OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

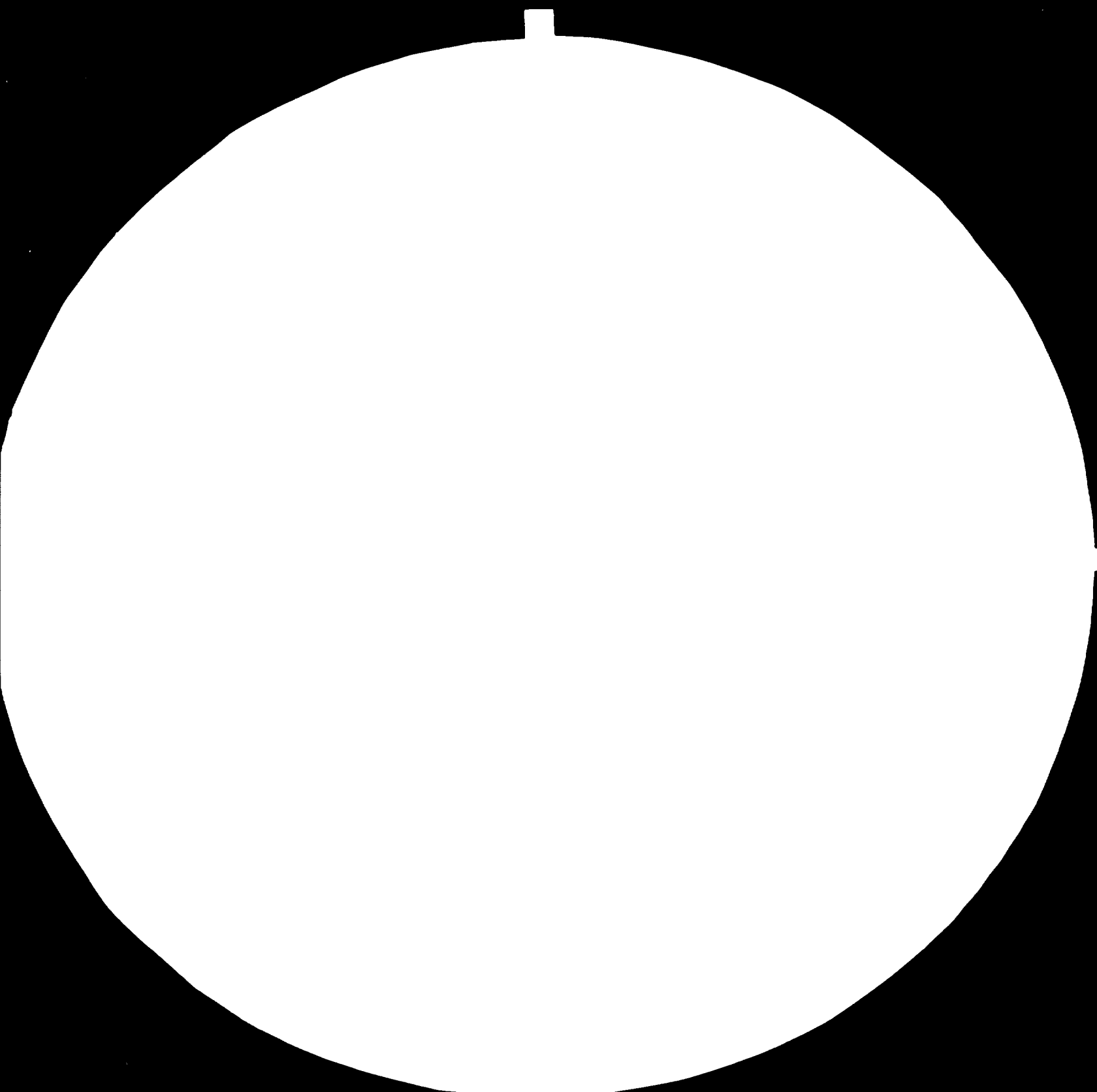
FAIR USE POLICY

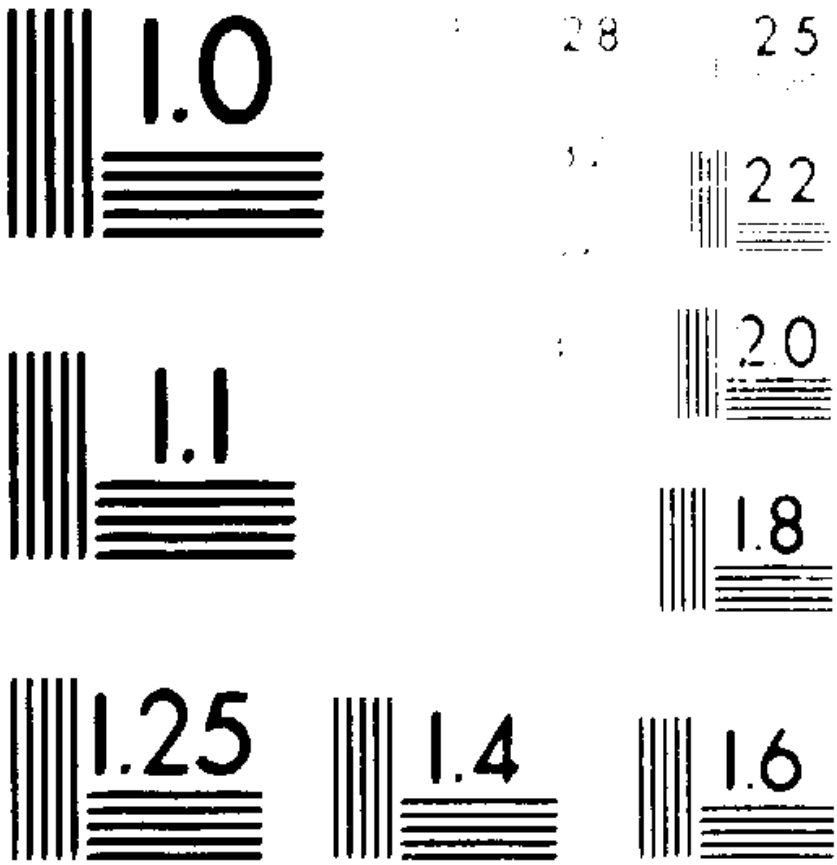
CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org




1.0
2.8
2.5
2.2
1.1
2.0
1.8
1.25
1.4
1.6

13567

Distr.
RESTRICTED

UNIDO/IC/R.118
5 April 1984

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

ENGLISH

EVALUATION OF THE COCONUT INDUSTRY IN SAINT LUCIA*.

US/GLO/80/005

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

*This document has been reproduced without formal editing

V.84-84681

ABSTRACT

Title of project:	Evaluations and Recommendations for the Coconut Industry in Saint Lucia - a special report under US/GLO/80/005/11-01
Duty station:	Castries, Saint Lucia
Duration:	22 July to 5 August 1983
Purpose:	To evaluate the status of two coconut industry and to recommend appropriate actions for the development of the industry.
Findings:	The immediate needof the coconut industry is to increase copra production to be able to increase capacity utilization of the existing oil mill. Setting up of new processing industries. at present, well aggravate the raw material shortage problem.
Recommendations:	It is recommended that existing coconut plantations be exploited for maximum copra production and that additional plantation be developed for other industries. The utilization of coconut shells for power generation is also recommended.
Currency	US$ 1 = EC$ 2.70.

TABLE OF CONTENT

INTRODUCTION

Agriculture forms the backbone of the economy and is the main source of foreign exchange in Saint Lucia. Bananas are the main export. contributing about EC$ 12.8 million of the total export receipts of EC$ 39.8 million during the first quarter of 1983. The other exports are: coconuts and coconut products, cacao, fruits and vegetable, beer and ale, paper and paper board, and clothing. During the same period, imports amounted to EC$ 63.1 million: EC$ 13.7 on food and live animals, and EC$ 11.9 million on machinery and transportation equipment.

Next to bananas, coconuts and coconut products are Saint Lucia's second major exports. During the first quarter of 1983, the total exports from the coconut industry, totalling EC$ 2,765,163 were as follows:

coconuts, whole	-	EC$ 27,015
crude copra oil	-	1,925,217
refined coconut oil	-	621,343
household soap	-	191,588

In 1980, the exports of refined and unrefined coconut oil amounted to US$ 2.944,000 which costs about 8.8 per cent of total domestic exports.

The country's development plan laid emphasis on increasing production and expanding diversification in agriculture and industrial sector. Cognizant of the economic potentials of the coconut industry the Government of Saint Lucia has taken keen interest in the development of the industry, both in form production and processing. It is within this context that the Government has requested for the services of a coconut processing expert from the United Nations Industrial Development Organization (UNIDO).

I. STATUS OF THE COCONUT INDUSTRY

Coconut and Copra Production

Before the hurricane "Allen" in 1980, the land area planted with coconuts in Saint Lucia was estimated at about 30,000 acres. The hurricane damage was estimated at about twenty-five per cent of the coconuts. Since there has not been significant plantings after the hurricane, the "net" coconut land area at present would be about 23,000 acres. Since the country is largely mountainous, a large portion of the coconut farms are located in steep mountain sides.

The plantations are scattered widely throughout the island (see map). Many of the small farms are interplanted with bananas and other food crops. In 1981, there were 2,296 coconut producers registered with the Saint Lucia Coconut Growers' Association producing some 3,700 tons of copra. The farm sizes vary from less than an acre to over 500 acres with annual copra production ranging from about a ton to 250 tons per year per farm. Copra yield vary widely from 0.1 ton to about one ton of copra per acre per year. Records show that smaller farms have generally higher yields than larger estates. This is explained by the fact that many of the small farms are interplanted with bananas which are regularly cleaned and fertilized while some of the estates are neglected or even abandoned.

In 1981, eighty-five per cent of copra deliveries to the Saint Lucia Coconut Growers' Association (SLCGA) were from small farms with less than twenty tons of copra per year. Table 1 shows copra production in relation to farm sizes, before and after the hurricane in 1980.

Table 1 - Copra Production vs. Farm Size (1978-1981)

(From SLCGA Members)

Category Tons copra per yr	Numbers of producers 1978	1979	1980	1981	Total copra delivered (m.tons) 1978	1979	1980	1981
Below 20	2,418	2,696	2,915	2,282	3,751	4,194	4,626	3,122
20 - 49	20	22	22	9	606	666	608	234
50 - 99	3	4	4	5	187	268	224	346
100 - 219	6	6	7	-	780	934	1,027	-
250 and above	1	---	---	---	269	-	-	-
Totals	2,448	2,728	2,948	2,296	5,593	6,062	6,485	3,692

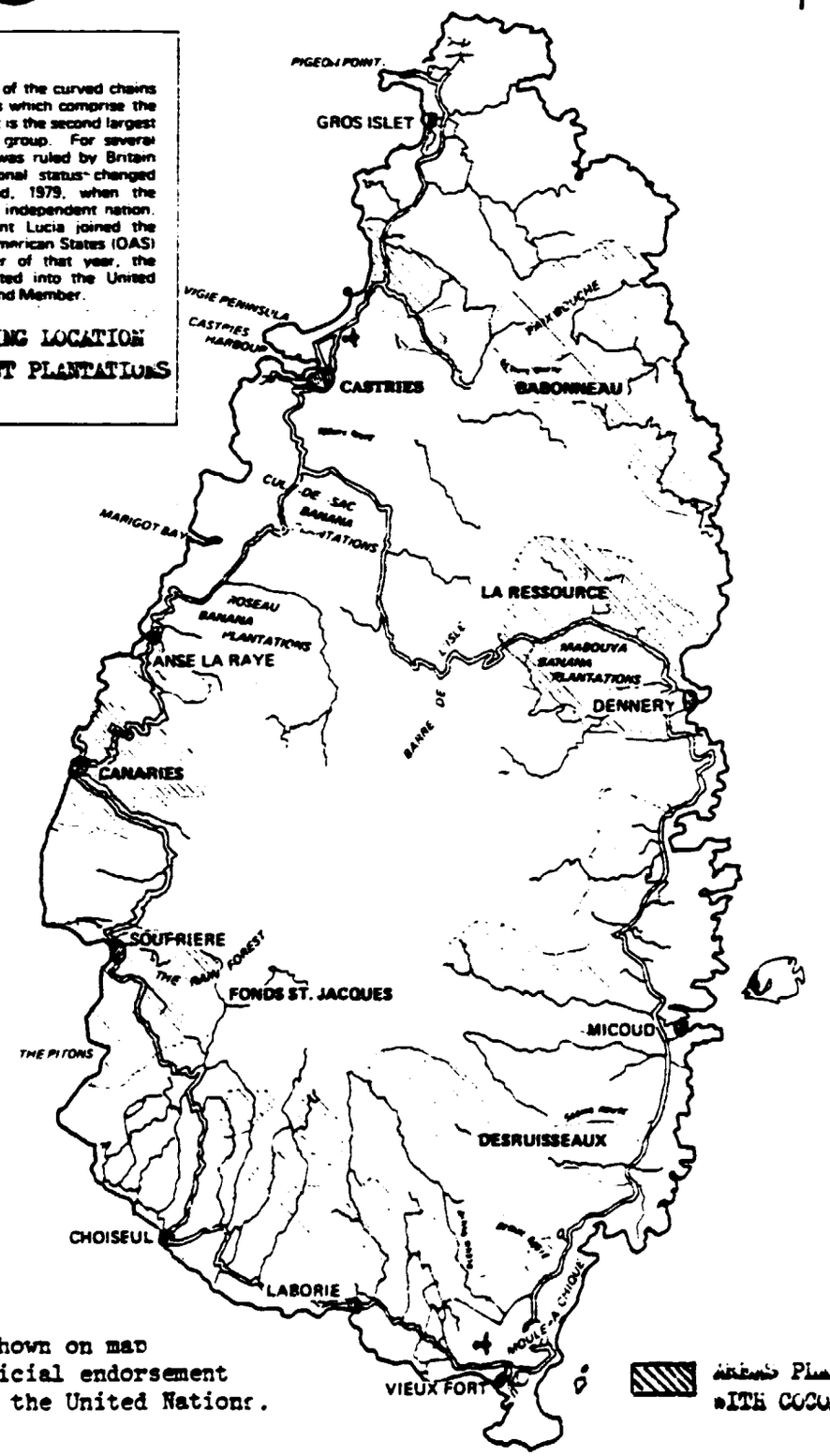
It will be noted that these has been a significant drop in copra production in 1981, after the hurricane and most of the larger producers dropped out of copra production.

In 1979, about 6,100 of copra were produced, 2,400 tons or thirty-nine per cent of these were produced from larger farms which supplied net ten tons of copra per year. Estimated average productivity from these farms was only 0.16 tons copra per year. About 3,700 tons or sixty-one per cent of these were from small farms which produced less than ten tons copra per year. Estimated average productivity from these farms was 0.45 tons copra per acre per year.

St. Lucia

Saint Lucia is one of the curved chains of volcanic islands which comprise the Lesser Antilles. It is the second largest of the Windward group. For several years the island was ruled by Britain but its constitutional status changed on February 22nd, 1979, when the island became an independent nation. In May 1979 Saint Lucia joined the Organisation of American States (OAS) and in September of that year, the island was admitted into the United Nations as the 142nd Member.

MAP SHOWING LOCATION OF COCONUT PLANTATIONS



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

Calculated from these information, the estimated area of the larger farms is about 15,000 acres or 63 per cent of the total land area planted to coconuts. the remaining 8,70 acres are small farms. It can be observed from production data that the productivity of small farms is about three times those of larger farms. If the productivity of the larger farms can be raised to the level of the small farms, there will be an increase in production of about 6,700 tons. an increase in copra production of 68 per cent over the 1979 production or about 180 per cent over the 1981 production. The copra production will then be about 10,000 tons of copra per year.

In 1982, copra production was 3.755 tons. Production for January to June 1983 was about 3,000 tons during the six months. If the production trend continues, a production of 6,000 to 7,000 tons of copra is anticipated during the year 1983. The increase in copra production in 1983 indicates that some of the idle farms and estates have resumed copra production.

On the basis of 23,000 acres and a productivity of 0.45 tons copra per care, the potential copra production is 10,350 tons per year, assuming 5000 nuts per ton, this is equivalent to about 52 million nuts per year or 2,250 nuts per acre. Experience in other Caribbean islands have proven that it is possible to produce at about 3,000 nuts per acre with proper maintenance and as much as 4,000 nuts per acre with application of proper fertilizer. This shows that it is possible to produce about 92 million nuts from existing coconut plantation or an equivalent of 18,000 tons of copra per year.

Most of the estates and farms in Saint Lucia require clearing and rehabilitation. Some of the farms and estates were abandoned after the hurricane. Abondment allowed the growth of weeds and trees under the coconuts which makes rehabilitation more costly. Due to the rugged terrain and prior visibility due to undergrwoths, a loss of at least 30 % of fallen nuts is expected. There is an alarming increase in the population of coconut mites as evident from the condition of nuts harvested. The effects of the mitesprevent the full development of the young nuts resulting in smaller mature nuts. Shrinkage effect is restimated at 10 to 20 per cent.

Copra Making and Marketing

Due to lack of copra dryers, small farmers dry their copra under the sun. Some larger farms have Malayan type copra dryers (copra house). These dryers are too costly for the small farmers to build. The lack of copra dryers is evidently a cause for low copra products or poor quality of copra produced. All copra are sold to the St. Lucia Coconut Growers Association which, in turn, sells the copra to the Copra Manufacturers' Association. The present price of copra paid to farmers is 50 cents per pound or EC$ 1.110 per metric ton. A copra production cost study made by the Ministry of Agriculture in 1981, estimated that the average copra production cost was EC$ 1,481 per ton or $ 381 higher than 1983 price of copra. Either or both of the two ramedial measures have to be done, to sustain or encourage copra production.

1. Increase the price of copra by reducing processing cost at the Copra Manufacturer's plant: and/or
2. Reduce cost of copra production by more efficient systems.

Coconut Processing

The only coconut processing plant in Saint Lucia is the Copra Manufacturers' plant at Soufriere. The plant is owned and oeprated by the St. Lucia Coconut Growers' Association. The plant has facilities for oil milling, refining, and laundry soap production. The oil mill

has three Rosedowns expellers with a total daily capacity of 50 metric tons copra per 24-hours operation. The refining capacity is about 24 metric tons of oil per day. Based on 300 days operation, the annual milling capacity is 15,000 metric tons while the refinering capacity is 7200 tons of oil. The soapstocks from the refineries go to laundry soap production. Due to shortage of copra supply, only two expellers are operated five days a week or as long as copra is available. With the expected copra production of 6,000 tons in 1983, the mill will have 40 per cent capacity utilization. Assuming all the crude coconut oil is processed to refined oil, the refined oil production will be about 3,500 tons or 840,000 gallons. The refinery capacity utilization will be about 50 per cent.

The Oil Mill is relatively an efficient plant. With a residual oil of 6 per cent in cake, as reported, extraction will be at least 150 gallons oil per ton copra. Reports show, however, that refining losses are on the high side. There are two oil refining plants, both of which are conventional batch systems.

The plant has two steam boilers, one which is in use, is a Bunker C - fired-fire-tube boiler, while the other which is idle, is a water-tube boiler. The water-tube boiler can easily be converted for coconut shell firing to reduce fuel cost.

Consumption and Market of Oils

Refined oil consumption for Saint Lucia was estimated to be abou. 194,000 gallons, or 800 metric tons in 1983. Assuming a copra production of 6,000 tons and all the oil is processed to refined oil, the exportable refined oil surplus will be about 650,000 gallons.

II. POSSIBILITIES AND PROBLEMS OF DIVERSIFICATION

Problems of Diversification

Due to the existence of the oil mill and refineries on which large amounts of capital was invested, the viability of the plant should be sustained by sufficient copra supply. Establishment of other coconut processing plants which will compete for raw materials with the

existing plant will be detrimental to the viabilities of the processing plants. Eventually either or all the plants will have to stop operations due to lack of raw materials.

Certain conditions may, however, justify establishment of other coconut processing plants, such as:

1. The new industry has a much higher returns to offset investment losses in the existing plant;
2. When the existing plant has attained viable capacity utilization (even if below maximum) to allow a new industry to share with the limited raw materials.
3. Coconut oil or refined oil production from the existing plant cannot be marketed adequately to sustain viable operations - thus requiring suspension of operations.

Considering that there is a stiff competition for markets of coconut products, any investment in new plants should be well studied.

Desiccated Coconut

Production of desiccated coconut is an alternative processing industry in St. Lucia. Its proximity and trade relations with the United States, the biggest importer of desiccated coconut, are assets to the country's desiccated coconut industry. Of all traditional coconut products, desiccated coconut has the highest added value.

Desiccated coconut processing, however, is labour-intensive, and the high cost of labour in St. Lucia may be a constraint. Furthermore, operations require the delivery of whole nuts to the plant, which is difficult and expensive in the country due to its rugged terrain. A feasible set-up would be to transport whole nuts produced near the roads, while the nuts in the interiors will be made to copra. Assuming that 20 million nuts can be made available for desiccated coconut production, two medium-scale plants each with a capacity of 50,000 nuts perday, one in the south and the other in the north side of the island are recommended.

A desiccated coconut plant with a capacity of 50,000 nuts per day, and equiped with facilities to meet the rigid quality specifications of the U.S. market, will cost approximately, US$ 1.1 million, excluding cost of land. The equipment supply will include a steam-driven power plant and a steam boiler fired with coconut shell.

Edible Coconut Flour and Cochin Oil

Another alternative is the production of edible coconut flour and water-white coconut oil (cochin oil). This will make use of the existing oil mill facilities at Soufrier and will require the setting up of several edible copra drying plants in the coconut areas. Copra, instead of whole nuts, will be delivered to the plant, hence a lower transport cost of raw materials. Factory operations will not be as labour-intensive as desiccated coconut processing since the drying operations are shifted to the farms.

The oil mill has to be modified for food-grade processing and additional equipment will be needed for flour milling. The investment cost for these changes will be much less than the cost of desiccated coconut processing equipment.

Edible coconut flour is a new product. It is produced by flour-milling the cake produced from edible copra. Its fineness is similar to wheat flour, has a light tan colour, and with a characteristic coconut flavor and smell. The approximate analysis of coconut flour (medium fat) is as follows:

Protein	23 per cent
Fat	9 per cent
Carbohydrates	49 per cent
Ash	5 per cent
Crude fiber	9 per cent
Moisture	5 per cent
Minerals:	
Calcium	317.8 mg/kg
Phosphorous	2,133.0
Iron	36.7
Sodium	226.0
Thiamine	0.4
Niacin	10.4
Ascorbic acid	0.36

The protein content of coconut flour (23 per cent) is slightly lower than powdered whole cow's milk (27.8 per cent), more than twice the protein content of all-purpose wheat flour (10.5 per cent), and 75 per cent of dry beef (33.2 per cent). It is used to increase the protein content of bread by mixing it with wheat flour before baking. For most breads and cakes, 30 per cent coconut flour can be added, for cookies up to 80 per cent. The use of coconut flour as a wheat flour builder has been evaluated in U.S. Food Laboratories and has been field-tested in the Philippines. The demand for high-fiber flour in the United States and Canada has opened a potential market for coconut flour. With the world shortage of protein foods, coconut flour promises to be a major export coconut product.

Coconut flour can be priced at the price of wheat flour, while cochin oil can be priced 20 per cent higher than ordinary coconut oil.

This industry will not compete with the oil mill for raw materials.

III. INDUSTRIAL UTILIZATION OF BY-PRODUCTS

Coconut Shell

The products that are commercially produced from coconut shell are: charcoal, activated carbon, shell powder, and handicrafts. It is also used as fuel for steam boilers, steam-turbine power plants, industrial furnaces, and as domestic fuel. Coconut shell has a heating value of about 7,000 BTU per pound.

Charcoal is madeby burning the shell in limited supply of air. The methods used are: drum method, pit method, kiln method and by retorts. Charcoal making is usually a batch process but there are continuous retorts. About 4 to 6 pounds of shells are required to make one pound of charcoal, depending on the medthod used and the maturity of the shells. Coconut shell charcoal has a heating value of about 10,000 BTU per pound and is almost smokeless. It is sometimes brequited to be used as special domestic fuel. Coconut shell charcoal is one of the best raw materials for the production of activated carbon of various types.

Activated carbon is produced by passing very high temperature superheated steam through a bed of charcoal granules, in continuous or batch systems. The product is a powerful absorbent. It is used as air or gas filter medium for gas masks, cigarette filters, and air conditioners, and as bleaching agent for refining oils, sugar, and other organic materials.

Shell powder or flour is made by grinding and pulverizing coconut shell to about 200 mesh. The equipment used consist of hammer mills, grinders, sifters, and cyclones. The product is used as a filler for plywood glues and some plastics formulations.

Handicraft articles such as buttons, necklaces, bracelets, trays and decorations, are made from coconut shells. Cut into special shapes, coconut shell are inlaid onto table tops and furnitures.

In desiccated coconut plants, coconut shells are used as fuel for steam boilers to supply process steam and to run steam-turbines or steam engines for electric power. With the increase in fuel oil price, many oil mills and refineries have converted their steam boilers.

to coconut shell fuel in the Philippines. Net savingson fuel is more than 50 per cent by shifting from oil to shell fuel. Coconut shells are generally used as fuel for copra dryers. In actual practice, 30 to 40 pounds of shell are equivalent to one gallon of fuel oil or diesel fuel. If diesel fuel is $ 4 per gallon, the fuel value of shell is about ten cents per pound. The weight of the shells is almost equal to the weight of copra, thus by using the shells as industrial fuels, the economic returns from the coconut industry can be increased by as much as ten per cent based on copra production.

Coconut Husks

During the last fifty years, industrial utilization of the coconut husks has been an area of interest. Equipment for defibering and utilizing the fibers for various products have been developed. Coconut fiber products include: carpets, door mats, floor mats, brushes, ropes, nets and upholstery materials. Rubberized fibers are used in cushions for car seats and furniture and bed mattresses. There was a sizeable market for unprocessed fibers in Europe but exportation has diminished due to high freight costs.

The husks can also be used as fuels. They have a heating value of about 6,000 BTU per pound. Their bulkiness is a disadvantage due to higher transport costs. With suitably designed dryers, coconuts husks can be used for copra drying - to replace coconut shells if the shells are utilized for other purposes.

Coconut Water

Coconut water contain about 2 per cent sugars and small quantities of other nutrients and organic substances. Researches have been conducted to find feasible commercial use of the water. It has been used successfully in pilot plant production of food yeast. By adding sugar to it, coconut water has been used as medium for the production of "nata de coco", a jelly-like material. The nata is washed, cooked, sweetened and packed in cans or bottles as a dessert or a mix for fruit cocktails. Vinegar can also be made by fermenting a ten per cent sugar solution in coconut water.

IV. REPLANTING AND PLANTING NEW AREAS

Hurricane "Allan" destroyed about 7,000 acres of coconut farms. A study should be made whether it is feasible and preferrable to replant the former plantations or to open plantations in new areas. Replanting will save idle lands but replanting has some technical and economic disadvantages which may make it more feasible to start with new plantations.

The variety of palms to be planted must be well studied since a mistake in the choice of variety will be an expensive and wastefull mistake. In recent years there has been keen interest in the "Malayan" dwarf and similar new varieties. The "Malayan dwarf" has some good characteristics. It bears fruits in 3 1/2 years in good soil and with good management, bears as much as 200 to 300 nuts per tree per year under correct conditions, and has been found to be more resistant to a number of coconut deseases. Some countries have been successful with the Malayan dwarf but in some, the results were dissapointing. The disadvantages of the Malayan dwarf are: 1) they require high fertilizer inputs to produce expected yields; 2) they require more intensive maintenance; 3) the oil content of the copra produced are lower than those of the "tall" varieties. If the fertility of the soil is not adequate, the kernels will be thin, thus requiring more nuts to produce a ton of copra, sometimes ten nuts per kilogram of copra. In case of doubt it will be safer to start with "selected" nuts from local varieties while "piloting" on new varieties.

To be able to supply raw material needs for new processing plants and to offset loss of production from the old trees, due to senility, it is necessary to undertaken a progressive replanting and planting programme.

V. CONCLUSIONS

The needs of the coconut industry in St. Lucia can be developed into short-term needs and long-term needs. The short-term needs are those related to meet the raw material needs of the existing processing pla. . and can be met within five years, while the long term needs are for the production of coconuts for the production of other coconut products and which can possibly be met in a period of about ten to 20 years.

Short-term Needs

1. To increase nut production to at least fifty million nuts per year by maximum exploitation of existing coconut plantations:

2. To increase copra production to at least 10,000 tons per year in order to achieve at least 80 per cent capacity utilization of the existing oil mill.

Long-term Needs

1. To produce an additional fifty million nuts per year to produce other coconut products such as desiccated coconut and to replenish loss of production from old coconut plantations due to old age.

Recommendations for Short-term Needs

1. Setting up of suitable copra processing facilities to stimulate collection of nuts and minimize wastage. Any of the following schemes may be adopted:

   a) Mechanization of copra production in large coconut estates:
   b) Setting-up of copra controls which will buy and collect nuts from small farmers:
   c) Setting-up of village or co-operative drying stations.

2. Launching of a coconut rehabilitation programme to:
   a) Rehabilitate neglected coconut farms:
   b) Fertilize coconut trees in poor soils:
   c) Control the coconut pest (coconut mite).

Recommendations for Long-term Need

1. Replanting of void lands within existing coconut plantation caused by hurricane damage:
2. Development of additional 20,000 acres of suitable land for coconut planting.

To facilitate and properly implement the coconut development in St. Lucia, it is recommended that a Coconut Development Company be created to be charged with the following specific responsibilities:

a) set-up copra controls in strategic locations to buy coconut from small farmers who are unable to set-up their own copra-making facilities:

b) to acquire for development, by lease or purchase coconut estates and farms which are under exploited and whose owners are uable or not interested to develop.

c) assist in inquiring loans or other financial facilities in the rehabilitation or development of farms and in the setting up of copras-making facilities.

Due to the high cost of petroleum fuels in St. Lucia, it is further recommended that project studies be undertaken to evaluate the feasibility of setting up steam-turbine power generating plants in suitable areas.

ANNEX I - PREFEASIBILITY STUDY OF A COPRA PRODUCTION MODEL FOR LARGE COCONUT ESTATES

MODEL B - For Coconut Estates with Rugged Terrain and Steep Hills

Basic Assumptions

1. Plantation area - 252 hectares
2. Productivity: Year 1 - 3,200 nuts per hectare per year
   Year 2 - 4,800 nuts
   Year 3 - 6,000 nuts
   Year 4 - 8,000 nuts
3. Nuts to copra conversion - 5,000 nuts per metric ton copra
4. Fertilizer application - 200 kg per hectare per year
5. Weedicide application for 50 % of area - 1,000 litres per ha/year
6. Copra production - 400 metric tons per year
7. Price of copra - (Ex-farm price) - $1,300 per ton plus 5 % price premium if FFA content is less than 0.5 % or an effective price of $1,365 per ton
8. All prices and costs in EC dollars (August 1983).

Estimate of project costs

Machinery and equipment	$165,000	
Farm: 2 tractors, wheel type, diesel driven, at least 45 hp		
1 Nut trailer, 3,000 nuts capacity		
1 Multi-purpose trailer		
6 Knapsack sprayers, 3 gallons		
10 Husking points		
Hand tools: nut pickers, cutlasses, etc.		
Copra plant		
1 Copra dryer, forced Draft, with shell-fired air heater, capacity - 10,000 nuts per 16 hours drying time		
1 Mechanical nut cracker for cracking bare nuts, capacity: 2,000 nuts/hour		
1 Bag closer, portable		
1 Platform scale, 500 kg capacity		
Hand tools: copra knives, shovels, etc.		
Engineering and installation cost	$15,000	
Installed Cost of Machinery and Equipment		$ 180,000
Buildings:		$ 160,000
Dryer shed and copra storage, including copra bin		
Work-shed for pre-drying operations		
Office, including office equipment		
Fuel shed		

Total Fixed Capital Investment	$ 340,000
Working Capital	20,000
Total Project Cost	$ 360,000

Investment Services

Equity (30 %)	$108,000
Loan (70 %)	252,000
Total:	$360,000

Loan Terms

Interest - 12 per cent per year on unpaid balance. Interests during grace period to be added to loan.

Repayment - 10 years with 3 years grace period on amortization. To be paid in seven equal annual installments, starting with year 4.

FINANCIAL PLAN

Year		Equity	Loan	Total
1	Purchase of Equipment and buildings	$ 96,000	$224,000	$320,000
3	Purcahse of another Tractor	12,000	28,000	40,000
	TOTALS	$108,000	$252,000	$360,000

INTERESRT AND AMORTIZATIONS SCHEDULE ($ 000)

Year	Drawdown	Amortization	Interest	Principal	Balance
1	224	-	-	-	224
2	-	-	27	-	251
3	28	-	30	-	309
4	-	67	37	30	279
5	-	67	33	34	245
6	-	67	29	38	207
7	-	67	25	42	163
8	-	67	20	47	118
9	-	67	14	53	65
10	-	73	8	65	0

PRODUCTION SCHEDULE	Year 1	Year 2	Year 3	Year 4
Nuts produced, 10^6	0.8	1.2	1.6	2.0
Copra Produced, MT	160	240	320	400
SALES REVENUES				
Copra Sales, MT	160	240	320	400
Price, $/MT	1,365	1,365	1,365	1,365
VALUE, $	218,400	327,600	436,800	546,000
RAW MATERIALS				
Nuts (millions)	0.8	1.2	1.6	2.0
Price, ¢per nut	8	8	8	8
VALUE, $	64,000	96,000	128,000	160,000

SUPPLIES				
Diesel Fuel, gal.	1,000	1,500	2,000	2,500
Price, $/gal.	4	4	4	4
VALUE, $	4,000	6,000	8,000	10,000
Fertilizer, MT	50	50	50	50
Price, $/MT	700	700	700	700
VALUE, $	35,000	35,000	35,000	35,000
Weedicide, liters	1,000	1,000	1,000	1,000
Price, $/liter	14	14	14	14
VALUE	14,000	14,000	14,000	14,000
Misc. Supplies, $	5,000	5,000	5,000	5,000
TOTAL SUPPLIES, $	58,000	60,000	62,000	64,000
POWER, kw-hrs	8,160	12,300	16,500	22,700
Price, ¢ per kw-hr	30	30	30	30
VALUE, $	2,700	4,100	5,500	6,800

SCHEDULE OF SALARIES AND WAGES

Year 1 Position	No.	Rate	Months or Days	Annual Salary	Total Annual Salary
Indirect Labor					
Farm Manager	1	1,500	7 mos.	10,500	10,500
Bookkeeper-Clerk	1	800	7	5,600	5,600
Utilityman	1	500	7	3,500	3,500
Mechanic	1	24/day	150	3,600	3,600
Repairman	1	20	150	3,000	3,000
TOTAL INDIRECT LABOR					26,200
Direct Labor					
Farm					
Tractor Operator	1	24	150	3,600	3,600
Tractor Helper	1	12	150	1,800	1,800
Nut Pickers	2	12	150	1,800	3,600
Huskers	2	12	150	1,800	3,600
Weeders	4	12	150	1,800	7,200
Nut Carriers	2	12	150	1,800	3,600
Copra Plant					
Dryer Operators	3	20	100	2,000	6,000
Copra makers	8	12	100	1,200	9,600
Utilityman	1	12	100	1,200	1,200
TOTAL DIRECT LABOR					40,200

Year 2					
Indirect Labor					
Farm Manager	1	1,500	12	18,000	18,000
Bookkeeper-Clerk	1	800	12	9,600	9,600
Utilityman	1	500	12	6,000	6,000
Mechanic	1	24	250	6,000	6,000
Repairman	1	20	250	5,000	5,000
TOTAL INDIRECT LABOR					44,600
Direct Labor					
Farm					
Tractor Operator	1	24	250	6,000	6,000
Tractor Helper	1	12	250	3,000	3,000
Nut Pickers	2	12	250	3,000	6,000
Huskers	2	12	250	3,000	6,000
Weeders	4	12	250	3,000	12,000
Nut Carriers	2	12	250	3,000	6,000
Copra Plant					
Dryer Operators	3	20	150	2,000	6,000
Copra makers	8	12	150	1,800	14,400
Utilityman	1	12	150	1,800	1,800
TOTAL DIRECT LABOR					64,200
Year 3					
Indirect Labor (Same as Year 2)					
TOTAL INDIRECT LABOR					44,600
Direct Labor					
Farm					
Tractor Operator	2	24	250	6,000	12,000
Tractor Helper	2	12	250	3,000	6,000
Nut Pickers	3	12	250	3,000	9,000
Huskers	3	12	250	3,000	9,000
Weeders	4	12	250	3,000	6,000
Nut carriers	3	12	250	3,000	9,000
Plant					
Dryer Operators	3	20	200	4,000	12,000
Copra makers	8	12	200	2,400	19,200
Utilityman	1	12	200	2,400	2,400
TOTAL DIRECT LABOR					90,600
Years 4-10					
Indirect Labor (Same as year 2)					
TOTAL INDIRECT LABOR					44.600

Direct Labor					
Farm					
Tractor Operator	2	24	250	6,000	12,000
Tractor Helper	2	12	250	3,000	6,000
Nut Pickers	4	12	250	3,000	12,000
Huskers	4	12	250	3,000	12,000
Weeders	4	12	250	3,000	12,000
Nut Carriers	4	12	250	3,000	12,000
Plant					
Dryer Operator	3	20	250	3,000	15,000
Copramakers	8	12	250	3,000	24,000
Utilityman	1	12	250	3,000	3,000
TOTAL DIRECT LABOR					108,000
DEPRECIATION - 10% of $340,000					34,000
INSURANCE - 1 % of $340,000					3,400
REPAIR & MAINTENANCE 5 % of $340,000					
MANAGEMENT OVERHEAD					10,000

COPRA PRODUCTION MODELS - PROJECTED INCOME STATEMENT (E$000) - MODEL B

SALES REVENUE										
Copra Sales	218.4	327.6	436.8	546.0	546.0	546.0	546.0	546.0	546.0	546.0
VARIABLE COSTS										
Cost of nuts	64.0	96.0	128.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0
Direct labour	40.2	64.2	90.6	108.0	108.0	108.0	108.0	108.0	108.0	108.0
Supplies	58.0	60.0	62.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0
Power	2.7	4.1	5.5	6.8	6.8	6.8	6.8	6.8	6.8	6.8
TOTAL VARIABLE COSTS	164.9	224.3	286.1	338.8	338.8	338.8	338.8	338.8	338.8	338.8
FIXED COSTS										
Indirect labour	26.2	44.6	44.6	44.6	44.6	44.6	44.6	44.6	44.6	44.6
Depreciation	17.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0
Insurace	1.7	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Repair and maintenance	8.5	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
Administrative overhead	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
TOTAL FIXED COSTS	63.4	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0
TOTAL COSTS	228.3	333.3	395.1	447.8	447.8	447.8	447.8	447.8	447.8	447.8
GROSS PROFIT (LOSS)	(8.9)	(5.7)	41.8	98.2	98.2	98.2	98.2	98.2	98.2	98.2
INTERESTS	-	27.0	30.0	37.0	33.0	29.0	25.0	20.0	14.0	8.0
PROFIT BEFORE TAXES	(8.9)	(32.7)	11.7	61.2	65.2	69.2	73.2	78.2	84.2	90.2

COPRA PRODUCTION MODELS - PROJECTED CASH FLOW STATEMENT (EC$000) - MODEL B

SOURCES OF INCOME										
Net Income	(8.9)	(32.7)	11.7	61.2	65.2	69.2	73.2	78.2	84.2	90.2
Add Back:										
Interests	-	27.0	30.0	37.0	33.0	29.0	25.0	20.0	14.0	8.0
Depreciation	17.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0
TOTAL INTERNAL RESOURCES	8.1	28.3	75.5	132.2	132.2	132.2	132.2	132.2	132.2	132.2
BORROWINGS										
Loan	224.0	-	28.0							
Equity	96.0	-	12.0							
TOTAL BORROWINGS	320.0	0	40.0							
TOTAL FUNDS	328.1	28.3	115.5	132.2	132.2	132.2	132.2	132.2	132.2	132.2
APPLICATION OF FUNDS										
Establishment cost	300.0	-	40.0							
Working capital	20.0	-	-							
Amortization of loan	-	-	-	67.0	67.0	67.0	67.0	67.0	67.0	73.0
TOTAL DISBURSEMENTS	320.0	-	40.0	67.0	67.0	67.0	67.0	67.0	67.0	73.0
NET CASH INFLOW/OUTFLOW	8.1	28.3	75.5	65.2	65.2	65.2	65.2	65.2	65.2	60.2
CASH: BEGINNING	-	8.1	36.4	111.9	177.1	242.3	307.5	372.7	437.9	503.1
ENDING	8.1	36.4	111.9	171.1	242.3	307.5	372.7	437.9	503.1	563.3
DEBT SERVICE RATIO	-	-	-	1.97	1.97	1.97	1.97	1.97	1.97	1.81

ANNEX II - PREFEASIBILITY STUDY OF A COPRA CENTRAL FOR SMALL FARMERS

MODEL C - Copra Central for Small Farmers

Basic Assumptions

1. Daily capacity of Central - 8,000 nuts
2. Area to be served - 300 to 400 hectares
3. Nuts to copra conversion - 5,000 nuts per metric ton copra
4. Purchase price of nuts - 16 cents per nut, husked and delivered to roadside
5. Price of copra - $ 1,300 per metric ton plus 3 per cent price premium if FFA content is less than 0.5 % or an effective price of $ 1,365 per ton.
6. All prices and costs in EC dollars (August 1983)

Estimate of Project Cost

Machinery and equipment	$ 130,000	
1 Copra dryer, forced-draft with shell-fired air heater capacity: 10,000 nuts per day		
1 Mechanical nut-cracker with a capacity of 2,000 nuts per hour		
2 Nut carts		
1 Bag closer, portable		
1 Platform scale 500 kg capacity		
1 Nut bin		
2 5-ton truck, stake-back, diesel-driven		
hand tools, copra knives, shovels, etc.		
Installation cost	$ 15,000	
Installed cost of machinery and equipment		$ 145,000
Buildings: (including site development)		
Dryer shed and copra storage		
Work shed for pre-drying operations		
Office, including office equipment		
Total Fixed Capital Investment		$ 280,000
Working Capital		40,000
Total Project Cost		$ 320,000

Investment Services

Equity (30 %)	$ 96,000
Loan (70 %)	224,000
Total:	$320,000

Loan Terms

Interest - 12 per cent per year on unpaid balance. Interests during grace period to be added to loan.

Repayment - 10 years period with 2 years grace on amortization.
To be paid in eight equal annual installments starting with year 3.

FINANCIAL PLAN	EQUITY	LOAN	TOTAL
Year 1	$ 96,000	$224,000	$320,000

INTERESTS AND AMORTIZATIONS SCHEDULE ($000)

Year	Drawdown	Amortization	Interest	Principal	Balance
1	224	-	-	-	224
2	-	-	27	-	251
3	-	50	30	20	231
4	-	50	28	22	209
5	-	50	25	25	184
6	-	50	22	28	156
7	-	50	19	31	125
8	-	50	15	35	90
9	-	50	11	39	51
10	-	57	6	51	0

PRODUCTION SCHEDULE	Year 1	Year 2	Years 3-10
Nuts purchased, 10^6	1.0	2.0	2.0
Copra Produced, MT	200	400	400
SALES REVENUES			
Copra Sales, MT	200	400	400
Price, $/MT	1,365	1,365	1,365
VALUE, $	273	546	546
RAW MATERIALS			
Nuts (millions)	1.0	2.0	2.0
Price, cents	16	16	16
VALUE, $	160,000	320,000	320,000
SUPPLIES			
Diesel Fuel, Gal.	1,000	2,000	2,000
Price, $/gal.	4	4	4
VALUE, $	4,000	8,000	8,000
Misc. Supplies, $	2,500	2,500	2,500
TOTAL SUPPLIES, $	6,500	10,500	10,500
POWER, kw-hrs	8,000	16,000	16,000
Price, ¢ /kw-hr	30	30	30
VALUE, $	2,400	4,800	4,800

SCHEDULE OF SALARIES AND WAGES

Year 1 (½ year)

Position	No.	Rate	Months or days	Annual Salary	Total Annual Salary
Indirect Labor					
Manager	1	1,500	7	10,500	10,500
Bookkeeper-clerk	1	800	7	5,600	5,600
Maintenance man	1	800	7	5,600	5,600
Driver-Mechanic	1	800	7	5,600	5,600
Truck Helper	1	500	7	3,500	3,500
TOTAL INDIRECT LABOR					30,800
Direct Labor					
Dryer Operator	3	14	150	2,100	6,300
Copramakers	4	12	150	1,800	7,200
TOTAL DIRECT LABOR					13,500

Year 2-10

Indirect Labor					
Manager	1	1,500	12	18,000	18,000
Bookkeeper-clerk	1	800	12	9,600	9,600
Maintenanceman	1	800	12	9,600	9,600
Driver-Mechanic	1	800	12	9,600	9,600
Truck Helper	1	500	12	6,000	6,000
TOTAL INDIRECT LABOR					52,000
Direct Labor					
Dryer Operators	3	14	250	3,500	10,500
Copramakers	4	12	250	3,000	12,000
TOTAL DIRECT LABOR					22,500
DEPRECIATION 10% of $280,000					28,000
INSURANCE 1 % of $280,000					2,800
REPAIR & MAINTENANCE 5 % of $280,000					14,000
ADMINISTRATIVE OVERHEAD					20,000

COPRA PRODUCTION MODELS - PROJECTED INCOME STATEMENT (EC$000) - MODEL C

SALES REVENUES										
Copra Sales	273.0	546.0	546.0	546.0	546.0	546.0	546.0	546.0	546.0	546.0
VARIABLE COSTS										
Cost of nuts	160.0	32.0	320.0	320.0	320.0	320.0	320.0	320.0	320.0	320.0
Direct labour	13.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Supplies	6.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Power	2.4	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
TOTAL VARIABLE COSTS	182.4	357.8	357.8	357.8	357.8	357.8	357.8	357.8	357.8	357.8
FIXED COSTS										
Indirect labour	30.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8
Depreciation	14.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Insurance	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Repair and maintenance	7.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Administrative overhead	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
TOTAL FIXED COSTS	74.6	117.6	117.6	117.6	117.6	117.6	117.6	117.6	117.6	117.6
TOTAL COSTS	257.0	475.4	475.4	475.4	475.4	475.4	475.4	475.4	475.4	475.4
GROSS PROFIT (LOSS)	16.0	70.6	70.6	70.6	70.6	70.6	70.6	70.6	70.6	70.6
INTERESTS	-	27.0	30.0	28.0	25.0	22.0	19.0	15.0	11.0	6.0
PROFIT BEFORE TAXES	16.0	43.6	40.6	42.6	45.6	48.6	51.6	55.6	59.6	64.6

COPRA PRODUCTION MODELS - PROJECTED CASH FLOW STATEMENT (EC$000) - MODEL C

SOURCES OF INCOME										
Net Income	16.0	43.6	40.6	42.6	45.6	48.6	51.6	55.6	59.6	64.6
Add Back: Interest	-	27.0	30.0	28.0	25.0	22.0	19.0	15.0	11.0	6.0
Depreciation	14.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
TOTAL INTERNAL RESOURCES	30.0	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6
BORROWINGS										
Loan	224.0									
Equity	96.0									
TOTAL BORROWINGS	320.0									
TOTAL FUNDS	350.0	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6
APPLICATION OF FUNDS										
Establishment cost	280.0									
Working capital	40.0									
Amortization of loans		-	50.0	50.0	50.0	50.0	50.0	50.0	50.0	57.0
TOTAL DISBURSEMENTS	320.0		50.0	50.0	50.0	50.0	50.0	50.0	50.0	57.0
NET CASH INFLOW/OUTFLOW	30.0	98.6	48.6	48.6	48.6	48.6	48.6	48.6	48.6	48.6
CASH: BEGINNING		30.0	128.6	177.2	225.8	274.4	323.0	371.6	420.2	468.8
ENDING	30.0	128.6	177.2	225.8	274.4	323.0	371.6	420.2	468.8	517.4
DEBT SERVICE RATIO			1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.73