

REPORT
ON
THE SURVEY FOR THE DEVELOPMENT PLAN
OF THE FOREST RESOURCES IN PARAGUAY
(PART OF TUNG OIL)

APRIL 1960

OVERSEAS TECHNICAL COOPERATION AGENCY
TOKYO JAPAN

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I. Introduction

1) Objective of the Survey

Though the tung oil manufacturing industry is thriving in Hapua and Central Prefectures, etc. in Paraguay, many problems remain unsettled. In this connection, Paraguayan Government has requested our Government to make a survey of the above industry. In reply to this request, as one of the overseas technical co-operations, our Government has dispatched the wood utilizing industry survey team including an expert in tung oil industry to investigate the plantation of tung tree, fundamental condition for building an oil press plant, possibility of the export of tung oil, etc.

2) Survey Team

Expert member in the tung oil and oil press industry:

HARUZO KASAHARA, P.P. MANAGER. MACHINERY NO. 1. DEPARTMENT,
TOKYO BRANCH F. KANEMATSU & CO., LTD..

3) Outline of the Survey

During the period from 2 to 22 Feb. 1965, he made the following survey activities:

Asuncion ; Plant inspection, market researches, harbor inspection
and the collection of data

Encarnacion, Chaveo, Lapaz, Santa Rosa, Alto Parana, Obligado All the
settlements ; Inspection of the tung tree plantations, shipping port
facilities, and oil press plants

San Pedro ; Inspection of oil press plant

Lo Cordillera, Central ; Inspection of tung tree plantation and oil press
plant

4) Thanks

By order of the Japanese Government, we have made a survey of the tung oil industry in Paraguay. We hereby express our hearty thanks to the Paraguayan Government authorities concerned, the Japanese Embassy, Overseas Migration Agency and Japanese immigrants in Paraguay, who positively co-operated

with us in our survey works during our stay there .

II. Present Condition

1) Oil Press Industry

Oil press industry in Paraguay has developed in its capital, Asuncion and on the outskirts of the city, chiefly used as the material, and pressed the tung oil, cotton seed oil, peanut oil, soybean oil, etc. to meet the export and domestic demand. The reasons why the oil press plants have concentrated in Asuncion and on its outskirts seem to be as follows:

a. Labor and power have been easily made available.

As approx. 80% of the total population in Paraguay concentrates in Asuncion and its suburbs, labor and power resources could be easily obtained.

b. Communication and transportation were favorable .

As the Asuncian area is along the Paraguay river, the inland navigation is possible. In recent days when the international highway has been built, the overland transportation have been developed to change the traffic condition.

c. Chief oil producing districts were near the Asuncion area.

Major oil material producing districts were close to Asuncion and its outskirts.

d. The Asuncion area was a consuming district.

As mentioned in the item, a, this was convenient for manufacturing the industrial material oil and food oil.

As for the scale of plants, there are 9 plants of daily oil press production of over 15 tons each, and 13 plants of less than that. Of the large-scaled plants, only 7 are provided with refining facilities. All the others are small home-industry-scaled workshops equipped with no refining facility. Name and location of oil press plants shall be given hereunder

in terms of raw materials:

i. Plants exclusively pressing the Coco oil.

<u>Name of the plant</u>	<u>Oil pressing capacity</u>		<u>Location</u>	<u>Remarks</u>
	<u>Daily</u>	<u>Yearly</u>		
Petersson S.A. Comer E.I.N.D	10 t	3,000 t	Atyra	
Grassi Y Compania S.R.L.	5	1,500	Capital	
A. Figari	20	6,000	Capital-17km	
Ingavi S.A.	5	1,500	Luque	
Cocotera Nemby, S.A	15	4,500	Nemby	
Industrial Del Norte S.A	25	7,500	Ypacarai	
Brvard Y. Compania	12	3,600	Caacupe	

All the above plants are small-scaled workshops without refining facility.

In addition to the above, there is the Abel-Stsuway plant, which, however, seems to be a small-scaled workshop exclusively treating the Coco, though it could not directly be surveyed.

ii. Plants pressing the Coco and other materials (cotton seed oil, soybean oil)

<u>Name of the plant</u>	<u>Tung oil pressing capacity</u>		<u>Location</u>	<u>Remarks</u>
	<u>Daily production</u>	<u>Annual production</u>		
Compania Oleaginosa Paraguaya S.R.L	40 t	12,000 t	Capital	
Cia. Algodonera Paraguaya S.A	15	4,500	Capiata	
Aceiteira Itagua S.A	35	10,500	Itagua	
Anderspm Cleyton Y Co., S.A	40	12,000	Villeta	
Manuel Ferreira S. A.C.	30	9,000	Ypacarai	
Felipe Armele Etuto S.E. Comer	10	3,000	Concepcion	
La. Fabril Paraguaya S.A.	40	12,000	Encarnacion	

Of the above, only the La Fabril Paraouaya S. A. plant does not treat the
Coco.

iii. Plants pressing the peanuts oil.

<u>Name of the plant</u>	<u>Oil pressing capacity</u>		<u>Location</u>	<u>Remarks</u>
	<u>Daily production</u>	<u>Annual production</u>		
Neuland Chaco Paraguaya Soc. Coo	7 t	2,000 t	Filadel Fia	
Chostitzen Komitee Colmenno Soc.	7	2,000	Chaco	
S.A. Coop Coloniza Dora Forahein	7	2,000	Chaco	

iv. Plant exclusively pressing the tung oil.

<u>Name of the plant</u>	<u>Oil pressing capacity</u>		<u>Location</u>	<u>Remarks</u>
	<u>Daily production</u>	<u>Annual production</u>		
Cooperative DeColonias Unidas	20 t	6,000 t	Obligado	
S.A.P.I.C. (Manuel Ferreira)	12	3,600	Encarnacion	

v. Plant exclusively pressing the cotton seed oil.

<u>Name of the plant</u>	<u>Oil pressing capacity</u>		<u>Location</u>	<u>Remarks</u>
	<u>Daily production</u>	<u>Annual production</u>		
Manufactura De Pilar, S.A	35 t	10,500 t	Pilar	

vi. Plant closed.

<u>Name of the plant</u>	<u>Oil pressing capacity</u>		<u>Location</u>	<u>Remarks</u>
	<u>Daily production</u>	<u>Annual production</u>		
Coidy	56 t	15,000 t	Capital	

The most of the machines in the plants are made 15 - 20 years ago.
which are extractors of Freach, Ciaster, Rosedawn, Anderson, Kapp and
Estaiuf systems. These machines seem to have been additionally arranged
to satisfy the demand of the time. They are, therefore, various in sort

and type, and arranged disorderly, so that, the material and machine operation is unreasonable, inconvenient and inefficient in many cases. Due to the unsmooth collection of materials in addition to the above, the operation efficiency of most of the machines has become 30 -- 55%. Although unsmooth collection of materials is partially upon the financial reason, chiefly based upon the high freight of materials because the producing districts are remote. The latter problem remains unsettled.

In May 1964, 4 companies, Manual Ferreira S.A.C., Cia Algodonera Paraguaya. S.A., Compania Oleaginosa Paraguaya S.A.L. and La Fabril Paraguaya. S.A. submitted a joint memorial to the Ministry of Commerce and Industry of Paraguayan Government.

According to the request for tung treatment made by the Colonia Carlos Antonio Lopez in Hapua Prefecture, the tung pressing capacity of the above four plants is reported 65,000 - 70,000 tons in terms of tung fruits with shells. Though such a production may be theoretically possible, when only the tung is treated for 24 hr. per day, it is almost impossible to send the material for approx. 400 Km long from the producing area, Hapua Prefecture to Asuncion, considering the road, freighter and railway transportation capacity at present.

Though it varies with the material supply and market conditions, the annual production of oil is almost as follows:

a. Coco oil (Coco Almeodera)	3,000 -- 4,000 tons
(Coco Pulpa)	5,000 tons
b. Tung oil	5,000 tons
c. Cotton seed oil	1,000 -- 2,000 tons
d. Peanut oil	1,000 -- 1,300 tons

According to the production statistics, the production of edible oils of the above is as follows:

<u>Year</u>	<u>Cotton seed oil</u>	<u>Peanut oil</u>	<u>Coco Almendra oil</u>	<u>Soybean oil</u>
1954	1,900 t	500 t	700 t	-
1955	1,753	300	589	-
1956	1,608	200	1,373	-
1957	1,516	700	163	-
1958	2,034	1,000	633	-
1959	1,095	900	2,141	-
1960	601	1,100	2,300	100
1961	1,065	1,100	1,200	200
1962	1,560	1,370	1,900	275
1963	1,423	1,200	1,743	300

According to the Secretaria Technica de Planificacion data, the Paraguayan imports of edible oil are as follows :

<u>Year</u>	<u>Domestic production</u>	<u>Normal imports</u>	<u>Smuggled amount</u>	<u>Total supply</u>
1954	3,100 t	1,600 t	- t	4,700 t
1955	2,642	2,158	-	4,800
1956	3,181	396	1,423	5,000
1957	2,379	1,502	1,219	5,100
1958	3,667	67	1,466	5,200
1959	4,136	51	1,213	5,400
1960	4,101	144	1,255	5,500
1961	3,565	1,759	406	5,700
1962	5,105	544	151	5,800
1963	4,666	722	612	6,000

Note: Considerable portion of the smuggled goods has been brought in from Argentine, Brazil, etc. by blackmarket peddlers.

According to the survey of Central Bank, the Paraguayan exports of the oils are as follows:

Year	Coco oil		Tung oil		Castor oil		Perfume oil	
	Quantity (Kg)	Amount (US\$)	Quantity (Kg)	Amount (US\$)	Quantity (Kg)	Amount (US\$)	Quantity (Kg)	Amount (US\$)
1954	1,835	2,090	2,529	834	653	145	327	1,421
1955	1,003	924	2,480	873	445	142	214	1,253
1956	1,955	599	2,004	726	440	73	236	1,166
1957	2,593	951	3,627	1,220	273	44	271	1,290
1958	1,517	640	3,794	855	43	14	208	796
1959	3,243	869	3,447	805	3	1	264	956
1960	1,873	469	3,519	1,065	18	8	288	1,008
1961	1,624	496	4,583	1,388	-	-	302	1,054
1962	2,928	741	5,195	1,568	124	21	310	1,078
1963	7,759	1,658	4,455	2,749	62	18	380	1,283

2) Tung Oil

Plantation of the Tung Tree Paraguay was started about 40 years ago by the German who had immigrated into Itapua Prefecture. In 1954, the Japanese immigrants, who had settled in the Chaves district of Itapua Prefecture, also commenced the plantation. Thereafter in 1956 and 1960, the plantation was started in the Fram district (Fuji, Lapaz and Santa-Losa) and the Alto-Parana district respectively. The area of tung tree cultivation terms of year and district is as follows:

<u>Year</u>	<u>Chaves</u>	<u>Fuji</u>	<u>Lapaz</u>	<u>Santa-Losa</u>	<u>Alto parana</u>	<u>Total</u>	<u>Ramark</u>
1955	21 ha	-ha	-ha	-ha	-ha	21ha	
1956	54	-	-	-	-	54	
1957	94	-	-	-	-	94	
1958	46.2	52.5	-	11.8	-	110.5	
1959	27	18	6	20	-	71	
1960	106.5	29	25	74.7	-	235.2	
1961	285	258.3	83	358.1	247.5	1,231.9	
1962	189	269	150.7	346.2	733.6	1,688.5	
1963	340	921.5	195.8	475.7	1,301	3,234	
1964	140	160	80	240	580	1,200	(supposed)
	1,302.7	540.5	540.5	1,526.5	2,862	7,940.1	

When the area, 12,000 ha. of the Obrigado district in Itapua Prefecture, which the German had planted, and the area, 1,500 ha. of the new plantation are added to the above, the total area amounts to 21,440 ha.. If the area, 250 ha in the Youazu district in Alto-Parana Prefecture, and the area, 300 ha. in the Cordellera district near Asuncion are further added to the above, the total area under cultivation amounts to 21,990 ha..

Tung tree begins to bear fruits in 4 years after the plantation, grows up in approx. 8 years and continues to bear fruits until its age becomes approx.

35. At present in Paraguay, the area under cultivation of tung trees aged over 4 years including those in Yguazu and Cordellera districts amounts to 13,135 ha.. The growth of tung trees planted by the Japanese immigrants in Itapua Prefecture is as follows:

Development of the production of tung fruits per area of tung trees planted in the Japanese colony in Itapua Prefecture.

<u>Year</u>	<u>Section</u>	<u>Tree aged 5</u>	<u>Tree aged 6</u>	<u>Tree aged 7</u>	<u>Tree aged 8</u>	<u>Total Production</u>
1965	Crop area (ha.)	235.2	71	110.5	169	
	Production(kilton)	588	284	552.5	1,014	2,438 ^t
1966	Crop area (ha.)	1,231.9	235.2	71	279.5	
	Production(kilton)	3,079.3	940.8	355	1,677	6,052
1967	Crop area (ha.)	1,688.5	1,231.9	235.2	350.5	
	Production(kilton)	4,221.3	4,927.6	1,176	2,103	12,427.9
1968	Crop area (ha.)	3,234	1,688.5	1,231.9	585.7	
	Production(kilton)	8,085	6,754	6,159.5	3,514.2	24,512.7
1969	Crop area (ha.)	1,200	3,234	1,688.5	1,817.6	
	Production(kilton)	3,000	12,936	8,442.5	10,905.6	35,284.1
1970	Crop area (ha.)	-	1,200	3,234	3,506.1	
	Production(kilton)	-	4,800	16,170	21,036.6	42,006.6
1971	Crop area (ha.)	-	-	1,200	6,740.1	
	Production(kilton)	-	-	6,000	40,440.6	46,440.6
1972	Crop area (ha.)	-	-	-	7,940.1	
	Production(kilton)	-	-	-	47,640.6	47,640.6

Note: According to the data of Alto Parana Agricultural Co-operative Union,

Production for the tree aged 5 : 2,500^t per ha.
" 6 : 4,000^t per ha.
" 7 : 5,000^t per ha.
" over 8 : 6,000^t per ha.

As disclosed in the above development of production of tung fruits, the low quotation on the tung oil market in 1965 and 1966, and the high freight cost due to the long-distance transit to the plants near Asuncion would be to stand at the sacrifice of the cost, 1.5 -- 2.5 guarani of tung fruits with shells per ton. In 1967 when the excessive capacity of the existing domestic plants

will become approx. 10,000 ton, the production of tung fruits, 12,428 ton will exceed the limit. In 1968, the production, 24,512 ton could not be treated, unless plants will be newly built.

Meanwhile, from a viewpoint of the farming economy of the Japanese immigrants in Hapua Prefecture, they can make their living by growing such shortterm crops as the soybean, raw cotton, corn, etc. planted between rows of tung trees for no more than 4 years, because there is a space, 7 -- 8 m between the rows of trees. After 5th year, when the tung trees grow thick, the harvest of crop will reduce to half or zero so that the immigrants will become badly off. As they will then force to rely on the profits accruing from the tung fruits, preparations shall be made before that period so that the immigrants may make profits from the tung fruits.

III Demand, Supply and the Market Condition

The tung oil producing areas of the world can be roughly divided into the following areas:

- (1) Area up the Yangtze river (Szechwan Province) in Communist China
- (2) Area (Mississippi State) along the Mississippi river in U.S.A.
- (3) Areas (Misiones Prefecture in Argentine, and Hapua Prefecture in Paraguay) along the Parana river of Laplata river system in South America.
- (4) Area in the Union of South Africa

The approximate production of tung oil is as follows:

1. Communist China	67,000 tons (estimated)
2. North America	15,000 tons
3. South America	25,000 tons
4. Others (South Africa)	3,000 tons
Total	110,000 tons

According to the Agricultural Organization of UN, the demand for tung oil is almost as follows:

1. Communist China	36,600 tons (estimated)
2. U.S.S.R. and communistic countries	14,300 tons (")
3. U.S.A. and Canada	21,200 "
4. E.C.M.	9,400 "
5. E.F.T.A.	11,800 "
6. Japan and Oceania	6,800 "
7. Other tree countries	44,000 "
Total	104,100 "

In relation to Communist China, the production and consumption are the estimated amounts.

The influx from the Communist World into the Free world is estimated at 10,000 -- 17,000 tons per year. When the inflex is large, the market condition is dull. When it is small, however, the market condition becomes brisk.

As of 17 Feb. 1965, the quotation is \$ 500 per ton, New York Port Delivery, while the cost in producing area, is \$ 503, Argentina-Benes-Aires FAS. The latter is conversely higher than the former.

The market situation depends upon the crop of the year, as well as the influx from the Communist World to the Free World. Not only that, the tung oil has been replaced by the synthetic resin greatly developed in recent days. In this connection, The recent market condition has disclosed that the price of tung oil is yearly on the decline, even if it is high for a while.

Even in process of the development of synthetic products, however, the demand for natural products would not go away so long as their characteristics are utilized. Anyway, the demand for tung oil could be maintained, so far as its is superior in accuracy and low in cost. Therefore, the accuracy must be retained, and the low cost must be guaranteed for the Paraguay-produced tung oil to secure its world market in future.

IV Observation Based upon the Survey Records

1) General Observation of the Tung Oil Industry

In relation to the tung oil industry, the Cooperativa de Colonias Unidas in Itapua Prefecture, and the S.A.P.I.C, subcontract plant of the Manuel Ferreira in Encarnacion City are the plants, in which the tung oil is exclusively made. Other plants press the tung oil in addition to the press of the Coco, cotton seed, peanut, soybean, etc. Their production is approx. 5,000 tons. As mentioned previously, only 3 plants in Itapua Prefecture are close to the tung fruit producing areas. Other plants are located in Asuncion and its suburbs approx. 400 Km off the producing areas, and subsequently the tung fruits must be sent overland. When the market price is high, therefore, the cost can be paid. When it is low, however, the cost is not paid.

If the tung fruits in Itapua Prefecture are to be pressed in plants in the prefecture, they can not press after 1967, when the tung trees planted by the Japanese immigrants bear fruits. It is, accordingly, necessary to build new plants on the farm site in 1968 at the latest.

Though the supply, demand and the market condition of the world do not necessarily warrant optimism, it is very difficult from a viewpoint of the farming economy to cut immediately the tung trees planted by the Japanese immigrants in Itapua Prefecture. In this connection, they must stop a new plantation of tung trees for the time being until there are good prospects of the supply, demand and the market condition of the world, and must treat effectively the fruits of growing tung trees.

As mentioned in the items of demand, supply and the market condition of the world, the present market price is higher than the cost. If the freight rate is reduced by rationalizing the inland transportation of raw material to be pressed, and the oil press efficiency is improved by the machines of excellent quality, however, the cost could be further curtailed, and the production may be fully paid, when the conventional export system is improved. When the freight (from Buenos Aires to New York), \$ 12.00 various charges, loading charge in

Buenos Aires harbor, freight from the Parana river coast in Itapua Prefecture, Paraguay to Buenos Aires, \$ 10.00, commissions of shipping agents, all other charges are subtracted from the retaining price employed by U.S. at present, \$ 480, New York harbor delivery per ton it would be not so difficult to deliver to the exporters at the cost of \$ 400.

In case the cost including the depreciation of newly built plant can be reduced to \$ 300.00 -- \$ 350.00 by rationalizing the oil press operation, the tung oil cannot only compete with the synthetic resin but also be exported to Japan.

(Import price in Japan in February, 1965 is \$ 458)

Thus the accuracy of tung oil can be improved, and the production cost can be reduced so much as to guarantee the farming cost (limit of the farming cost is 35 guarani per ton) for the immigrants.

In this connection, the following measures should be taken:

- (1) Farming work shall be rationalized, and researches shall be made to reduce the cost of materials.
- (2) Collection and transportation of tung fruit materials shall be rationalized.
- (3) Production shall be rationalized by means of oil presses of high accuracy and efficiency.
- (4) Transportation to the export harbor shall be rationalized to reduce the transit cost.
- (5) Agreement on the permanent transaction with the exporters or consumers shall be concluded, and the trade guarantee system shall be established.

In addition to the above it is necessary for us to request the Paraguayan Government to stipulate export standard, inspection of the commodities. guarantee of their quality, etc, by establishing an agricultural product examination law, export goods examination law, etc., and take various export encouraging measure through the administrative and taxation policies.

2) Indust Development Program

A. Temporary Measures

The area of the tung trees planted by the Japanese immigrants, who had since 1954 settled down in the Chaves, Fram, Alto Parana districts in Itapua Prefecture, amounted to 7,940 ha. The production of tung fruits with shells will amount to 12,427 tons in 1967 and 24,512 tons in 1968. After its continuous increase, it will be equivalent to the total production in Paraguay at present.

Even the surplus capacity of domestic plant is mobilized, these tung fruits can not be treated.

The higher freight due to the long-distance transportation of the materials will force the producers to ultimately absorb the increase an extremely of the freight, making them stand in unfavorable situation economically.

In order to avoid such a situation, establish a guarantee system for the farming in future and contribute to the economic development of Paraguay, it is necessary to build a new plant at the tung producing districts by 1968 at the latest.

In building a new plant, it is required to choose a site, to where the materials can be easily sent from the tung fruit producing area at a low freight rate.

Considering the convenience of export harbor, plant shall be built in the Alto Parana district to meet the above requirement, and the roads from the Chaves, Fuji Lapaz and Santa Losa districts shall be improved for the transportation of materials.

As for the collection of materials, meanwhile, shipment shall be so planned that the products of immigrants may be smoothly treated in the plant throughout the year, and the shipment shall be so assigned to the produces that the plant may have no excessive material in stock.

Power for the oil press machine shall be generated by the steam engine using the tung fruits with shells, and the shortage of power be generated by Diesel engine to save the fuel for power. In the meantime, the oil press shall be operated for 8 hr. per day for the present, and be of 10-ton

continuous expeller system. After that, the operation time shall be gradually lengthened to increase the treatment quantity economically. In other words, if the oil press is operated for 300 days a year, the tung fruits with shells, 24,512 tons in 1968 are equivalent to approx. 80 tons per day. If the operation is then 8 hr. long and the oil press rate is 20%, the oil refining yield becomes 16 tons per day, and subsequently the annual yield becomes 4,800 tons, This quantity is equal to the total export of tung oil from Paraguay at present. If the daily operation hours are lengthened to increase the treating quantity gradually with the production increase since 1969, no trouble would be caused until 1972.

Pressed oil cake, approx. 28% of the production is obtained. In this connection, it is a matter of course that this oil cake should be returned to the producers and serve as an aid to the cultivation as the fertilizer.

In the shipping port for export, Caarendy, meanwhile, oil tank shall be built, and connected with the plant by means of tank lorry.

In manufacturing the oil, it is necessary to conclude a long-term agreement with the selected exporters for the transaction, and secure the sale business.

Pressing oil materials except the tung fruits are the important short-term crops for immigrants. As mentioned in the item, Present Condition, they have been processed in subcontract factories in Asuncion and its outskirts, or collected by the agricultural co-operative union to be joint-sold as the materials pressing oil. It is, therefore, desirable that the press equipment for such edible oil as the cotton seed, peanut, soybean oil, etc. should be additionally installed to increase the profits of farmers. This step would contribute to the rationalization of plant management, make possible the utilization of more oil materials in the Prefecture, save the import of edible oil to Paraguay and consequently be helpful to the saving of foreign fund. The press machine shall be daily operated for 12 hr. and have a making capacity of 7-ton oil. With the increase in production of the materials, its operation hour shall be gradually increased to 24 hr. By adjusting the

B* Permanent Measures

When the above temporary measures are taken almost of all the tung fruit produced on the plantation area can be treated at the present capacity of plants. In the years following 1972 when all the tung trees so far planted grow and bear fruit, or the settlers plant more tung trees, or new immigrants gradually plant the tung trees, all their products not be treated naturally.

An expansion program should be made carefully, only after observing the trend of making researches in the change in supply and demand, no decision could be made offhand.

Paraguay is geographically destined to export her products by way of the adjacent countries, Argentina and Brazil.

It is, therefore, advisable for the Paraguayan Government to have more friendly diplomatic tie-up with the Argentine Government and take diplomatic measure so that the government-owned custody and shipment facilities in Argentina may be utilized.

As mentioned in the item, Temporary Measures, the immigrants should request the Paraguayan Government to make arrangements for the law, administration and taxation by way of the encouraging measures for the export industry.

As the domestic market is small, the agricultural produces in Paraguay must be sold to the world-wide market.

In this connection, proper measures should be taken to grasp the agricultural produce market condition of the world correctly at any time, and constant efforts must be made to process the agricultural produce, and ship the produce to the world market.

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