**

Shellers	9	500	260	130,000	1,170,000
Parers	9	500	260	130,000	1,170,000
Cutter Optr	1	400	260	104,000	104,000
Washers	2	400	260	104,000	208,000
Grinder Optr	1	400	260	104,000	104,000
Dryers Optr	2	400	260	104,000	208,000
Screeener Optr	1	400	260	104,000	104,000
Baggers	2	400	260	104,000	208,000
Utilityman	2	400	260	104,000	208,000
Hauler	1	400	260	104,000	104,000
Driver-Mech.	2	600	260	156,000	312,000
<b>TOTALS</b>	<b>32</b>			<b>\$000</b>	<b>3,900</b>

**Year 4**

**Indirect Labor**

Manager	1	60,000	12	720,000	720,000
Technician	2	40,000	12	480,000	960,000
Clerk	2	18,000	12	216,000	432,000
<b>TOTALS</b>	<b>5</b>			<b>\$000</b>	<b>2,112</b>

**Direct Labor (same positions)**

Day shift-	32 workers				3,900,000
Night shift-	32 workers	+25% night differential			4,875,000
<b>TOTALS</b>	<b>64</b>			<b>\$</b>	<b>8,775</b>

Year 5

Indirect Labor

Manager	1	60,000	12	720,000	720,000
Technicians	3	40,000	12	480,000	1,440,000
Clerks	2	18,000	12	216,000	432,000
TOTALS	6			\$000	2,592

Direct Labor (same positions)

Day shift	32 workers			3,900,000
2nd shift	32	+ 25%		4,875,000
3rd shift	32	+ 25%		4,875,000
TOTALS	96			\$000 13,650

DEPRECIATION - 10% of fixed investment  
except Land cost \$000 1,379

INSURANCE- 1% of equipment and buildings \$000 123

ADMINISTRATIVE OVERHEAD \$000

Year 2 - 4 1,200  
Year 5 - 10 2,000

REPAIR AND MAINTENANCE - 5% of fixed investment  
except land cost \$000 690

HANDLING COSTS \$000

Year 2 100  
3 150  
4 200  
5 - 10 250

AMORTIZATION OF PRE-OPERATING EXPENSES

10% of pre-operating expenses \$000 50

MISCELLANEOUS EXPENSES - \$100,000 per year

DESICCATED COCONUT PLANT  
PROJECTED INCOME STATEMENT      C\$000

	1	2	3	4	5	6	7	8	9	10
<b>SALES REVENUES</b>										
DCN Sales		22,500	39,000	72,800	105,300	105,300	105,300	105,300	105,300	105,300
Parings Sales		1,390	2,410	4,820	7,230	7,230	7,230	7,230	7,230	7,230
<b>TOTAL SALES</b>		23,890	41,410	77,620	112,530	112,530	112,530	112,530	112,530	112,530
<b>VARIABLE COSTS</b>										
Raw Materials		16,320	28,200	56,520	84,720	84,720	84,720	84,720	84,720	84,720
Direct Labor		2,250	3,900	8,775	13,650	13,650	13,650	13,650	13,650	13,650
Supplies		371	583	1,016	1,450	1,450	1,450	1,450	1,450	1,450
Power		134	233	466	699	699	699	699	699	699
Handling		100	150	200	250	250	250	250	250	250
<b>TOTAL VARIABLE COSTS</b>		19,175	33,066	66,977	100,769	100,769	100,769	100,769	100,769	100,769
<b>FIXED COSTS</b>										
Indirect Labor		1,416	1,416	2,112	2,592	2,592	2,592	2,592	2,592	2,592
Amort. of Pre-Optg Expenses		50	50	50	50	50	50	50	50	50
Depreciation		1,379	1,379	1,379	1,379	1,379	1,379	1,379	1,379	1,379
Insurance		123	123	123	123	123	123	123	123	123
Repair and Maintenance		690	690	690	690	690	690	690	690	690
Administrative Overhead		1,200	1,200	1,200	2,000	2,000	2,000	2,000	2,000	2,000
Miscellaneous Expenses		100	100	100	100	100	100	100	100	100
<b>TOTAL FIXED COSTS</b>		4,958	4,958	4,958	5,758	5,758	5,758	5,758	5,758	5,758
<b>TOTAL COSTS</b>		24,133	38,024	71,937	106,527	106,527	106,527	106,527	106,527	106,527
<b>GROSS PROFIT (LOSS)</b>		(-243)	3,386	5,685	6,003	6,003	6,003	6,003	6,003	6,003
<b>INTERESTS</b>		1,980	3,080	2,980	2,670	2,400	2,070	1,670	1,180	580
<b>PROFIT BEFORE TAX</b>		(-2,233)	306	2,795	3,330	3,603	3,933	4,333	4,823	5,423
<b>INCOME TAX</b>			77	698	833	901	983	1,083	1,206	1,356
<b>NET PROFIT (LOSS)</b>		(-2,233)	229	2,097	2,500	2,702	2,950	3,250	3,617	4,067

**DESICCATED COCONUT PLANT  
PROJECTED CASH FLOW STATEMENT C\$000**

	1	2	3	4	5	6	7	8	9	10
<b>SOURCES OF INCOME</b>										
Net Income		(-2,233)	229	2,097	2,500	2,702	2,950	3,250	3,617	4,067
Add Back:										
Depreciation		1,379	1,379	1,379	1,379	1,379	1,379	1,379	1,379	1,379
Interest		1,980	3,080	2,890	2,670	2,400	2,070	1,670	1,180	580
<b>TOTAL INTERNAL RESOURCES</b>		<b>1,126</b>	<b>4,688</b>	<b>6,366</b>	<b>6,549</b>	<b>6,481</b>	<b>6,399</b>	<b>6,299</b>	<b>6,176</b>	<b>6,026</b>
<b>BORROWINGS</b>										
Loan	9,000	3,000								
Equity	5,500									
<b>TOTAL CASH CONTRIBUTION</b>	<b>14,500</b>	<b>3,000</b>								
<b>TOTAL FUNDS</b>	<b>14,500</b>	<b>4,126</b>	<b>4,688</b>	<b>6,366</b>	<b>6,549</b>	<b>6,481</b>	<b>6,399</b>	<b>6,299</b>	<b>6,176</b>	<b>6,026</b>
<b>APPLICATION OF FUNDS</b>										
Pre-Operating Expenses	500									
Purchase of Plant	14,000									
Working Capital		3,000								
Amortization of Loan			3,900	3,900	3,900	3,900	3,900	3,900	3,900	3,900
<b>TOTAL DISBURSEMENTS</b>	<b>14,500</b>	<b>3,000</b>	<b>3,900</b>	<b>3,900</b>	<b>3,900</b>	<b>3,900</b>	<b>3,900</b>	<b>3,900</b>	<b>3,900</b>	<b>3,900</b>
<b>CASH INFLOW / OUTFLOW</b>	<b>0</b>	<b>1,126</b>	<b>788</b>	<b>2,466</b>	<b>2,649</b>	<b>2,581</b>	<b>2,499</b>	<b>2,399</b>	<b>2,276</b>	<b>2,806</b>
<b>CASH: BEGINNING</b>			1,126	1,914	4,830	7,479	10,060	12,559	14,958	17,234
<b>ENDING</b>		1,126	1,914	4,380	7,479	10,060	12,559	14,958	17,234	20,040
<b>DEBT SERVICE RATIO</b>			1.2	1.6	1.6	1.6	1.6	1.6	1.6	1.5
<b>DISCOUNTED CASH FLOW RATE OF RETURN ON INVESTMENT</b>										- 26.0%

ANNEX F - AN INTEGRATED COCONUT PROCESSING PROJECT FOR ISLA DE  
SAN ANDRES, COLOMBIA (1983)

Description of project

The integrated coconut processing project proposes to process the estimated 8.5 million nuts surplus in San Andres into three high-value products, namely: canned coconut cream, sweetened desiccated coconut (SDC) and refined oil. Copra meal, a by-product from oil milling will also be produced.

The integrated plant shall consist of three sections: the coconut cream section, the desiccated coconut section and the oil section (copra making, oil mill and refinery). The plant shall have a total capacity of 37,500 nuts (30 tons) per day or about 8.5 million nuts per year. Each of the processing sections shall have equal capacities of about 12,500 nuts per day of eight hours operation. If operated on 24 hours or 3 shifts, any of the sections can process 37,500 nuts per day. The flexible operation is designed to be able to meet varying demands of the products.

Since the raw materials (coconuts) are now available, the project is ready for implementation. As shown by the following prefeasibility study, the project is viable.

Description of products

Canned coconut cream is almost similar to coconut milk extracted by hand, however, the canned cream will contain less water and more cream can be produced per nut as extraction in the plant is done by machine. The product will be cheaper and more convenient for the city consumers.

Sweetened desiccated coconut (SDC) is dried, white coconut meat in granular or flake form. The product will be produced under sanitary conditions to meet food processing requirements. The granules or flakes will be coated with sugar to give a delicious sweet taste and coconut flavour.

The refined coconut oil will be almost odourless, tasteless, and with a very light yellow colour. Like the other refined oils in the market, it is used in cooking and other food preparations. Pure, refined coconut oil is extensively used in the Philippines, Indonesia, Malaysia and other Asian and Pacific countries.

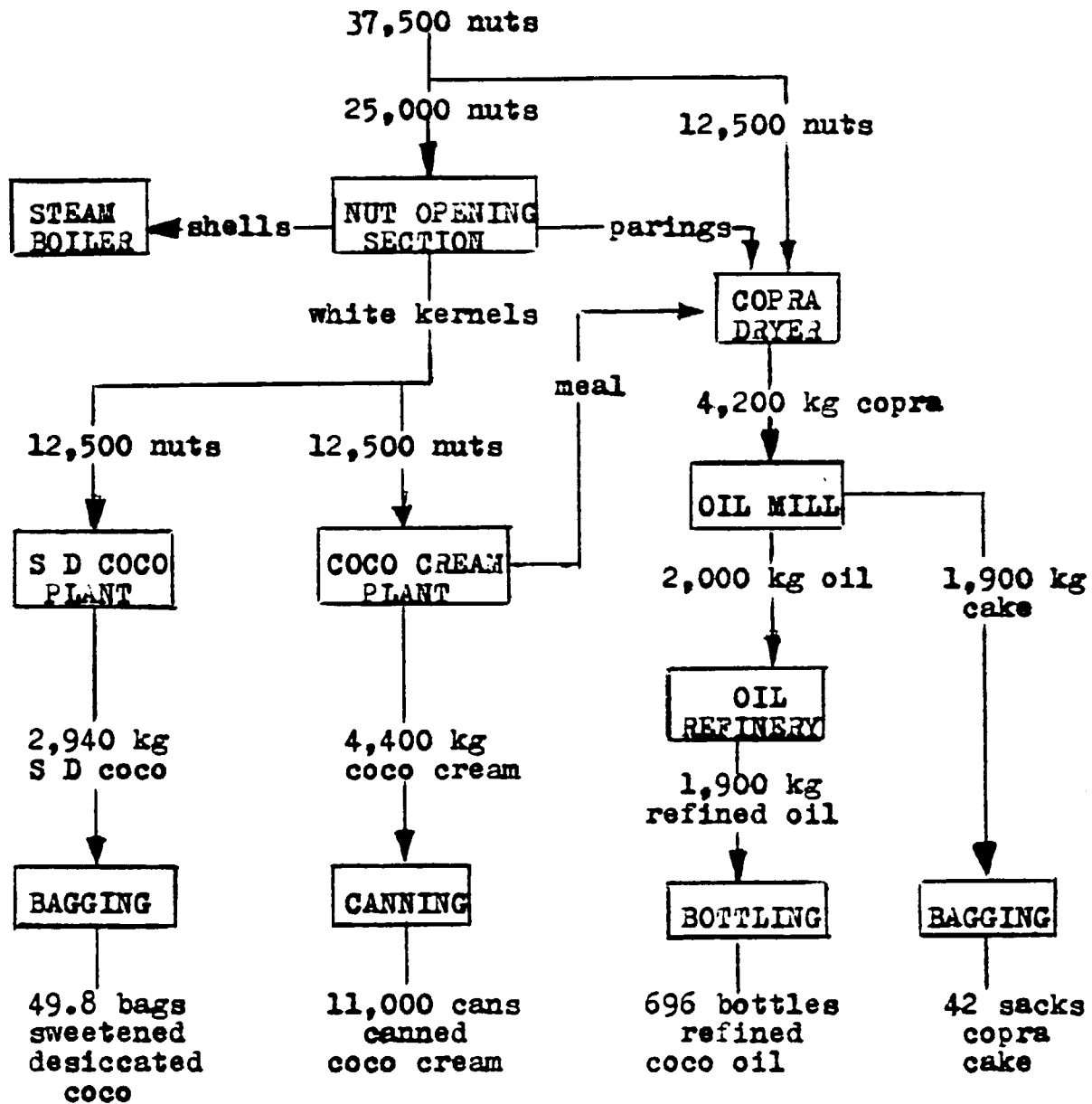
The copra meal by-product is light-brown granular solid. It contains about 18 per cent protein, 8 per cent oil, 45 per cent carbohydrates and 12 per cent fiber. It is used extensively in cattle feeds in Europe and Australia. It is also used in other animal feeds formulations.

Market for the products

The production of the San Andres plant is primarily intended for the mainland Colombia market. The coconut cream and refined oil production will not be sufficient to meet the existing demand for the products. The copra meal has also a ready market in the cattle industry of the country. The sweetened desiccated coconut market still has to be developed, but the product can be exported to the United States and Europe where there is a ready market.

Other related projects

The integrated coconut project will be the base for the development of by-products utilization industries, such as coconut fiber products and coconut shell charcoal.



MATERIALS FLOW DIAGRAM  
INTEGRATED COCONUT PROCESSING PLANT



PPE-FEASIBILITY STUDY OF THE SAN ANDRES INTEGRATED COCONUT PROCESSING PROJECT

Capacity: 37,500 nuts per day - 8.25 million per year.

Products: Sweetened Desiccated Coconut (SDC)

Canned Coconut Cream

Refined Coconut Oil

Copra Meal (Cattle Feed).

Estimate Project Cost (\$ 000).

Machinery and equipment		43,000
Cream Plant	18,500	
SDC Plant	3,600	
Oil Mill	7,400	
Refinery	5,200	
Copra Plant	800	
Steam Boiler	6,500	
Laboratory and Misc.	1,200	
Engineering and Installation		7,500
Installed Cost and Equipment		50,700
Buildings		25,000
Vehicles		3,300
Site Preparation		4,000
Sub-Total		83,000
Land		1,000
Project Management		2,000
Total Fixed Capital Investment		86,000
Pre-operating expenses		1,000
Working capital		4,000
Estimated Total Project Cost		91,000

Investment Services

Equity	\$ 28,000,000
Loan	\$ 63,000,000
Total	\$ 91,000,000

Loan Terms

Interest - 22 per cent on unpaid balance. Interest during grace period to be added to loan.

Repayment period - ten years with two years grace period. Eight equal annual installments starting with the fourth year.

<u>Financial Plan (\$000)</u>	<u>Equity</u>	<u>Loan</u>	<u>Total</u>
Year 1 - pre-operating expenses	1,000	-	1,000
Year 2 - establishment cost	25,800	60,200	86,000
Year 3 - working capital	1,200	2,800	4,000
Totals	28,000	63,000	91,000

Interests and Amortizations Schedule

<u>Year</u>	<u>DRAWDOWN</u>	<u>AMORTIZATION</u>	<u>INTEREST</u>	<u>PRINCIPAL</u>	<u>BALANCE</u>
1	-	-	-	-	-
2	60,200	-	-	-	60,200
3	2,800	-	13,240	-	76,240
4	-	21,000	16,770	4,230	72,010
5	-	21,000	15,840	5,160	66,850
6	-	21,000	14,710	6,290	60,560
7	-	21,000	13,320	7,680	52,880
8	-	21,000	11,630	9,370	43,510
9	-	21,000	9,570	11,430	32,080
10	-	21,000	7,060	13,940	18,140
11	-	22,130	3,990	18,140	0

Taxes

Income tax - 25 per cent of net profit.

Production data (8-hour operation)

Nuts required - 37,500 based on average weight of 800 grams.

Production:

Sweetened Desiccated Coconut (SDC) - 2,490 kg - 49.8 bags at 50 kg.

Canned Coconut Cream - 4,400 kg - 11,000 cans at 400 cc.

Refined Coconut Oil - 1,900 kg - 696 bottles at 300 cc.

Copra Meal - 2,100 kg - 42 sacks at 50 kg.

Production Schedule

Years 1 - 2	No production
Year 3	110 days at 8 hours (1 shift)
Year 4 - 11	220 days at 8 hours (1 shift)

Sales Revenues (\$000)

	Year 3	Year 4
SDC Sales, Bags	5,478	10,956
Price \$	10,000	10,000
Value \$000	54,780	109,560
Cream Sales, Cans (000)	1,210	2,420
Price \$	60	60
Value \$000	72,600	145,200
Refined Oil Sales, Bottles	76,560	153,120
Price \$	320	320
Value \$000	24,500	49,000
Copra Meal Sales (Sacks)	4,620	9,240
Price \$	900	900
Value \$000	4,158	8,316
TOTAL SALES \$000	156,038	312,076

Raw Materials (\$000)

Nuts (without husk) (000)	4,125	8,250
Price \$	15	15
Value \$000	61,875	123,750
Refined Sugar, MT	195	390
Price	37,700	37,700
Value \$000	7,350	14,700
TOTAL RAW MATERIAL COST	69,225	138,450

SUPPLIES:

Caustic Soda Solids MT	1.95	3.9
Price \$000	60	60
Value \$000	117	234
Bleaching Clay MT	0.7	1.4
Price \$000	900	900
Value	810	1,620
Industrial Salt MT	1.25	2.5
Price \$000	19	19
Value	24	48
Tin Cans, 400cc (000)	1,210	2,420
Price \$	29	29
Value \$000	35,090	70,180
Plastic Bottles, 3000 cc	65,010	130,020
Price \$	37	37
Value \$000	2,405	4,810
Cartons for Tins	50,420	100,840
Price \$	30	30
Value \$000	1,513	3,026
Cartons for Bottles	10,840	21,680
Price \$	60	60
Value \$000	650	1,300
Kraft Bags w/Liner	5,478	10,956
Price \$	90	90
Value \$000	493	986
Misc. Supplies \$000	1,100	2,200
TOTAL COST OF SUPPLIES	45,990	91,980

Power Kw-hr	79,200	158,400
Price \$	8	8
Value \$000	634	1,268

Water cu.m.	20,570	41,140
Price \$	32	32
Value \$000	658	1,316

SCHEDULE OF SALARIES AND WAGES

Year 3

Indirect Labor

Position	Number	Rate	No. of mos. or Days	Unit Annual Salary	Annual Salary
Manager	1	70,000	12 mos.	840,000	840,000
Production Supervisor	1	40,000	12	480,000	480,000
Chemist	1	40,000	12	480,000	480,000
Accountant	1	40,000	12	480,000	480,000
Office Head	1	40,000	12	480,000	480,000
Clerks	3	20,000	12	240,000	240,000
Warehouseman	1	20,000	12	240,000	240,000
Utilityman	1	18,000	12	216,000	216,000
TOTALS	10			\$000	3,936

Indirect Labor

Opening Section	90	500	110 days	55,000	4,950,000
Cream Section	16	500	110	55,000	880,000
SDC Section	8	500	110	55,000	440,000
Oil Mill	4	500	110	55,000	220,000
Refinery	4	500	110	55,000	220,000
Warehouse	4	550	110	55,000	220,000
Copra Section	9	550	110	55,000	495,000
Boiler	2	550	110	55,000	110,000
Maintenance	2	550	110	55,000	110,000
TOTALS	139			\$000	7,645

YEARS 4-11

Indirect Labor - Same as year 3 \$000 3,936

Direct Labor

Positions - Same as Year 3

No. of Workers - Same as year 3

No. of days of work - 220 days

Total Annual Wages 7,645 x 2 \$000 15,290

DEPRECIATION: \$000	
10% of \$83,000,000 per year	830
INSURANCE: \$000	
1% of \$83,000,000 per year	83
REPAIR AND MAINTENANCE:	
5% of \$83,000,000 per year	415
HANDLING COSTS \$000 - 1% of Sales	
Year 3	1,570
4-11 per year	3,140
AMORTIZATION OF PRE-OPERATING EXPENSES \$000	
10% of \$1,000,000 per year	100
ADMINISTRATIVE OVERHEAD \$000 per year	2,400
MISCELLANEOUS FIXED COSTS per year \$000	1,000

NOTE: ALL COSTS IN THIS STUDY ARE FOR PRE-FEASIBILITY STUDY ONLY. A PRE-INVESTMENT FEASIBILITY STUDY WILL REQUIRE ACTUAL QUOTATIONS FROM SUPPLIERS AND BUYERS.

**SAN ANDRES INTEGRATED COCONUT PROCESSING PROJECT**  
**PROJECTED INCOME STATEMENT      C\$000**

	1	2	3	4	5	6	7	8	9	10	11
<b>SALES REVENUES</b>											
Cream Sales			72,600	145,200	145,200	145,200	145,200	145,200	145,200	145,200	145,200
SDC Sales			54,780	109,560	109,560	109,560	109,560	109,560	109,560	109,560	109,560
Refined Oil Sales			24,500	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000
Copra Meal Sales			4,158	8,316	8,316	8,316	8,316	8,316	8,316	8,316	8,316
<b>TOTAL SALES</b>			<b>156,038</b>	<b>312,076</b>	<b>312,076</b>	<b>312,076</b>	<b>312,076</b>	<b>312,076</b>	<b>312,076</b>	<b>312,076</b>	<b>312,076</b>
<b>VARIABLE COSTS</b>											
Raw Materials			69,225	138,450	138,450	138,450	138,450	138,450	138,450	138,450	138,450
Direct Labor			7,649	15,290	15,290	15,290	15,290	15,290	15,290	15,290	15,290
Supplies			45,990	91,980	91,980	91,980	91,980	91,980	91,980	91,980	91,980
Power			634	1,268	1,268	1,268	1,268	1,268	1,268	1,268	1,268
Water			658	1,316	1,316	1,316	1,316	1,316	1,316	1,316	1,316
Handling			1,570	3,140	3,140	3,140	3,140	3,140	3,140	3,140	3,140
<b>TOTAL VARIABLE COSTS</b>			<b>125,722</b>	<b>251,444</b>	<b>251,444</b>	<b>251,444</b>	<b>251,444</b>	<b>251,444</b>	<b>251,444</b>	<b>251,444</b>	<b>251,444</b>
<b>FIXED COSTS</b>											
Indirect Labor			3,936	3,936	3,936	3,936	3,936	3,936	3,936	3,936	3,936
Amort. of Pre-Optg Expenses			100	100	100	100	100	100	100	100	100
Depreciation			830	830	830	830	830	830	830	830	830
Insurance			83	83	83	83	83	83	83	83	83
Repair and Maintenance			415	415	415	415	415	415	415	415	415
Administrative Overhead			2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Miscellaneous Fixed Costs			1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
<b>TOTAL FIXED COSTS</b>			<b>8,764</b>	<b>8,764</b>	<b>8,764</b>	<b>8,764</b>	<b>8,764</b>	<b>8,764</b>	<b>8,764</b>	<b>8,764</b>	<b>8,764</b>
<b>TOTAL COSTS</b>			<b>134,486</b>	<b>260,208</b>	<b>260,208</b>	<b>260,208</b>	<b>260,208</b>	<b>260,208</b>	<b>260,208</b>	<b>260,208</b>	<b>260,208</b>
<b>GROSS PROFIT</b>			<b>21,552</b>	<b>51,868</b>	<b>51,868</b>	<b>51,868</b>	<b>51,868</b>	<b>51,868</b>	<b>51,868</b>	<b>51,868</b>	<b>51,868</b>
<b>INTERESTS</b>			<b>13,240</b>	<b>16,770</b>	<b>15,840</b>	<b>14,710</b>	<b>13,320</b>	<b>11,630</b>	<b>9,570</b>	<b>7,060</b>	<b>3,990</b>
<b>PROFIT BEFORE TAX</b>			<b>8,312</b>	<b>35,098</b>	<b>36,028</b>	<b>37,158</b>	<b>38,548</b>	<b>40,238</b>	<b>42,298</b>	<b>44,808</b>	<b>47,878</b>
<b>INCOME TAX 25%</b>			<b>2,078</b>	<b>8,775</b>	<b>9,007</b>	<b>9,290</b>	<b>9,637</b>	<b>10,060</b>	<b>10,575</b>	<b>11,202</b>	<b>11,970</b>
<b>NET PROFIT</b>			<b>6,234</b>	<b>26,323</b>	<b>27,021</b>	<b>27,868</b>	<b>28,911</b>	<b>30,178</b>	<b>31,723</b>	<b>33,606</b>	<b>35,909</b>





ANNEX G - A PRE-FEASIBILITY STUDY OF A SMALL-SCALE OIL MILL AND REFINERY  
FOR TOMACO

Description of project

The proposed oil mill and refinery shall be located beside the Palm Oil Pilot Plant of the ICA El Mira Research Station in Tumaco. The plant consists of two sections: the oil mill section and the refinery section. The oil mill shall have a capacity of at least 10 tons of copra per 24 hours operation to produce 5.9 tons of crude coconut oil and 3.3 tons of copra meal. The mill equipment consist of a high-pressure oil expeller with cookers, copra grinder, oil screener, filter press, oil pumps, set of conveyors, oil tank and bins. The refinery can process the 5.9 tons of crude oil into 5.6 tons of refined oil. The refined oil will be placed in 3,000-cc plastic containers and packed in 6-bottle carton boxes. The refinery equipment consist of: a neutralizer-bleacher, filter press, bleched oil holding tank, de-odourizer-cooler, vacuum system, brine and caustic tanks, refined oil storage tank, set of pumps and a water cooling tower. The plant building shall have about 1,000 sq.m. of floor area. Steam, power and water shall be supplied from the existing facilities of the palm oil plant, but will provide coconut shell for boiler fuel. Further, during the initial years of operation, the plant will also share with the services of personnel of the palm oil plant. The sharing of facilities and personnel should improve the viability of both plants.

Rationale of the project

Tumaco is the main commercial center in the southern end of the coconut producing Pacific coast region. About 120 kilometers north of Tumaco is Guapi, another coconut-producing and commercial town. While there is a net shortage of coconut supply in the whole Pacific region, there are actual local and seasonal surpluses in these areas due to marketing and transport problems. The increasing coconut production from rehabilitated coconut plantations damaged by "red ring" and new coconut areas will aggravate the coconut surplus problem and may discourage further planting of coconuts.

The feasible solution to the problem would be to convert the nut surplus into copra, which in turn will be sold to Lloreda Grasas in Cali. However, due to the limited and uncertain quantity of copra, it is not feasible for large operations like Lloreda Grasas, to convert operation for copra processing. The only alternative then, is to put-up a small-scale plant, as proposed, to process the still limited copra production in the region.

#### Supply of copra

During the first year of operation, the plant will need about 1,100 tons of copra, requiring about 7 million nuts. During the third year of operation, the plant is expected to achieve its maximum production capacity of 2,200 tons of copra. This will require about 14 million nuts, about 20 per cent of the estimated production in the region. The area required to supply the plant's requirement is about 1,500 hectares. The 4,000 hectares of rehabilitated areas should be able to cover the requirement.

#### Market for products

The plant shall have a maximum production of 1,230,000 kg of refined oil and 840 tons of copra meal per year. At a per capita consumption of 7 kg per person per year, the plant will serve the refined oil needs of about 180,000 persons. The logical market for the refined oil will be the coastal towns and villages up to Buenaventura. Boats distributing the refined oil will also pick-up copra to be delivered to the plant on the return trip. Copra meal is used in cattle feeds and there should be no problem marketing the product.

#### Financing the project

Due to the importance of the project and its lack of economies of scale, it is proposed that a special loan with an interest rate of not more than 18 per cent be created to finance the oil mill and refinery. This is the highest interest rate at which the project is viable.

Financial Feasibility Evaluation - Small-scale Oil Mill and Refinery  
for Tumaco

Daily capacity (24 hours operation - 3 shifts)

Milling	-	10 metric tons copra
		5.9 metric tons coconut oil
		3.8 metric tons copra meal
Refining	-	5.9 metric tons coconut oil
		5.6 metric tons refined oil

Annual capacity (220 days per year operation)

Milling	-	2,200 metric tons copra
		1,300 metric tons coconut oil
		840 metric tons copra meal
Refining	-	1,300 metric tons coconut oil
		1,230 metric tons refined oil

Proposed production schedule

Year 1	No production (construction year)
2	1st year of operations - 110 days (50 %)
3	2nd year of operations - 165 days (75 %)
4	3rd year of operation, onward, 220 days (100 %)

1. Estimate of project cost (\$000)

Machinery and equipment	13,400
Oil Mill	7,700
Refinery	5,200
Miscellaneous equipment	500
Engineering and installation	2,000
Installed cost of equipment	15,400
Buildings	11,000
Site development	1,000
Sub-total:	27,400

Project Management	1,200
Total Fixed Capital Investment	28,600
Pre-operating expenses	1,000
Working capital	3,000
Estimated Total Project Cost	32,600

2. Investment services

Equity	9,600
Loan	23,000
Total:	32,600

3. Loan terms

Interest - Since the project is a pilot project, a special loan with 18 per cent interest is proposed. This is the highest interest viable for the project.

Repayment period - 12 years with 3 years grace period. Nine equal annual installments starting with year 4.

4. Financial plan

	Equity	Loan	Total
Year 1			
Pre-operating expenses	1,000	-	1,000
Establishment cost	8,600	20,000	28,600
Total:	9,600	20,000	29,600
Year 2			
Working capital	-	3,000	3,000
Totals:	9,600	23,000	32,600

5. Taxes - Tax exemption is proposed (pilot project)

6. Interests and amortizations schedule

Year	Drawdown	Amortization	Interest	Principal	Balance
1	20,000	-	-	-	20,000
2	3,000	-	3,600	-	26,600
3	-	-	4,800	-	31,400
4	-	7,400	5,700	1,700	29,700
5	-	7,400	5,400	2,000	27,700
6	-	7,400	5,000	2,400	25,300
7	-	7,400	4,600	2,800	22,500
8	-	7,400	4,000	3,400	19,100
9	-	7,400	3,400	4,000	15,100
10	-	7,400	2,700	4,700	10,400
11	-	7,400	1,900	5,500	4,900
12	-	5,800	900	4,900	0

7. Production details

1 day = 24 hours: 1 year = 220 days.

Copra requirement - 10 MT per day 2.200 MT per year

Refined oil - 1,230<sup>MT</sup> per year

No. of bottles (3,000 cc) à 2.73 kg per bottle - 451,000

Copra meal - 840 MT per year

No. of bags à 50 kg per bag - 16,800

8. Sales revenues (\$000)

	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Refined oil, bottles	225,500	338,250	451,000
Price \$	345	345	345
Value, \$000	77,800	116,700	155,600
Copra meal, bags	8,400	12,600	16,800
Price, \$	1,000	1,000	1,000
Value, \$000	8,400	12,600	16,800

9. Raw materials

Copra, MT	1,100	1,650	2,200
Price, \$	55,000	55,000	55,000
Value, \$ 000	60,500	90,750	121,000

10. Supplies

Caustic soda, MT	4.4	6.6	8.8
Price, \$000	60	60	60
Value, \$000	264	396	528
Bleaching clay, MT	2	3	4
Price, \$000	900	900	900
Value, \$00	1,800	1,800	1,800
Industrial salt, MT	3.5	5.25	7.0
Price, \$000	24	24	24
Value, \$000	84	126	168
Plastic bottles (3,000 cc)	225,500	338,250	451,000
Price, \$	37	37	37
Value, \$000	8,344	12,516	16,638

Carton boxes (6 bottles)	37,100	55,650	74,200
Price, \$	60	60	60
Value, \$000	2,226	3,339	4,452
Filter cloth, yards	330	495	660
Price, \$	800	800	800
Value, \$000	264	396	528
Miscellaneous supplies \$000	500	750	1,000
Total supplies \$000	13,480	20,220	26,960
11. <u>Power. Kw-hr</u>	81,400	122,100	162,800
Price, \$	8	8	8
Value, \$000	650	980	1,300
12. <u>Water. cu.m.</u>	48,400	72,600	96,800
Price, \$	16	16	16
Value, \$000	770	1,160	1,540
13. <u>Fuel (shells). MT</u>	330	495	660
Price, \$	1,500	1,500	1,500
Value, \$000	500	750	1,000

14. Salaries and wages

<u>Year 2</u>						
<u>Position</u>	<u>No.</u>	<u>Rate</u>	<u>No. of days or months</u>	<u>Annual Salary</u>	<u>Total Salary</u>	
<u>Indirect Labour</u>						
Manager	1	60,000	12	720,000	720,000	
Technician	1	40,000	12	480,000	480,000	
Clerk	1	18,000	12	216,000	216,000	
Utility-man	1	18,000	12	216,000	216,000	
Total	4					1,630,000
<u>Direct Labour</u>						
Foreman	3	800	110	88,000	264,000	
Factory workers	15	500	110	55,000	825,000	
Boiler operator	3	500	110	55,000	165,000	
Mechanic	1	600	110	66,000	66,000	
Utility-men	3	400	110	44,000	132,000	
Total	25					1,452,000
<u>Year 3</u>						
<u>Indirect Labour (12 months)</u>						1,630,000
<u>Direct Labour (165 days)</u>						2,178,000

Year 4

Indirect Labour (12 months)		1,630,000
Direct Labour (220 days)		2,904,000
15. <u>Depreciation</u> - 10 per cent of 27,400 (\$000)		2,740
16. <u>Insurance</u> - 1 per cent of 27,400 (\$000)		270
17. <u>Repair and maintenance</u> 5 per cent of 27,400 (\$000)		1,370
18. <u>Handling costs</u> - 1 per cent of sales. (\$000)		
Year 2	Sales 86,200	860
Year 3	129,000	1,290
Year 4	172,400	1,720
19. <u>Amortization of pre-operating expenses</u>		
10 per cent of \$1,000,000 (\$000)		100
20. <u>Administrative overhead</u> , per year. (\$000)		1,000
21. Miscellaneous costs, (\$000)		500





SMALL-SCALE OIL MILL AND REFINERY FOR TURKEY (1983)

PROJECTED INCOME COMPONENT (C1000)	1	2	3	4	5	6	7	8	9	10	11	12
<b>NET REVENUES</b>												
Refined Oil Sales	77,800	115,600	132,600	152,600	172,600	192,600	212,600	232,600	252,600	272,600	292,600	312,600
By-Product Sales	3,400	14,800	16,800	18,800	20,800	22,800	24,800	26,800	28,800	30,800	32,800	34,800
<b>TOTAL SALES</b>	81,200	130,400	149,400	171,400	193,400	215,400	237,400	259,400	281,400	303,400	325,400	347,400
<b>OPERATING COSTS</b>												
Raw Materials (cont.)	60,500	91,750	121,000	152,000	182,000	212,000	242,000	272,000	302,000	332,000	362,000	392,000
Direct Labor	1,450	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
Supplies	11,480	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220
Overhead	650	650	650	650	650	650	650	650	650	650	650	650
Water	770	770	770	770	770	770	770	770	770	770	770	770
Fuel	500	500	500	500	500	500	500	500	500	500	500	500
Handling Costs	860	860	860	860	860	860	860	860	860	860	860	860
<b>TOTAL OPERATING COSTS</b>	70,310	102,370	132,530	160,420	188,320	216,320	244,320	272,320	300,320	328,320	356,320	384,320
<b>STAFF COSTS</b>												
Direct Labor	1,630	1,630	1,630	1,630	1,630	1,630	1,630	1,630	1,630	1,630	1,630	1,630
Staff Expenses	300	300	300	300	300	300	300	300	300	300	300	300
<b>Repair and Maintenance</b>												
Perpetual	1,370	1,370	1,370	1,370	1,370	1,370	1,370	1,370	1,370	1,370	1,370	1,370
Perpetual	2,740	2,740	2,740	2,740	2,740	2,740	2,740	2,740	2,740	2,740	2,740	2,740
Insurance	270	270	270	270	270	270	270	270	270	270	270	270
<b>Administrative Overhead</b>												
Perpetual	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Perpetual	500	500	500	500	500	500	500	500	500	500	500	500
<b>TOTAL FIXED COSTS</b>	7,610	7,610	7,610	7,610	7,610	7,610	7,610	7,610	7,610	7,610	7,610	7,610
<b>TOTAL COSTS</b>	85,820	124,940	144,940	168,030	195,930	223,930	251,930	279,930	307,930	335,930	363,930	391,930
<b>PROFIT (LOSS)</b>	380	4,360	4,360	8,370	8,370	8,370	8,370	8,370	8,370	8,370	8,370	8,370
<b>INTEREST</b>	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600
<b>NET PROFIT (LOSS)</b>	(3,220)	(1,240)	(1,240)	3,370	3,370	3,370	3,370	3,370	3,370	3,370	3,370	3,370

PERSON WHO ATTENDED THE COCONUT INDUSTRY STUDY GROUP MEETINGS

1. Dario Bustamante Roldan Director Proyecto OPSA-FAO
2. Jose Vallejo Gomez Jefe de OPSA, Ministerio de Agricultura
3. Jose Rubio Ayala OPSA, Grupo Estudios Agricola
4. Jorge Zamudio Avellaneda Technico OPSA, Ministerio de Agricultura
5. Guillermo Vallejo E. ICA Coordinador de Programa
6. Manuel Torregrosa ICA
7. Cayetano Marsiglia Salas FEDECOCOS, Presedente
8. Stella Estrada Lodoño PROEXPO - Promotor Artesanias
9. Anzel Lopez Forero PROEXPO - Promotor Agricola
10. Alvaro Archbold PROEXPO
11. Carmen Cecilia Silva D. CVC Plan Buenaventura, Promocion Industrial
12. Francisco Carrillo b. Banco Ganadero, Profesional Fomento
13. Jorge Tovar Banco Ganadero
14. Francisco Javier Zapata INDUCOCO, Gerente
15. Gildardo Zapata INDUCOCO
16. Hector Hernandez INDUCOCO
17. Alicia Romero DNP-CIP Tecnico
18. Jose Luis Pulido FAO, Oficial de Programa
19. Jean-Luis Serre ONUDI Consultante
20. Geert Dancet ONUDI, Oficial de Programa
21. P. C. Catanaoan UNIDO Expert

