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PRE-FEASIBILITY STUDY FOR ESTABLISHING COCONUT COIR FIBRE PROCESSING INDUSTRY

SI/INS/77/803

INDONESIA

Terminal Report*

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

Based on the work of S. Srinivasan,
expert in the production of coconut coir fibre

United Nations Industrial Development Organization
Vienna

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List of abbreviations used in the Report

1.	Ha	Hectare
2.	Kwh	Kilowatt-hour
3.	t.p.d.	Tons per day
4.	cbm.	Cubic metre
5.	ton/tones	1000 Kilograms weight
6.	p.a.	per annum
7.	F.O.B.	Free on Board
8.	C.I.F.	Cost including Insurance and Freight
9.	60% DRC Latex	Latex rubber containing 60% Dry rubber content by weight
10.	Twisted fibre/curled coir/curled rope	Coir fibre processed and twisted to form a resilient rope
11.	N. Malukm	North Moluccas Island
12.	APCC	Asian and Pacific Coconut Community
13.	NAFED	National Agency for Export Development
14.	BAPENGKO	Copra Management Board
15.	BAPPEDA	Planning Department
16.	KADIN	Indonesian Chamber of commerce and Industry
17.	GAAKINDO	Association of Automobile Assemblers in Indonesia.
18.	BKPM	Investment Coordination and Promotion Board in Indonesia.

SUMMARY :

1. Indonesia, the second largest producer of coconuts in the world, has tremendous potential for the development of the coir industry. After the edible portion of coconut kernel is removed the outer husks are just thrown away now. At present the 7265 million nuts produced in Indonesia have a potential to produce nearly 720,000 tons of coir fibre (i.e. 2 ½ times the present total world production of coir fibre).

2. Utilisation of husks to produce fibre and fibre products means converting waste into wealth. Every husk can generate 16 Rp by way of cost, processing charges and profit to the farmer. Utilisation of even 10% of this huge potential would add to the wealth of the farmers to the extent of 16 million dollars every year.

3. After an extensive field study of the coconut wealth and husk potential in Indonesia and the marketing prospects and on the basis of my personal experience in coir fibre processing industries and marketing extending over 20 years, I am convinced that the coir fibre processing industry in Indonesia is COMMERCIALLY PROFITABLE, TECHNICALLY FEASIBLE and ideally suited to the Indonesian economy.

4. The coir processing industry in Indonesia should get organised and develop on the lines sucessfully being followed in India and Sri Lanka with the fabric of small scale units at the coconut producing centres involving coconut producers. It should employ simple automatic machines for fibre extraction and adopt manual process for producing simple handicraft items - viz. brushes, coir bags, door mats and ropes etc. With a view to generate larger

employment. Medium scale units should be set up to produce sophisticated and value added secondary processing items like twisted fibre and rubberized coir fibre products.

5. Great enthusiasm and interest were shown by entrepreneurs and copra producers as well as officers of the Department of Trade Industry and Plantation in Sulawesi and Java when the end uses of coir fibre and end products were explained to them.

6. It was encouraging to observe the cheerful disposition and positive approach of Mr.Rudylengkong, Secretary, National Agency for export development and Mr.Pantow, Director, Bapengko (Copra Management Board). Prospective entrepreneurs have been identified and five entrepreneurs are ready and eager to start the industry. They have shown great interest and keeness to promote coir fibre development in Indonesia. This augurs well for the success of the projects.

7. The establishment of the coir industry in Indonesia should begin with:

i. One medium scale industry in North Sulawesi to produce annually 1200 MT of twisted coir fibre. The investment would be US $ 500,000. Annual sales US $ 319,200 and return US $ 79,000 or 16% on investment It will provide employment to 118 persons and will have a pay-back period of 4.2 years.

ii. A medium scale unit in Java to produce annually 900 MT rubberised coir products to cater to the readily available demand for automobile cushions, beddings, furniture cushions and a wide range of rubberized coir products for daily household needs. This factory will need an investment of US $1,000,000 have annual sales of US $ 2,070,000 and give a

return of US $ 300,000 or 30% on investment. Its pay back period wouldbe less than 3 years. It would provide direct employment to 178 persons.

iii. Five small scale units each requiring US $ 54,000 investment having an annual output of 250 MT coir fibre, sales of US $ 72,000 with a return of US $ 19.000 or 35% on investment. Employment potential per factory would be 139.

8. Development of coir industry in India in the past two decades especially in the machanised production of coir fibre and rubberized coir has been phenomenal. Though the traditional process has existed for several decades, production of coir fibre with machines was initiated only a few years ago. Starting with a small scale unit it has now grown into an industry of 400 units in less than 7 years.

9. The constraints in the development of the coir industry observed in Indonesia are difficulty in husk collection and transportation and high shipping freight due to lack of proper classification of coir products, in the freight list etc. These problems were encountered in India also during the developmental stage of the industry. Husk collection and transportation on bottle-neck are removed by locating units in coconut production centres. The shipping freight question could be solved like India by taking up with the shipping conference bodies and using tramp vessels. I feel convinced that in Indonesia too, the coir fibre processing industry is feasible, and would prove quite successful as there are no insurmountable difficulties. I strongly recommend that the vast opportunities present for developing coir fibre processing industry in Indonesia should be utilised without delay.

INTRODUCTION .

PROJECT BACKGROUND:

1. The Government of Indonesia undertook in the past various projects for the development of coir fibre by-products processing industry with UNIDO assistance through project VS/RAS/75/011. A study team was sent to Sri Lanka and Japan to study the coir situation in those countries. As a result of successive studies, the Government of Indonesia decided to start with the project for establishing coconut fibre processing industry in North Sulawesi where coconut production is abundant.

The NAFED (National Agency for Export Development) as the executing Agency carried out a reconnaissance survey for the project in concurrence with North Sulawesi Government and requested UNIDO assistance in carrying out a prefeasibility study through the above project VS/RAS/75/011.

2. The project was approved by UNIDO in 1978. Thereafter it was undertaken for a period of two months commencing September 18, 1979. The Expert arrived in Jakarta on 17th September 1979 and was assigned to the NAFED and the study was completed on the 17th November 1979.

OBJECTIVES OF THE PROJECT:

3. The immediate objective of the project is to carry out a prefeasibility study for establishing coir fibre processing industry in North Sulawesi and advise on the type quality and quantity of coir products that should be produced for domestic utilisation and export.

4. NAFED also proposed with the offer of joint efforts and co-operation from the COPRA MANAGEMENT BOARD (BAPENGKO)

to promote coir fibre processing in other intensive coconut producing regions of Indonesia as well. It was hence required to study the existing situation of coconut production and related industries and make specific recommendations and a plan of operation for the promotion of coir fibre industry on a wide base and to develop it.

5. The prefeasibility study identifies production of coir fibre from husks and process the fibre into twisted and rubberized fibre to cater to a large and ready demand of the domestic market.

Accordingly a detailed report on the lines of the UNIDO manual relating to the setting up of two medium scale industries, one for the annual production of 1200 MT of twisted fibre for domestic and export market and another for an annual output of 900 MT of rubberized coir. [illegible] is furnished in Part II.

In addition, a detailed scheme for the setting up of small scale industries to produce coir fibre and handicraft items is given in Part III.

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FINDINGS.

1. Indonesia ranks asthe second largest producer of coconuts in the world. Its annual production of 7265 million nuts is next only to that of Phillippines. The area of coconuts cultivation is estimated at 2.4 million hectares with a production of 1.5 million tons of copra equivalent. Copra production in Sulawesi is about 396,000 tons and the husks available from copra production would yield about 200,000 tons of coir fibre. Minahasa District in North Sulawesi alone has an annual output of 740 million coconuts and has a fibre production potential of 74,000 tons per annum.

2. Apart from copra manufacture industrial utilization of coconut is confined to desiccated coconut manufacture. Only one factory produces desiccated coconut in Indonesia at Air Madidi in North Sulawesi and this is exported. A small quantity of charcoal is produced by farmers from the coconut shell on a cottage industry basis. There has been no production of coir fibre or any coir products from the enormous quantity of husks left over after copra is made.

3. The efforts made in the past for establishment of coir fibre industry in Indonesia particularly the unit in Wani in central Sulawesi did not succeed primarily because of (i) wrong location, (ii) absence of technology, (iii) incorrect choice of products (iv) erroneous project engineering and (v) emphasis on export without exploring domestic markets.

4. There is an identifiable ready domestic market for a large volume of rubberized coir products and coir fibre for other products. Export of fibre as twisted coir is also possible. It would be necessary to undertake intensive sales promotion efforts. The uses of coir fibre and various end products are yet to be made known to

consumers. There is a big vacuum in the knowledge of use and value of end products.

5. The technology for fibre extraction and further processing into rubberized coir products is simple. Machinery has to be imported and technology transfer has to be secured from machinery manufacturers. Adequate skills for maintenance of machines is available locally.

6. Factories of size exist in North Sulawesi. Managerial personnel can be secured with the assistance of Department of Manpower. Labour of the required skill is available and Indonesian Transmigration Department also helps in the mobility of required skilled labour to labour scarce areas.

7. Infrastructure viz. land, water and energy is available in abundance. Indonesia being a producer of petroleum products, solar energy (diesel oil) is supplied by the state enterprise at a very low rate of US $ 56/kilo litre. Most of the industries have installed own power generating sets as the cost of power generation is cheaper. As far transport facilities, access to coconut producing regions is possible by bullock carts or horse carts. Collection of husks and transport may be somewhat expensive especially in South and Central Sulawesi. To avoid this handicap fibre industry should be located at the same spots whereto coconuts are brought for being dehusked for copra making.

8. At present conference vessels do not call at North Sulawesi ports for picking up outward traffic because of inadequate volume. Shipments to Japan and Australia from North Sulawesi ports, hence involve transhipment at Surabaya or Jakarta (resulting cross movements for consignments intended for Japan) at considerable additional expense.

9. Now Japanese T.S.K. Lines are agreeable to

call at Betung harbour (North Sulawesi) on their return trips and pick up cargo to Japan at reduced freight rates.

10. Current ocean freight rates for coir fibre from Indonesian ports to Europe are twice that from Sri Lanka to Europe and ocean freight rates to Japanese ports (which are nearer to North Sulawesi are higher than the rates from Sri Lanka. Sri Lanka is charged for twisted coir, freight by weight. Similar freight tariff classification for Indonesia has to be secured. Further cheaper freight to Japan could be secured by shipping in tramp vessels chartered by Japanese importers for import of timber from the Northern Maluku port, Tennoti (Indonesia) which is very close to the North Sulawesi port of Bitung.

11. With abundant availability of raw material viz. coconut husks and rubber and a ready demand in the domestic market and scope for export, there is a big opportunity for immediate establishment of coir fibre industry. The industry can get itself well set within a short time of its establishment and it would make a significant contribution to the growth of national wealth of Indonesia.

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RECOMMENDATIONS.

1. The development of the coir fibre industry in Indonesia should be on the lines successfully adopted in Sri Lanka and India through the involvement of small scale sector and securing a simultaneous complementary development of medium scale units. The industry should aim at tapping the vast source of domestic market and also penetrate gradually into the export market.

2. A rubberized coir manufacturing unit should be immediately set up in Java since the Government has decreed that all automobile assemblers are mandatiorily required to utilise indigenously manufactured components in their vehicles by 1980. This assures a permanent outlet for a sizable part of the rubberized coir production in the country itself.

3. A medium scale twisted coir production unit should also be set up immediately in North Sulawesi to feed rubberized coir unit in Java with the required twisted coir and to export the balance production.

4. The National Agency for Export Development (NAFED) and Copra Management Board (BAPENGKO) as agreed, should promote the establishment of five coir fibre units in the small scale sector concurrently to develop coir production and marketing of other coir products on a National scale.

5. The necessary data, covering the above projects for investment are given below:

Details	North Sulawesi twisted coir fibre unit	Java rubberized coir products unit.	Small scale Coir fibre unit:	
			per unit	Total for 5 units.
MT/annum.				
Capacity	1200	900	250	1250
Investment ('000 Us$)	500	1000	54	270
Turnover "	319	2070	52	260
Return "	79	300	19	95
Return/Investment %	16	30	35	35
Employment	118	178	139	695
Investment/Employee (US $)	4237	5618	388	388

6. NAFED should procure rubberized coir products like mattresses, automobile seat cushions and other coir fibre by-products brushes, cordages etc from coir processing countries like India, Sri Lanka, Federal Republic Germany Japan etc and display them in showroom to educate the consumers of these and their uses. This should be followed up with intensive promotional compaign using television, cinema and other media.

7. NAFED should also conduct a supporting detailed market survey for assessing the effective demand for rubberized coir and other products for the country as a whole. This study may extend over a period of two months.

8. Fellowship should be granted to two officials who assisted in the prefeasibility study namely. Mr.Teddy of NAFED and Mr.Bachmid of North Sulawesi provincial Government Trade Department to study the processing and marketing of coir fibre and fibre products for three weeks in Sri Lanka and five weeks in India. They have shown promise of development and ability to shoulder responsibilities in project implementation.

9. Machinery suppliers should be asked to provide in plant training at manufacturers' works and through their erectors for operation at the time of setting up and commissioning of plants.

10. The Government of Indonesia should avail of the training programme facilities provided under the aegis of inter governmental channels for transfer of coir technology from India and Sri Lanka and assistance of APCC and UNIDO.

11. Copra Management Board (BAPENGKO) should set up technical centres in the three regions, North Sulawesi and Central Sulawesi to provide training facilities for artisans in the manufacture of products like coir bags, ropes, door mats, brushes etc using simple technology. The training may be organised on the lines followed by the Coir Board of India.

12. The Government of Indonesia should restrict import of rubberized coir cushions and those other articles which are substituted by locally produced coir and rubberised coir products.

13. The Government of Indonesia should ensure the use of locally produced rubberized coir mattresses,

cushions etc in state hospitals, offices for furniture, Railways and Transport vehicles to popularise and accelerate the development of the industry. In India such encouragement by local Government has helped considerably the accelerated growth of the industry. This step is most essential for the rapid development of the Indonesian Industry.

14. Necessary financial facilities should be provided with concessional rates of interest to entrepreneurs desiring to start coir fibre industry through development banks and other financial institutions.

15. The department of Sea Transportation and NAFED should secure a reduced ocean freight as conveyed in the findings.

16. Coir industry should be included in the list of priority industries published by the Investment Co-ordination Board (BKPM) and the benefits and reliefs listed below are extended to them.

i. Tax holiday for 6 years as the projects comply with the stipulated conditions.

ii. Exemption from import duty on the machinery for coir processing.

iii. Exemption from purchase, sales and export taxes, and

iv. incentives granted to foreign investments.

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ACKNOWLEDGEMENT.

This study was made possible due to the ready and willing co-operation of various Government officials, information and suggestions, furnished by the Asian and Pacific Coconut Community, the Investment Co-ordination Board as well as the Senior Industrial Field Development Advisor (UNIDO) and other individuals, their cooperation is hereby acknowledged.

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Prefeasibility study for setting up Coir Fibre Processing Industry for North Sulawesi, Indonesia.

EXECUTIVE SUMMARY.

1. PROJECT BACKGROUND AND HISTORY:

The establishment of coir fibre by-product processing industry in Indonesia has been sponsored by the National Agency for Export Development (NAFED) with UNIDO assistance. Indonesia is the second largest country producing coconuts (7,265 million nuts per annum) but coir fibre production has not been organised on a commercial scale. The proposal is to set up a plant in Minahasa District. In Minahasa District the production of coconuts is about 740 million nuts per annum which is about 66% of the total production of the whole of North Sulawesi. The coconut husk availability would be adequate for the production of 74,000 tons of coir fibre on the standard basis that one ton of fibre can be obtained from out of 10,000 husks.

2. MARKET AND PLANT CAPACITY:

A study of the demand for domestic consumption and the scope for export indicates that a pilot plant can be set up immediately in North Sulawesi. To add value to the product the output of the North Sulawesi factory may be of the curled coir or twisted fibre which is the starting material for production of rubberized coir. Twisted fibre is imported in large quantities by Germany and other European countries as well as by Japan for use in the manufacture of rubberized seat cushions for automobiles and other industrial application.

The present imports of twisted fibre by nereby countries like Japan and USA are 3,700 tons per annum. (Japan 3,200 tons and USA 500 tons a year). Indonesia would have to enter the export trade in the commodity and penetrate the market already dominated by Sri Lanka. It would be possible to secure a share of 20% (700 tons) in the begining and reach a level of 30 to 35% over a period of 4 to 5 years.

Immediate demand for rubberized coir products for domestic consumption flows from automobile, bedding and furniture industry and is estimated at 1,070 MT. per annum. Automobile assemblers alone require 320 MT rubberized coir cushions for assembling their vehicles to comply with the Government decree to utilize the indigenous components for assembly by 1980. 90% of the demand materialising the entire output of a 900 MT plant operating at hundred per cent capacity could be marketed internally. A factory of this size would need 500 MT twisted coir per annum as one of the input raw material.

Plentiful availability of raw materials (coconut husks - which are now wasted) and good opportunities for export and domestic sales justify the setting up of the above two pilot plants immediately.

i. North Sulawesi Twisted Coir Factory with an annual output of 1,200 MT (utilise plentiful raw materials resource).

ii. A rubberized coir products factory in Java with an annual output of 900 MT (tap the virgin domestic market).

The product patterns of both the factories are set out in the pages following:

PRODUCT PATTERN.

NORTH SULAWESI COIR FIBRE UNIT.

Raw material (12 million coconut busks/year).

Fibre extraction by defibering process

1,400 tons coir fibre per year

spinning and curling

1,200 tons twisted fibre (after process wastage ± 10%)

500 tons for being utilised in rubberising for domestic market.

700 tons/year for export to Japan and America.

Production Pattern.

JAVA RUBBERIZED FIBRE UNIT

RAW MATERIAL: 500 tons twisted fibre - locally from North Sulawesi.

+

450 tons - 60% DRC Latex Rubber - Locally available

+

150 tons - rubber chemicals

Process into rubberized fibre'

Output - 900 tons finished goods per year

Utilizations ± 10%

300 tons - for Automobile Assembling Industry of 75,000 vehicles.

240 tons - Bus body industry (1,500 buses/year)

250 tons - Beddings (25,000 beds)

250 tons - Furniture cushion & upholstery market

30 tons - Industrial products like air filters.

MATERIALS AND INPUTS:

Material	Quantity	Consumption per annum availablity.
a. Coconut husks	12 million husks	plentiful - will use only less than 2% of husks available in Minahasa District. (740 million nuts a year).
b. Latex rubber 60% DRC	450 tons	Available in plenty in West Java & Sumatra. upto 30,000 tons/year.

c. Chemicals:

Accelerators, Antioxidants, Stabilizers, Sulphur, Kaolin	150 tons/year. generally imported by rubberized coir manufacturing industries. Quantity to be imported accounts for one sixth of the cost of latex.

d. Auxiliary materials:

Furnace oil, Solar/Diesel	Locally available. No difficulty in procurement.
Consumable stores.	

LOCATIONS AND SITE:

For reasons of easy accessibility to source of raw materials, required labour force of varied skills, water and electricity, facilities of road and other transportation to reach domestic and export, the plant locations would be:

a. Coir fibre production unit - Manado/Bitung Belt in Minahasa, North Sulawesi.

b. Rubberized coir products factory - Jakarta, Bogor, Cirebon Area Java.

PROJECT ENGINEERING :

The Coir Fibre Factory in North Sulawesi will manufacture brown fibre fromdry coconut Husks by the mechanical defibrering process and thereafter curl the coir fibre by the spinning and twisting process so as to obtain a resilient and springy material suitable for subsequent rubberizing process.

Three defibering machines with auxiliary equipments viz. two crushers, two revolving screeners and two turbo cleaners working on three shifts of 7 hours duration would give an output of 1,400 tons of coir fibre per annum, six spinning and curling machines would process 1,400 tons of coir fibre and convert into 1,200 metric tonnes of twisted fibre or curled rope per year working 3 shifts a day.

Theproduction of rubberized coir at Java would require further processing of curled coir obtained from North Sulawesi. The curled coir is first untwisted, formed into a random fleece on a conveyor, rubberized by traversing latex spraying devices,pre dried, cut to specified size, placed in moulds or pressed in a hydraulic hot press.

Thereafter it is vulcanized in a drying stove or chamber drier. It is then cut and trimmed and becomes the finished product for use in automobile industry and other upholstery and industrial and uses.

The machinery and equipment required for the output of 900 metric tons of finished rubberized fibre products on a three shifts working are:

One Unit consisting of:

1 Untwisting machine
1 Rubberizing sheet machine plant
1 Hydraulic steam press
1 Drying stove and vulcanizer

1 Spraying cabin
1 Latex spray unit with tank
1 Colloid mill and ball mill for compounding of chemicals
1 Bandsaw cutter with moving table
1 Set of 8 chamber driers
1 Air compressor of 20 HP
1 Steam generator
1 Generator for power generation

The rubberizing plant can produce upto 2 tons of fleece per shift and can cope with demands of finished product with addition of auxiliary steam press and driers and produce upto 1,500 tons finished goods per year.

PLANT ORGANIZATION AND OVERHEAD COST:

Each production plant forms a production cost centre. The administration and selling organization would be additional cost centres for the respective functions. The plant service cost centres like air compressor, steam and power generators would serve particular production cost centres.

MANPOWER:

The coir fibre factory in North Sulawesi would need about 92 operators of different skills for machine operation, internal transport and for material handling. The maintenance administrative and managerial personnel are 6,5,and 15 respectively.

The Java Rubberized coir products factory would need about 110 workers. The maintenance, administrative and managerial personnel are 20, 32 and 10 respectively. The sales staff required is 6.

For the smooth functioning of the factories during the gestation period, assistance of one expatriate for the rubberized coir factory in Java with expertise and knowledge of the coir industry in production, marketing and

general management may be secured. Training must be secured in the processing of coir fibre and rubberized coir for 3 to 4 operatives for each factory, through the plant suppliers.

During erection and commissioning, training of the workers to acquire production skill for a desired period may also be secured.

IMPLEMENTATION :

The implementation of the project coir fibre factory at North Sulawesi would extend over a period of one year and that for the Java rubberized fibre factory would cover a period of two years from the time an investment decision is made.

The gestation period for the North Sulawesi factory would be a year from the date of commencement of trial production to overcome the initial production bottlenecks and be able to secure export orders.

The gestation period for the rubberized coir factory in Java would likewise extend over one year after the start of trial production. If sales promotion drive keeps pace with production, target production sales can be achieved over a period of two years after initial start.

FINANCIAL AND ECONOMIC EVALUATION:

Capital Cost:

The total capital investment of North Sulawesi coir fibre factory would be US $ 500,000.00

The total capital investment for the rubberized coir fibre factory in Java would be US $ 1,000,000.00

PATTERN OF FINANCING :

NAFED indicated equity investment for the total requirements.

Alternatives adopted are:

a. Entire financing equity (NAFED).

b. 30% equity and 70% by borrowings (INDUSTRY PRACTICE)

COMMERCIAL PROFITABILITY:

	Pattern of financing.	
	NAFED 100% equity	Industry practice. equity 30% / debt 70%
1.NORTH SULAWESI FACTORY:		
a. Rate of return	14.1%	15.8%
b. Repayment period	4.6 years	4.2 years.
c. Specific investment cost of plant(US $ per ton)	3833	3833
d. Specific production cost US $ per ton	193	228
e. Break-even point	45.3 %	71.3%
2.JAVA RUBBERIZED COIR FACTORY:		
a. Rate of return	28.3%	30%
b. Repayment period	2.9 years	2.8 years.
c. Specific investment cost of plant(US $ per ton)	8333	8333
d. Specific production cost US $ per ton	1907	2000
e. Break-even point	51.2 %	62.8 %

THE SENSITIVITY ANALYSIS:

1. The break-even points of both the projects are good indices of the projects' ability to maintain profitable working on a continuing basis.

International trend of selling prices of products show an upward movement and operating costs are all controllable.

COST BENEFIT ANALYSIS :

Employment :

The North Sulawesi coir fibre factory would create direct employment for 118 persons, creating more jobs at the rate of one job for every US $ 4237 invested.

The Java rubberized coir factory would create direct employment for 178 persons, creating additional jobs at the rate of one job for every US $ 5618 invested.

FOREIGN EXCHANGE :

The North Sulawesi coir factory by exporting 700 tons of twisted fibre would earn US $ 186,200.00 annually in the form of foreign exchange.

In the case of the Java ruoberized coir products factory the establishment of the factory would result in import substitution of car seats by the automobile industry and air filter by the air conditioning equipment trade. The other part of the production of the factory viz. bedding would also result in import subsitution.

Air filter and other products (20 tons) can be exported to the extent of US $ 115,000 to neighbouring countries like Australia, New Zealand, Malaysia etc. Therefore 60% of the total annual sales of US $ 2,070,000 would result in equivalent foreign exchange savings or earnings. Even assuming that the imported goods are cheaper, the foreign exchange savings may be substantial and not less than one million dollars per annum. There would be a very negligible foreign exchange expenditure on imported chemicals annually to the extent of US $ 60,000. In other words, the foreign exchange saved in one year may be equal to the total investment.

CONCLUSION :

1. The projects are economically viable, satisfy local demand and will earn foreign exchange. They will fulfil a social purpose. They are agrobased and would result in the profitable use of the waste product (coconut husks) which is now being thrown away or burnt. The project would lead to the development of export oriented industry in the outer islands with future growth prospects. Farmer's income would increase since the entire value of 12 million husks is added to present agricultural income.

Major disadvantages:

2. Intensive sales promotion effort and export drive are essential. Markets (domestic and export) should be developed and an optimum market share should be attained within a reasonable time, if the project is to succeed.

Direct shipment facilities from Bitung harbour in North Sulawesi and fixing of a workable freight rate from Bitung harbour to Japan and America is very essential in order to be competitive in the export market. At present freight classification for twisted fibre and rubberized coir has not yet been listed in Indonesia Conference Tariff. Freight rates which would be comparable with these from Sri Lanka and Malaysia to Japan must be fixed at the earliest.

Chances of Implementation:

3. As the chances of success are bright and would result in profitable employment of abundant resources, steps for the implementation can be taken up on a priority basis. With the experience and the background of the industry for more than twenty years, I would say that the success of

the project is greatly assured and therefore, it deserves a high priority implementation programme. A supporting study by way of market survey for 2 months for the domestic market for rubberized coir products and three weeks in Japan and USA, for exports of twisted fibre may be instituted when the implementation of the project is decided upon.

Chapter II

PROJECT BACKGROUND & HISTORY

INTRODUCTION:

Indonesia ranks as the second largest producer of coconuts in the world, its annual production of 7,265 million nuts being next only to that of Phillippines. The area of coconut cultivation is estimated at 2,400,000 Ha. with a production of 1.5 million tons of copra equivalent.

Coconut is mainly produced in North Sulawesi. Other important producing regions are the Moluccas, North Sumatra, Java, the Rian archipelago and West Kalimantan. More than 1.2 million farm families earn most of their income from coconut especially in North Sulawesi.

Coconut is cultivated in small holdings of one to five hectares. Nearly 40% of the nut production is consumed as fresh nuts for food. Out of 7,265 million nuts produced in 1978 (Copra equivalent 1.5 million tons) only 900,000 tons copra were produced.

Apart from copra manufacture industrial utilization of coconut is confined to desiccated coconut manufacture. Only one factory produces desiccated coconut in Indonesia at Air Madidi in North Sulawesi and this is exported. Copra is prodessed into crude coconut oil and is k shipped to Surabaya in East Java for being refined and utilized for domestic market consumption. 65% of copra and coconut oil is utilized in home consumption and the balance 35% in intermediate demand use such as soap cleaning preparation industries and food products.

There is little utilization of the coconut after removal of the

kernel for copra production. A small quantity of charcoal is produced by farmers from the coconut shell on a cottage industry basis. At present one or two firms are exporting coconut charcoal to Japan which imports charcoal for manufacturing activated carbon. Enquiries show that export of coconut charcoal is very uneconomical due to the low recovery and high ocean freight rates from Indonesian ports. Further enforcement of very rigid specifications of quality and consequential rejections and heavy claims add to the frustration to exporters of coconut charcoal.

There has been no production of coir fibre or fibre by-products in Sulawesi from the enormous quantity of husks left over after copra is made. Potential for fibre production from out of the coconut husks after production of 396,000 tons of copra in Sulawesi can be extimated at nearly 200,000 tons (4,500 coconuts yield one ton copra and the husks from 4,500 nuts would give 500 kg fibre). North Sulawesi alone with an annual output of 740 million nuts has a fibre production potential of 74000 MT. This potential has to be utilised to make coir fibre, rubberized fibre mattress, Automobile and upholstery cushions and Air filters which have ready local market. Export possibilities must be developed.

PROJECT BACKGROUND AND HISTORY:

The Government of Indonesia undertook in the past various projects for the development of processing of coir fibre and by-products through UNIDO project VS/RAS/75/011.

The main object of the first project undertaken in 1976 was to reactivate some of the idle coir plants in Indonesia, especially the one in Wani in Central Sulawesi. This factory never went into operation even though the machines had been imported and erected before 1965.

According to the report of the Expert (T.K.G. Ranasinghe) associated with the above project recommendations were given to reactivate the Wani Plant by adding more equipments like curling machines and Turbocleaner and producing twisted fibre for being used in the manufacture of rubberised coir products for the domestic market and export.

Subsequently a study team was sent to Sri Lank and Japan in 1976 to study the coir situation in those countries and seek proposals from prospective entrepreneurs in Japan to set up a coir Industry in Indonesia on a joint venture. According to the Report of the team (M. Vanakulasingham export of coir fibre from Indonesia was impossible due to prohibitive shipping freight rates prevailing in Indonesian ports. The main importer of coir fibre in Japan M/s Marubeni Trading Co., had already established their own subsidiary undertaking in Malaysia producing and exporting coir fibre from Penang. Better and more economic shipment facilities are available at Penang. In view of the above reason Japanese collabaration in a coir industry in Indonesia could not take shape. The report, however, indicated that coir Industry can be developed in Indonesia for the domestic market especially to produce rubberised coir products and also coir bags as a packaging material for copra transportation.

As a result of these successive studies the Government of Indonesia decided to start with the project for establishing coconut fibre processing industry in North Sulawesi.

The NAFED (National Agency for Export Development) as the executing agency carried out a reconnaissance survey for the coir project in concurrence with North Sulawesi Government and requested for UNIDO assitance in carrying out a prefeasibility study through the above project VS/RAS/75/001.

The project was approved by UNIDO in 1978. Thereafter it was undertaken for a period of two months commencing from September 18,1979.

The expert arrived in Jakarta on 17th September 1979 and after being briefed by the Senior Industrial Development Field Adviser (UNIDO) Jakarta, was assigned to NAFED.

In order to fulfill this assignment field trips were arranged by NAFED to various coconut producing regions in South, Central and North Sulawesi. Various officials of the Government Departmentof Trade, Industry, Plantation, Manpower and Labour Electricity Board, District chiefs, Mayors port authorities Planning Board(BAPEEDA), investment coordination Board (BKPM) and Copra Management Board (BAPENGKO) Shipping conference and Secretariats, Chambers of Commerce and Industry, and Assian and Pacific Coconut Community, Private Entrepreneurs, Copra producers, cocomut oil and desiccated coconut manufacturing industries were contacted. Discussions were held with them covering various factors for utilisation of coconut husks and establishing coir

industry in Indonesia relating to availability of raw materials, power, water, transport facilities, manpower with various skills, wage levels, facilities for factory construction and machinery maintenance, harbour facilities and export possibilities. The project study was completed on 17th November 1979.

During the discussions and lectures, great enthusiasm and interest was shown by copra producers and coconut growers to know about the various uses of coir fibre and end products used currently in other coconut producing countries and for which markets can be developed in Indonesia too. They evinced a keen desire to start producing coir fibre and further end-products utilising the huge husk availably. Trade Industry and Plantations Department personnel also enthusiastically offered to sponsor and assist in the development of coir industry in the various regions of Sulawesi.

The study proved a success due to the ready and willing co-operation of the various officers of the provincial and central Governments, the information and suggestions furnished by the Asian and Pacific Coconut Community, and the Senior Industrial Development Field Adviser (UNIDO) and other individuals. Their co-operation is hereby acknowledged.

OBJECTIVES OF THE PROJECT:

The immediate objective of the project is to carry out a prefeasibility study for establishing a coir fibre processing industry in North Sulawesi to produce coir fibre products for domestic market consumption and export.

NAFED also proposed, with the offer of joint efforts, financial resources and cooperation by the Copra Management Board (BAPENGKO) to promote coir fibre processing in other regions of Sulawesi as well. With this end in view specific recommendations and a plan of operation for a follow-up to this study were sought for long term development of coir industry on a widerbase. and these are furnished.

MARKET DEMAND AND PLANT CAPACITY.

COIR FIBRE/ITS PROPERTIES AND USES:

Coir fibre is obtained from the coconut fruit, extracted out of the fibrous tissues enclosed between the tough outer covering and the hard shell which surrounds the kernel. It is extracted either by manualy process or by mechanized equipment. In the manual process, green husks are soaked in backwaters, or lagoons over a period of 8/10 months. In the mechanical extraction husks are soaked for 4 days or soaking is even dispensed with. Fibre obtained in the manual process soaking method is known as white fibre or yarn, while mechanically extracted fibre is known as brown fibre or coir fibre.

Coir fibre is a versatile product. Its special properties place it in a distinct category among fibres. It is not affected either by light or moisture. It is resistant to decomposition and is hygroscopic. It has good insulation properties and is resistant to abrasion and rubbing. Coir burnt or buried does not create any pollution problem.

END USES OF COIR:

White fibre is spun into yarn and is used for manufacture of mats, mattings and floor coverings and also for rope and cordage. Brown fibre is used as a stuffing material for inner sprung mattresses, insulating pads for the building industry, rubberized coir for the automobile and upholstery industries, brushes and brooms, fishing nets and bags.

Charts I and II below show the different methods of fibre extraction and the end products obtainable from coir fibre.

CHART I

THE MOST EFFICIENT METHOD FOR COIR PRODUCTION

Raw - Materials

Coconut-husks

CRUSHING PROCESS

Husks are required to be properly crushed before they are put through the defibering machine.

↓

SOFTENING PROCESS

Soaking in water for 2 to 7 days, according to condition.

↓

DEFIBERING PROCESS

Crushed husks are to be put through a defibering machine for carding out and automatically separating into standard bristles, short fibres and coir-dusts.

STANDARD BRISTLES	SHORT FIBRES	COIR DUSTS
Long fibres (25%)	Short fibres other than standard and coir-dusts. (25%)	Foreign matters other than standard and short fibres. (50%)
↓	↓	↓
FOR DIRECT EXPORT AND FOR MANUFACTURING INTO SECONDARY PRODUCTS FOR INTERNAL CONSUMPTION.	MATERIALS FOR RUBBERIZED CUSHION MATERIALS AND FOR MATTRESS MATERIALS ETC.	MATERIALS FOR PRESSED HARD BOARDS.

Remarks: Percentages of yield specified are average figures. In some countries are more and while others are less.

PROCESSING OF COIR FIBRE OBTAINED BY THE MECHANICAL EXTRACTION METHOD

(Defibering or Decortication)

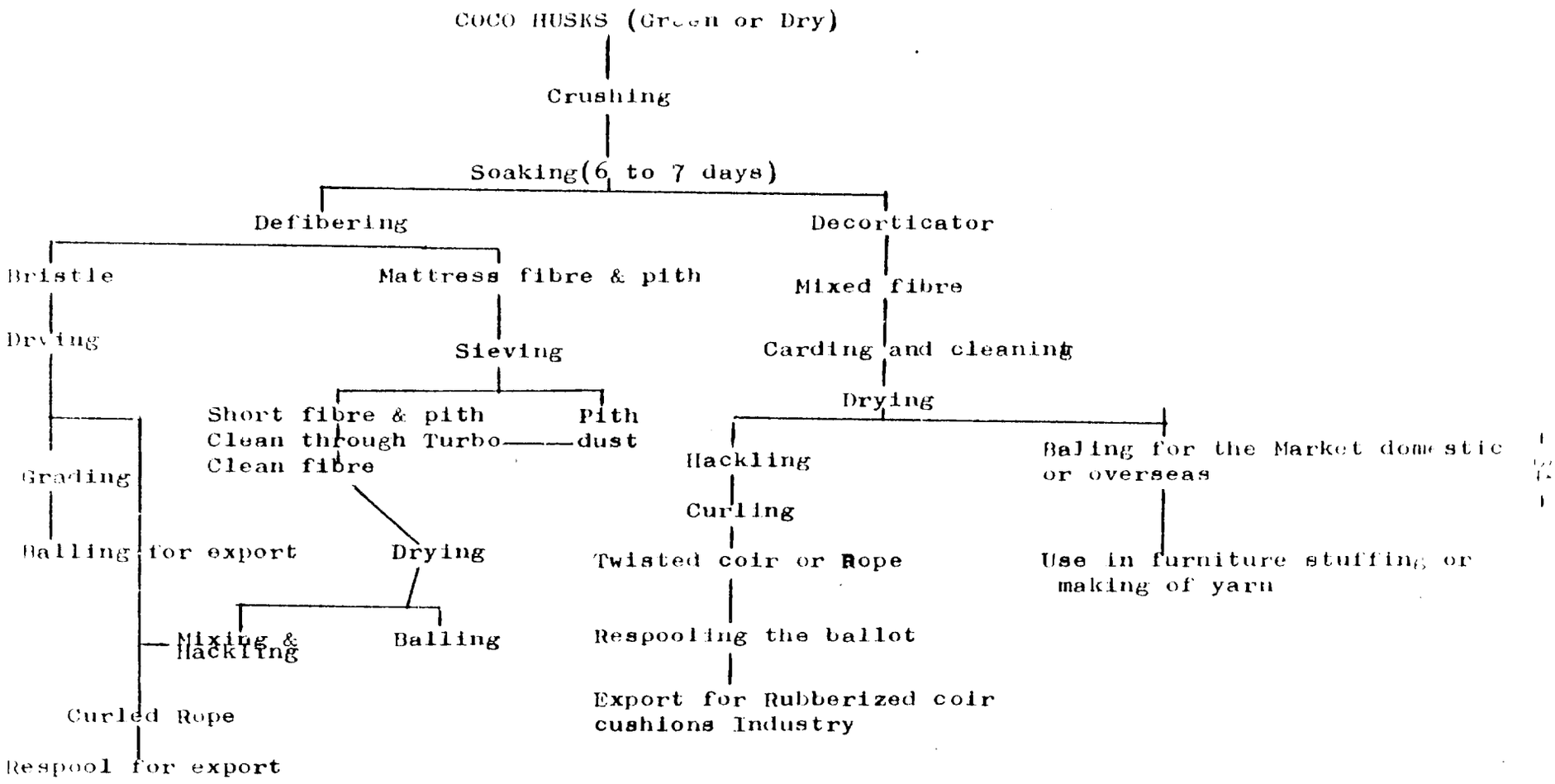

CHART III

PRODUCTION OF MATTRESS AND BRISTLE FIBRE

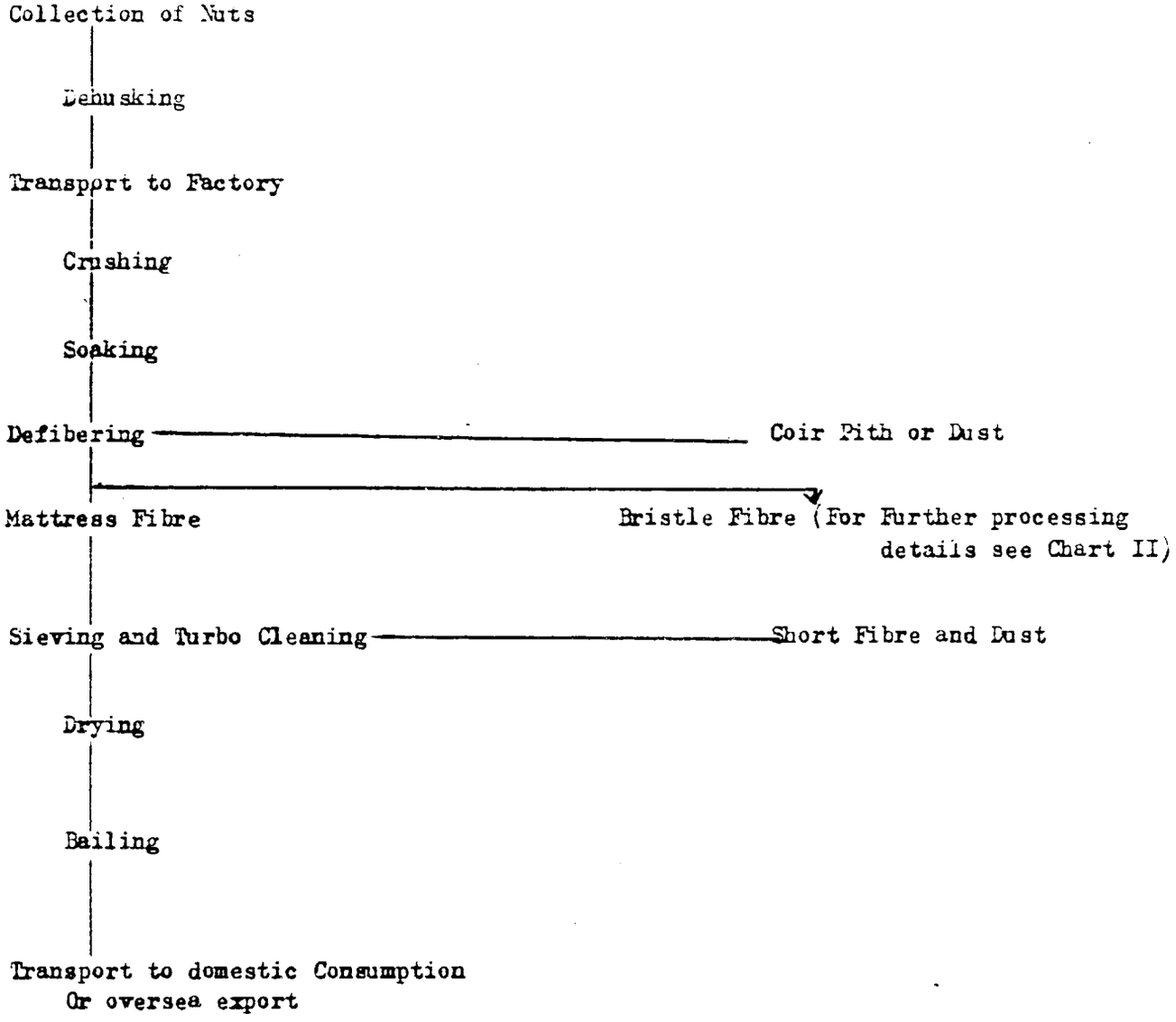

CHART IV

VARIOUS PRODUCTS CAN BE MANUFACTURED OUT OF COIR

STANDARD BRISTLE (25%)

- TWINES - 2 ply a 3 ply.
- ROPES - Various sizes.
- DOOR MATTS - Various types and sizes.
- ROLL TAPESTRIES FOR CORRIDORS AND STAIRS Etc.
- BROOMS, KITCHEN OR DECK AND OTHER BRUSHES etc.
- HIGH CLASS MATTS FOR AUTOMOBILESAND HOMES
- HIGH CLASS RUBBERISED CUSHION MATERIALS FOR AUTOMOBILES AND FURNITURE Etc.
- FOR MATERIAL USED IN BASIC WEAVING AS CUSHION OF HIGH CLASS WOOLEN TAPESTRIES.

SHORT FIBRES (25%)

- COMMON CUSHION MATERIAL FOR CHEAP MATTRESSES AND FURNITURES Etc.
- DIRECT RAW MATERIALS FOR HIGH CLASS RUBBERIZED CUSHION MATERIAL Etc.
- RAW MATERIALS FOR PRESSED HARD BOARDS Etc.

COIR DUSTS (50%)

- DIRECT - RAW-MATERIALS FOR PRESSED HARD BOARDS Etc.

Remarks: Percentages of yield specified are average figures. In some countries are more and while others are less.

WORLD TRADE IN COIR AND COIR PRODUCTS:

It will be observed from Appendix NS 1.1 that the total world production of coir fibre is 299,000 tons. India produces 155,000 tons (51.86%) Sri Lanka 115,000 tons (38.47%) and all other countries accounting for the balance of 29,000 tons (9.67%). India and Sri Lanka happen to be the two largest producers of coir fibre, in the world accounting for 90% of world's coir production.

Of the above India's production is confined mainly to white fibre or yarn extracted from green husks while production in Sri Lanka and other countries is confined to coir fibre (brown fibre).

In the producing countries, traditional methods are followed for coir production whereas importing countries possess advanced technologies to produce sophisticated coir products from imported yarn (white fibre) and coir (brown fibre).

In the producing countries, coir industry is raw material and labour intensive and is a source of employment and income [illegible] in the relatively backward regions of the countries. In India 500,000 persons are directly engaged in coir fibre production and another one million persons are dependent on it. In Sri Lanka coir industry provides employment to nearly 30,000 persons.

Coir industry has developed as a small scale sector industry in Sri Lanka and India and has a wide base. In India on the western coast of South India over 2,000 industrial units are engaged in white fibre processing. In Sri Lanka in a relatively small sector of 6,000 sq. miles over 621 fibre mills are operating as small scale industries producing brown fibre.

The principal export of India is coir yarn and that of Sri Lanka is coir fibre either as bristle, mattress or twisted fibre. Statements showing exports of these two products from producing countries are given in appendix NS 1.2 NS 1.3.

Europe is the main outlet for coir and coir products. Nearly 75 per cent of the total exports of coir and coir products are directed towards Europe.

PRODUCT PATTERN IN PRODUCING COUNTRIES.

In the year 1977-78 India produced 146,500 tons of white fibre (yarn fibre) and 19,000 tons of brown fibre.

Sri Lanka produced 102,900 tons of brown fibre in the year 1978 and exported 90,000 tons in the forms of mattress fibre, bristle fibre, twisted fibre yarn. The coir fibre exports of Sri Lanka by products and by destinations are given in appendix NS 1.4 and NS 1.5.

COIR IMPORTING COUNTRIES.

The main importing countries for coir fibre and coir products are in Europe: (i) Federal Republic of Germany; (ii) United Kingdom; (iii) France: (iv) Netherlands and (v) Italy; in Asia: (i) Japan (ii) Australia (iii) United States of America. The trends of imports by these countries over the period 1960-77 are given in appendices NS 1.6 to 1.9. Supplementary product wise statistics of imports by European countries are given in appendices NS 6.1 to NS 6.5.

Bristle fibre is used by the brush making industry in Germany and Japan. In U.K. and in USA mattress fibre is imported in bales and used in bedding industry.

Germany, Japan and Italy use imported twisted fibre or curled coir for rubberized coir manufacture especially for the automobile industry for seat cushioning.

In U.S.A. a small quantity of door mats and mattings imported from India is utilised in the consumer market.

TRENDS AND FORECASTS:

Supply, demand and trade projections through 1985 by FAO indicates the basic world demand for coir fibre would be in the region of 140,000 tons (Appendices NS 1.10) Corresponding demand for yarn and manufactures has been estimated at 150,000 tons. Alternative estimates with different assumptions for a fall in the price of coir place the demand for fibres at 100,000 tons and yarn and manufacture at 113,000 tons. Under the basic assumption an increase in the import demand has been anticipated to the extent of 25% over the actuals for 1976.

Competition from synthetic substitues had an impact on coir products exports to Europe and Japan. Steep increases in crude prices in the recent past has, however, made synthetic products more expensive. Coir fibre has, therefore, come to occupy its former position in the world fibre market.

The FOB prices realised by India and Japan for twisted fibre and other fibre products for its exports to Japan, USA, Federal Republic of Germany and other countries show an upward movement (Appendices NS 1.11 and NS 1.12). It confirms the view that coir fibre would continue to enjoy increased demand in the future.

Analysis of imports of coir fibre and coir products (Appendix NS 1.9) would also show that the demand in the

new markets in other than traditional importing countries like Germany register a gradual increase. Hence it would be fruitful to carefully nurture these markets besides taking efforts to steps up the off take in traditional markets. Sri Lanka and India enjoy a long established export market for their coir and coir products in Europe, Japan and U.S.A. At present Japan imports annually about 12,000 MT of coir fibre yarn and coir products.

Imports of Japan from Sri Lanka are around 3,000 tons of twisted fibre, 3,800 tons of bristle fibre and 1,000 tons of baled mattress fibre. Sri Lanka has established a stable market for its coir products in Japan for the past several decades. It will, therefore, be necessary for Indonesia to penetrate aggressively into Japan to secure a share of Sri Lanka's exports to Japan. (Details in appendix NS 1.13)

A new exporter like Indonesia will have a low net realisation if freight is greater as is the case with European markets. Appendices NS 1.13 and NS 1.14 give the current shipping freights for coir fibre and coir fibre products to Europe, Japan, U.S.A. and Australia from Sri Lanka and Indonesian ports respectively.

The shipping freight rates is a serious disadvantage for Indonesian Exports, coir fibre being a low priced commodity. Baled coir fibre fetches US $ 140 a ton FOB Sri Lanka and freight from Sri Lanka to Europe is US $ 54.79 per CBM or US $ 109.58 per ton. The total C & F cost of baled fibre comes to US $ 249.58 for European importer.

For the same commodity the freight rate to Europe from Indonesian ports in US $ 264.56 and US $ 309.56 /ton from Jakarta and North Sulawesi ports respectively. Assuming FOB prices of baled fibre are same, the freight element fromIndonesian ports alone is more than the CIF,

cost of fibre for the European importer to get the supply from Indonesia. Hence exports of coir products to Europe from Indonesia is unthinkable. This anomaly was brought to the notice of the Indonesian Government and Shipping Conference Secretariat.

If coir fibre is processed into curled coir, it fetches a higher value (US $ 260). Freight is calculated on the volume for coir fibre in bales but by weight for twisted fibre. It is hence necessary to reduce the volume for exporting fibre to get advantageous freight rate and keep the sale price of the product competitive. To achieve this, coir fibre is usually hydraulically pressed by a high power baling machine to a density of 500 kg. per cubic metre, so that one ton of fibre can be compressed in 2 cbm volume. Packing in bales is an auxilary operation to keep shipping freight low by reducing the volume. It does not add value to the product. The cost of a high power balling machine is over US $300,000/-. This press can handle 10-15 bales an hour or 100-150 tons fibre per day. Installation of such high priced balling machine in Indonesia for the expected low export volume of 700/1000 tons fibre per year to Japan and nearby countries is highly uneconomical. Hence instead of shipping fibre in bales, it should be processed into twisted or curled coir and so exported to get a better return and be fairly priced. Twisted fibre can be classified for freight on weight basis.

At present shipping freight from Sri Lanka to Japan for baled fibre is US 41.51/cbm. or US $ 83.02/ton. For the same commodity the freight from Indonesia ports is US $ 48.54/cbm or US $ 97.08/ton.

Several discussions on this shipping freight, were held with shipping companies and shipping conference secretariat in Jakarta as well as the Department of Sea

Transportation. It was pointed cut to the Secretariat and member companies that the freight rates to Japan should be lower than those from Sri Lanka as Indonesian ports are in nearer. The present higher rates are not supportable logically or otherwise. Now there is no classification for twisted fibre in freight tariff list of export commodities from Indonesia. There is also need for premotional freight rates for coir fibre. Freight for twisted fibre from Sri Lanka to Japan is now US $ 73.26 per 1000 kgs. This should be the guideline for fixation of freight on twisted fibre to be exported from Indonesia to Japan. The need for promotional freight rates comparable with Sri Lanka's shipping freight was stressed. A rate of US $ 60/1000 kgs would be supportable, from North Sulawesi to Japan. Conference vessels come only if load offered for a shipment is over 5,000 tons at a time. This is not possible as quantity to be exported will not be of that volume. This matter was discussed at length with shipping conference members, Conference Secretariat in Jakarta and Department of Sea Transportation in Jakarta and Manado.

It was suggested that loads of even less than 500 tons can be transhipped from Betung harbour in North Sulawesi to Tenato port in North Maluku which is very near to Betung for further transport to Japan by log carrying tramp vessels, as Japan regularly imports timber logs through this port. It was explained that twisted fibre is packed in open circular coils and does not need any special protective space in the vessel, as itwould not get affected by exposure or moisture and it can be conveniently accommodated with log consignments. The freight rate to Japan for twisted fibre including transhipment charges at Tenato was worked out to approximately US $ 66 aton. This is afavourable development for export

of twisted fibre from North Sulawesi to Japan as freight for twisted fibre from Sri Lanka to Japan is hgiher at US $ 73.25/ton.

A fellow up of the action already intiated with the Shipping Conference Secretariat and Department of Sea Transportation would result in the total removal of this freight constraint and enable smooth development for export trade of coir fibre from North Sulawesi to Japan. Japan is presently importing annually 3,200 tons of twisted fibre from Sri Lanka. To start with Indonesia can expect to get 20 to 25% of Japan's present imports of twisted fibre, say 700 tons a year and this can be built upto 1,200 tons per year on the next few years.

- -

DOMESTIC MARKET IN INDONESIA FOR COIR FIBRE PRODUCTS.

There is immense scope for utilisation of coir fibre products in the following sectors which can be immediately exploited.

AUTOMOBILE ASSEMBLY INDUSTRY.

There are 19 automobile assembly units in Indonesia importing various brands of 4 wheeler vehicles from Japan and Europe received in C.K.D. condition and assembled in Indonesia. Present production of 4 wheeler automobiles has exceeded 100,000 units a year. The production of 4 wheeler vehicles since 1975 through 1978 is given below:

Year	Commercial vehicles	Jeeps	Sedan	Total
1975	45022	3081	30770	78873
1976	44517	6759	24298	75574
1977	74333	6049	12853	93235
1978	84191	9103	15373	108667

According to Decree 307 issued by the Ministry of Industry on August 3, 1976 automobile assemblers in Indonesia should ensure that before 1980, certain specified parts of automobiles should be of indigenous manufacture. Seat cushion assemblies presently being imported as part of automobiles is one of them. On November 8, 1979 Government have again notified through order SK 168 that the enforcement of the above policy would be done immediately. Hence automobile assembly industry presently importing these part of automobiles are immediate prospects and can

be made to utilise locally produced rubberized coir seat cushions for their requirement to comply with the above.

One vehicle requires 4 kg of rubberized coir for seat cushioning. To cater to the requirements of 75% of current annual 4 wheeler production, 300 tons of rubberized coir cushions have to be manufactured locally in Indonesia.

BUS BODY BUILDING INDUSTRY:

Over 30,000 buses are plying in Indonesia as per 1977-78 statistics. Most of these buses are without cushions. In addition to the existing buses, to keep pace with the Government's programme to develop infra-structure road transportation facilities, the number of buses is expected to increase at the rate of 1000 buses annually. Government is keen to provide increased passenger amenities providing cushions in buses. So bus body building industry is another immediate outlet for consuming rubberized coir cushions as rubberized coir is cheaper and more durable than other expensive cushioning materials like foam rubber. One bus with a seating capacity of 40 passengers need 160 kg of rubberized coir cushioning. Every 1000 buses would need additional 160 tons of rubberised coir annually. The demand from this sector could be placed at 240 tons a year.

MIDDLE INCOME GROUP POPULATION: FURNITURE INDUSTRY HOTELS, CINEMA, OFFICES ETC.

This market can consume easily 500 tons of rubberized coir mattresses, furniture cushions, upholstery cushions for cinema theatres and various offices. Rubberized coir material is airy, hygienic and resilient. For tropical countries it is a very economic and durable substitute for foam rubber. Offering rubberized coir products at 60% of foam

rubber prices, India and Sri Lanka have developed 8 rubberized coir factories (6 in India and 2 in Sri Lanka) catering to middle income group people, cinema theatre, railways and transport industry to the extent of 6000 tons of products a year.

A standard rubber foam mattress costs Rp.50,000 (US $ 80) in Indonesia. A rubberized coir mattress of same size also can be produced and sold for Rp.25,000 (US $ 40) i.e. at 50% of a foam rubber mattress cost.

Out of 139 million population in Indonesia nearly 150,000 households are in the income group of Rp.75,000-150,000 per month, or US $ 120-240 per month. According to statistics 10% of the income goes for misscellaneous services and comfort materials. Bedding and furniture cushions come under this category. An annual sale of 25,000 mattresses (250 tons), furniture cushions for cinemas, hotel industry which are developing fast (consuming 250 tons) are foreseeable. Besides the above, industrial uses for airfilters for air conditioners, acoustic insulation for theatre and autitoria are possible with rubberized coir. In India these applications have grown considerably in the past 10 years. In Indonesia too scope for similar development of various household and industrial uses exists.

The immediate demand for rubberized coir in Indonesia can be estimated at around 1000 tons a year. A medium scale factory producing one ton per shift and 900 tons for 3 shifts of 300 working days should be established to meet this demand in Java utilising easy availability of coir and c. rubber and proximity to consumer points.

HANDICRAFTS ITEMS:

Besides sophisticated industrial products like rubberized coir products, handicraft products developed from

coir fibre will have a good local market in Indonesia. Coir bags, ropes, door mats, cordage and brushes come in use in daily home life. These are presently imported of nylon and plastic materials. In India and Sri Lanka the above uses of coir are fully developed from locally produced coir fibre and secondary processing of same. In Indonesia too, by introducing the uses to the consumers, vast scope for producing coir fibre from wasted coconut husks and developing intermediate and end products exists and this can be further easily developed.

At present the copra community is purchasing second hand bags at Rp.380-400 per bag (US $ 0.64) for packing and transporting copra. These hessian bags can be replaced by coir bags, by producing fibre from coconut husks with simple husks decorticating machines, and manually spinning of the fibre into yarn and weaving into bags. A coir bag of size 42" x 27" to hold 50 kg copra can be produced at a cost of Rp.250 much cheaper than the present cost of a second hand hessian bag purchased at Rp.400. So copra producers can profitably utilise husks and produce bags and save their outlay on hessian bags. They can also market the bags to other sections utilising the scope existing for similar packing especially to pack vegetables like sweet potato, cabbage, cassava etc. Over 150,000 tons of these vegetables are produced and traded in at Sulawesi.

For the copra industry in Sulawesi alone for producing (396.000 tons a year) for packing purposes 24,000 tons of fibre are required and this can be produced. One ton of copra would require 20 bags capable of holding 50 kg copra. Even if a bag is cycled 5 times, annual requirements would be 16 million bags. This justifies the establishment of production capacity to produce 24,000 tons of coir fibre annually in Sulawesi.

This can be taken care of by the small scale sector. In India and Sri Lanka development of coir fibre commenced at the very coconut production centres and through the small scale industry grew to a nation wide magnitude. In India domestic consumption of coir products in various handicraft applications exceeds 1,00,000 tons a year, generating employment for 1.5 million persons.

In Indonesia too, coir fibre production should get established right at coconut producing countries involving coconut growers and copra producers. Husks will not be wasted and discarded as their utilisation is easy and brings wealth. With the vast scope for domestic utilisation of handicraft products, the coir in Indonesia can be utilised profitably.

To start with each province in Sulawesi can set up one or two pilot small scale industrial units in the coconut producing regions. Polmas in South Sulawesi Poso and Luwuk in Central Sulawesi Gorontalo Minahasa regencies in North Sulawesi. 5 prospective entrepreneurs have been identified for this (please see the appendix for names and addresses). On my explaining the simplicity of production, the use of coir fibre and the marketing scope they are keen to set up small industries in their own copra production centre immediately. The added advantage for these five prospects is they get white coconuts delivered at their copra kilns for dehusking for copra production. Husks are obtained free of cost, as part of the whole coconuts. No collection and transportation charges are also incurred. To them the entire raw material husk is free and sale proceeds of fibre from these husks are added income. These 5 prospects are ready to set up 5 units capable of producing 250 tons of coir fibre per unit utilising 7,000 husks a day and produce various handicrafts items, using automatic decorticating machines

for fibre extraction and employing simple wooden spinning wheels for yarn making and weaving the yarn into bags with locally made wooden looms employing local unskilled agricultural labour available in plenty.

In India the small scale mechanised coir and handicraft product development have made phenomenal headway in the last 6 years starting from 4 units to 400. In Sri Lanka there are 620 fibre mills in a limited region. I am confident that setting up of five pilot coir fibre and products production units in different regions of Sulawesi would similarly bring in the next five years similar growth and development of the industry.

The product pattern and size of pilot plants recommended for Indonesia are given in the charts attached.

DEVELOPMENT PATTERN FOR THE PILOT COIR FIBRE PROCESSING INDUSTRY IN INDONESIA

COIR PRODUCTION INDUSTRY

	Small Scale Sector (5 Units)	Medium Scale Sector Units
	South Sulawesi	
Poso	- Central Sulawesi	(Minahasa)
Luwuk	- Central Sulawesi	North Sulawesi
Gorontalo	- North Sulawesi	1) NORTH SULAWESI COIR FIBRE UNIT
Minahasa	- North Sulawesi	Raw Materials 12 million coconut husks/year
1) RAW MATERIALS:	10.5 million Husks per year	
2) PROCESSING:	Production of fibre with automatic Decorticating Machine and Manual processing for Handicrafts - items.	Fibre extraction defibering process and Spinning and Curling by Curling Machines.
3) ANNUAL PRODUCTION:	1250/MT coir	1200 tons twisted fibre.
4) PRODUCTS:	1) Bags 2) Ropes 3) Door mats 4) Brushes 5) Handicrafts items	
5) MARKETING:	1) Copra community 2) Vegetable producers 3) Home needs for entire Indonesia	1) 500 tons for domestic market. 2) 700 tons for export.

JAVA RUBBERIZED FIBRE UNIT

1. Raw Materials: 1) 500 tons twisted fibre - Locally from North Sulawesi

+

2) 450 tons - 60% DRC Latex Rubber - Locally available

+

3) 150 tons - Rubber chemicals

2. Processing - Rubberizing

3. Annual production - 900 tons finished goods

4. Products

5. Marketing

1) Automobile seat cushions

2) Bus seat cushioning

3) Bedding

4) Furniture cushioning

5) Air filters

1) 300 tons - For automobile Assembling Industry of 75,000 vehicles

2) 240 tons - Bus body industry (1,500 buses/year)

3) 250 tons - Beddings (25,000 Beds)

4) 250 tons - Furniture cushion and Upholstery blanket

5) 30 tons - Industrial products like Air Filters.

RAW MATERIALS AND INPUTS.

Indonesia is second largest producer of coconuts in the world. Its annual output is 7265 million nuts. Having more than 25% of this produced in North Sulawesi, North Sulawesi provides immense quantities of coconut husks for production of coir fibre and is most suitable for setting up of pilot coir fibre processing industries. Total area of coconut cultivation in Sulawesi is 458,495 ha. and copra production is of the order of 396,000 tons per year.

Nearly 50% of the coconuts are consumed as fresh nuts for food. The balance quantity comes for copra production. 4,500 nuts yield one ton copra. The husks left over after production of copra and available at the kiln site form the ready and immediate raw material source for fibre production without the collection and transportation costs. About 1,800 million husks are readily available per annum in kiln site alone for fibre extraction in Sulawesi alone.

On the universal standard that one ton of fibre can be obtained from 10,000 husks, the fibre potential in Sulawesi is 180,000 tons annually. The size and the fibre content in Sulawesi husks are larger than of India, Malaysia, Thailand and Sri Lanka. Average husk weighs 450 gms. in Sulawesi while in India it is 340 gms, 320 gms. in Malaysia and Thailand and 420 gms in Sri Lanka. In Sulawesi 8,000 to 8,200 husks would yield one ton fibre. On this basis the coir fibre potential in Sulawesi can be easily estimated at 200,000 tons a year. The proposed medium scale industry to produce 1,200 MT of twisted fibre per annum would require 1,400 tons of raw coir fibre allowing 10% process wastage. This quantity can be extracted from 12 million husks. Five small scale industries each producing 250 MT of fibre per year would produce 1,250 tons of raw coir. In setting up the pilot units in the medium scale and small scale for producing 2,650 tons of fibre refered above only 1.5%

of potential is sought to be exploited at the outset.

CONSTRAINTS IN HUSK COLLECTION AND TRANSPORT AND HOW THEY CAN BE OVERCOME.

In most places, access to the interior coconut plantation especially in North and Central Sulawesi with no good infrastructure and road transportation facilities is by bullock or horse cart only. Almost all the coconut growers have their own horse or bullock carts driven by family members for transport of coconuts to the copra kiln or to the copra market.

Copra producers purchase whole coconuts delivered in cart loads at kiln site where the nuts are piled up and dehusked for copra production. Since whole nuts are purchased, and dehusking takes place at the kiln site, no separate costs for husk collection and transportation has to be incurred if the fibre production industry is set up at the same spot where coconuts are delivered. It will hence be profitable if fibre production is integrated with copra production.

According to copra producers collection and transportation charges at present should be taken at Rp.500 to Rp.1,000 per 2,000 nuts or husks for delivery from distances upto 15 kilometers.

At present the luggage box in the bullock cart is (3 cbm) in Sulawesi and holds only 400 husks. In India and Sri Lanka, the carts have a longitudinal base of 10 ft. long 4 ft.wide with angle side supports of 12 cbm. to hold upto 2,000 husks and these are easily transported by bullock carts.

When this design was explained, it received enthusiastic response from the coconut producers in Sulawesi since this modification in the existing bullock carts would result in larger transport capacity and reduce

transport costs of husks. Husks now wasted and discarded are available free of cost. Yet to provide incentive to farmer a price of 1 Rp/husk may be offered. The entire cost of 22.5 million husks utilised in these pilot projects would add US $ 36,000 per annum income to the farmer.

For the setting up of small scale units, areas where annual coconut production exceed 4 million have to be selected. The fibre pilot plants in the small scale sector for which entrepreneurs have already been identified in this field study have assured supply of husks to meet their annual requirements viz. 2.1 million husks per unit.

For the medium scale industry, the many regions in North Minahasa district (i) Manado -Bitung (ii) Amurang area in Minahasa (iii) Gorontalo (iv) Bolaang Mongandow offer plentiful supply of coconut husks from 20 to 50 million husks annually. In Manado Bitung highway, the United Tina Coconut Industry at Air Madidi is daily receiving 150,000 nuts for manufacture of dessiccated coconut. During the field visit, the firm expressed its keenness to set up coir fibre production as integrated with their present production of dessiccated coconut, and shell charcoal. They get the coconuts delivered by truck daily from distance upto 50 kilo metres. The freight by truck for nut is 1 Rp. 40,000 husks per day is required for the medium scale fibre production unit to produce 1,200 MT of twisted fibre annually. They are getting four times supply of this quantity for their dessiccated coconut production.

RAW MATERIALS:

Coconut husks for the five small scale pilot units and the medium scale industry are fully assured

with free or economic delivery at factory site.

The raw mateirals required in the manufacture of rubberized coir products are (i) coir fibre and (ii) natural rubber latex. The availability of coir has been elaborately discussed and shown above.

NATURAL RUBBER LATEX:

For production of 900 MT of rubberised coir, 500 tons twisted fibre and 450 MT of centrifuged latex with 60% dry rubber content are needed along with rubber chemicals. 500 MT of twisted coir can be obtained out of the production of the North Sulawesi medium scale industrial unit and 450 tons of centrifuged latex can be easilsy obtained from the enormous quantity of rubber produced in Sumetra and Java. Indonesian average annual rubber production is 880,000 tons. Nearly 800,000 tons of rubber is annually exported. Only about 4% of the total production of 880,000 tons is centrifuged latex with 60% dry rubber content. This is used for manufacture of foam rubber etc. Two state undertakings at Bogor near Jakarta in Java produce 4,500 tons of centrifuged latex to International. standards. Out of this, the 450 tons required by the proposed rubberized coir manufacturing unit can be easily obtained in Java itself. The present price of 60% DRC latex is competitively US $ 1.08/litre.

RUBBER CHEMICALS used in the compounding of latex for use in rubberized coir manufacture are accelerators, antioxidants, dispersing agents, stabilisers, wetting agents and include sulphur, zinc oxide, pottassium hydroxide and kaolin. Items like kaolin are locally obtainable and other chemicals are generally imported by all rubberized products manufacturers. The value of chemicals required will be 1/6th ofthe cost of latex.

OTHER AUXILARY INPUTS:

1. POWER: Indonesia produces its own petroleum products. Diesel oil is supplied by the state entreprise (PERTAMINA) and is available @ Rp.35/litre or US $ 56.00 per Kilolitre. Most of the Industries opt to employ their own diesel generating sets to produce power in view of cheaper and plentiful availability of diesel. In the Manado-Bitung area two large factories, one producing coconut oil employing 600 persons is operating 3 shifts and another producing dessiccated coconut employing 500 persons also covering 3 shifts, [illegible] have their own generator sets though state electricity is available, this being cheaper and more dependable. Cost of power generation works out to US $ 0.03/KWH with diesel generator, while state electricity supply listed under various tariff comes to about US $ 0.06 KWH.

2. FURNACE OIL for boiler for steam generation is easily available at US $ 48/kilolitre.

3. WATER requirements for fibre production factory: Plenty of water is available from ground sources throughout Sulawesi. Daily requirements for the coir processing factory would be 4000 gallons and this can be easily met by installing a pumpset. Annual requirements of raw materials for North Sulawesi coir processing factory are given in Appendices NS 5.1. and Java rubberized coir unit in Appendices J 5.1.

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LOCATION AND SITE

Several coconut producing regions in South, Central and North Sulawesi provinces were visited. A study of the existing conditions of coconut production, infrastructure, road transport facilities, availability of man power, skills, facilities for machine production and maintenance, accessibility to marketing points was made. Port facilities in Ujung Pandang (Capital of South Sulawesi), Dongalla, Poso and Luwuk harbours in Central Sulawesi as well as those in the North Sulawesi ports of Kwandang, Gorontalo and Bitung were visited and surveyed with a view to assess the possibility for exporting coir products through these ports to Europe, Japan, Australia and USA. The following is the picture emerging from the study.

	South Sulawesi	Central Sulawesi	North Sulawesi
Annual Copra Production (tons)	67,862	1,09,223	2,05,353
Fibre Potential (in '000 tons)	33,931	54,612	1,02,676
Infrastructure	Poor	Poor	Good roads and have more transport vehicles
Land transportation facilities	Inadequate	Inadequate	Better facilities available
Accessibility to Husk procurement	By bullock and Horse Carts	By bullock and Horse Carts	by truck and bullock and Horse Carts
Port facilities for export	Ujung Pandang major port visited by ocean going vessels. Other ports have only inter-island traffic Ujung Pandang is far from coconut centres.	Ports suitable for inter-island traffic only	Has a deep natural harbour in Bitung to receive ocean going vessels and very near to all coconut production centres. most suitable
Power	Power has to be generated with diesel sets.	Power has to be generated with diesel sets.	State supplied electric power available.
Water	Available	Available	Available

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	South Sulawesi	Central Sulawesi	North Sulawesi
Labour availability	Unskilled agricultural force available - skilled labour has to be engaged by transmigration scheme	Unskilled agricultural force available- skilled labour has to be engaged by transmigration scheme	Labour both skilled and unskilled are available in Manado, Bitung region.
Wage levels	Wage moderate	Wage high	Wage higher.
Cost of factory construction	Moderate	Moderate	comparatively More expensive.
General suitability for establishing coir fibre units	Suitable for setting up small scale pilot plants in coconut producing regions to produce primary coir fibre and handicrafts products for near-by markets. Can support 4 or 5 small scale units. to start with	Suitable for setting up small scale pilot plants in coconut producing regions to produce primary coir fibre and handicrafts products for nearby markets can support 4 or 5 small scale units. to start with.	Most suitable for establishing 10 to 12 small scale units and one medium scale fibre production units supply to other Indonesian Islands and export to foreign countries is possible from Bitung Harbour in North Sulawesi.

The above data would indicate the preeminent position occupied by North Sulawesi for establishing Coir Fibre Industry.

A further study in detail of alternative locations within North Sulawesi has been made to assess (1) raw material availability (2) transport facilities (3) labour availability and (4) shipping traffic so that the regency most suited for locating the industry can be selected. The tables given below contain information on the above aspects.

1. RAW MATERIAL AVAILABILITY:-

	Regency/Municipality		Area of coconut cultivation (ha)	Copra Production (tons)	Fibre Potential (tons)
1.	Sangihe Talaud	(R)	39,503	23,885	11,942
2.	Kodya Manado	(M)	1,798	1,157	678
3.	Minahasa	(R)	126,397	128,881	64,440
4.	Bolaang Mongondow	(R)	36,132	30,017	15,000
5.	Kodya Gorontalo	(M)	2,036	2,273	1,280
6.	Gorontalo	(R)	32,040	28,713	14,360
			237,906 (ha)	214,926 (t)	107,550 (t)

North Sulawesi is the biggest Copra producing province in Indonesia. Minahasa regency has more than 50% of total North Sulawesi coconut production. Almost in all the districts and sub-districts coconut plantations are abundant. Its sitatuon (3,0-4.3° - N.L. & 121° - 127 E.L. is climatically most suited for coconut development.

2. LAND TRANSPORTATION:- Land Transportation in North Sulawesi is heterogeneous in different regencies. Minahasa Regency possesses better and longer roads. Principal towns are connected by ashpalt roads. Bridge facilities are better almost throughout the regency. In Gorontalo, Bitung, Bolaang Mongondow and other areas, only the capital town is connected with nearby principal towns by ashpalt roads. In most places people use sea transportation especially for trade. The available transport facility is given in the table below:

TRANSPORT FACILITY:-

Regency/Municipality		Passenger cars	trucks	buses	motor cycles	total
1. Sangir Talaud	(R)	146	34	167	370	717
2. Kodya Manado	(M)	2,682	2,409	713	6,757	12,561
3. Minahasa	(R)	756	1,316	805	2,904	5,781
4. Bolaang Mongondow	(R)	163	218	202	953	1,536
5. Kodya Gorontalo	(M)	131	341	35	1,887	2,394
6. Gorontalo	(R)	49	67	24	628	768
		3,927	4,385	1,946	13,499	23,757

3. MAN POWER AVAILABILITY:-

Population in North Sulawesi in 1976

Age-Group	Male	Female
0 - 14	435801	428293
15 - 24	192623	188668
25 - 49	266487	273525
50 - 59	49056	51594
above 60	38362	45579
	982329	987659

LABOUR FORCE:-

Based on a census carried out during the first Pelita period the labour force in North Sulawesi is distributed among the following fields of activities.

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—	agriculture	338,112	(65.49%)
—	industry	24,411	(4.73%)
—	transportation	11,327	(2.19%)
—	trade	26,072	(5.05%)
—	construction	3,887	(1.71%)
—	services	66,255	(12.83%)
—	electricity and water system	1,261	(0.25%)
—	finance	1,225	(0.24%)
—	miscellaneous	38,771	(7.50%)

4. HARBOUR FACILITIES:- Bitung Harbour is most ideal for export. depth of the harbour is 30^{m}. Ships of capacity is 55000 DWT can berth in the port. Length of quay is 507^{m}. Two warehouses 13360^{m2} and 4321^{m2} exist and availability for forklifts of 25 ton capacity enhance the utility of the harbour. The shipping traffic by the ports is given in the table below.

SHIPPING TRAFFIC:-

Sea Ports - Cargo flow - (Tons)

	1974	1975	1976	1977	1978
1. Bitung	—	593027	731427	853445	988925
2. Manado	5876	27228	25835	36666	30126
3. Gorontalo	22941	79696	79570	95663	108446
4. Tahuna	72080	26868	28829	36516	36853
5. Sian	29653	13778	11784	15813	14220
6. Lirung	13143	2417	3544	3733	3489
7. Inobonto	3315	24700	24035	10856	4799
8. Kwandang	15562	30977	13669	7687	6206

Possibilities for regular, liner service conference vessels in Bitung Harbour in the near future are very promising. The port is already handling sizeable export and inter-island trade.

Other ports in North Sulawesi are handling only inter-island traffic and facilities for export handling have yet to be developed there

Raw Material requirements of the proposed medium size coir processing factory for North Sulawesi is 40000 husks a day. On either side af the highway linking Manado the capital of North Sulawesi and Bitung Harbour coconut plantations are concentrated in a depth of 30 kilometers. Annual coconut [illegible] production in this belt, a radius of 30 kilometers around Bitung Manado highway accounts for 25% of total Minahasa districts coconutproduction. Fibre potential for Minahasa District is therefore 50000 tons a year. In the Manado-Bitung cocomuts belt delivers 200000 nuts per day. Out of this 150000 nuts are used by M/s.United Tina Coconut Dessiccated Factory at Air Madidi and the other 50000 nuts go to Manado market. This zone ranks the most suitable for locating the medium scale coir processing factory with the ready availability of 200000 nuts and giving equal quantity of husks and good transportation facilities and power, water and labour and Bitung Harbour nearby.

In fact M/s. United Tina Industry themselves expressed keen desire to set up a coir fibre processing section as part of their expansion programme for their dessiccated coconut factory in Air Madidi which is midway between Manado and Bitung. This organisation is now purchasing dehusked coconuts from the plantations and are assured of continuous supply of husks upto 200000 husks a day and are uniquely placed to set up a coir industry. The North Sulawesi Government can set up the medium scale coir unit even as a joint venture with M/s. United Tina Industries, Air Madidi. This suggestion was received with interest and enthusiasm by both the authorities of the North Sulawesi Government and the General Manager of United Tina Industry during the discussions I had with both the parties at Manado on October 22, 1979. The main appealing aspects of this proposition was the ideal location in the Manado-Bitung Harbour zone for the assuri successful operation of the medium scale coir processing unit. Other zones in North Sulawesi which can be considered on second priority are given below.

Priority	I	-	Bitung Harbour (within 15 kms of the port)
	II	-	Amurang - (Minahasa)
	III	-	Gorontalo - (Gorontalo District)
	IV	-	Inobonto - (Bolaang Mongondow District)
	V	-	Kwandang - (Gorontalo District)
	VI	-	Tohima - (Sangihe Talaud District)

Bitung area is by far the best since it is strategically located with a good natural harbour and export possibility can be well developed.

a) The area is now developing fast as an industrial complex with many small and medium scale industry.

b) Labour of required skill is easily secured.

c) Water, power and transportation facilities are excellent.

d) Raw material sources are very near and abundant, easily procured and transported.

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e) The assistance of the coconut working centres of the Plantation Department in procuring raw materials is assured.

f) Present suppliers of coconuts to the dessiccated co conut factory and the large cocomut oil mill near Bitung can supply the husks at economic rate of 2000 Rp for 1000 husks delivered at Bitung.

g) Capital of North Sulawesi Manado is within 40 k.m and all facilities of recruitment of Labour, Machinery maintenance and marketing are easily accessible.

The Mayor of Bitung has assured cheap land site in Monembo Nambo within 5 tokilometer of Bitung Harbour. All the above mentioned facilities are readyly available. So the proposed coir processing unit is strongly recommended to set up in Monembo Nambo, near Bitung Harbour.

RUBBERIZED COIR FACTORY:- Rubber is plenty in Java and Sumatra. In locating the rubberized coir factory consideration has to be given for availability of raw material, power, water, labour force of varying skills, their cost, access to marketing points and cost of reaching the product to consumers.

The main factors that have to be kept in view for the selection of the site being availability of labour force and managerial skills and Cost of transportating finished rubberized coir goods to consumer point, North Sulawesi island is not suited because of its location in the North East corner seperated by a distance of 2000 miles from the main island of Java, which is the capital of Indonesia where all important commercial and trading activities are centred. More than 65% of the population of the country is in Java and the main consumers of rubberized coir viz automobile assemble indu[illegible]s transport and furniture industry are concentrated in Java making it the most ideal location for setting up this industry.

If rubberized coir products are to be manufactured in North Sulawesi they have to be brought to Java by inter insular transportation. They are light and voluminous. The transport costs are calculated on volume basis and 1 cubic metre of rubberized coir weighing 50 kg load attracts a freight of Rp 15000 or US $ 24 by way of inter island transport cost, and a further handling charge of US $ 5 for cbm. These charges will add 30% to the manufacturing cost and will make the product uneconomical.

To ensure competitiveness of costs and prompt supply to automobile assemblers and consumers most of whom are located in Java the rubberized coir factory should be located there.

The area between Jakarta and Bogor 50 km from Jakarta offers abundant availability of rubber, power, water, transportation facilities and marketing possibilities. Numerous small and medium scale industrial units are operating in this belt. The Government of Indonesia is also developing industrial plots and propose to set up industrial estates for expansion of the industrial base there. The department of Manpower in Jakarta haspromised to assist in the recruitment of labour of various skills required.

The strategic location of Jakarta-Bogor belt with nearby ports of Jakarta Cirebons and Surabaya has all the advantages for the successful development of the rubberized coir industry both for the domestic market and for export should hence be selected for locating the rubberized coir industry for Indonesia.

LAND BUILDING UTILITIES

Cost of the requirements of Land buildings including closed godown, Drying yard, soaking tank and office space required for the factory in North Sulawesi to produce coir fibre from 12 million husks and process into 1200 tons of twisted fibre are worked out in current land and building costs and given in Appendix NS 2.1. The utilities required would include platform scales Trolleys etc and details and costs are given in Appendix NS 2.3.

Similarly the detailed estimation of Land Building including workshop, Boiler room, Goddwn for raw material and finished goods office space in respect of the Java Rubberised Coir Manufacturing unit worked out at current land and building cost including functional facilities are given in Appendix J-2.1. Cost of auxiliaries/utilities and service facilities are given in Appendix J-2.3. These include water pumping station, tank, and Air and waterlines Electrical cables, laboratory equipment, workshop equipments, Racks, Trolleys and Material Handling equipment,, Fire fighting equipment, one truck and the office car which would take care of the smooth functioning of the industry.

PROJECT ENGINEERING

COIR FIBRE EXTRACTION PROCESSES: AN EVALUATION:

INDIA

Several methods are in vogue in the coir producing countries for the extraction of coir fibre from coconut husks depending upon the characteriness of the regions where coconut are produced and dehusked and the facilities available for processing the husks and the enduses to which the fibre is put.

Coir fibre is primarily classified into two groups. (i) White fibre or yarn fibre and (ii) brown fibre or coir. Brown fibre is again classified as (1) Bristle variety ar the long staple fibre and (2) Mattress fibre which is short.

White or yarn fibre is obtained from green coconut husks; by the traditional methods or retting, India is the largest producer of this variety and the industry is concentrated in Kerala on the West Cost of India where coconut growth isabundant, and the coast line abounds in lagoons or backwaters. This is a rare natural facility that has contributed to the development of yarn fibre industry in the Western Coast of Kerala in India.

Retting process consists essentially in soaking the green husk for long period in briny water. In this process the fibre in the husk is loosened from inter connective tissues by bacterial actior. Retting period lasts from 6 to 10 months. After this period the retted husks are washed to remove the mud and other sticking imp ties and the outer skin ispeeled off. The husks are then placed on wooden blocks and beaten with wooden mallets to seperate the fibre from the pith. The wet fibre is then spread out in the shade to dry. The dried fibre is then passed through a winnowingmachine to remove the last traces of pith and impurities. The winnowing machine consists of a closed drum with a number of curved blunt knives wi h saw like teeth fixed to a middle shaft which is rotated by hand. After passing through this machine, the fibre is clean and is rolled into sliver packs for spinning.

Yarn fibre or white fibre thus obtained being long and soft and possessing a good colour is used for spinning into yarn and for weaving of mattings.

1. The above retting process is possible only with green husks that are soaked within three or four days of harvesting the nuts. Dry husks cannot be used in natural retting process.

2. This process is practicable only where natural retting facilities, like lagoons or backwaters are available and not in the hinterland though coconut production may be abundant there.

3. The soaking period is 6 to 10 months. This is inordinately long and occupies a vast extent of space, which inhibits large production and ties up investment on husks for long.

Retted husk has a foul smell and the long stretches of soaking regions are stinky. The process is highly unhygienic and fraught with environmental pollution problems a veritable health hazard.

For these reasons, this process isbeing considered as outdated and is slowly being superseded by mechanised extraction of coir fibre, without dependence on lagoons or backwater.

As retting process involves the use of only green husks, Main production of Copra in Sulawesi will be seriously affected if husks are plucked green as Copra can be produced only with fully ripe and dry coconuts. Hence the retting process is not recommended for fibre production in Sulawesi.

MODERN MECHANIZED PRODUCTION OF COIR FIBRE

The following two processes are followed for the extraction of coir fibre from dry coconut husks in Sri Lanka - the largest producers of brown coir fibre in the world. The first is known as the wet milling and the second dry milling process.

DE-HUSKING:- Coconuts are collected together at one central point in the estates and are de-husked by striking them against a sharp spike. In certain, cases de-husking is done in the fibre mills.

SOAKING:- The next stage is the softening of the husk to facilitate extraction of fibre. This is done by soaking. This process is carried out any where, where fresh water is available, filled in specially dug pits. The average sized mill has two soaking pits. Larger and more moden mills have their own well-built concrete soaking tanks built in series, so that the water can be frequently changed to be fresh often to obtain cleaner and better quality fibre. The husks are well weighted down in pits and tanks with boards during soaking. In some factories, they pre-treat the husks by crushing them in a crusher equipment where they are passed between fluted rollers in it before soaking. This facilitates easy penetration of water through the outer skin. If the husks are crushed, soaking is limited to 4 or 5 days. Otherwise, the soaking lasts for 10 to 14 days. The fully soaked husks are then removed from the pits or tanks for fibre extraction.

EXTRACTION:- After soaking, the next stage is extraction of the fibre from the husks. This is done by using specially fabricated machines known as Ceylon drums arranged in pairs. The first drum is called the opener or breaker drum and the other, dresser or cleaner drum. The husk segments are first held against the breaker drum which consists of fluted rollers and iron nails, wooden drums with spikes are enclosed in a wooden guard as casing with an opening for inserting the husk segments through fluted rollers for combing. The lower parts of the casing takes the form of a chute whereby the short fibre and pith are dropped, in the ground below and removed. As the drum revolves to comb the husk each end of the

husk is held by hand by the operator alternatively for thorough combing between the fluted rollers which assist the feeding of husks. The spikes tear away the husk and the short mattress fibre and pith pass down the chute leaving only the longer bristle fibre in the operator's hands. The Bristle fibre is laid aside for another operator to process further on the second dresser or cleaner drum with thinner spikes rotating at a slower speed and this leaves in the operator's hands, the bristle fibre further cleaned free of pith and short fibres.

A pair of drums handles 2000 husks in a working day of 8 hours. The output of fibre depend upon the size, the fibre content of the husks and the skill of the operator. In this the human fatigue factor is very great since the operator has to remain standing, holding the husks in this hand throughout the day.

This equipment is considered primitive and dangerous as it causes injury to operators hands very frequently. According to local millers it is proving difficult because of this to recruit further young operatives and to replace the older ones leaving the industry. Considering the fatigue factor for the operatives in this process the hazards of injury to them and dependence on human skill to obtain even the small output possible in this process, the Coir Industry is switching over to the dry milling process, or the decortication and de-fibering process in which automatic machines operate without hazards, and deliver larger output of fibre. The dry milling operation is carried out in one of the following two ways.

In the dry milling a burster or disintegrater and decorticator equipment is used. In this the husks are not soaked in pits prior to extraction for any long period, but water is only sprinkled on them for periods extending upto 24 hours. The wet husks are then fed into the Burster which disintegrates the husk segments by the beater bars, in the machine beating them revolving at high speed into loosened lumps of fibre and pith. This lump is then passed through the Decorticator which separates the fibre and pith and leaves the fibre at the

at the delivery end. The fibre from the Decorticator is then passed on to the Turbo Cleaner to free further non-fibrous and sticking matter. The fibre obtained by this Decorticating method is known as mixed fibre or decorticated fibre (bristle and mattress fibre obtained mixed together).

The other kind of fibre extraction is by automatic de-fibering machines with combing drums where the husk segments are fed at one end, they are combined and separated into fibre and pith and Bristle fibre is delivered at the other end dropping the mattress fibre and pith in the sides.

Distinction between de-fibering and Decorticating process:
In decortication process the husks are subjected to beating by metal bars revolving at high speed. The fibre content in the husk is obtained as mixed without being seperated into long (bristle) and short (mattress) grades.

In the de-fibering process, combing drum comb out the fibre from the wet husks and the long bristle and short bristle fibre are obtained separately. Soaking for 4 days is a pre-condition in the defibering process, while for decortication, it is optional. Decortication process can be done even with unsoaked husks.

In the defibering process, the fibre in the husk is obtained separately in different places as Bristle and Mattress. The bristle fibre generally comes clean. This has the advantage of enabling mixing of bristle fibre in various proportions with Mattress as may be desired in further production of curled coir.

De-fibering Machines are available in different ranges to handle 4000 to 7000 husks per shift of 8 hours and require only one operator to feed the husks segments.

PITH REMOVAL: In any extraction process, a very large quantity of pith or dust is produced (for every kilo of fibre produced about 1.75 kilos of dust will accumulate. As very large quantities of pith would accumulate in the factory every day and create problems of storage space and fire hazard, the pith should be

FILTERING:- After the process of decortication, the short fibres or mattress fibres deposited along with the dust have to be passed through a Revolving Screener (with slow revolutions) and this filters off the dust and hard substances adhering to the mattress fibre and leaves the mattress fibres free.

CLEANING AND DRYING:- The filtered or sieved mattress fibre is again passed through a Turbo Cleaner equipeed with rotating beaters so as to free the sticking pith to obtain good quality of clean mattress fibre. After cleaning, the fibre is dried in the sun and where the monsoon and other special features necessiate, fibre is dried in shade. Artificial dryers are also sometimes used. Aftificial Drier equipments are very costly and their maintenance very expensive. This is not required in Indonesia.

The drying of the fibre can be totally eliminated by choosing further processing of fibre in wet condition straightaway for making yarn to process it further into bags and other finished products or to produce curled fibre for rubberising needs.

PRODUCTION OF CURLED COIR/TWISTED FIBRE

In the process of manufacture of rubberised coir products, the first starting raw material is curled or twisted fibre. Twisted Fibre is a semi-finished material obtained from coir fibre extracted from coconut husks. During the process of curling, tight twisting offibre into ropes results in imparting a permanent curl and resilience.

The coir fibre obtained by the defibering or decorticating process is purified from adhering impurities by being passed through a carding machine or hackler. Depending on the customers requirements, twisted or curled fibre is made from bristle, or mixed in the desired proportion with mattress fibre or decorticated fibre. This is done by passing these through the hackler mixture which eliminates at the same time further impurities present in the fibre. This mixed purified fibre is then fed into the hopper unit in the curling machine and the fibre passes through the hackler drum in it to eliminate further adhering hard substances. A weighing device attached to the feeder ensures automatic and precise feeding of the pre-determined quantity. The fibre is curled by a curling device into twisted rope and would on a drum. This spun and curled fibre is then offered for export in coils weighing 20-25 kg. Curled fibre is usually stored for 8-12 weeks so that the curl remain permanent as it becomes dry.

If the curled fibre is to be used before this period, it is steamed in an autoclave or drier to eliminate all moisture and have the curling set before it is used for rubberizing.

Curled coir or twisted fibre is imported in very large quantities by Germany, Yugoslavia, Italy and Japan for being used in the manufacture of rubberized coir, cushions, for the automobile and other industries Curled coir is produced in $\frac{1}{2}$" or $\frac{5}{8}$" thickness as desired. The smaller the thickness and the tighter the twist better is the price fetched, and greater the resilience in the end product.

RUBBERISED COIR MANUFACTURE:- The following sequence of operations takes place:

1. The curled coir rope is first unwound by being passed through an untwisting machine. Here the curled fibre is broken into myriad of highly resilient fibre springs. This is thus fed into the sheet forming machine for rubberizing.

2. These fibre springs are passed through a hackler drum in the rubberizing machine where they are purified and feed from adhering dust and impurities.

3. The cleaned fibre springs are thrown out of the hackler drum on to a conveyor belt automatically. A constant weight of fibre is thrown on the conveyor in a random manner to form a sheet or fleece usually of 2 cm thickness.

4. Latex rubber of 60% dry rubber content, compounded homogeniously with rubber chemicals and stored in tanks by the side of the rubberizing machine is sprayed on to the fleece by automatic travelling spraying equipment. First Latex is sprayed on to the top surface of the sheet.

5. The sheet passes through a drying chamber where it is pre-dried and reversed and Latex sprayed on the other side of the fleece and passes through the drying chamber for a second time.

6. The Rubberized fleece issuing as an endless sheet is then cut to required length.

7. Several layers of rubberized fleeces are needed to make up the required thickness in a mattress. Handspray of Latex is given to bind several layers to ensure proper unification. The multilayered mattress initially formed thicker than the finally required size is placed on a hydraulic steam press and compressed to desired thickness. In the hot press, the mattress is partially cured by the steam and also getting compressed.

8. This is then placed in the trolley and fed into the vulcanizer-stove equipment and obtaining completely vulcanized.

9. Finally the mattress is trimmed in a movable band/saw cutting table and enclosed in cloth covers ready for sale and use.

Automobile seat cushions and other moulded articles made by cutting the piece to required size and enclosed sheet metal moulds or wooden moulds and passes through a series of chamber dryers are vulcanized. Chamber driers in succession in a conveyor system delivers continuous and large out put of moulded cushions.

SELECTION OF PLANT AND EQUIPMENT:-

In selecting the plant and machinery, the criteria should be i) the equipment is a balanced one containing all auxilary equipments for the production of the required end product and does not include superfluous item ii) such equipment is already in use and found to be efficient, durable and satisfactory iii) it is suited to the condition of operation obtaining in the buyer's country iv) operation involves technology and skill which can be easily imbibed v) maintenance is simple and economic vi) machinery supplier can undertake erection, and commissioning of the plant at the buyer's place and in factory training can be secured for the operation of the plant vii) availability of spares for the efficient maintenance of the plant locally or from machinery suppliers and viii) the cost of equipment.

In determining the size of the plant the criteria should be the best means of economically achieving the desired production target and the possibility of enlarging the production capacity with the addition of auxilary equipment.

The plant and machinery required for the North Sulawesi coir processing unit and Java Rubberised fibre manufacturing unit are discussed keeping in view the points refered above.

1) The coir fibre factory in North Sulawesi will adopt the mechanical defibering process to extract fibre from coconut husks. Thereafter the coir fibre will be spun into twisted fibre or curled coir to impart resilience to the

ibre and make it suitable for subsequent rubberizing. Three defibering machines together with two crushers for protecting the husks before soaking in water and two revolving screeners and two turbo screeners for purifying the fibre extracted by the defibering machines would be required. Working three shifts of 7 hours duration, the annual output of the fibre plant would be 1400 tons of coir fibre. Six spinning and curling machines working three shifts a day would process 1400 tons of coir fibre and produce 1200 metric tons of twisted fibre. Details of the machines together with their cost of installation are given in Appendix NS 2.2.

The machinery and equipment required for the production of 900 metric tonnes of finished rubberised fibre products on a three shifts/days. Working are:

<u>One unit Consisting of:</u>

1 Untwisting machine

1 Rubberizing Sheet machine plant

1 Hydraulic Steam press

1 Drying Stove and Vulconizer

1 Spraying Cabin

1 Latex Spray Unit with Tanks

1 Colloid Mill and Ball mill for compounding of chemicals

1 Band saw cutter with moving table

1 Set of 8 chamber driers

1 Air compressor of 20 HP

1 Steam Boiler

1 Power Generator

The rubberizing plant can produce upto 2 tons of fleece per shift and can cope up with increased demand of finished product upto 1500 tons finished goods per year with addition of auxiliary hydraulic mat press and driers.

Details of cost of the equipment for rubberized coir production is furnished in Appendix J 2.2. based on quotations received from different machinery suppliers.

SMALL SCALE INDUSTRIAL UNITS would employ automatic decorticating machines along with auxiliary crusher for pretreatment of the husks, and turbocleaners for purification of the fibre obtained. Thereafter manual process will be adopted utilising simple locally fabricated wooden spinning wheels for processing the fibre into yarn and process the yarn further into Ropes or Bags with wooden looms. One small scale industry would need 1 Disintegrator, 1 Decorticating machine revolving system and one turbo cleaner. Further 30 spinning wheels and 5 wooden looms would be required for yarn making and Bag making. Utilising 7000 husks a day, the above plant would produce 840 kg. 1 fibre a day. Annual output working a single shift of 2 hours would be 250 tons of coir fibre. 250 tons of coir fibre would be further processed into yarn and thereafter woven into Bags. of size 42" x 27" each weighing 1.5 kg to be used for packing of copra or vegetables. 250 tons of coir fibre in ayear can be processed into 150000 coir bags.

Coir bags is one product for which copra community itself is an important consumer. Other handicrafts like brushes, Door mats and ropes can also be developed under the samll scale sector. Full details of the cost of equipment for the small scale sector along with other particulars are furnished in Part III.

PLANT ORGANISATION AND OVERHEAD COST.

Each production plant forms a production cost centre. The administration and selling organization would be additional cost centres for the respective functions. Air compressor, steam and power generators would serve particular production centres.

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MAN POWER.

North Sulawesi Coir Processing Unit:

For a 3 shift working of the coir extraction and curling operations, employees of various skills would be required for the machine operation, internal services and material handling. Defibering machines and curling machines require skilled operators while the crusher, and cleaners can be operated by semiskilled workers. The factory would need 92 workers of varying skills. Maintenance, administrative and clerical, managerial and supervisory personnel are 6,15 and 5 respectively. Appendix NS 5.2 furnishes the detailed requirements of man power including maintenance, administrative and managerial personnel required for the 3 shift operation of the unit, providing for leave absenteism. The total number of workers is 118 and the annual wage bill at the prevailing wage levels also is given in the appendix.

The Java rubberized coir manufacturing unit would require 110 workers of varying skills. Maintenance, administrative and clerical, Managerial and supervisory personnel and sales staff are 20,32, 10 and 6 respectively. Appendix J.2 furnishes the man power requirement for a 3 shift working of the rubberized coir factory in Java providing for leave and absenteism. The total number of workers is 178. The annual wage bill at the prevailing wage level also is given in the Appendix.

Unskilled and semiskilled labour are available in North Sulawesi as well as Java. Managerial skill can also be secured through the Department of Manpower at Manado (capital of North Sulawesi). The scheme of the department of Transmigration assist in the mobility of skilled labour from Java to labour scarce areas. For acquiring special skill in the production of twisted coir and to be able to ensure quality, two workers must be

given training for two months in one of the coir processing countries. Machinery suppliers can be asked to provide the inplant training for two persons as part of the contractual obligations for machinery supply. Further, during erection of the plant, machinery suppliers should be asked to train local personnel in the operation of the machines, for two/three months for ensuring quality of production to international standards.

Similarly for the rubberized coir manufacturing factory, two persons must be provided in-factory-training by the machinery suppliers. In addition, at the time of machinery erection, local factory workers must be instructed in the production of quality production and output. For the smooth functioning of the rubberized coir factory in Java during the gestation period assistance of one expatriate with expertise and knowledge of this industry in production, marketing and general management is necessary for an initial period of 6/12 months. This will help the local managerial personnel get trained and enable them to take over the entire management responsibilities at the end of the gestation period.

Training expenses are included as part of pre investment and start up expenses in the financial estimations of the projects (vide Appendix NS 3.1 and J 3.1). It is however recommended that training facilities provided under the transfer of technology schemes at inter governmental levels should be availed of. The assistance from UNIDO and Asian and Pacific Coconut Community would also be invaluable.

Since the small scale units would employ automatic decorticating machines and the technology is simple special skills are not required. The fibre extraction is done by automatic decorticator. Processing of fibre into yarn and weaving into bags is labour intensive.

After extraction from husks, fibre should be given to farmers for being processed into yarn and bags, processing charges fixed, payable to them on their delivering the finished product. The number of persons required for fibre production and bag making and all other details are furnished in the scheme in part III.

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IMPLEMENTATION.

The project for setting up of the medium scale industry in North Sulawesi for production of twisted fibre would need a year for implementation, from the date an investment decision is taken. The gestation period would be about six months from the date of commencement of trial production to overcome the initial production bottlenecks and be able to secure export orders.

For the Java rubberized fibre factory, the implementation of the project would cover a periodof two years from the date an investment decision is taken. The gestation period for this factory also would be about six months from the date of commencement of trial production. Sales promotion drive is necessary to keep pace along with production so that target production scales can be achieved in two years after initial start.

For the small scale industry, the industry can be set up and trial production commenced within six months of taking an investment decision. With energetic market development, target production can be achieved within two years of initial start.

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FINANCIAL AND ECONOMIC EVALUATION.

NORTH SULAWESI TWISTED C O IR FACTORY:

1. INVESTMENT:

Land and buildings:

The land requirements for the construction of the plant buildings, godown, drying yard, plant office, workshop and soaking tanks has been estimated at 15000 square metres. The enclosed construction would utilise only a fraction of the land(about 2000 square metres) and generous provision for open storage space and for future expansion has been made in the estimate of land requirements. The buildings proposed consist of units of different categories depending upon the purpose to which they are used. Providing for these, land and building would cost US $ 140,000 (details in appendix NS 2.1).

Machinery and equipment:

The factory would be handling 12 million husks per annum or 40,000 husks per day for an annual working of 300 days on a three shift basis. The defibering machine handles about 6000 to 7000 husks per shift and provision has been made for installing three defibering machines. Other auxiliary machines for the pretreatment of husks before fibre extraction and cleaning of the fibre after extraction have been provided. Power for the operation of the machines will be obtained through the installation of a generator of 250 KVA capacity. All the machines are imported and will incur freight, insurance, clearing, erection and installation expenses. The total cost of the machinery and equipment is estimated at US $ 302,618 (details Appendix NS 2.2). Provision for utilities like platform scales, trolleys has been made and their estimated cost would be US $ 15,000 (Appendix NS 2.3). The total investment required for the factory is about US $ 500,000 which includes preinvestment and initial trial production expenses and training costs of two persons for two months in foreign countries. Working capital requirements for two months is included in the investment estimate. (details in Appendix NS 3.1).

2. OPERATING INCOME AND COST OF SALES.

Sales Income:

Twisted fibre produced in the factory will be utilised to meet the requirements of the rubberized coir factory at Java and the balance exported to Japan. The saless realisation on the twisted fibre porduced will be US $ 319.200, calculated on the basis of the current FOB realization of US $ 260 per ton in India and Sri Lanka (details in appendix NS 4.1).

Raw Material Cost:

Cost of husk has been taken liberally at US $ 40 for 10,000 though anticipated delivered cost of husks is US $ 3.50 as given in the findings.

The total raw material costs will be US $ 48,000 per year (details in appendix NS 5.1).

Labour cost:

The factory would require 118 persons to be employed for successful operation. Wages for different skills and trades range between US $ 30 per month for an unskilled worker to US $ 300 per month for the chief executive. Provision for 30% of the wages for fringe benefits has been included and the annual labour cost will be US $ 84,000 (details in appendix NS 5.2).

Total operating cost: The annual total operating cost will be about US $ 2,73,000 (details in appendix NS 5.3). This includes provisions for repairs and maintenance of at 5% on cost of machinery, 2% on cost of building, depreciation at 5% for land and buildings and 10% for machinery and interest charges on borrowed capital at 12% per annum on 70% of investments. A break up of the operating costs for production of coir fibre and curled coir is given separately in appendices NS 5.4 and 5.5 respectively. The resultant cost of coir fibre is US $ 108.84 per ton and that of curled coir is US $ 227.50 per ton. The comparative production costs in the other countries are given in appendices NS 5.9 and NS 5.10 and

and this shows that the cost of production in North Sulawesi is comparable.

3. COMMERCIAL PROFITABILITY:

The financing pattern of the investment in the North Sulawesi coir factory may be either on the basis of equity financing (NAFED indication) or alternatively by an appropriate debt equity basis observing industry practice of debt 70% and equity 30%. Commercial profitability is assessed for an operating year at full capacity production for both the alternatives.

The gross profit after depreciation but before the charging interest on borrowings is US $ 88,200. The tax incidence in the alternative for debt financing is US $ 9,240 at the current corporate tax rate of 20%. This has the advantage of lower tax incidence against the tax incidence of US $ 17,640 when financed by equity. Because of this, the rate of return is 15.79% on investment against 14.12% for equity financing (details in appendix NS 5.6). The repayment period will be 4.2 years for debt financing and 4.6 years for equity financing (details in appendix NS 5.7).

The variable costs of the factory comprising cost of raw materials husks, wages of operating personnel, power and transport charges to ports work out to US $ 132,600 per annum for full capacity working. Sales income will be US $ 318,200 per annum. A contribution of US $ 186,600 (about 60% of the sales revenue) per annum will be available to meet the fixed expenses and provide surplus. The factory's production costs break even when 52.7% of capacity production is reached.(details in appendix NS 5.8).

JAVA RUBBERIZED COIR FACTORY:

4. INVESTMENT:

Land and buildings:

Land requirements are about 6000 square meter. Similarly the cost would be about US $ 200,000(details in appendix J 2.1).

Plant and Machinery: The cost of machinery and equipment including freight, insurance, erection and installation charges would be US $ 448,000 (details in appendix J 2.2.).

Utilities: These would cost about US $37,500 (Details in appendix J.3)

Total investment: The total investment including provision for working capital would be about US $ 1,000,000

5. OPERATING INCOME AND COST OF SALES:

The sales income would be US $ 2,070,000 per annum at an average price of US $ 2,300 per ton on the basis of prevailing prices in India.

The raw material of twisted fibre, latex and chemical cost would be US $ 762.000 with an import content of US $ 60,000 for chemicals (details in appendix J 5.2)

Labour cost: The factory would employ 178 persons. Wages for different categories of workers range between US $48 per month for an unskilled worker to US $ 240 per month for a works manager. An expatriate General Manager at US $ 1,600 per month has also been included in estimating the total labour cost. When he is replaced by a national reduction in the labour cost may take place. Yet the annual labour cost is taken as US $ 250.000 (details in appendix J 5.2)

Total operating cost: The annual operating cost is US $ 1,800.000 and cost per ton of product is US $ 2,000 (details in appendix J 5.3). Comparative costs, sales recovery and profit or rubberized coir factories in India/Indonesia are furnished in appendix J 5.7. The cost per ton of the proposed factory is lower because of cheaper cost of materials (60% DRC latex at US $ 1.08 per kg. against about US $ 2.00 per kg. in India)

6. COMMERCIAL PROFITABILITY:

The rate of return on investment is between 28.32% and 30% for the alternatives equity and debt equity financing respectively (details in appendix J 5.4)

The repayment period is less than three years and the production cost breaks even when 55.7% capacity of production is reached.(details in appendix J 5.5 and J 5.6).

7. SMALL SCALE PILOT PLANTS:

The investment of each small scale coir fibre production unit would be Rp. 33,750.00 or US $ 54,000. The output will be 250 MT of fibre per annum and will have a total sale of Rp.45,000,000 or US $ 72,000. The return would be Rp.11,757,000 (profit Rp.7,707,000 + interest Rp. 4,050,000) or about US $ 19,000 per annum i.e. 35.2% on investment. The repayment period would be less than three years.

CONCLUSION.

All these projects are economically viable, will create and satisfy local demand, give a good return and earn foreign exchange. At a rough rocekoning the foriegn exchange earnings by exports of products or by import substitution would be about US $ 1,200,000. The investment per employee is very low for the small scale coir fibre units at US $ 388 per employee and US $ 4237 and US $ 5618 for the medium scale unit in North Sulawesi and for rubberized coir unit in Java.

With abundant availability of raw materials, opportunities for employment and creation of National wealth and foreign exchange savings, there is a good justification for the immediate establishment of the proposed units for development of coir industry in Indonesia.

Sl. No.	Details	Appendix No.
1.	World production of coir	NS 1.1
2.	Exports of coir fibre from producing countries	NS 1.2
3.	Exports of coir yarn from producing countries	NS 1.3
4.	Coir Fibre Exports - Producing countries	NS 1.4
5.	Coir Fibre Exports classified by Destination	NS 1.5
6.	Japan: Imports of coir fibre, yarn and manufactured products.	NS 1.6
7.	Australia: Imports of coir fibre, yarn and manufactured products.	NS 1.7
8.	United States: Import of coir fibre, yarn and manufactured products.	NS 1.8
9.	Trends in the imports of coir fibre	NS 1.9
10.	Implications of demand and productions projections for world trade in coir.	NS 1.10
11.	International prices of Sri Lanka coir fibre	NS 1.11
12.	International prices of Indian curled coir.	NS 1.12
13.	Japan import statistics on coir fibre and its producta.	NS 1.13
14.	Shipping freig t rate on coir fibre in Bales.	NS 1.14
15.	Shipping freight rate on Twisted coir fibre in circular coils.	NS 1.15
16.	Estimated costof Land, Site Development and Buildings required for production of 1,200 tons of Twisted coir.	NS 2.1
17.	Details of Machinery and Equipment required for production of coir fibre.	NS 2.2;
18.	Details of utilities for the production of 1,400 tons coir fibre in North Sulawesi.	NS 2.3
19.	Details of capital avestment required for productions of 1,400 tons coir fibre.	NS 3.1
20.	Details of capital investment required for production of 900 MT Rubberized coir products.	J 3.1
21.	Coir Fibre Factory at North Sulawesi	NS 4.1
22.	North Sulawesi coir processing factory - Indonesia	NS 5.1
23.	Man power requirements for production of coir fibre.	NS 5.2
24.	Estimate of Annual operation cost.	NS 5.3
25.	Estimate Annual Operation Cost.	NS 5.4
26.	Estimate of Annual Operan Cost Sulawesi(North) coir plant.	NS 5.5
27.	North Sulawesi coir factory	NS 5.6
28.	North Sulawesi coir fibre factory	NS 5.7
29.	North Sulawesi coir fibre factory	NS 5.8
30	Comparative cost of production of coir fibre in different coir producing countries.	NS 5.9

Sl.No.	Details	Appendix No.
E.		
31.	Comparative cost of Production of curled coir in different exporting countries.	NS 5.10
31.	Feberal Republic of Germany: Imports of coir fibre, yarn and Manufactured products.	NS 6.1
32.	United Kingdom: Imports of coir fibre, yarn and manufactured products.	NS 6.2
33.	France: Imports of coir fibre, yarn and manufactured products.	NS 6.3
34.	Netherlands: Imports of coir fibre, yarn and manufactured products.	NS 6.4
35.	Italy: Imports of coir fibre, yarn and manufactured products.	NS 6.5
36.	Estimated cost of Land, Site Development, Buildings,	J 2.1
37.	Details of Plant & Machinery/Equipment required for the production of Rubberized coir in Java.	J 2.2
38.	Details of utilities required for production of 900 MT Rubberized coir in Java.	J 2.3
39.	Details of capital investment required for production of 900 MT Rubberized coir products.	J 3.1
40.	Annual Sales of Rubberized coir factory in Java	J 4.1
41.	Annual requirements of major Raw materials for production of 900 Tons Rubberized coir - In Java.	J 5.1
42.	Man power requirements for the Rubberized fibre factory - in Java.	J 5.2
43.	Estimates of Annual operation cost for Java factory.	J 5.3
44.	Java Rubberized coir factory.	J 5.4
45.	Java Rubberized coir factory.	J 5.5
46.	Java Rubberized coir factory.	J 5.6
47.	Comparative costs, sales recovery and profit of Rubberized coir factories in India/Indonesia.	J 5.7
48.	Scheme for setting small scale industry in Indonesia	SS 1

APPENDIX
NS 1.1

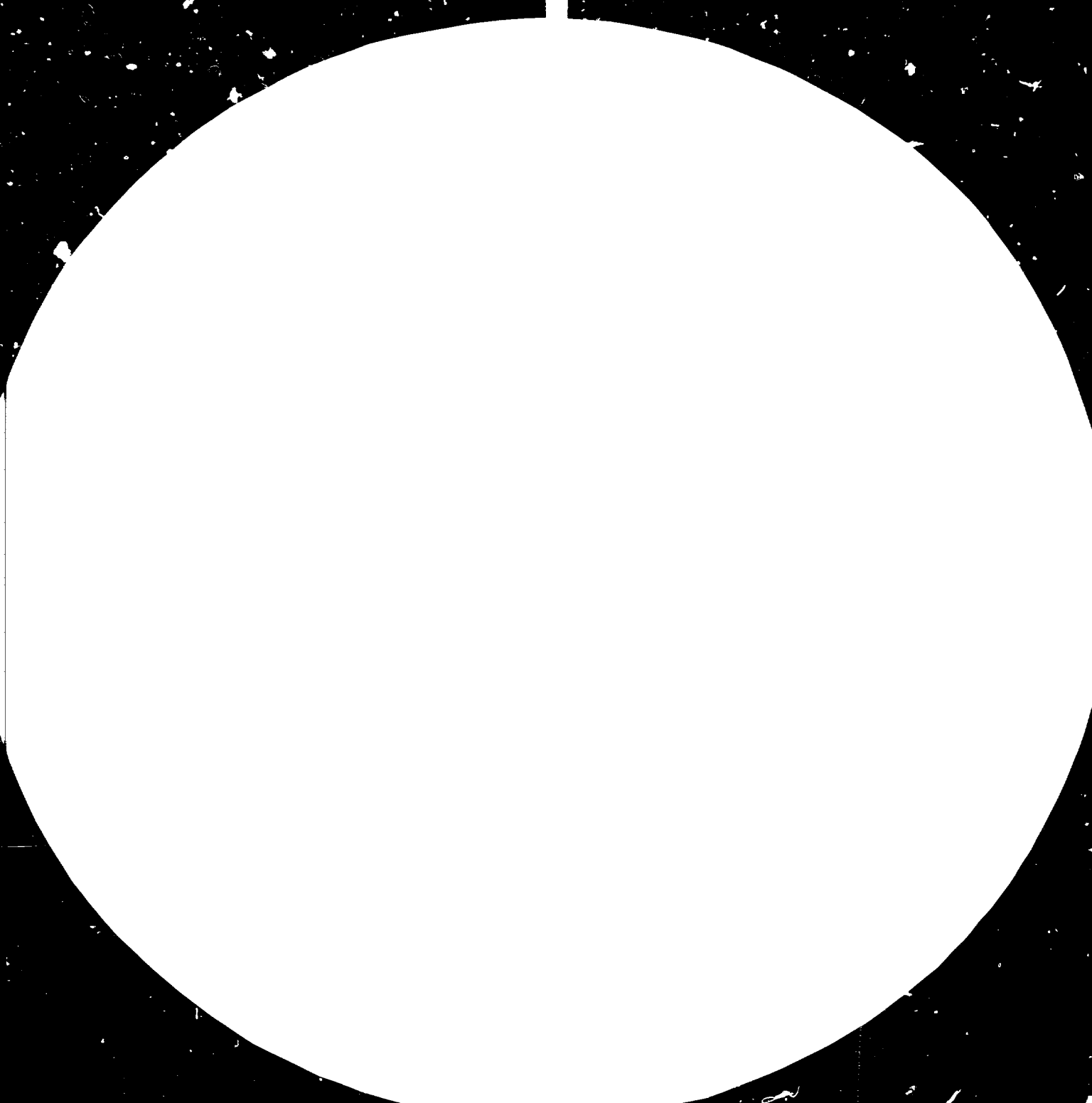
WORLD PRODUCTION OF COIR.

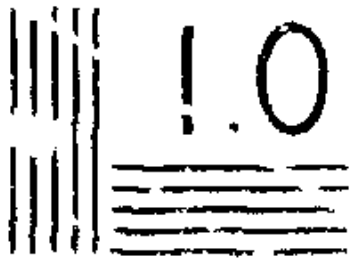
1973-1974

(000 tons)

Country	Production 73-74	Per cent of total
India	155.00	51.86
Sri Lanka	115.00	38.47
Tanzania	8.50	2.84
Bangladesh	5.80	1.94
Thailand	3.00	1.00
Philippines	2.50	0.84
Burma	2.17	0.73
Kenya	2.00	0.72
Seychelles	1.90	0.60
Malaysia	1.50	0.50
Mozambique	1.00	0.33
Morocco	0.50	0.17
	298.87	100.00

Source: FAO Coir promotion survey. RAS/71/715. Vol.1 Nov.75

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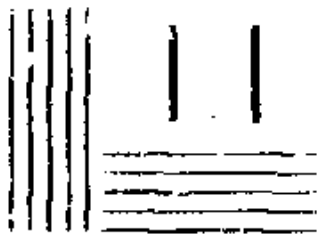
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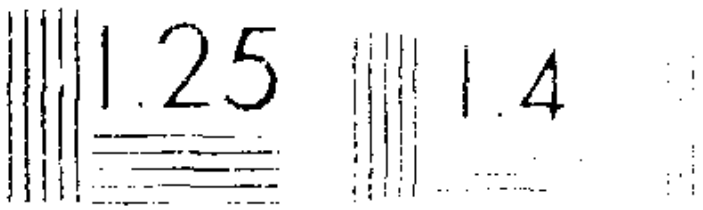
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EXPORTS OF COIR FIBRE FROM PRODUCING COUNTRIES.

(Thousand Metric Tons)

	1974	1975	1976	1977	1978 prelim.
Sri Lanka					
Bristle fibre/fibre & brosse	32.8	19.3	47.9	52.0	54.3
Mattress fibre/fibre & mateles	72.6	45.6	36.6	40.5	33.6
Total Sri Lanka	105.4	64.9	84.5	92.5	87.9
India					
Mat.Fibre/Fibre pour tapis	0.2	0.1	0.1	0.1	0.0
Curled Fibre/fibre bouclee	0.3	0.8	0.7	0.8	0.3
Total India	0.5	0.9	0.8	0.9	0.3
Malaysia	1.5	1.6	1.5	1.6	1.5
Phillippines	0.7	1.3	0.5	1.0	1.0
Thailand	4.4	4.4	4.4	4.0	4.8
Singapore	0.6	0.2	0.2 *	0.2 *	0.2
Total Far East	113.1	73.3	91.9	100.2	95.7
Kenya	0.4	0.1	0.0	0.1	0.1
Mozambique	0.4	0.3	0.3 *	0.3 *	0.3
Tanzania	2.0	1.3	1.2	1.1	1.0
Total Africa	2.8	1.7	1.5	1.5	1.4
Mexico	1.7	0.7	1.5	1.5 *	1.5
Brazil and Trinidad	0.2	0.1	0.1	0.1 *	0.1
Total America	1.9	0.8	1.6	1.6	1.6
WORLD, TOTAL	117.8	75.8	95.0	103.3	98.7

Source: FAO.REPORT. HF/79/3 APR'79.

APPENDIX
N S 1.3

EXPORTS OF COIR YARN FROM PRODUCING COUNTRIES.

	1974	1975	1976	1977	1978 prelim.
	(thousand metric tons)				
India	28.3	22.9	26.7	25.1	20.9
Sri Lanka	2.2	2.5	3.3	2.1	2.1
Thailand	-	-	-	-	0.3
Total	30.5	25.4	30.0	27.2	23.3

Source: FAO REPORT HF/79/3 April 1979

APPENDIX
N S 1.4

COIR FIBRE EXPORTS - PRODUCING COUNTRIES.

1972 - 1978

SRI LANKA

Year	MATTRESS FIBRE IN BALES (MT)	BRISTLE FIBRE * (MT)	TWISTED FIBRE** (MT)	COIR YARN (MT)	TOTAL (MT)	TOTAL EXPORT VALUE Rs.Million	AVERAGE VALUE PER MT. (RUPEES)
1972	65,143	12,250	17,807	1,975	97,785	62.74	641.61
1973	71,600	13,680	21,114	2,409	108,805	75.97	698.22
1974	67,854	13,598	22,326	2,243	106,020	110.76	1,050.30
1975	41,605	8,154	16,658	2,954	68,372	84.45	1,235.15
1976	47,882	11,528	25,085	3,254	87,749	100.50	1,145.31
1977	51,997	12,376	28,135	2,081	94,592	152.54	1,612.63
1978	54,253	9,350	24,296	2,077	89,976	245.37	2,727.06

* Omatt 1,2,3 tie grades.

** Includes Machine and Hand Twisted Fibre

SOURCE: COCONUT MARKETING BOARD ANNUAL REVIEWFOR 1978.

APPENDIX.
N S 1.5

COIR FIBRE EXPORTS CLASSIFIED BY DESTINATION

1977 - 1978

SRI LANKA. IN METRIC TONS

	MATTRESS FIBRE		BRISTLE FIBRE		TWISTED FIBRE.	
	1977	1978	1977	1978	1977	1978
1.E.E.C. of which	22,955	27,157	5,254	3,584	16,536	14,664
a) U.K.	14,521	18,642	934	627	130	141
b) W.Germany	5,479	4,883	1,761	1,312	11,759	10,714
c) France	157	80	856	640	1,424	958
d) Holland	1,006	878	978	463	1,425	1,594
e) Belgium	748	278	569	291	05	160
f) Denmark	677	913	09	04	-	70
f) Italy	110	1,033	160	115	1,793	1,027
2.U.S.S.R. & East Europe of which	8,250	7,713	455	486	6,879	5,857
a) U.S.S.R	-	-	-	-	2,989	2,529
b) Yugoslavia	6,719	4,864	05	02	2,278	1,908
c) C.S.S.R	901	749	-	-	265	445
d) Hungary	-	-	10	10	274	260
e) Poland	30	100	440	474	1,069	715
3.Rest of Eurpoe of which	4,725	4,399	89	91	808	240
a) Portugal	3,161	2,173	-	-	110	-
b) Spain	878	825	-	-	446	35
c) Austria	212	360	-	06	10	15
4. U.S.A	600	1,256	02	06	639	256
5. Middle East	704	656	167	150	-	30
6. South Africa	1,290	724	542	200	70	109
7. Japan	1,780	307	4,453	3,387	3,070	2,985
8. Australia	2,966	2,461	81	69	-	-
9. Newsealand	940	402	14	13	-	-
10. Others.	7,795	9,178	1,317	1,364	90	155
TOTAL.	52,005	54,253	12,374	9,350	28,092	24,296

SOURCE: COCONUT MARKETING BOARD ANNUAL REVIEW FOR 1978

APPENDIX
N S 1.6

J A P A N : IMPORTS OF COIR FIBRE, YARN AND MANUFACTURED PRODUCTS.

1960 - 1978

Q: '000 tons.

YEAR	COIR FIBRE	COIR YARN	MFD PRODUCTS	TOTAL.
Average 1960-1964	9.8	1.6	-	11.4
Average 1965-1969	10.3	0.8	-	11.1
Average 1970-1973	11.4	0.2	0.4	12.0
1974	15.5	0.2	0.3	16.0
1975	9.6	0.1	0.3	10.0
1976	10.9	0.0	0.3	11.2
1977	11.4	0.1	0.3	11.8

SOURCE: 1. Coir Production Survey RAS/71/715 Nov.1975
United Nations Development Programme.
2. FAO Report HF/79/3 April 1979

APPENDIX
N S 1.7

AUSTRALIA : IMPORTS OF COIR FIBRE, YARN AND MANUFACTURED PRODUCTS.

In Q: '000 tons.

YEAR	COIR FIBRE	COIR YARN	MFD PRODUCTS	TOTAL
1974	11.6	0.5	1.8	13.9
1975	3.9	0.1	1.2	5.2
1976	4.5	0.1	1.5	6.1
1977	4.3	0.1	1.6	6.0
1978 (Prd)	4.0	0.1	1.5	5.6
1974-77 (Average)	6.1	0.2	1.5	7.9

SOURCE: CCP - HF 79/3 April 1979

APPENDIX
N S 1.3

UNITED STATES : IMPORT OF COIR FIBRE, YARN AND MANUFACTURED PRODUCTS.

1960 - 1978

Q : '000 tons

YEAR	COIR FIBRE	COIR YARN	MFD PRODUCTS.	TOTAL
Average 1960 -1964	0.5	3.1	2.8	6.4
Average 1965 - 1969	2.4	3.4	2.8	8.6
Average 1970 - 1973	3.7	2.9	2.3	8.9
1974	9.4	4.0	1.6	15.0
1975	6.1	3.8	0.7	10.6
1976	6.4	3.0	1.3	10.7
1977	8.6	1.5	1.7	11.8

SOURCE: 1. Coir Production Survey RAS/71/715 Nov.1975
United Nations Development Programme
2. FAO Report HF/79/3 April 1979

APPENDIX
N S 1.9

Trends in the imports of Coir Fibre, Coir Yarn and Coir Manufactures products by principal importing Countries. The USA, the EEC, Austria, Finland, Norway, Portugal, Sweeden, Switzerland, Greece, Spain, Yugoslavia, Australia, New Zealand, South Africa, Japan, Poland, and other East European Countries & other developing countries.

COUNTRIES.	Average 60-64	65-69	70-73	74	75	76	77
	(thousand matric ton)						
Selected European Countries:							
Federal Republic of Germany	34.8	36.5	24.6	23.6	20.0	21.5	21.1
United Kingdom	33.3	27.4	27.3	23.6	17.6	19.6	19.5
Netherlands	14.9	11.6	7.0	7.4	6.7	8.5	8.8
France	7.5	9.2	10.0	12.2	5.9	10.8	11.1
Italy	10.2	8.7	9.1	7.8	4.2	6.3	5.6
	100.7	93.4	78.0	74.6	54.4	66.7	66.1
United States of America	6.4	8.6	8.9	15.0	10.6	10.7	11.8
Japan	11.4	11.1	12.0	16.0	10.0	11.2	11.8
Other countries	44.5	46.4	56.9	66.6	50.9	57.7	59.0
	163.0	159.0	155.8	172.2	125.9	146.3	148.7

SOURCE: 1. For figures upto 1973 UNDP Coir Promotion Survey Nov. 1975 Vol.1.

2. For figures for 1974 - 77 FAO Coir Statistics 1974- 1979

APPENDIX
N S 1.10

IMPLICATIONS OF DEMAND AND PRODUCTIONS PROJECTIONS FOR WORLD TRADE IN COIR.

	ACTUAL			PROJECTED 1985	
	1964-65 Average	1972 Average	1976	basic	suppl.
	thousand matric tons fibre equivalent				
a. Fibre (bristle, twisted & mattress fibres)					
Total World demand					
of which	127.0	136.0	130.0	140.0	100.0
Demand in producing countries.	27.0	28.5	36.0	45.5	37.5
Total Import demand	100.0	107.5	94.0	94.5	62.5
b. Yarn & Manufactures					
Total world demand of which.	142.0	140.0	140.0	150.0	113.0
Demand inproducing countries.	81.0	90.0	96.0	96.0	92.0
Total Import demand	61.0	50.0	44.0	54.0	21.0
of which:					
Yarn	48.0	32.5	27.0	30.0	14.0
Manufactures	13.0	17.5	17.0	24.0	7.0

SOURCE: FAO.COMMODITY PROJECTION . ESC.PROJ/78/12.

APENDIX
N S 1.1.1

INTERNATIONAL PRICES OF SRI LANKA COIR FIBRE

(US.$. PER M.T. FOB COLOMBO).

PRODUCT.		1976	1977	1978
Mattress Fibre in Sale (FAQ)	High	120	115	140
	Low	110	104	109
Bristle 2 Tie Grade (HB 1)	High	390	550	aobve 400
	Low	190	320	400
Machine Twisted 100% Omatt/Bristle	High	300	350	above 225
	Low	195	225	225
Machine Twisted 100% Mattress Fibre	High	230	210	175
	Low	132	150	150
Coir Yarn Lower Grade	High	250	275	350
	Low	200	200	215

SOURCE: COCONUT MARKETING BOARD. SRI LANKA. ANNUAL REVIEW (1977 & 1978).

APPENDIX
N S 1.12

INTERNATIONAL PRICES OF INDIAN CURLED COIR.

Details.	1975-1976	1976-1977	1977-1978
Quantity exported in tonnes	1014	868	789
Value realised in (lakhs) Indian Rupees.	19.52	19.48	16.67
F.O.B. Price per ton Indian Rupees	1925.00	2244.00	2113.00
F.O.B. Price per ton in U.S.$	241	280	264

SOURCE: COIR BOARD, INDIA, REPORT 1978

APPENDIX.
N S 1.13

JAPAN IMPORT STATISTICS ON COIR FIBRE AND ITS PRODUCTS.

A. IMPORT RECORD (COIR 1000 KG).

	1972	1973	1974	1975
CHINA	114	111	92	68
THAILAND	1,885	1,972	1,804	1,518
SINGAPORE	430	100	180	15
MALAYSIA	163	246	1,117	1,662
PHILIPPINES	166	224	410	410
INDIA	62	81	175	40
SRI LANKA	8,229	10,322	11,757	6,305
PAPUA NEW GUINEA	10	0	0	0
INDONESIA	0	10	0	0
TOTAL.	11,059	13,066	15,535	9,610

B. U S A G E.

BRUSH, KITCHEN BRUSH	150 TON/MONTH	(Tawashi)
TWINE ROPE	150 TON/MONTH	(General Use)
PADDING (CAR SEAT BED)	600 TON/MONTH	
DRAIN PIPE OTHERS)		

C. SORT OF THE FIBRE IMPORTED

BRISTLE FIBRE	300 TON/MONTH
TWISTED FIBRE	500 TON/MONTH
MATTRESS FIBRE	100 TON/MONTH

D. FUTURE DEMAND

BRUSH SCRUB BRUSH	UNCHANGED
TWINE ROPE	"
PADDING FOR CAR SEAT	DECREASED
PADDING FOR BED	UNCHANGED
DRAIN PIPE	UNKNOWN
TOTAL	DECREASED.

SOURCE: SRI M. VARNAKULASINGAM'S REPORT (1976)

SHIPPING FREIGHT RATE ON COIR FIBRE IN BALES.

Commodity: Coir Fibre in Hydraulically Pressed Bales: 500 KG/M^3 Freight in US $

Loading Port	Destination	Freight Basic per CBM	Currency adjustment.	Factor	Bunker	Surcharge	Total per CBM	Total per Ton
Sri Lanka	U.K	40.95	(7.00)%	2.87	(18.60%)	7.60	51.44	102.88
	Europe	39.25	(21.00%)	9.24	(18.60%)	7.30	54.79	109.58
	Japan	31.45	(9.00%)	2.83	(23.00%)	7.23	41.51	83.02
	USA (West)	51.25	-			32.10	83.35	166.70
	Australia	59.85	(4.11%)	2.46	(42.03%)	25.15	84.46	174.92
Malaysia) Penang)	Europe	53.15						
	Non Contract.							
	Additional Charge 1.78%	0.95						
		54.10	(24.00%)	12.99	(16.22%)	8.99	76.08 58.95	
	Contract Rate							
Jakarta	London Europe	98.50				33.78	132.28	264.56
	Japan	29.00	(21.00%)	6.15	(46.20%)	13.39	48.54	97.08
	USA(East)	98.25					98.25	196.50
	USA(West)	97.25				22.00	119.25	238.50
	Australia	57.22	(22.25%)		(14.66%)		78.30	156.60

From Bitung for shipment to Europe, U.K. and Australia, transhipment charges of Rp. 14,000.00M^3 or U S $ 45.00 per ton will be payable in addition to the above rate.

APPENDIX
N S 1.15

SHIPPING FREIGHT RATE ON TWISTED COIR FIBRE IN CIRCULAR COILS.

Freight in US $

Loading Port	Destination.	Freight Basic in CBM	Currency adjustment factor	Bunker surcharge	Total per CBM	Total per Ton
SRI LANKA	Japan	55.50	9.00%	25.00%	73.26	73.26
	U.K	79.30	7.00%	18.60%	109.60	109.60
	Continent	76.00	21.00%	18.60%	106.10	106.10
	Australia	117.50	4.11%	42.03%	171.71	171.71
THAILAND	Europe	-	-	-	-	185.00

Freight for Twisted Fibre has not been fixed in the commodities list by Indonesia Shipping Conference.

APPENDIX
N S 2.1

Estimated Cost of Land, Site Development and Buildings required for Production of 1,200 Tons Twisted Coir Fibre per year in North Sulawesi, Indonesia.

No.	Assets	Quantitative Data	Cost / Sqm		Total	
			Rp	US$	Rp	US$
1.	Land	15,000 sqm	1,000	1.60	15,000.00	24,000
2.	Building plant	600 sqm	60,000	96.00	36,000.00	57,600
3.	Godown	200 sqm	30,000	48,00	6,000.00	9,600
4.	Drying Yard	400 sqm	20,000	32.00	8,000.00	12,800
5.	Office	200 sqm	60,000	96.00	12,000.00	19,200
6.	Workshop	60 sqm	50,000	80.00	3,000.00	4,800
7.	Soaking Tank	250 sqm	30,000	48.00	7,500.00	12,000
	Total				87,500.00	140,000

APPENDIX.
N.S 2.2

Details of Machinery and Equipment required for Production of Coir Fibre

Machine & Power Requirement			Description of Machine/ Equipment.	Cost per machine		Total Cost	
No.of M/c Requirement.	Power in HP per M/c	Total HP		US$	RP	US$	RP
1. FOR COIR EXTRACTION - 1400 MT per annum.							
2	5	10	Crusher	3,200	2,000.000	6400	4,000.000
3	7.5	22.5	Defibering Machine	7,600	4,750.000	22800	14,250.000
2	2	4	Revolving Screener	1,910	1,193.750	3820	2,387.500
2	15	30	Turbo Cleaner	4,350	2,718.750	8700	5,437.500
		66.5				41720	26,075.000
			Freight,Insurance	30%		12516	7,822.500
			Clearing,Erection and Installation.	10%		4172	2,607.500
			Total Cost			58408	36,505.000
2. Twisted Fibre:Production-1200 Mt Per annum.							
6	9	54	Curling Machine	22,000	13,750.000	132000	82,500.000
			Freight & Insurance	30%		39600	24,750.000
			Clearing ERection & Installation	10%		13200	8,250.000
			Total Cost			184800	115,500.000
3. Generator 250 KVA						45000	28,125.000
Pre investment cost and start up cost 5% of cost of Machinery.						14410	9,006.250
			Total Cost			302618	189,136.250

APPENDIX
N S 2.3

Details of Utilities for the Production of 1,400 Tons Coir Fibre in North Sulawesi.

		RP	US $
Platform Scales	2	9,375.000	15,000
Trolleys	6		
Workshop Equipment			
Water Pump			
Fire Fighting Equipment			

APPENDIX
NS 3.1

Details of Capital Investment required for Productions of 1,400 Tons Coir Fibre to be Processed further into 1,200 Tons Twisted fibre.

			US $	RP
I.	Land and Site Development Building		140,000	87.500.000
II.	Machinery for Fibre Production.	58,408	288,208	180.130.000
	Machinery for Curled Coir Production	184,800		
	Generator	45,000		
III.	Utilities		15,000	9.375.000
IV.	Reinvestment and Start up expenses. 5% x II (288,208)		14,410	9.006.250
V.	Total Fixed Assets		457,618	286.000.250
VI.	Working Capital for 2 months		40,000	25.000.000
VII.	Total Investment		497,618	311.011.250
		Say US$	500,000	312.500.000

N S 9.1

COIR FIBRE FACTORY AT NORTH SULAWESI.

Estimated of Sales Revenue in full Production.

Output 1200 MT Twisted Fibre

Producat	Unit Price		Quantity Total Sold		Sales Revenue.		Total
	Export	Local	Export	Local	Export	Local	
Twisted Fibre (Curled Coir)	US.$ 266	266	700 MT	500 MT	186,200	133,000	319,200
	RP 166250	166250	700 MT	500 MT	116,375.000	83,125,000	199,500,000

APPENDIX
N S 5.1

NORTH SULAWESI COIR PROCESSING FACTORY -INDONESIA.

Annual Requirements of Major Raw Materials - Coir Fibre output 1400 MT per annum.

Quantity	Description of Raw Materials.	Unit Cost. US $	Unit Cost. RP	Total Cost US $	Total Cost RP
12 millior.	Coconut Husks (One million Husks for production of 120 Metric Tons of Coir Fibre)	40 per 10,000 Husks)	25,000	48,000	30,000.000

APPENDIX
N S 5.2

Man Power Requirements for Production of Coir Fibre
Plant Annual Output 1,400 MT Coir Fibre/1,200 Twisted Fibre.

Designation.	No. of person.	Salary/Wages/Month US $	Salary/Wages/Month RP	Total US $	Total RP
Managerial & Supervision					
General Manager	1	300	187.500	300	187.500
Works Manager	1	200	125.000	200	125.000
Plant Foreman	3	150	93,750	450	281.250
	5			950	593.750
Administration & Clerical					
Accountant.	1	150	93,750	150	93,750
Store Keeper	2	60	37,500	120	75.000
Clerks/Typist	6	60	37.500	360	225.000
Driver	1	50	31.250	50	31.250
Peon	2	40	25.000	80	50.000
Watchman	3	40	25.000	120	75.000
	15			880	550.000
Services & Facilities.					
Electricians	3	50	31.250	150	93.750
Mechanics	3	50	31.250	150	93.750
	6			300	187.500
Works:					
Skilled Curling	10	50	31.250	500	312.500
Defibering skilled	10	50	31.250	500	312.500
Semi skilled	10	40	25.000	400	250.000
Unskilled.	12	30	18.750	360	225.000
Unskilled	50	30	18.750	1,500	937.500
	92			3,260	2,037.500
Managerial & Supervision	5			950	593.750
Adm.& Clerical	15			880	550.000
Services & Facilities	6			300	187.500
Works	92			3,260	2,037.500
	118			5,390	3,368.750
Fringe benefit 30%				1,617	1,010.625
				7,007	4,379.375
For I year x12.				84,084	52552.500
				======	=========

APPENDIX
N S 5.3

ESTIMATE OF ANNUAL OPERATION COST
NORTH SULAWESI COIR PLANT.

Raw Material: 12 Million Coconut Husks.

Product. 1400 tons Coir Fibre - processed into 1200 tons of Twisted Fibre.

Details of Expenses.	Total US.$	Total RP	Cost per M.Ton US.$	Cost per M.Ton RP
1. Raw Materials. 12 Million husks @ US.$.4 per 1000 husks.	48,000	30,000.000	40.00	25,000
2. Conversion Cost:				
2.1 Power/Water	21,000	13,125.000	17.50	10.938
2.2 Wages/benefits	84,000	52,500.000	70.00	43.750
2.3 Machinery Maintenance (5% of plants value)	16,000	10,000.000	13.34	8.337
2.4 Building Maintenance (2% of building value)	2,800	1,750.000	2.33	1.456
2.5 Pith removal expenses	2,400	1,500.000	2.00	1.250
2.6 Other factory expenses (5% of b)	4,200	2,625.000	3.50	2.188
2.7 Office + Administration expenses (5% of b)	4,200	2,625.000	3.50	2.188
2.8 Depreciation. 5% of land + building & 10% of Machinery.	38,800	24,250.000	32.33	20.206
Interest on borrowing C 12% (70%of total of US.$. 500,000)	42,000	26,250.000	35.00	21.875
3, Manufacturing Cost	263,200	164,625.000	219.50	137.188
4. Transport to Port + FOB.	9,600	6,000.000	8.00	5.000
5. Total Cost.	273.000	170,625.000	227.50	142.188

ESTIMATE ANNUAL OPERATION COST.

COIR FIBRE PLANT - NORTH SULAWESI

Product: Coir Fibre

Raw material: Coconut Husks. Output: 1,400 MT

DETAILS OF EXPENSES.	COST TOTAL US $	COST TOTAL RP	COST PER METRIC TON US $	COST PER METRIC TON RP
1. Cost of Husk 12 million C US $40 per 10000.	48.000	30,000.000	34,29	21.431
2. Conversion cost.				
Power/water	15.000	9,375.000	10,71	6.604
Wages/benefits-Monthly Cost US $.7007 less curling US $.3107 12 x US $.3900	46.800	29,250.000	33.43	20.894
Machinery Maintenance 5% of plant	5.000	3,125.000	3.57	2.231
Building Maintenance 2% of value	1.200	750.000	0.86	.538
Pith Removal expenses (US $.2/ton)	2.400	1,500.000	1.71	1.069
Other factory expenses administration 5% of wages	2.400	1,500.000	1.71	1.069
Administration + office expenses 5% of wages	2.400	1,500.000	1.71	1.069
Proportional Depreciation C 5% on value of building C10% on M/C + utilities	14.200	8,875.000	10.14	6.338
Proportional interest on borrowing 12% of US.$.350.000	15.000	9,375.000	10.71	6.694
Total cost for production 1400 tons of coir fibre.	152.400	92,250.000	108.84	68.027

APPENDIX
NS 5.5

ESTIMATE OF ANNUAL OPERATION COST
NORTH SULAWESI COIR PLANT.

Product: Curled Coir (Twisted Fibre)

Raw Material: Coconut Fibre. Output: 1200 Ton

DETAILS OF EXPENSES.	TOTAL COST US.$	TOTAL COST RP	PER METRIC TON. US.$	PER METRIC TON. RP
Cost of Raw Materials				
1400 tons Decorticated Coir a US.$ 127/MT including process Waste (± 10%) 1200 Ton.	152.400	95,250.000	127.00	79.375
Wages (benefits)	37.200	23,250.000	31.00	19.375
Power/Water	6.000	3,750.000	5.00	3.125
Machinery Maintenance (5% of Plant)	11.000	6,895.000	9.17	5.730
Building Maintenance	1,600	1,000.000	1.33	.831
Factory Expenses (5% of wages)	1,800	1,125.000	1.50	.938
Office Expenses (5% of wages)	1,800	1,125.000	1.50	.938
Proportionate Depreciation 5% on Building 2800 10% on Machinery 21.800	24.600	15,375.000	20.50	12.813
Proportionate Interest on borrowings (12% of 350000) (420000 - 150000)	27.000	16,875.000	22.50	14.063
	263.400	164625.000	219.50	139.188
Transport to Port & FOB	9.600	6000 .000	8.00	5.000
Total FOB Cost of 11000 Tons Twisted Feibre.	273.000	170625.000	227.50	142.188

APPENDIX
NS 5.6.

NORTH SULAWESI COIR FIBRE FACTORY

Commercial Profitability

Rate of Return

	A 100% Equity	B 30% Equity 70% Borrowings.
SALES REVENUE:		
By sale of 1,200 MT Twisted Fibre Fibre @ 266/ton FOB	319,200	319,200
Less:		
Operating cost 191,800		
Depreciation 38,800	231,000	231,000
		88,200
Less: Interest on borrowing.		42,000
Gross Profit before tax	88,200	46,200
Corporate Tax @ 20%	17,640	9,240
Net Profit after Tax	70,560	36,960

RATE OF RETURN:

$$\frac{\text{Net Profit}}{\text{Investment}} \qquad \frac{\text{Net Profit \& + Interest}}{\text{Investment}}$$

$$= \frac{70,560}{500,000} \times 100 \qquad \frac{36,960 + 42,000}{500,000} \times 100$$

$$= 14.12\% \qquad 15.79\%$$

APPENDIX
NS 5.7

NORTH SULAWESI COIR FIBRE FACTORY

Commercial Profitability

REPAYMENT PERIOD.

	A Wholly Equity		B 30% Equity 70% Borrowings US $
Net Profit after tax	70,560		36,960
		Interest	42,000
Depreciation	38,800		38,800
Total	109,360		117,760
Funds available per year	109,360		117,760
Total amount to be paid back US $ 500,000.			
No.of years required.	US $ 500,000 / 109,360		500,000 / 117,760
	= 4.6 years		4.2 years.

APPENDIX
N S 5.8

NORTH SULAWESI COIR FIBRE FACTORY

Commercial Profitability

BREAK-EVEN POINT

Total Sales : US $ 319,200

Items	Variable	Fixed
Husks	48,000	
Power & Oil	21,000	
Wages	54,000	
Salaries		30,000
Maintenance		16,000
Factory Expenses		13,600
Depreciation		38,800
Transport to Ports	9,600	
	132,600	98,400

Contribution: Sales - Variable

319,200 - 132,600

= 186,600

B.E.P. : $\frac{\text{Fixed expenses}}{\text{Contribution}} \times 100$

$\frac{98,400}{186,600} \times 100$

= 52.7%

APPENDIX
No 5.9

Comparative Cost of Production of Coir Fibre (Aug.79) in Different Coir Producing Countries.

Cost in US $ per M.Ton

Details.	Sri Lanka	India	Thailand	Malaysia	Indonesia (Estimated)
Cost of Raw Materials	28.31	50.00	30.00	30.00	34.29
Coconut Husks	8,000 Husks	10,000 Husks	10,000 Husks	10,000 Husks	9,000 Husks
Conversion Expenses:					
Wages/Power/Machinery Maintenance/Depreciation Interest on Investment	21.34	85.00	90.00	90.00	74.55
Total Cost of Production	49.55				
Transport to Processor/ Exporter	5.67				
Total Cost of Product	55.22	135.00	120.00	120.00	108.84

APPENDIX
N S 5.10

Comparative Cost of Production of Curled Coir (Twisted Fibre) in different Exporting Countries (Aug.1979)

Cost Per M-Ton in US.$

DETAILS	SRI LANKA	INDIA	THAILAND	MALAYSIA	INDONESIA Estimated
Cost of Raw Materials.	103.90	180.00	143.00	143.00	127.00
Allowing for 10% Process wastage.					
Conversion Costs:					
Wages/Power/Machinery Maintenance/Factory & Office expenses. Depreciation. Interest on Investment FOB Expenses.	50.00	69.00	95.00	90.00	100.50
Export Duty at 15% of FOB Price	40.00				
Total FOB Cost	194.70	249.00	238.00	233.00	227.50
FOB Recovery	266.00	266.00	266.00	266.00	266.00
PROFIT PER TON	71.30	17.00	28.00	33.00	38.50

APPENDIX
N S 6.1

FEDERAL REPUBLIC OF GERMANY: IMPORTS OF COIR FIBRE, YARN AND MANUFACTURED PRODUCTS.

1960-1978

Q : '000 tons.

Year	Coir Fibre	Coir Yarn	Mfd. products	Total
Average				
1960-1964	22.9	9.4	2.5	34.8
Average				
1965-69	27.5	5.7	3.3	36.5
Average				
1970-1973	19.4	2.5	2.7	24.6
1974	19.1	1.8	2.7	23.6
1975	14.9	2.4	2.7	20.0
1976	16.4	2.4	2.7	21.5
1977	16.2	2.4	2.5	21.1

SOURCE: 1. Coir Production Survey RAS/71/715 Nov.1975
United Nations Development Programme.
2. FAO Report HF/79/3 April 1979

APPENDIX
N S 6.2

UNITED KINGDOM: IMPORTS OF COIR FIBRE, YARN AND MANUFACTURED PRODUCTS.

1960-1978

Q : '000 tons

Year		COIR FIBRE	COIR YARN	MFD PRODUCTS	TOTAL.
Average	1960-1964	22.7	4.5	6.1	33.3
Average	1965-1969	20.0	3.1	4.3	27.4
Average	1970-1973	21.2	2.4	3.7	27.3
	1974	18.5	1.8	3.3	23.6
	1975	12.8	1.9	2.9	17.6
	1976	14.7	1.6	3.3	19.6
	1977	14.6	1.3	3.6	19.5

SOURCE; 1. Coir Production Survey RAS/71/715 Nov.1975
United Nations Development Programme
2. FAO Report HF/79/3 April 1979

APPENDIX
N S 6.3

FRANCE : IMPORTS OF COIR FIBRE, YARN AND MANUFACTURED PRODUCTS.

1960 - 1978

Q : '000 tons.

Year	COIR FIBRE	COIR YARN	MFD PRODUCTS	TOTAL.
Average 1960-1964	3.2	4.0	0.3	7.5
Average 1965-1969	3.9	4.6	0.7	9.2
Average 1970-1973	3.0	6.0	1.0	10.0
1974	3.1	7.6	1.5	12.2
1975	1.6	3.4	0.9	5.9
1976	2.8	6.8	1.2	10.8
1977	3.0	6.9	1.2	11.1

SOURCE: 1. Coir Production Survey RAS/71/715 Nov.1975
United Nations Development Programme.
2. FAO Report HF/79/3 April 1979

APPENDIX
N S 6.4

NETHERLANDS : IMPORTS OF COIR FIBRE, YARN AND MANUFACTURED PRODUCTS.

1960 - 1978

Q : '000 tons.

YEAR	COIR FIBRE	COIR YARN	MFD PRODUCTS	TOTAL
Average 1960 - 1964	2.8	11.5	0.6	14.9
Average 1965 - 1969	2.1	8.2	1.3	11.6
Average 1970 - 1973	1.3	4.0	1.7	7.0
1974	2.2	3.1	2.1	7.4
1975	2.0	2.5	2.2	6.7
1976	3.6	2.4	2.5	8.5
1977	3.7	2.7	2.4	8.8

SOURCE: 1. Coir Production Survey RAS/71/715 Nov.1975
United Nations Development Programme

2. FAO Report HF/79/3 April 1979

APPENDIX
N S 6.5

I T A L Y : IMPORTS OF COIR FIBRE, YARN AND MANUFACTURED PRODUCTS

1960 - 1978

Q: '000 tons.

YEAR	COIR FIBRE	COIR YARN	MFD PRODUCTS	TOTAL.
Average 1960-1964	4.9	4.7	0.6	10.2
Average 1965-1969	3.9	3.7	1.1	8.7
Average 1970-1973	4.5	3.0	1.6	9.1
1974	3.8	2.3	1.7	7.8
1975	1.9	1.2	1.1	4.2
1976	2.7	1.9	1.7	6.3
1977	2.0	1.8	1.8	5.6

SOURCE: 1. Coir Production Survey RAS/71/715 Nov.1975
United Nations Development Programme

2. FAO Report HF/79/3 April 1979

APPENDIX
J 2.1

ESTIMATED COST OF LAND, SITE DEVELOPMENT, BUILDINGS INCLUDING FUNCTIONAL FACILITIES FOR PRODUCTION OF RUBBERIZED COIR IN JAVA.

Annual Output 900 Tons.

Asset.	Quantitative Data	Rate RP currency	Total in RP	Total in U S$
1. Land including site Development	6,000 Sqm	2,500/sqm	15,000.000	24,000
2. Buildings				
Workshed 900 Sqm Store 100 Sqm Godown for Coir 200 Sqm Godown for finished goods. 200 Sqm Chemicals room 30 Sqm Boiler room 30 Sqm Packing Dept 40 Sqm	1,500 sqm	50,000/sqm	75,000.000	120,000
Office	150 sqm	100,000/sqm	15,000.000	24,000
Functional Facilities @20% of Building cost			18,000.000	28,800
Contingencis.			2,000.000	3,200
	Total		125,000.000	200,000

APPENDIX
J 2.2

DETAILS OF PLANT & MACHINERY/EQUIPMENT REQUIRED FOR THE PRODUCTION OF RUBBERIZED COIR IN JAVA.

Annual Output 900 MT

Machine & Power Requirement.			Description of the Machine/Equipment	Cost per Machine	Total Cost.	
Quantity Requirement	HP	Total			RP	US $
1	9	9	Untwisting Machine			
1	36	36	Rubberizing Plant including spraying system/Latex Pressure Tanks & Accessories		200,000.000	320,000
1	7.5	7.5	Hydraulic Hot Press			
1	15	15	Drying stove + vulcaniser cutting Devices/ Bandsaw Machines			
1	9	9	Colloid Mill for Latex compounding			
1	2	2	Agitator			
1	10	10	Chamber Driers 1 set			
1	20	20	Air compressor			
			Steam Generator (Boiler)			
			Ocean freight & Insurance (30%)		60,000.000	96,000
			Clearing, Erection & Installation (10%)		20,000.000	32,000
	108.5		Total		280,000.000	448,000

APPENDIX
J 2.3

D DETAILS OF UTILITIES REQUIRED FOR PRODUCTION OF 900 MT RUBBERIZED COIR IN JAVA.

A. Auxilliaries/Utilities & Service facilities.

	US $	RP
Water Pumping station, Tank) Steam-Air & Water Pipes.)	10,000	6,250.000
Electrical Cabling.	10,000	6,250.000
Laboratory Equipment	5,000	3,125.000
Workshop Equipment	5,000	3,125.000
Racks & Trolleys) Material Handling) Fire Fighting)	5,000	3,125.000
Truck & Car for office.	25,000	15,625.000
Total	60,000	37,500.000

APPENDIX
J 3.1

Details of Capital investment required for Production of 900 MT Rubberised Coir Products.

		US $	RP
I.	Land and Site Development and building.	200,000	125,000.000
II	Machinery and Equipment	448,000	280,000.000
III.	Utilities	60,000	37,500.000
IV.	Preinvestment and Start up expenses	32,000	20,000.000
V.	Contingencies	10,000	6,250.000
VI.	Total fixed assets	750,000	468,750.000
VII.	Working capital for 2 months	250,000	156,250.000
	Total	1000,000	625,000.000

APPENDIX
J 4.1

Annual Sales of Rubberized Coir Factory in Java - in full Production.

Product.	Quantity Total Sold	Unit Price US.$	Unit Price RP	Total Sales. US.$	Total Sales. Rp.
Car Seat Cushions Transport Bus Seat Beddings and Furniture Cushions. Air Filters etc	400 Tons 500 Tons.	2,300	1,437,500	2,070,000	1,293,750.000

APPENDIX.
J 5.1

ANNUAL REQUIREMENTS OF MAJOR RAW MATERIALS FOR PRODUCTION OF (900 TONS RUBBERIZED COIR - IN JAVA.

Quantity	Description of Raw Materials	Unit Cost US.$	Unit Cost RP	Total Cost US$	Total Cost RP
450 M.Tons	Centrifuged Latex (60% Dry Rubber contedt)	1,080 (per MT)	675.000	486,000	303,750.000
500 M.Tons	Twisted Coir Fibre	300 (per MT)	187,500	150,000	93,750.000
	Rubber Chemicals (at 1/6 of Latex cost rounded)				
1/3 local and balance imported.	Accelerator Antioxidant Stabilizer		imported	60,000	3,750.000
	Dispersing Agent. 1. Zinc Oxide 2.Kaolin 3.Sulphur Pottasium Hydroxide		Local	30,000	1,875.000
360 KL	Furnace Oil	48	30,000	17,280	10,800.000
	Water	Lump sum		720	450.000
	Cons stores	Lump sum		18,000	11,250.000
			Total	762,000	476,250.000

APPENDIX.
J 5.2.

MAN POWER REQUIREMENTS FOR THE RUBBERIZED FIBRE FACTORY -IN JAVA.

	No.of persons.	Per Month. US $	Per Month. RP	Total. US.$	Total. RP
Managerial & Supervisory					
General Manager (Expartriate)	1	1,600	1,000.000	1,600	1,000.000
Finance Manager	1	240	150.000	240	150.000
Works Manager	1	240	150.000	240	150.000
Commercial Manager	1	240	150.000	240	150.000
Plant Supervisor	4	160	100.000	640	400.000
Chemists	2	160	100.000	320	200.000
	10			3,280	2,050.000
Administrative/Clerical					
Personnel Officer	1	160	100.000	160	100.000
Accounts Officer	1	160	100.000	160	100.000
Store Keeper	4	100	62.500	400	250.000
Clerks/Typists	10	80	50.000	800	500.000
Peons	12	48	30.000	576	360.000
Driver	4	64	40.000	256	160.000
	32			2,352	1,470,000
Service & Facilities.					
Electricians	4	80	50,000	320	200.000
Mechanics	4	80	50.000	320	200.000
Boilerman	4	64	40.000	256	160.000
General operator	4	64	40.000	256	160.000
Packers	4	64	40.000	256	160.000
	20			1,408	880.000
Workers:					
Skilled	20	80	50.000	1,600	1,000.000
Semiskilled	40	64	40.000	2,560	1,600.000
Unskilled	50	48	30.000	2,400	1,500.000
	110			6,560	4,100.000
Sales Staff	6	160	100.000	960	600.000

Managerial & Supervisory	10	3,280	2,050.000
Administrative & Clerical	32	2,352	1,470.000
Service & Facilities	20	1,408	880.000
Workers	110	6,560	4,100.000
Sales Staff	6	960	600.000
	178	14,560	9,100.000
Fringe Benefits	30%	4,368	2,730.000
Escalation	10%	1,892	1,182,500
Total per month		20,820	13,012,500
For 12 months		249.840	156,150.000
	Say	250.000	156,250.000

APPENDIX
J 5.3

ESTIMATES OF ANNUAL OPERATION COST FOR JAVA FACTORY.

PRODUCTS: RUBBERIZED COIR.

Automobile Seats - Cushion - Mattresses.

Output: 900 MT.

Details of Expenses.	Total Cost US.$ '000	Total Cost RP '000	Cost per MT US.$	Cost per MT RP
A. RAW MATERIALS:				
1.1 Curled Coir (Twisted Fibre) 500 MT at US $ 300 or RP.187.500	150	93 750	166.67	104.167
1.2 60% DRC Latex at US$1.08 per Kg. or Rp.675 per Kg	486	303,750	540.00	337.500
1.3 Rubber Chemicals 1/6 of Latex Cost	90	5,625	100.00	62,500
1.4 Furnace Oil & Water	18	11,250	20.00	12.500
1.5 Other consumable stores	18	11,250	20.00	12.500
1.6 Total Material Cost	762	476,250	846.67	529.167
B. Conversion Cost.				
2.1 Power	36	22,500	40.00	25.000
2.2 Wages & Benefits	250	156,250	277.77	173.611
2.3 Machinery maintenance 6% of Machinery)	33	20,625	36,67	22.917
2.4 Building Maintenance 2% of building.	4	2,500	4.44	2.777
2.5 Factory Production Expenses 10% of b	25	15,625	27.78	17.361
2.6 Office Expenses 20% of b	50	31,250	55.56	34.722
2.7 Car Maintenance	5	3,125	5.56	3,472
2.8 Depreciation on building 5% and 10% on Machinery	65	40,625	72.22	45,139
2.9 Interest at 12% on 70% borrowings.	84	52,500	93.33	58.334
2.10 Sundries.	6	3,750	6.67	4.167
	558	348,750	620.00	387.500
C. Manufacturing Cost	1,320	825,000	1,466.67	616.667
D. Sales & Administrative expenses.				
4.1 Packing expenses	150	93,750	166.67	104.162
4.2 Sales Expenses (Travelling and Promotion)	198	123.750	220.00	137.500
4.3 Office overhead 10% of Manufacturing cost	132	82,500	146.66	91.662
	480	300,000	533.33	333.333
E Total Cost	1,800	1125,000	2,000.00	1,250.000

APPENDIX
J 5.4

JAVA RUBBERIZED COIR FACTORY.

Commercial Profitability.

RATE OF RETURN.

	A 100% Equity		B 30% Equity 70% Borrowings.	
	US $		US $	
Sales Recovery		2,070,000		2,070,000
Less:				
Production costs	1,171,000			
Depreciation	65,000			
Administrative overhead	132,000			
Selling & Distribution	348,000			
		1,716,000		1,716,000
Grossprofit before tax		354,000		354,000
Corporate Tax at 20%		70,800	Interest	84,000
			G.P.before Tax	270,000
			Corporate Tax @ 20%	54,000
Profit after tax		283,200		216,000

Rate of return: $\frac{\text{N.P. after Tax}}{\text{Investment}}$ $\frac{\text{N.P.after tax + Interest}}{\text{Investment}}$

$= \frac{283,200}{1,000,000} \times 100$ $\frac{216,000 + 84,000}{1,000,000} \times 100$

$= 28.32\%$ $= 30\%$

APPENDIX
J 5.5

JAVA RUBBERIZED COIR FACTORY.

Commercial Profitability.

REPAYMENT PERIOD.

A 100% Equity	US $	B 30% Equity 70% Borrowings.	US $
Net Profit after tax.	283,200	Net Profit after tax	216,000
		Interest	84,000
Depreciation	65,000	Depreciation	65,000
	348,200		365,000

This amount will pay back total investment of US $ 1,000,000 in

$$\frac{\text{US \$ } 1,000,000}{348,200} = 2.9 \text{ years.}$$

2.9 years.

This amount will facilitate repayment of Investment of US $ 1,000,000 in

$$\frac{\text{US \$ } 1,000,000}{365,000} = 2.8 \text{ years.}$$

2.8 years.

APPENDIX
J 5.6.

JAVA RUBBERIZED COIR FACTORY

Commercial Profitability

BREAK-EVEN POINT

Total Sales US $ 2,070,000

Operational Expenses	US $ Variable	Fixed
Raw Materials	762,000	
Power & Water	36,000	
Wages	125,000	
Salaries		125,000
Maintenance & Other Factory Expenses		48,000
Factory Prod.expenses		75,000
Depreciation		65,000
Factory cost	923,000	313,000
Administrative		132,000
Packing/Sales Distribution	348,000	
	1,271,000	445,000
Total Sales	2,070,000	
Variable	1,271,000	
Contribution	799,000	
Fixed Expenses	445,000	
B.E.P. :	445,000 / 799,000 x 100	
=	55.7%	

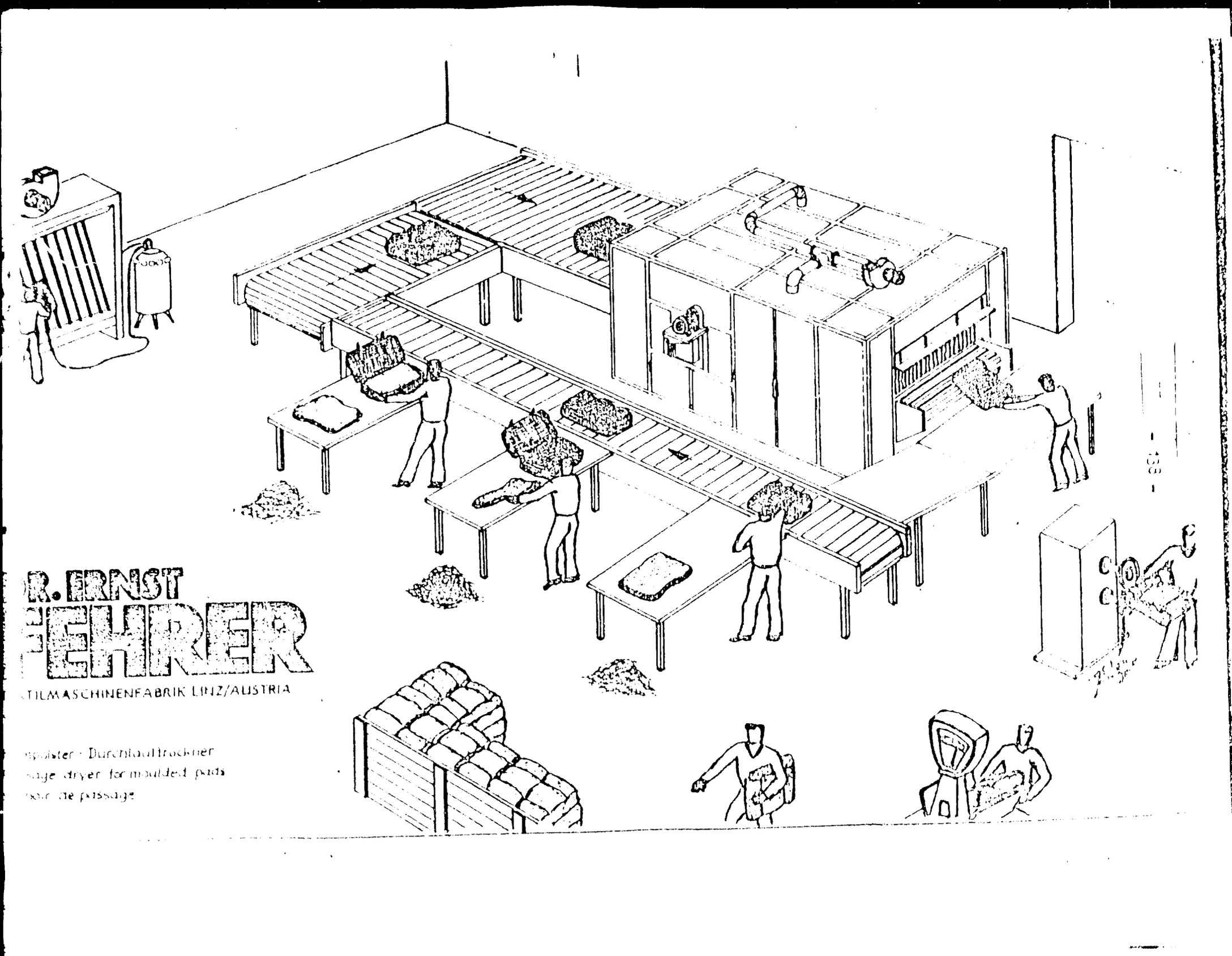
APPENDIX
J 5.7

COMPARATIVE COSTS, SALES RECOVERY AND PROFIT OF RUBBERIZED COIR ~~XXX~~ FACTORIES IN INDIA/INDONESIA (PROPOSED).

DETAILS.	INDIA Factory A	Factory B	INDONESIA (Proposed)
1. Year of Establishment.	1965	1963	Proposed.
2. Fixed Capital Investment (US.$)	500.000	99,000	750,000
3. Output in MT.per annum.	422	136	900
4. Average investment per ton	1,184	662	1,111

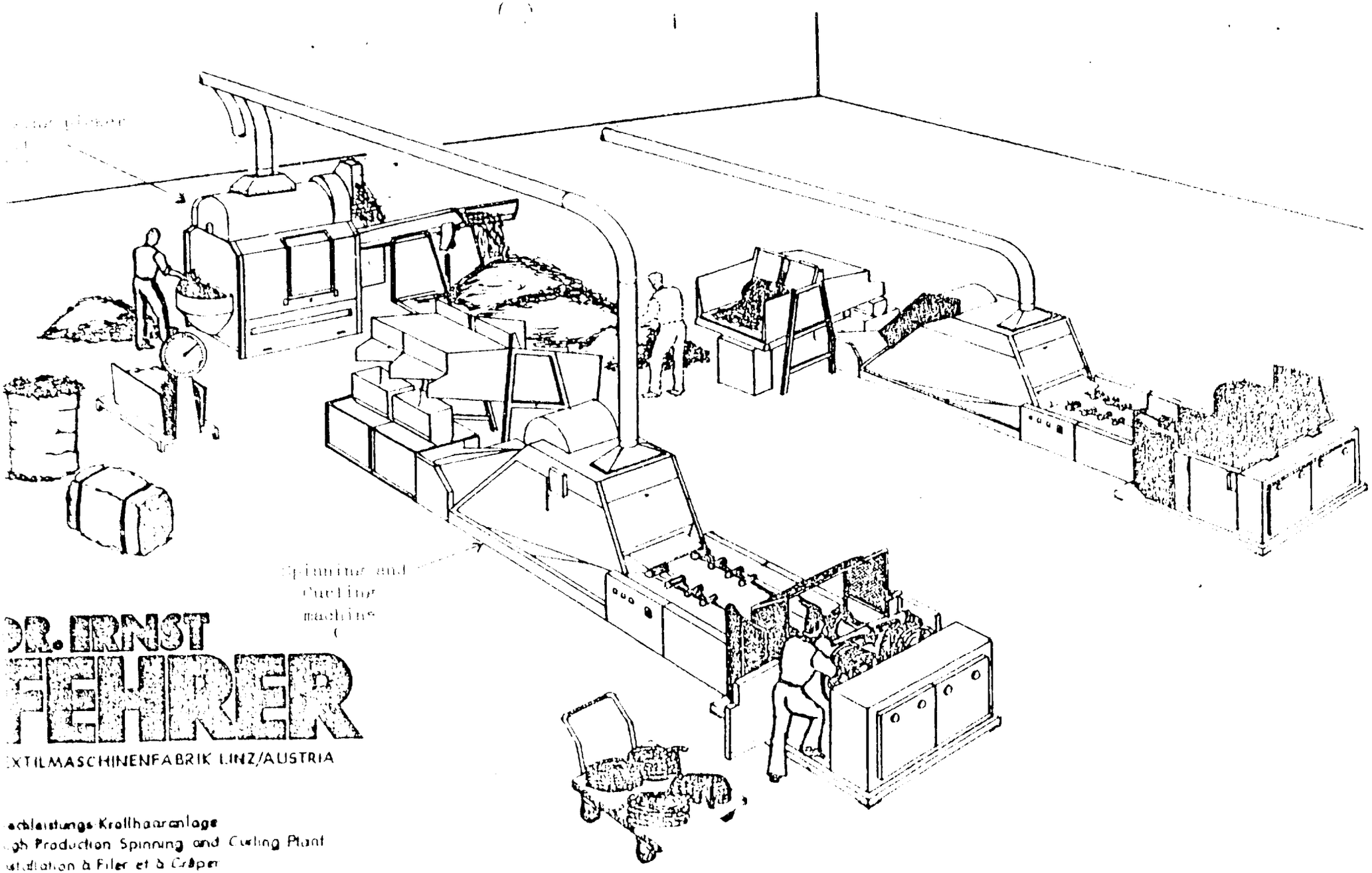
COST OF PRODUCTION PER MT.(In US.$)

DETAILS OF EXPENSES.	INDIA Factory A	Factory B	INDONESIA (Proposed)
1. Raw Materials consumed	1,192	1,383	847
2. Labour/wages	283	214	278
3. Machinery Maintenance	122	32	47
4. Power and Lighting	108	38	40
5. Other Factory expenses	64	22	89
6. Depreciation	79	48	72
7. Manufacturing cost	1,769	1,737	1,373
8. Packing/outward freight	160	150	167
9. Selling & Administrative	285	276	367
10. Interest on Borrowings	89	34	93
Total Cost	2,303	2,197	2,000
Sales Recovery	2,403	2,341	2,300
PROFIT PER.TON IN US.$.	100	144	300



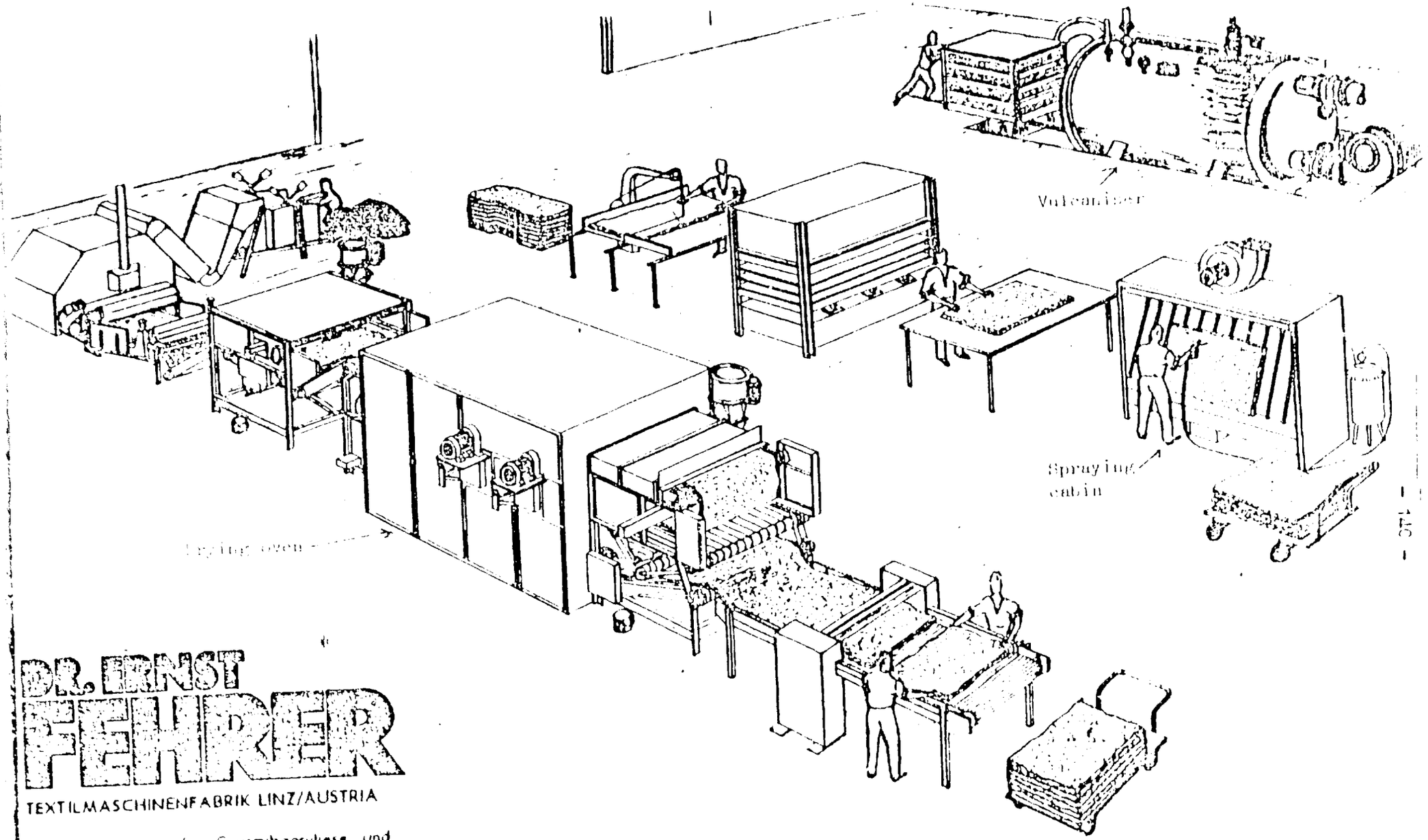
R. ERNST
FEHRER
TILMASCHINENFABRIK LINZ/AUSTRIA

polster - Durchlauftrockner
age dryer for moulded pads
sec de passage



DR. ERNST
FEHRER
EXTILMASCHINENFABRIK LINZ/AUSTRIA

...schleistungs-Krollhaaranlage
...gh Production Spinning and Curling Plant
...stallation à Filer et à Crêper



DR. ERNST FEHRER

TEXTILMASCHINENFABRIK LINZ/AUSTRIA

Erzeugungsanlage für Gummihaarvliese und Gummihaarplatten

Plant for the production of rubberised hair sheets and rubberised hair pads

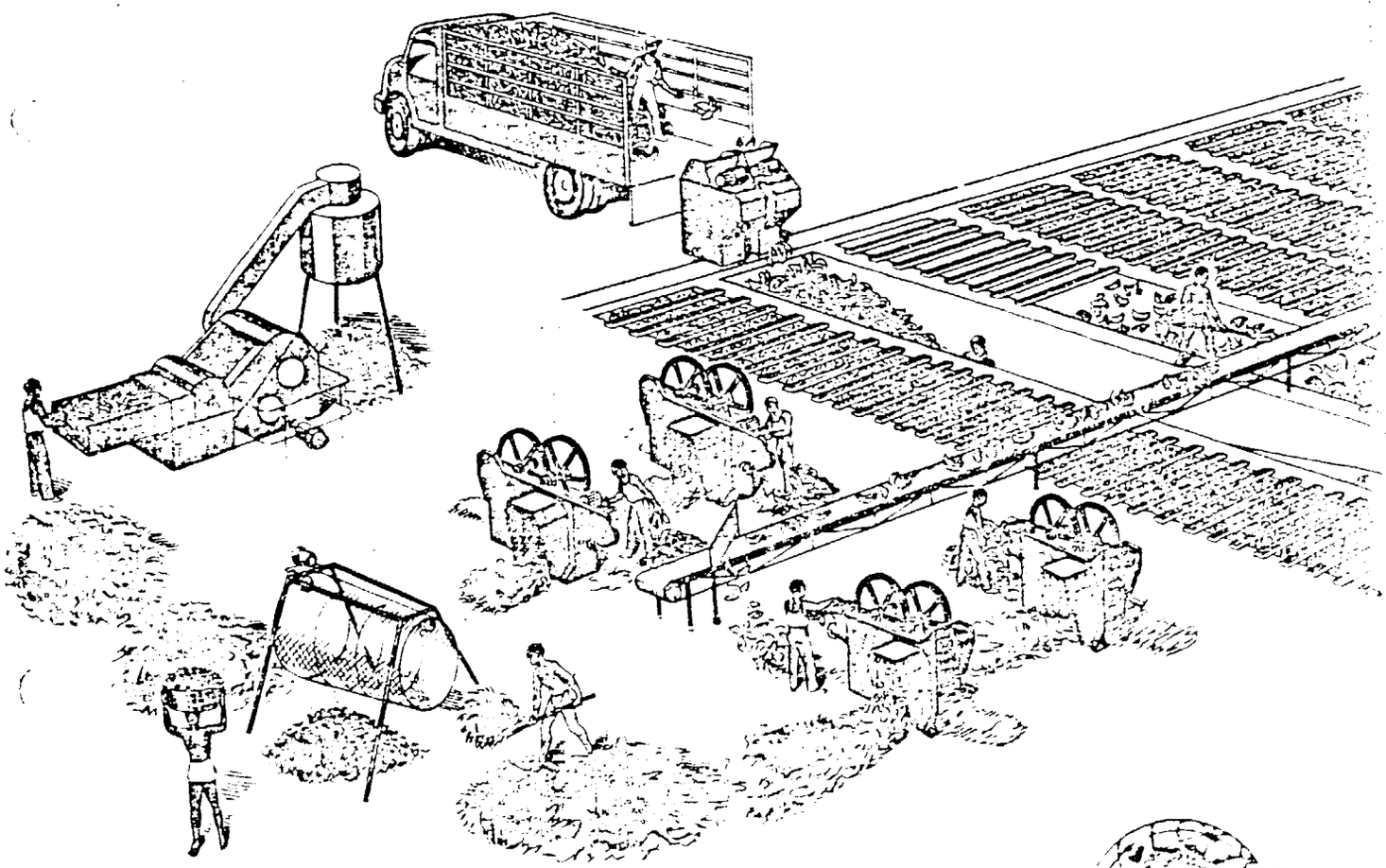
Installation de production des nappes en crin caoutchouté et des plaques en crin caoutchouté

DOA FIBRE PRODUCTION PLANT

Owing to the particular qualities of the DOA machines for producing bristle and mattress fibre, the mill can be built-up for most economic working.

INSTALACIÓN DOA
PARA FABRICACIÓN DE FIBRAS DE COCO

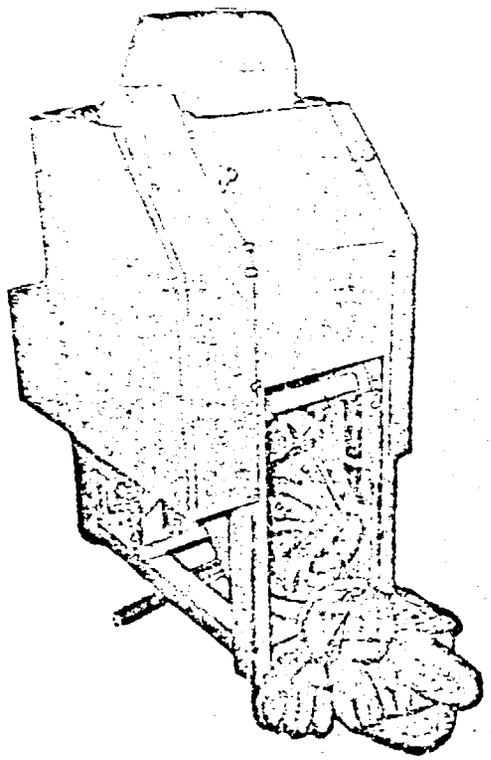
Gracias a las cualidades particulares de las máquinas DOA para o provecho de las fibras de coco, la fábrica puede ser construido de tal manera que está trabajando lo más racional posible.



Patented
Patentado
Breveté

INSTALLATION DOA
POUR FABRICATION DE FIBRES DE COCO

Grâce aux qualités particulières des machines DOA pour produire les fibres de coco, la fabrique peut-être construite pour mode de travail le plus économique.



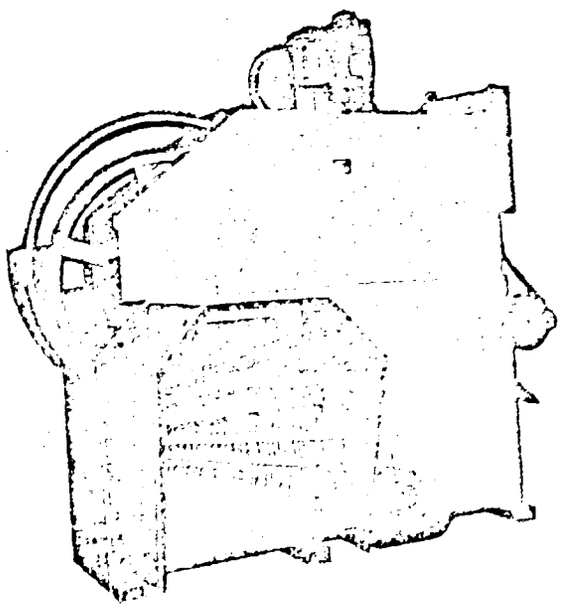
ENNOR CRUSHER

Coconut husks used to be soaked in water for 7-10 months before extracting coir fibre by manual process all these years. Now with this machine — ENNOR CRUSHER — equipped with fluted and spiked rollers the husks are conditioned for the extraction of fibre with just 5 to 7 days. For green and fresh husks only sprinkling of water is necessary after crushing, thus saving on months of soaking.

Power required	:	5 H. P.
Output	:	1000 Husks per hour

ENNOR DEFIBERING MACHINE

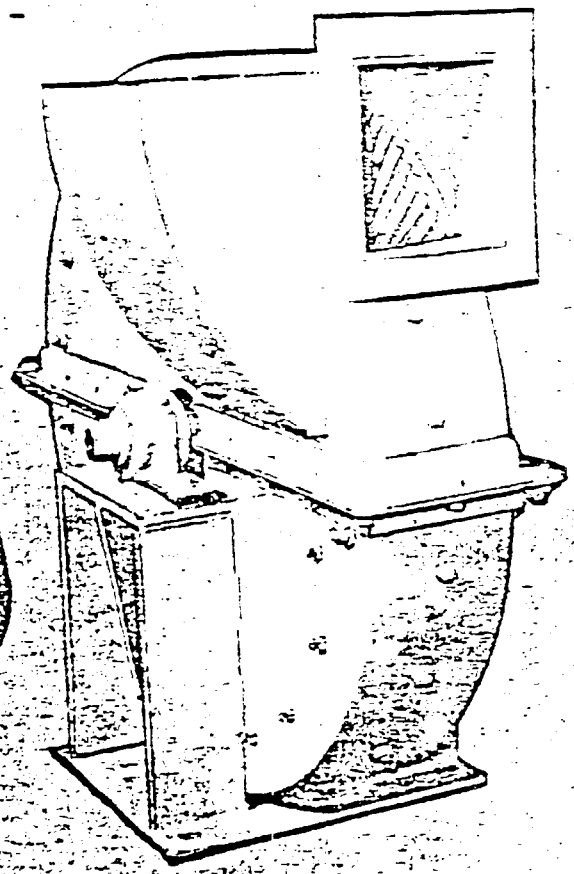
This most modern equipment is designed and engineered for automatically extracting the fibre from the coconut Husks. You can get simultaneously Bristle Fibre (long) and Mattress Fibre (short) separately. This machine ensures absolute safety for the operator.



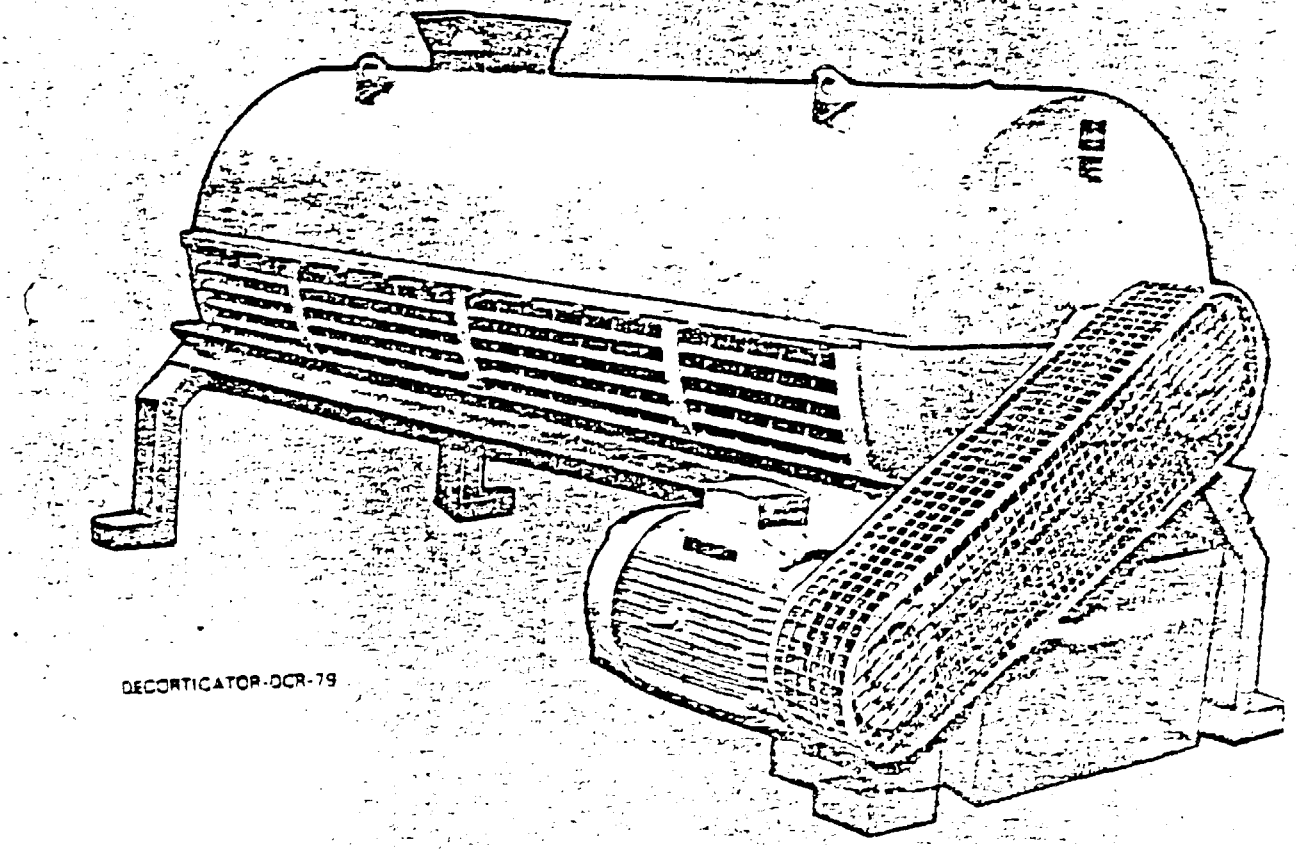
Power required	:	14.5 HP.
Output	:	700 to 900 husks per hour

Enor

COIR DECORTICATING PLANTS



DISINTEGRATOR-DIR-79

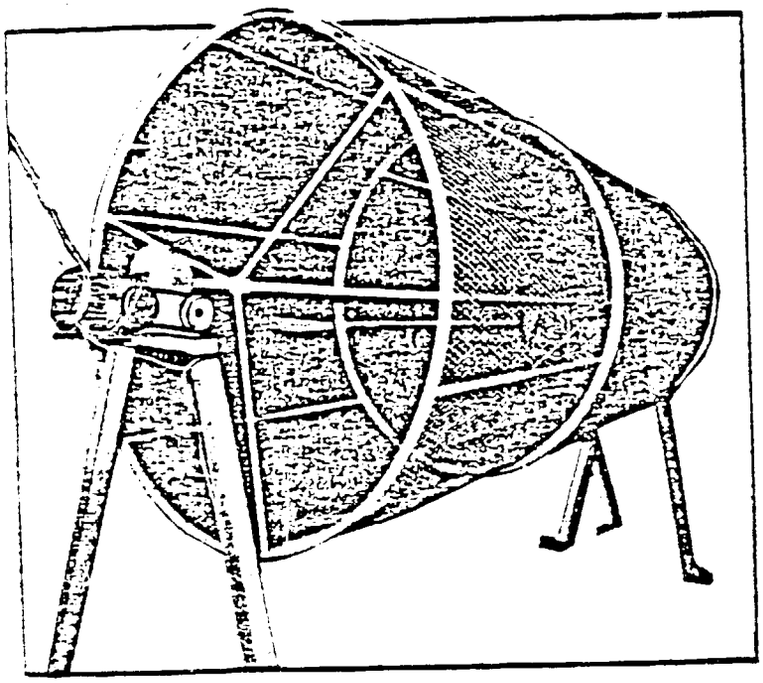


DECORTICATOR-DCR-79

Ennor EQUIPMENTS

for COIR DECORTICATING PLANTS

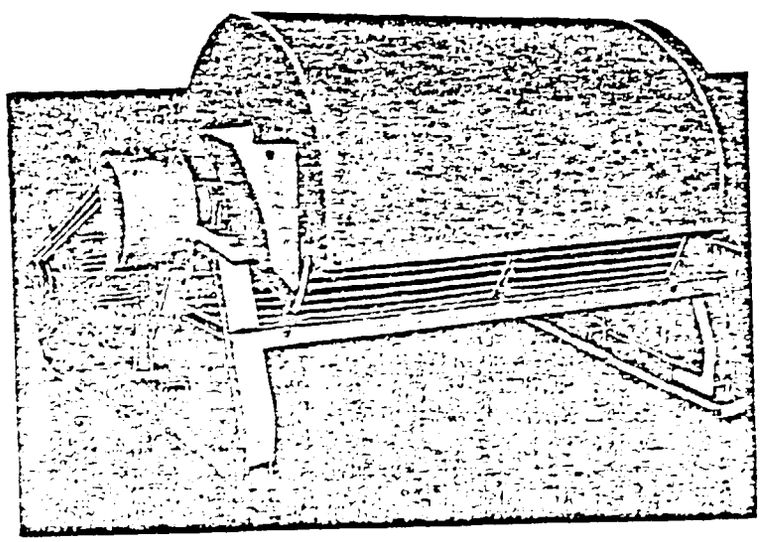
REVOLVING SCREENER • TURBO CLEANER • FIBRE BALING PRESS



Ennor

REVOLVING SCREENER

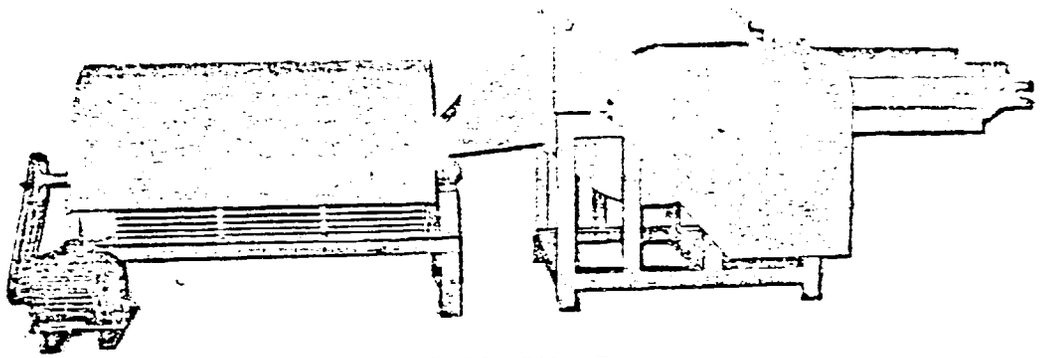
New Standard ENNOR Revolving Screener RS-73 : For efficient cleaning, the Pith and Mattress Fibres thrown from the two sides of the ENNOR Defibering Machine are collected and thrown into the smaller end of the Screener which rotates at specific slow revolutions per minute. By the time the fed material travels to the larger end, all pith and dust drop down and the separated mattress fibre drops in the other larger end, for collection. The reduction gear fitted facilitates the slow rotation and the machine is driven by 1 h.p. electric motor. 300 Kgs to 400 Kgs of fibre can be cleaned in 8 hour shift.



Ennor

TURBO CLEANER

New Standard ENNOR Turbo Cleaner TC-73 : The short mattress fibres taken out from the wider end of the screener are fed into the hopper of this machine when these are pushed by the revolving shaft arms driven at high speed rubbing them against the rods provided on the periphery. This effects the cleaning of the fibre from hard ends, knots and sticking pith. The cleaned short mattress fibre is delivered at the other end while pith, detached knots and dust drop at the bottom. Of sturdy construction this machine is driven by 7.5 h.p. electric motor directly coupled to the shaft and has an output of 400 Kgs.

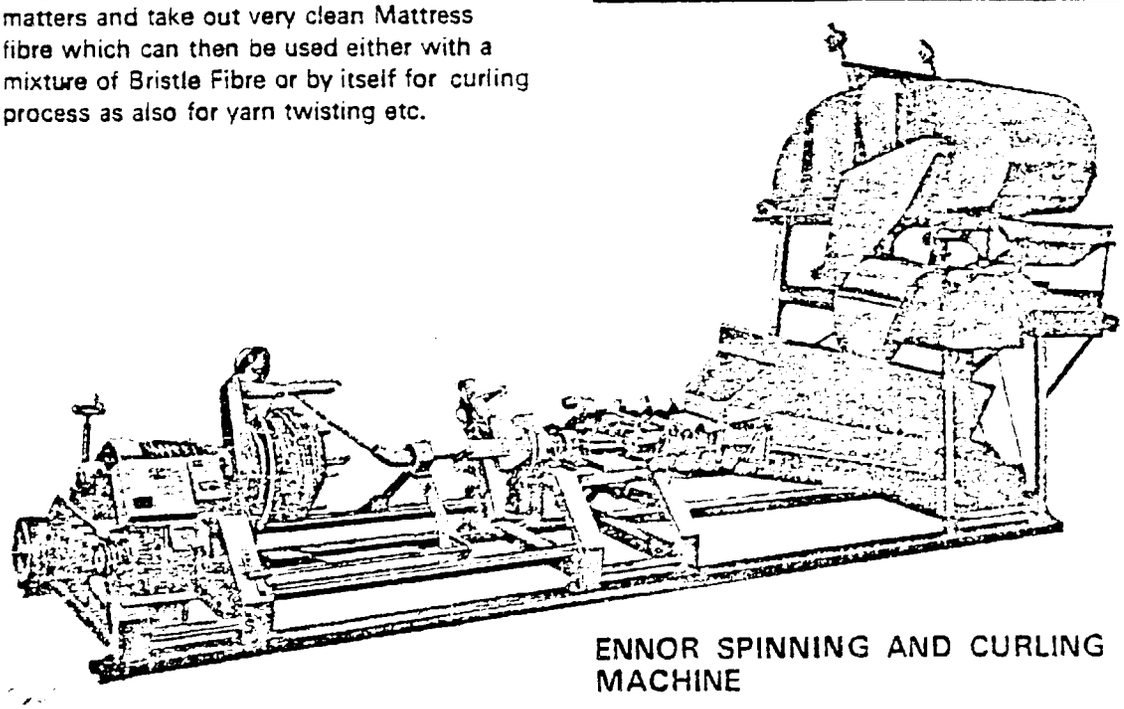


ENNOR CARDING & CLEANING MACHINE

The Mattress fibre coming out of the De-fibering Machine still contains foreign matters like pith, dust, etc., and are also in tangles.

A special ENNOR Carding & Cleaning Equipment is provided to remove these tangles, sieve the pith, dust and other foreign matters and take out very clean Mattress fibre which can then be used either with a mixture of Bristle Fibre or by itself for curling process as also for yarn twisting etc.

Power required :		12.5 H. P.
Output	:	100 - 150 Kg. per hour



ENNOR SPINNING AND CURLING MACHINE

A special process for imparting springiness in coir fibre to achieve a highly resilient material to be used in Rubberised Coir Cushion manufacture requires our ENNOR Spinning & Curling Machines. This machine made to International standards produces automatically curled resilient fibre which is later on uncurled to form myriad of springs required for rubberising process.

Power required :		9 H. P.
Output	:	20 to 30 Kg. per hour

SPINNING OF COIR YARN AND WEAVING

Coir yarn is prepared by spinning the coir fibre. It is spun either by hand or with the help of a spinning wheel.

HAND SPINNING: The usual practice in hand spinning is to roll the fibre into short lengths of 15 cm to 20 cm giving a clockwise twist by hand. When a sufficient quantity has been made, two of these short lengths are taken together and made into yarn of two plies by giving a counter-twist, using both palms. When the counter-twist reaches the end of the string, further pieces of short lengths, kept ready, are added, while the counter-twist by hand is continued till the required length of yarn for a knot is reached. When the required length of about 6 m to 18 m is reached, the yarn is reeled in the form of a 'hank' and a knot is made at the end. The work is generally done by women, some of whom are so adept in the work that they make yarn of remarkably even thickness and twist. A woman generally spins one to two kgs of yarn in a day. The proportion of handspun yarn is declining due to low output and low wages.

WHEEL (RATT) SPINNING: Coir spinning wheels have been introduced from the middle of the 19th century in order to increase output and so obtain the hard twist yarn required for the manufacture of floor-coverings. To prepare two ply coir yarn on the spinning wheel, one set of two wheels, one stationary and the other movable, is required. The stationary wheel contains two spindles, set in motion through the central wheel. The movable wheel contains only one spindle. The packs of coir are taken by two persons, usually women, who, keeping them in their arms, make a loop with a small quantity of fibre. Each then puts the loop thus formed into the notch of one of the spindles on the stationary wheel, and gives the fibre a uniform thickness while walking backwards. Another operator then gives the twist to the fibre thus led, by turning the handle of the spinning wheel. This operation is continued till the required length of the strands is reached. The strands are then passed through a grooved rod being allowed to move forward. The movable wheel is turned in the opposite direction. The object of the grooved rod is to regulate the doubling twist of the yarn and to prevent entanglement of the

strands at the time of doubling. When the grooved rod reaches the stationary wheel is stopped and all the end from the spindles of the stationary wheel are cut off and the yarn is tested for sufficient twist. If it contains twist than required, the movable wheel is turned towards its original direction till the required twist is obtained; if it contains more twist than desired, the movable wheel is turned in a direction contrary to the original twist. This yarn is then reeled into the forms of hanks of usually 15 to 18 metres length. Three persons working on a set of wheels produce on average 10 kgs of yarn per 8 hours.

WEAVING: Yarn obtained in the above spinning process is further developed into ropes bags and door mats by subsequent weaving. For weaving of matting or bags simple wooden loom is employed. The weaving is similar to textile weaving. Weaver boom is prepared according to the width of the matting required. The standard size of woven coir bags is 42" x 27" (warp density 90-92 strand weft density - 28-30 per foot).

The operation is similar to pit-loom weaving without the fly shuttle arrangements. For a close weave a stick is inserted through every shed and beaten properly to get a clean shed. After removing the stick, the weft is inserted and well beaten before the shed is changed. The process is repeated until the required length of matting is obtained.

SPINNING

The fibres are now ready for spinning into yarn and this may be done by hand or by wheel. Spinning on the wheel gives a better quality yarn, and is usually carried out by two experienced persons assisted by a boy or a girl. Two wheels are required for spinning; one of them is stationary and carries two spindles driven by the centre wheel. The other wheel is mounted on three casters and has one spindle. The spinners each carry a bundle of fibre, sometimes in small mat bags kept under their arms, and they fix the fibre strand to the spindle of the fixed wheel. The fibre is delivered according to the thickness of the yarn required and the spinners walk back to the other frame or till the yarn is the required length. At the same time the young assistant turns the stationary wheel to give the yarn the necessary twist. When the strands have reached the desired length (about 18 m) the ends are put together and fixed to the single spindle on .

Figure 23 Hand spinning 2-ply coir yarn

Figure 24 Wheel spinning 2-ply coir yarn

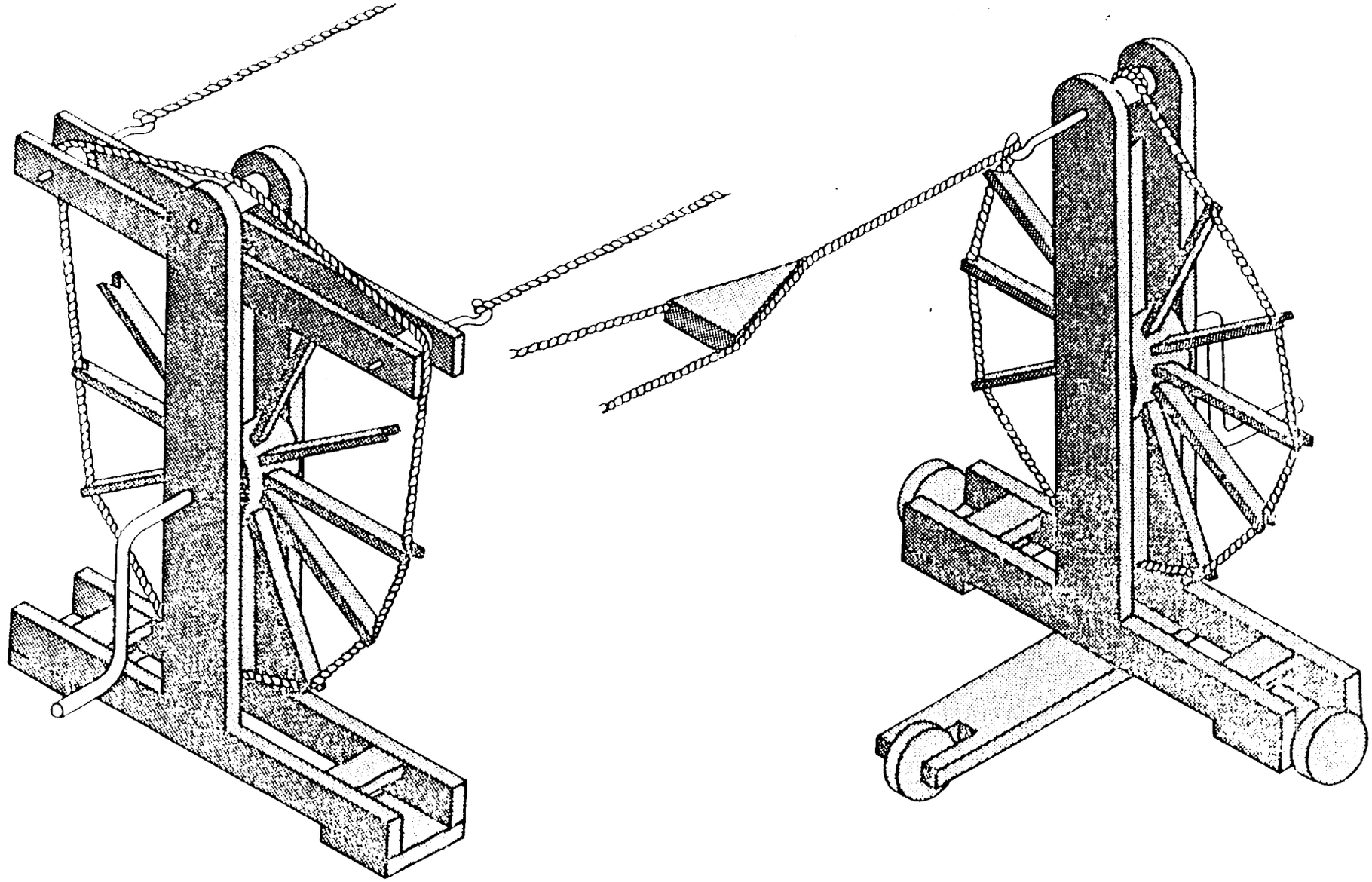
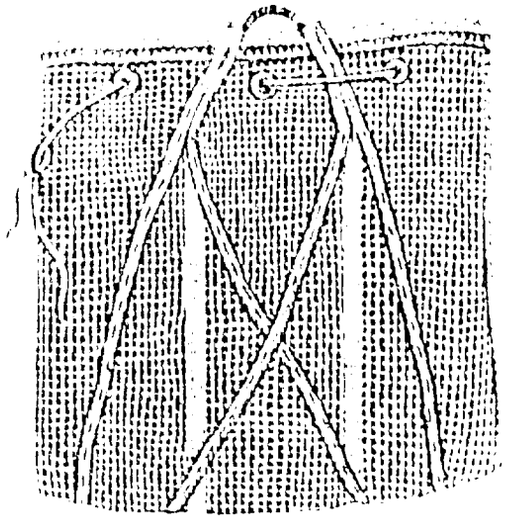
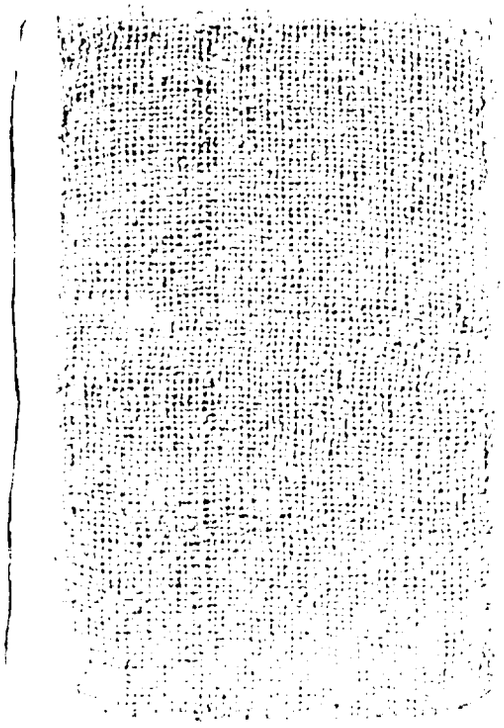


Figure 25 (b) Movable wheel for making twine



Tea Leaf Bag

Vegetable Bag



APPENDIX
SS 1

A SCHEME for setting up a small scale industry in Sulawesi. Indonesia for manufacture of coconut fibre and by products from coconut Husks.

AIMS : To utilise wasted coconut husks available in plenty and produce coir fibre and process into coir bags for use in packing and transporting vegetable -Copra.

REQUIREMENTS: CAPITAL:

		Rp.
Land	: 5,000 sqm. @ Rp.500.00/sqm.	2,500,000.00
Building	: Workshed 200 Sqm. (16 x 12.5 m) @ Rp.30,000.00/Sqm	6,000,000.00
Soaking Tank:	135 Sqm. @ Rp.20,000.00/Sqm	2,700,000.00
Electrical Wiring + Installation.		800,000.00
		12,000,000.00

MACHINERY : FIBRE PRODUCTION:

1 Disintegrator 1 Decorticator 1 Turbo Cleaner	US.$ 15,000/CIF including Erection	
1 Power Generator (60 KVA)	US$12,500	
1 Platform Sclale		
2 Trolleys/Water Pump		19,250,000.00
BAG PROCESSING:		
30 spinning Coir Wheels		
5 Wooden looms.		
Working Capital.		2,500,000.00
	TOTAL INVESTMENT	33,750,000.00

POWER REQUIREMENT 60 HP

Men Power Required Fibre Production:

Skilled	1
Semi Skilled	3
Unskilled	8
Generator operator	1
Watchman	1
	14 Persons.

Yarn and Bag Making:

Unskilled	115
Semiskilled	10
	125 Persons.

RAW MATERIALS: required per day of 7 hours =

7 x 1,000 husks.= 7000 Husks.

Annual requirement for 300 days: 2.1 million Husks.

OUTPUT per day af 7 hours = 7,000 Husks x120 gr/husk = 840 Kg.

Annual Output of Fibre = 252 Tons.

Say = 250 Tons Fibre.

Output of Coir Bags per year allowing 10% Process Wastage at 1.5 Kg.of fibre/bag. } 150,000 bags.

Daily output of Bags = 500 bags.

ANNUAL WORKING OF THE PROJECT:

RAW MATERIALS:

2.1 million Husks @ Rp.2,00/Husks including transport.	Rp. 4,200,000.00
Power 7,500 KWH and Water.	Rp. 1,500,000.00
Wages:	
1 skilled = 2,000 x 300 = 600.000	
3 Semiskilled 1,000 x 300 = 900.000	
8 Unskilled = 500 x 300 =1200.000	
1 Generator operator = 1,200 x 300 = 360.000	
1 Watchman = 1,000 x 300 = 300.000	Rp. 3,360,000.00
Machinery maintenance (5% of Machinery)	Rp. 1,000,000.00
Factory expenses (10% of wages)	Rp. 336,000.00
Office expenses (@ 20% of wages)	Rp. 672,000.00
Depreciation (5% on Building) (10% on Machinery)	Rp. 2,525,000.00
Interest on investment @ 12%	Rp. 4,050,000.00
Total Manufacturing Cost.	Rp.17,643,000.00

Annual Output = 250 Tons Fibre.

Cost Per Ton = Rp.70,572.00

Cost/Kg of fibre Rp.70.50

PROCESSING OF FIBRE INTO COIR BAGS.

Annual Cutput = 150,000 Bags of 1.5 Kg each size 42" x 27"

Raw Materials - 250 Tons Coir Fibre - Rp.17,643,000.00

Daily processing -840 Kg fibre into 500 Coir bags.

PROCESSING EXPENSES:

Yarn Making:	80 Unskilled	@ Rp.500.00/day)	
Bag Making :	10 Semiskilled	@ Rp.800.00/day)	To produce
	35 Unskilled	@ Rp.500.00/day)	500 bags per day.
	125 Persons.		

Annual Wages -	10 x 800 x 300 days	Rp. 2,400,000.00
	115 x 500 x 300 days	Rp.17,250,000.00
		Rp.19,650,000.00
	Cost of Raw Materials	Rp.17,643,000.00
	Total Manufactuing Cost for 150,000 Coir bags.	Rp.37,293,000.00
Cost of Production per Bag .		Rp.248,62 per bag
	say =	Rp.250.00 per bag.

SELLING PRICE: Secondhand hessian bag sells at Rp.380.00/each

New hessian bag sells at Rp.500.00/each

Coir bags can be sold in the marker @ Rp.300.00/each Competatively.

Sales Revenue from 150,000 oags @ Rp.300.00/each 45,000,000.00

Profit = (45,000,000 - 37,293,000) Rp. 7,707,000.00

% of Return on investment; after meeting defrecition & Interest on investment. 23%

Pay back Period = 3 to 4 years.

(By working a single shift, after providing for Depreciation and 12% interest on entire investment the net profit per year to investor is 23%. If two shift are worked the net profit would be nearly 50% since for the some fixed expenses, for larger output the cost of production decrease and profitability increases. Thus for an investment of 33.75 million Rp.the net minimum realization of 23% is got).

HOW COCONUT HUSK GENERATES WEALTH THROUGH COIR FIBRE BY PRODUCTS INDUSTRY.

2.1 million Husks employed in a small scale industry.

Fetch to Farmer at purchase stage	Rp.2,10 mill (Rp.1.00/Husk)
Wages for fibre extraction	Rp.3.36 mill (1.50 /Husk)
Processing wages for Bag Weavings	Rp19.65 mill (Rp.9.40/Husk)
	Rp25.11 Mill.
Profit to Investor..	Rp 8.45 Mill (Rp.4.00/Husk)
	Rp32.56 mill (Rp.15.95/Husk)

Every Husk generates wealth of Rp.16.00 (Rp.12.00 by wages and Rp.4.00 by net profit).

The potential wealth at 7.265 million Husks available in Indonesia attainable through small scale industry is evident.

ADVANTAGES OF THE COIR BY PRODUCTS INDUSTRY.

1. Generates wealth from WASTE.
2. AGROBASED - develops value added products.
3. Provides employment at the rate Rp.0.27 millions per person. Every million rupiah creates employment for nearly 4 persons.
4. Puts up a new Industry on the map of Industrial Production for domestic as well as export market.
5. Promotes Industries in the outer Islands of Indonesia.
6. Leads to more Industries for subsequent processing and value added products and consequential additional employment.

ENTREPRENURS IDENFIED DURING THE FIELD TRIP WHO ARE INTERESTED IN SETTING UP COIR INDUSTRIES IN SULAWESI, INDONESIA.

1. KELAPA JAYA,
   Polmos/Polweli,
   South Sulawesi.

2. Mr. WEM BENGAN,
   C.V. Sumber Bulur,
   JL. Hasanmudin,
   Poso, Sulawesi Tengah. Central Sulawesi.

3. MURAD HUSEN,
   C.V. Kurnia,
   Luwuk, Central Sulawesi.

4. KEN TUMEWA,
   Fabrik Minyak Kelapa Juwito,
   Batudaa - Coconut Oil Factory. Batudda - Gorontalo Dt./North Sulawesi.

5. A. DOTULONG, PT. ANOMY - Integrated Coconut Complex.
   Desa Pondang, Amurang,
   Minahasa, Minahasa Dt./North Sulawesi.

6. P.T. UNITED TINA COCONUT INDUSTRIES, Interested in setting up Twisted Fibre
   Desiccated Coconut Factory, production in North Sulawesi and
   Airmadidi, Rubberised Coir Industry in Java.
   Minahasa Dt., North Sulawesi.

7. H.N. BAUTY - Copra Producer,
   Villa Batudaa,
   Dt. Gorontalo,
   North Sulawesi.

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UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

UNIDO 16 February 1979

Request From the Government of the Republic of Indonesia

For Special Industrial Services

INTERNAL

JOB DESCRIPTION

SI/INS/77/803/14-01/31.6.A Rev. 1 **

POST TITLE	Coconut Coir Fibre Processing Expert
DURATION	Two months
DATE REQUIRED	As soon as possible
DUTY STATION	Jakarta and Menado
PURPOSE OF PROJECT	To promote the development of coconut coir fibre export through assistance in establishing a coconut coir fibre processing industry.
DUTIES	The expert will be responsible for carrying out a pre-feasibility study on establishing coconut coir fibre processing industry in North Sulawesi and will be specifically expected to:

1. Review and study existing situation of:
   a) Coconut production and related industries
   b) land transportation
   c) harbour and availability of liner cargo
   d) energy and water supply
   e) local capacity for machine production and repair
   f) managerial resources
   g) labour availability
   h) land availability
   i) local capacity for factory construction.
2. Design the outline of the processing plant.
3. Identify proposed sites.
4. Estimate the cost.

** The revision of this Job Description, previously distributed on 4.11.77, is being issued to replace the former incumbent.

...2.

5. Draw up the technique and economic guidelines which should be taken into account in formulating the detailed plan.

6. Advise on the type, quantity and quality of coconut coir products to be most beneficially produced for domestic utilisation and exports.

7. Study marketing situations through contacting the Asian Pacific Coconut Community Secretariat and UNCTAD/ITC Advisory Team for Trade Promotion in Jakarta and determine the level of applicable freight rate of the liner cargo through discussing with the liner conference secretariats in Jakarta.

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

QUALIFICATIONS — Specialist with expertise and experience in the preparation of pre-investment study and in the marketing of coconut products.

LANGUAGE — English.

BACKGROUND INFORMATION — Coconut industry in the country has the second largest scale with approximately 5.5 million coconuts produced annually throughout the country, and it contributes to improvement of food conditions by the supply of edible oil from copras. However, huge amounts of remaining husks and shells after taking copras from coconuts are now burnt for disposal as wastes.

The establishment of a coconut coir fibre processing plant and its operation do not require a huge amount of capital. It is suitable for the plant to be located within the coconut producing regions. Processing techniques are simple but production control is needed to assure the quality of the products. Besides, this industry is labour intensive.

During Repelita II (Second Five Year Development Programme) the country is trying to make the transition towards a production pattern emphasizing both labour intensive, balanced domestic growth and labour intensive exports. Therefore, the products that are considered to have export potential and that could be marketed abroad must have high labour and indigenous raw material content.

In view of the above, coconut by-product industries, especially coir fibre processing industry is most promising with export potential and offers good potential for the expansion of the country's coconut industry. Accordingly the Government is now promoting establishment and development of this industry, and NAFED (National Agency for Export Development), held a special workshop in Menado with the co-operation of UNIDO through the project VS/RAS/75/001 in June 1976 for the promotion of export of coconut by-products.

In addition, through the assistance provided by UNIDO in the frame of project VS/RAS/75/001, the Government sent a comparative study mission to Sri Lanka and Japan to study the situation of coir fibre production and as a result of these activities decided to start with the project for establishing coconut coir fibre processing industry in North Sulawesi. NAFED carried out a reconnaissance survey in concurrence with the local Government for this purpose. To review the result of this survey and to enable the authorities to plan ahead for an appropriate establishment of the industry, the Government has requested urgent UNIDO expert assistance in carrying out a pre-feasibility study for the above project.

SCHEDULE OF VISITS DURING ASSIGNMENT

September 1979	17	Arrival at duty station (Jakarta)	
	18	Discussion with SIDFA (UNIDO)	- Mr.F.M.Iqbal, Senior Industrial Development Field Adviser, UNIDO.
	19	Discussion with NAFED Officials	- Drs. Siyabaan, Drs.Suroyo and Drs. M.Asjik Ali of NAFED.
	20		
	21	Indonesian Gunny Manufacturer's Association	- Mrs.EE.Kaligis - Polii S.H. Office Manager.
		Australian Trade Commissioner's Office - Jakarta	
	24	Central Bureau of Statistics - Jakarta - Kadin - Indonesian Chamber of Commerce and Industry	- Mr. R. Soetadi - Secretary - Trade and Monetary Department.
	25	P.T. Samudera Indonesia -Shipping Conference	- Mr. F.B. Tjandra S.H. Freight Manager.
		P.T. Pelni - National Shipping Corporation	- Mr. Achidruddin - Freight Manager
		NAFED	- Mr. Soetadi - Chairman.
	26	Gaakindo - Automobile Sole Agents Assemblers Association - Jakarta	- Drs. Soebianto, Secretary - General.
		BKPM - Investment Co-ordinating Board, Jakarta.	- Mr. Samuel Tiwon, Head, Investment Promotion Division.
September to October	27 to 4	Visit to South Sulawesi	- Accompanied by Miss. Nuraini Simatupang Counterpart from NAFED and Mr. Darwin, Counterpart from South Sulawesi Provincial Gove t.
		Visit to prepare District Trade Office Pinrang-Coconut Producing Region.	- Drs. M. Jusuf L. District-vice Chief.

	Polwali Coconut producing Region -	Discussed with Private Copra Producers
		PT. Kelapa Jaya - Copra Producers.
	State Planning Board-Ketua Bappeda -	AB. Malaka S.H. Chief of Trade Centre.
	State Electricty Department -	
	Coconut Oil Factory - Ujung Pandang	
	Department of Trade Ujung Pandang - -	Chief and H.Ch.Andresen staff officers.
	PT.Trikora Lloyd. Shipping Company -	Mr.J.A.A. Pelenkahu, Branch Manager.
	Kadin-Chamber of Commerce and Industry-	Mr.Ensain Ibrahim, Sekretaris Umum.
	Arrive in Palu - Central Sulawesi -	Accompanied by Mr.Teddy Setiadi (counterpart from NAFED) and Mr.Hasan Basri-Trade Department Official (counter part for Central Sulawesi)
October 4 to October 10	Palu Trade Office -	Discussion with Chief of Central Sulawesi Trade Department and Industries Departme Officials.
5	Visit to Wani Coir Fibre Plant -	Review of plant with Industries and Trad Department officers.
6	Visit to Dongalla Port -	Discussed with port authorities
	P.T. Colano Tiga Dua - Exporters -	Mr. Mua Saleh Tonio-Branch Manager.
7	Visit to Poso Regency. Copra Production-	
	Centres. Coconut Plantations -	Discussed with Prospective Entrepreneurs.
	District Administrative Office -	Drs.R.P.M.H. Koeswandi (Chief)
	Coconut oil factory Poso -	Mr. Wem Rangan, Proprietor.
8	Arrive in Luwuk Regency	
	District Administrator's Office -	Chief Drs. Malaka.
	Trade Department Office -	Discussion with officials.
	Copra Production Centres -	Discussion with Prospective Entrepreneur
	Luwuk Harbour -	Discussion with port authorities.
	Discussion with District Administrator- and Entrepreneurs	Addressed a meeting of Entrepreneurs Port authorities, and District Indust Department Officials.

	Discussion with District Administrator and Entrepreneuers	- Addressed a meeting of Entrepreneurs, Port authorities, and District Industries, Department Officials.
October 9 & 10	Discussion at Chief of Trade Department and Departmental officials from Industry and plantations.	
	Discussion with Governor of Central Sulawesi	- on reactivating the idle coir plant in Wani.
October 10	Arrive in Menado-North Sulawesi	- Accompanied by Mr.Teddy of MAFMD and Mr.Bachmid of North Sulawesi Trade Department (counterpart for North Sulawesi)
11	Discussion with provincial chief of Trade Department, North Sulawesi and Heads of Department of Plantation, Industry, Governor's Administrative	- Provincial Chief of Trade Mr.Siregor and Mr.Tungka, Chief of Industry Department.
	Department of ManPower -Manado	- Mr. A.W.Rompas, Chief
	Department of Sea Transportation , Menado-	
	State Electricity Department, Menado	- Discussion on power supply position and Tariff.
	Planning Board - North Sulawesi	- Mr.J.J.A. Saruan.
13	Bitung - Mayor's office	
	Bitung - Harbour	- Mr.Chris Paendong,Chief Port Officer.
	P.T. Trikora Lloyd	- Mr.F.R.Tumbol, Branch Manager.
	P.T. Bimoli-Copra Oil Extraction Plant - Bitung.	Mr.L.Bawung, Production Manager.
	P.T.United Tine-Desiccated Cocomut Factory - Air Madidi.	- Mr.Yusoff Abdullah, General Manager
	Department of Industries, North Sulawesi-	Mr.M.E.Tungka, Industry - Chief.
	District Administrator's Office Minahasa - Tondano.	- Discussion with Administrator.

October	17	Gorontalo - Mayor's Office	- Drs. H.A. Nasi, Mayor.
		District Administrator's Office	
		Trade Department Office	
		Kwandang Harbour	- Discussion with port authorities.
		Coconut oil factory	
		Batuda - Gorontalo	- Discussion with prospective entrepreneur.
	18	Gorontalo-Harbour	- Discussion with port authorities.
		Coconut plantations Batuda	
		Department of Trade	- Addressed Inter-Departmental meeting of officials from Industries, Plantation and planning Department.
	19	Copra centres, Amurang.	
		Integrated Coconut Complex Factory Tumpaan	- Discussion with private Entrepreneurs
	20	Arrive Kotamobagu-Capital-District of Boloang Mongondow.	
		Coconut centres/Inobonto.	
		Poigar.	
		UKI - Harbour.	
		District Administrator's office	- U.Laruppe, Trade Chief.
		Department of Trade Office.	
	22	Planning Board Office	
		Public Works Department	- Discussion on Local costs of Building Construction.
	23	Meeting all officials of Department of Trade, Industry & Plantations and Private Entrepreneurs.	- Lecture on Development of coconut/ coir-wealth from wasted husks."

October	24	Arrive in Jakarta	
		Meeting with NAFED	- Mr.Rudy Lengkong, Secretary.
		Department of Manpower	
	25	Airconditioning Industry	- Discussion on rubberised coir airfilters for airconditioners.
	29	Shipping conference secretariat	- Mr.T.A. Soedira.
	30	Asean and Pacific coconut community	- Coir processing Expert; Industrial Economist and Director.
November	1	APCC	
		SIDFA (UNIDO)	
		Visit to Bogor Industrial Area	
	2	Bandung District Trade Office and	Drs. Goenardi
		Planning Board.	- Drs. Misbach.
		Visit to investment promotion	
		Board office - Bandung.	
		Bogor	- Discussion on rubber prices
		Site Survey	- Jakarta - Bogor Belt
	5	Asian and Pacific coconut community	- Economic Expert Mr.VarnakulaSingam and Coir technologist Mr.Ranesinghe.
	6	Asian and Pacific coconut community	- Director Mr.G.P. Reyes.
	8	Department of sea transportation	- Mr.Martias Ranf & Mr.Drs.W.S.Meijer.
		Shipping conference Secretariat	- Mr.M.Roesmanhadi Karjadi
		Copra Management Board	- Mr.Panto - Copra Management Board.
	9	NAFED Executives	- Lecture on the prospects of coir industry in Indonesia.
	10	Inter Ministrial and Departmental conference at NAFED	- Lectured on the Development of Coir Industry Attended by planning board, Investment promotion board, Industries Department. Bank of Indonesia officials and Plantation Department officials.

November	12	APCC	- Industrial Economist/Coir Technologist.
		Directorate General of small Industries	- Director of small unit.
		Directorate General of Miscellaneous Industries	- Mr.Sjarif Bustaman.
	13	Meeting with NAFED	- Drs. Soetadi, Chairman.
		APCC	- Director and Coir Technologist - Industrial Economist.
		APCC	- Director and Industrial Economist.
		UNDP Office	- Attended meeting of UN Experts.
	17	Left Jakarta for Madras.