AN AGRO-INDUSTRIAL PLAN FOR THE DEVELOPMENT OF THE KITUL INDUSTRY IN SRI LANKA

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1. Introduction

1.1 Caryota urens, Linn also known as the Hill Palm, Sago Palm, jaggery-palm, fish tail palm, toddy palm is known to us as the Kitul Palm. It belongs to the family Palmaceae. The palm has been important in the village economies of the wet zone of Sri Lanka since ancient times. After coconut and areca it is the most common economic palm found on the West and South sides of Sri Lanka at elevations from practically sea level to 3800 feet. However, the greatest concentration of Kitul Palms is between 2000 and 2800 feet in areas of high and fairly evenly distributed annual rainfall. It occurs also in small patches around the fringes of the dry zone of Sri Lanka. An attempt was made in the mid 70's to revive and rehabilitate Kitul industry under late Dr. Colvin R. de Silva when he was the Minister of Plantation Industries. It was recommended that it be grown in run down abandoned denuded land in hill country from Ginigathhena with pasture and dairy development. This project mooted by the Planning division of the then Ministry of Plantation Industries with the Tea Commissioner's Department never took off the planning stage. (Abeysinghe A: 1974). This is the second attempt by the same Ministry to revive and rehabilitate the industry.

2. Habitat

Caryota urens or kitul is a beautiful palm, with smooth, annulated stem, met with in the forest of the moist zones of the Monsoon South and South East Asia. In Sri Lanka, it is concentrated in primary and secondary areas. Kandy, Matale, Ratnapura, Rakwana, North Matara, Lower Uva and Moneragala are the primary areas. The secondary areas are the Colombo, Kalutara, Galle, Kegalle, Kurunegala and Badulla Districts. Figure I is a tentative attempt to locate the main surviving Kitul growing areas in Sri Lanka. Traditional Kitul areas in Elpitiya, Bulathsinhala, Horana, Bandaragama, Kiriella, Ratnapura, Rakwana, Galle, Matara, parts of Hambantota, Badulla, Kandy, Matale, Kegalle, and Kurunegala. New crops like tea, rubber, cocoa and spices have replaced Kitul. It now grows sporadically in the mid-zone country on waste land, along streams, gullies and in village gardens.

The major Kitul growing pockets in Sri Lanka in the Dumbara valley and Kotmale have gone under the Mahaweli reservoirs of Victoria and Kotmale. Kotmale which was the major Kitul growing area had 10,200 palms in 35 villages of which 6000 palms were in production distributed among 4000 small holdings (D.J. Mc Connell: UNDP/SF-FA Crop Diversification Project, September, 1973). In India, the Kitul palm is found in the Western Ghats extending to near Mahabaleshwar. In the settlement reports of the Chanda District in India, it is stated, that this palm abounds in the South East corner of Aberee and might with advantage extend in the whole district, because it thrives well wherever it is planted. It is also commonly found in Bengal, Orissa, Bangladesh, Indo-china, Malaysian Peninsular, Java, Borneo, Sumatra, Timor, Irian Jayah in Indonesia, Philippines and part of Australia.

3. Varieties (Species of Caryota)

3.1 A genus of about 10 species of East Indian (Indonesian) and Australian palms, with delta-shaped leaflets to which they owe their common name exists. They are spineless with stout, ringed stems which attains their optimum potential height before flowering. After the palm flowers they die, usually having produced suckers at the base. Flowering beings at the top and continues down the trunk to the base (or less in weak plants). The large leaves are twice pinnately divided, the segments beings half-fan-shaped, sometimes split, irregularly toothed and pleated; stalk round below. Spathes keeled on back, fibrous along margins. Spadices usually alternately male and female with a short penduncle and long pendent branches; flowers green and purple, large fruits are large as a cherry, purple, globular. Young plants are excellent for pot plants, decorations and two species C. mitis and C. urens have been used for sub-tropical bedding. To grow the palm to maturity it is necessary to apply compost of loam and leaf soil in equal parts with a little sand. Through drainage and an ample water supply during the growing season are needed. Propagation is easy by seed, and some species produces suckers freely, especially C. mitis. C. urens is widely cultivated, yielding palm sugar, treacle sago, wine, fibre and wood.

The varieties of green Caryota (kitul) known are as follows:

i. Caryota Albert's

It is a variety of C. Rumphiana.

ii. **Caryota Cuming' II**

It is a palm with a rather slim stem about 10 feet high, leaf large spreading. 4-6 feet long 3 feet wide dark green, 2-pinnate; It has 8-10 inches long, toothed, fibre bright red. The type is reported to be found in the Philippines Islands.

iii. **Caryota Maxima**

This is a tall palm with leathery leaves. Leaflets are rigid, long lanceolate, slender, pointed. These palms are found in Java, Indonesia.

iv. **Caryota Mitis**

The stem of the palms 15-25 feet high, 4-5 inches thick leaves are 4-9 feet long with obliquely wedge shaped, irregularly toothed leaflets of 40" - 7" long, bright light green. Stalks are I-sheathes shortly black-scurfy. This type is found in Burma and Malaysia. This variety produces suckers more freely than others.

v. **Caryota Obtu'sa**

This variety is much like Caryota urens but with shorter male flowers and leafets. They are more rounded at the tips. This variety is found in Upper Assam. The variety acquitoria'lis reflects a characteristics with male flowers large and leaflets more acute. These are found in Malaysia.

vi. **Caryota propin'qua**

This variety is similar to Caryota maxima but leaflets are rhomboidal. This variety is reported from Java.

vii. **Caryota Rumphia'na**

This variety is 3 to 8 feet long. The leaflets are sessile, leathery, obliquely wedge-shaped, 4" - 6" long and wide, deep green. Found predominantly in Malaya. The variety Albert'e is much large with leaf up to 18 feet long.

viii. **Caryota U'rens**

This variety is called the Wine palm. It has a stem of 100 feet long 18' thick (taller in nature) without suckers. The leaf is 10'-20' long, 10' - 12' wide. The leaflets are obliquely wedge-shaped, some what leathery, irregularly toothed, caudate. 6" to 9" long 4" wide dark green. This variety is found in India, Sri Lanka and Malaysia. When mature the palm will yield 3 gallons of wine in 24 hours.

3.2 Kitul varieties in Sri Lanka

There are at least two or more types of caryota. "Tall" Kitul has a straight/-cylindrical trunk reaching 35 to 45 feet. "Barrel" Kitul type typically tapers to a minimum diameter about 3 feet above ground level then swells out to a minimum diameter about ¾ way up the trunk, then tapers again slightly. This type is much shorter; at tapping age it may be 18-25 feet high to first leaf.

It is known that in Kotmale, the tappers identify 4 types of Kitul palms:

a. tall, straight palms referred to as "male" trees and which are high producers;
b. shorter, barrel shaped palms, referred to as "female" trees and which are the highest producers;
c. a second tall, straight palm which has small leaves than the above, which are low yielding but which is also tapped (at least for 2 or 3 inflorescences);
d. another type which flowers only rarely.

But tappers estimates, type (a) palms account for about 50% of the Kitul palms in the Kotmale area. (Most have been submerged under the Kotmale reservoir). Type (b) account for about 30-40% in the valley and type (c) is in the hilly areas. Type (d) is found sporadically in the upper valley. Roughly, according to tappers, 15-20% of palms of all types which mature would be unproductive.

Economic comparisons of these types is made difficult by many factors, some of which are:

i. location is important in determining yield. Other things being equal, highest yields are from palms in well

Table 1
Analysis of Kitul Products in Relation to Palmyrah and Coconut
A. SAP (MIRA)

Kitul

Sample	*Total Solids*	*Cane Sugar*	*Reducing Sugar*	*Acetic Acid*	*Alcohol*
Unfermented	-	13.60	-	-	-
Unfermented	13.2	12.65	-	-	-
Very slightly unfermented	12.2	11.20	0.22	0.07	-
Very slightly unfermented	12.8	12.00	0.22	0.06	-
Slightly fermented	11.6	8.90	1.65	0.02	-
Slightly fermented	12.4	9.85	0.60	0.16	-
Fermented	11.0	4.50	5.60	0.28	-
Highly fermented	1.2	-	0.98	0.27	3.32

(Cane sugar content of fresh mira ranges from 9.8 to 13.6%)

Palmyrah

Sample	*Total Solids*	*Cane Sugar*	*Reducing Sugar*	*Acetic Acid*	*Alcohol*
Unfermented	-	7.32	-	-	-
Unfermented	-	8.10	-	-	-
Very slightly unfermented	10.8	8.89	0.46	0.12	-
Very slightly unfermented	10.2	9.58	0.27	0.06	-
Slightly fermented	10.8	6.74	3.00	-	-
Slightly fermented	10.8	9.07	0.98	-	-
Fermented	6.2	1.90	0.51	-	2.01
Highly fermented	5.8	1.87	0.46	0.40	3.14

(Cane sugar content of fresh sap ranges from 6.7 to 9.6%)

B. JAGGERY

	Kitul	*Palmyrah*	*Coconut*
Moisture	11.40	7.36	8.38
Sucrose	72.04	77.39	78.45
Reducing sugar	7.79	1.54	0.96
(Total sugar)	79.83	79.93	89.41
Ash	1.13	3.99	1.98
Protein	0.55	1.16	1.79
Protein, Gums	7.09	8.56	8.34
Calorific value per 100 gms.	321.6	320.3	324.8

(All have about 80% total sugar)

Source: A.W.R. Joachim and S. Kandian - *The Analysis of Ceylon Foodstuffs, V. Tropical Agriculturist, Ceylon.* Department of Agriculture, Peradeniya, January 1938

drained places but closer to streams. On the other hand, some tappers claim that the sugar content of mira of such palms is lower than palms growing on hill-sides.

ii. there is a belief that tall palms produce a lower rate of flow but do so over a longer time than do the barrel-shaped palms:

iii. degree of skill in "training" an early inflorescence can greatly affect a palm's subsequent productivity. Thus the Caryota found in South-Eastern Asia, Malaysia, Indonesia, Papua New Guinea and Northern Australia is a small genus of tall palm in the family. However, the Caryota which is more important economically is Caryota urens Linn which we call the Kitul palm. This palm is found throughout the hotter, most parts from Sikkim to Sri Lanka and apparently through Burma, Thailand, Cambodia, Indonesia to Northern Australia. Kitul is a palm with a solitary trunk, about 40–60 feet high and with a very large compound leaves. It grows for about 15 years and then flowers in a very conspicuous way, from the crown downwards to the base, after which at an age of 20–25 years it dies. The bases of the leaves are surrounded by fibre, ranging from stiff bristles to fine down. This is Kitul fibre. Before flowering the pith is rich in starch, called Kitul flour, and sago can be made from it. The cabbage is edible. When flowering begins, the inflorescence may be bound into a "candle" and tapped for its sweet juice, (called mira) by repeatedly slicing from the end. After flowering, fruits are formed, which are abundantly protected by irritant needle crystals.

4. Economic Potential

The Kitul palm yields a minimum of 9 different products, the most important of which is sap or mira which may be converted to toddy, arrack, treacle or jaggery. The other is the fibre (see Fig. 1).

4.1 Sap Based Products

The sugar content of fresh mira from the Kitul palm ranges from 9.8 to 13.6%. The total sugar content of Kitul jaggery is about 80%. The composition of these products is in relation to palmyrah and coconut is shown in table 1. On the basis of this high sugar content, suggestions have been made from time to time that Kitul should be grown commercially under plantation conditions in uneconomic wet and humid areas. The chances of commercial success seems not good unless an integrated programme is developed.

i. the long gestation period until the first tapping, is at least 10 and usually 12 or more years;

ii. the palm has a shorter productive life after tapping commences, usually 3 to 5 years;

iii. it is susceptible to droughts, during which production may be interrupted from 6 to 12 months;

iv. reliability of yield among palms is low and can only be assessed by actually tapping and proving the productivity of each;

v. there is a lack of reliable yield data, obtained under controlled conditions, for agricultural planning purposes;

vi. there is no R & D work done on plant genetics, propagation, variety etc. in the country;

vii. the scattered nature of the plant.

An alternative approach to the exploitation of the palm, and one which is being pragmatically possible is to—

a. extend the growing of kitul as a small holder crop;

b. encouraging planting as a agro-forest

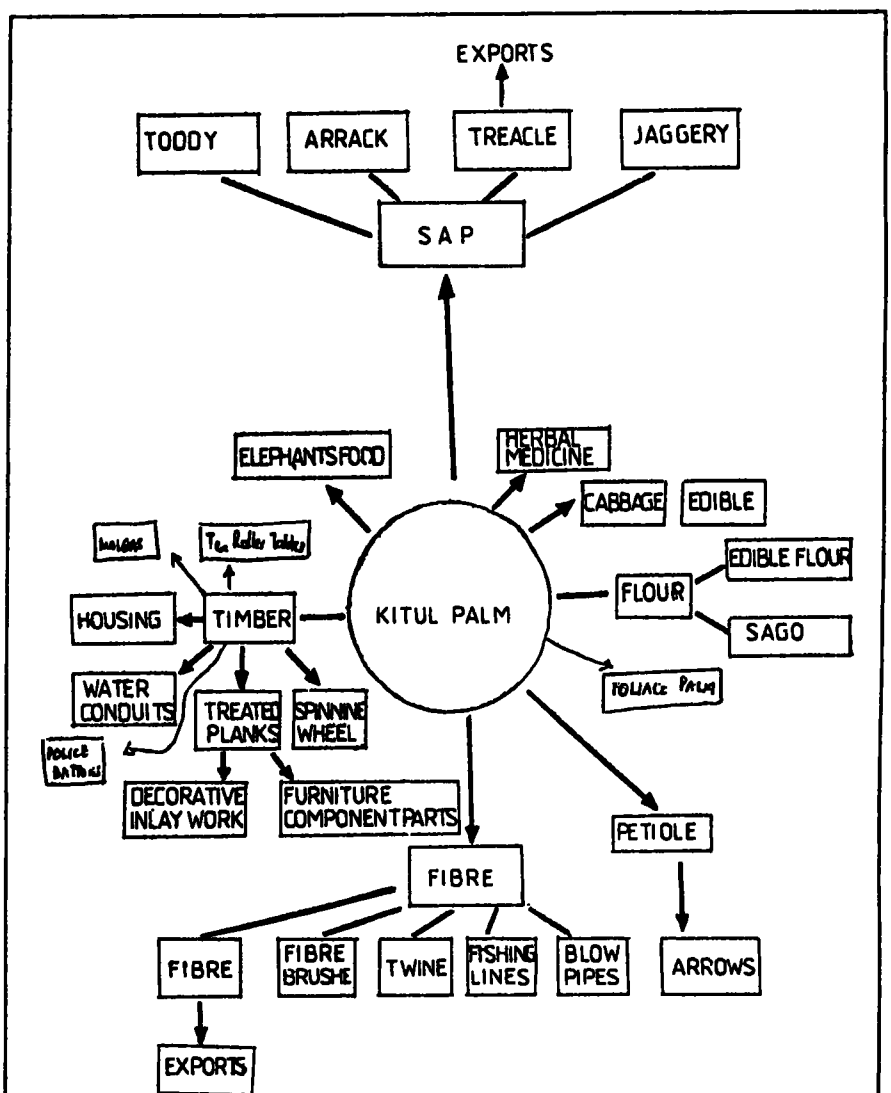


FIG-1 THE ECONOMIC USE OF THE KITUL PALM

crop in reafforestation programmes;

c. encourage further and new planting on waste lands with pasture and develop dairy industry;
d. encourage planting on roadsides and give blocks to individuals to look after and exploit economically;
e. encourage kitul in green belts along stream banks and reservoirs;
f. encourage kitul on all lands in the wet zone which have no other use.

In this manner, the following advantages can be achieved.

i. facilitate establishment of jaggery/ treacle making centres;
ii. facilitate establishing mira collecting centres to be despatched for making kitul arrack, vinegar or bottled toddy;
iii. better land use;
iv. settlements can be established in waste lands with kitul and dairy (may be goat farming also)
v. environmental upgrading.

4.2 Toddy

This is the simplest of sap products. The mira is poured into clay pots and allowed to stand and ferment for about 8 - 10 hours, washing or lining the clay mira collection pots with lime is recommended to delay fermentation. Most mira is used for toddy.

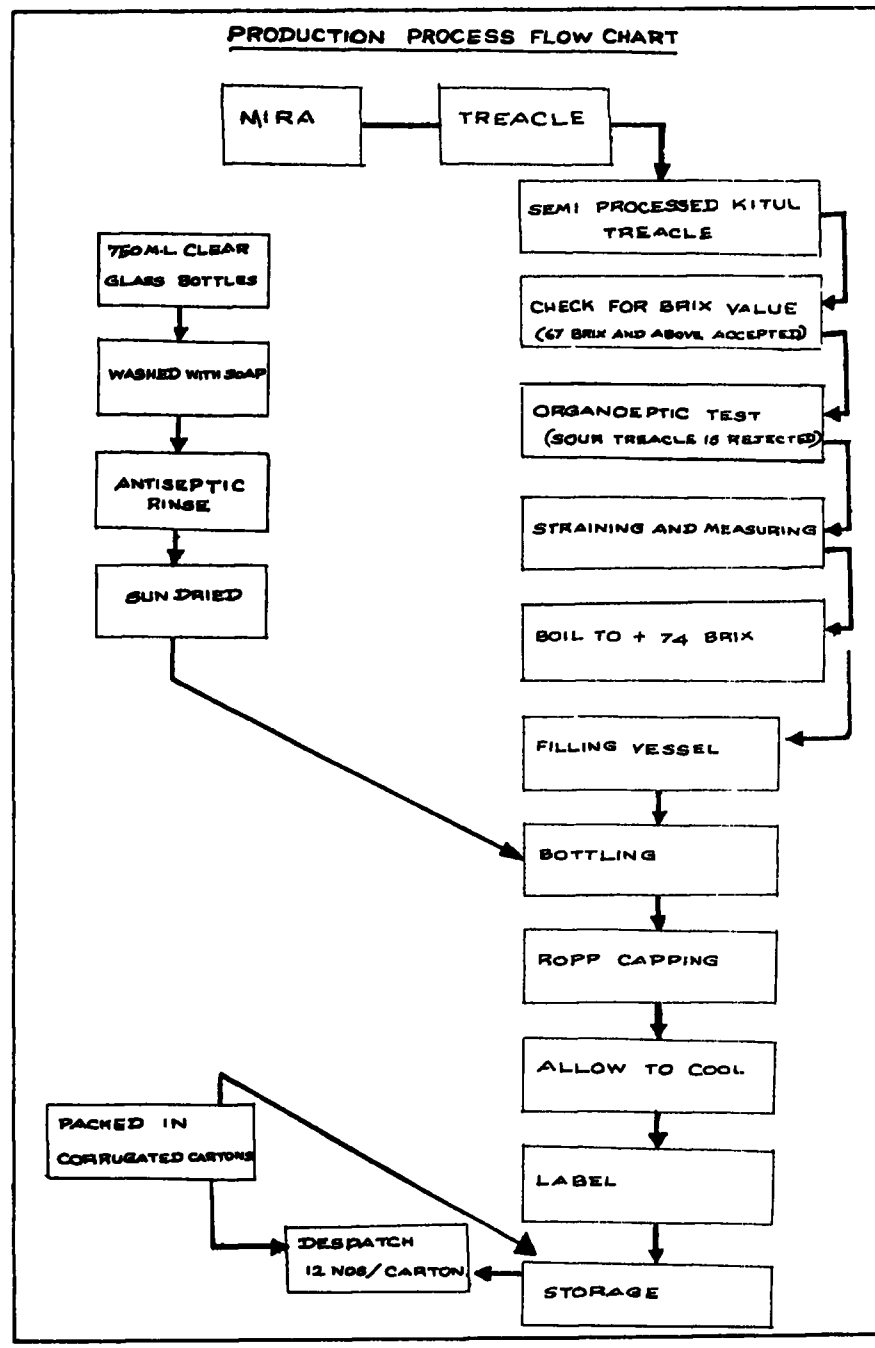
4.3 Kitul Arrack

This is obtainable by fermenting mira in a barrel for 15-30 days (longer the better) without the addition of DCL yeast or 7-10 days with DCL, then distilling this off through a home made water cooled distillation unit. For quality length of time and addition of fruits like pineapple, banana into mira is ideal. It is possible for a distillation company to introduce kitul arrack commercially with flavours.

4.4 Kitul Treacle

This is made by decanting the mira from the sediment present, straining through a fine cloth, then heating slowly until coagulation occurs.* The heating continues without stirring until a scum of impurities forms on the surface. This is laddled off before the juice reaches the boiling point. Boiling continues until the juice is reduced to about 70% total solids, at which point it is a thick syrup.

Roughly one bottle of treacle required 7 bottles of high sugar content mira or 8 bottles of average sugar content mira. The Employment Investment and Enterprises Development Division of the Mahaweli Authority together with the Mahaweli Venture Capital Company (MVCC) established a commercial treacle and a jaggery project at Kotmale. In order to supplement the income of the Kotmale settlers who owned kitul palms or were familiar with the know- how of tapping or engaged traditionally in this cottage industry were pooled together to avoid being exploited by middle men/sap collectors/treacle collectors, a small scale project was established at Kadadora in Kotmale. The Industrial Development Board established a similar project in 1984 at Lunugalle (to produce treacle with 73-74 brix).



* Charavanapavan has recommended two items which can be added while heating if coagulation does not occur. (C. Charavanapavan, Improved Methods of Producing Cane and Palm Jaggery, Tropical Agriculturist April 1954). The first is prepared by adding 6-8 ounces of superphosphates to a gallon of water, leaving this stand for 12 hours, then decanting and adding this to the heating miru until coagulation occurs. The other is to leave mira with a mixture of one pound of okra leaves/stems (Hibiscus esculentis) in a gallon of water for 12 hours, the adding this solution as above.

Investment Analysis (as at January, 1989)

Source of Finance:	Rs.	Rs.	Rs.
Capital			197,323.53
Pre profit			28,712.47
			226,536.00
Fixed Assets			
	Cost	*Accl. Dep.*	*W.D.V.*
Machinery & Equipment	50,145	2,089.38	48,055.62
Office Equipment	965	40.21	924.79
Wooden Crates	6,000	250.00	5,750.00
	57,110	2,379.59	54,730.00
Development Cost	3,000		
Deduct: Amortisation	(250)		2,750.00
Current Assets			
Debtors	40,105.00		
Closing Stocks			
Finished goods	96,930.00		
Empty bottles	11,429.98		
Ropp Caps	409.05		
Labels	5,141.91		
Consumables	3,354.00		
Suspense Account	840.00		
Bank	35,000.00		
	193,259.94		
Deduct			
Current liabilities			
BTT payable	3,486.45		
Payment-Manager	720.00		
Cash	19,597.85		
Subscription	400.00		
	24,294.30		168,965.64
Nett Current Assets			226,445.64

Manufacturing, Trading and Profit and Loss Statement

Cost of Production	*Rs.*	*Rs.*
Empty bottles	25,427.70	
Carriage luward	350.00	
ROPP Caps	2,296.95	
Labels	4,720.09	
		32,794.74
Add:		
Purchases	134,434.75	
Labour charges	7,065.00	
Fixing charges	69.00	
Cost of Production		141,568.75
		174,363.49
Cost of Sales		
Less finished goods		96,930.00
Cash of Sales		77,433.49
Gross Profit		33,731.51
		116,251.00
Nett Profit		33,731.51
Gross Profit		
Less: Administrative expense		
Managers Allowances	720	
Charges for name board	300	
Depreciation/Amortization		(3,649.59)
Selling & Distribution Expenses		(6,419.45)
		10,069.04
Net Profit		28,712.47

The Mahaweli treacle project was established in a building of a simple structure 72 feet long and 20 feet wide divided into four sections:

— a large working area
— office cum sales room with a counter;
— stores
— living quarters for manager.

The management of the project was gradually transferred to the Kotmale Kitul Treacle Producers Association, formed in 1989 January. The initial capital inputs were financed by the MVCC. The Draught Animal and Dairy Development Programme of the MASL provided the glass bottles. The treacle is supplied to the project by collectors and individuals living close by who deliver on Tuesday, Wednesday and Thursday. A guaranteed price of Rs. 25/- is paid per bottles at the project which is Rs. 4/- more than the open market price before the project was started.

The production process is straightforward based on intermediate technology. All the equipment and the hand equipment consists of stainless steel boiling pans and fill vessel, liquid propane gas (LPG) heating system mesh strainers and capping machines. A precision refractometer is used to ascertain the brix value of treacle.

Packaging of treacle is in new 750 ml. glass bottles and are meticulously washed and sun dried before use. Hot filling is carried out to minimize spoilage due to contamination.

Production per 8 hours per day is 200 bottles of processed kitul treacle. The treacle is canned in Colombo for export by a private entrepreneur. (See production process flow chart.)

Will be continued on Next Issue.