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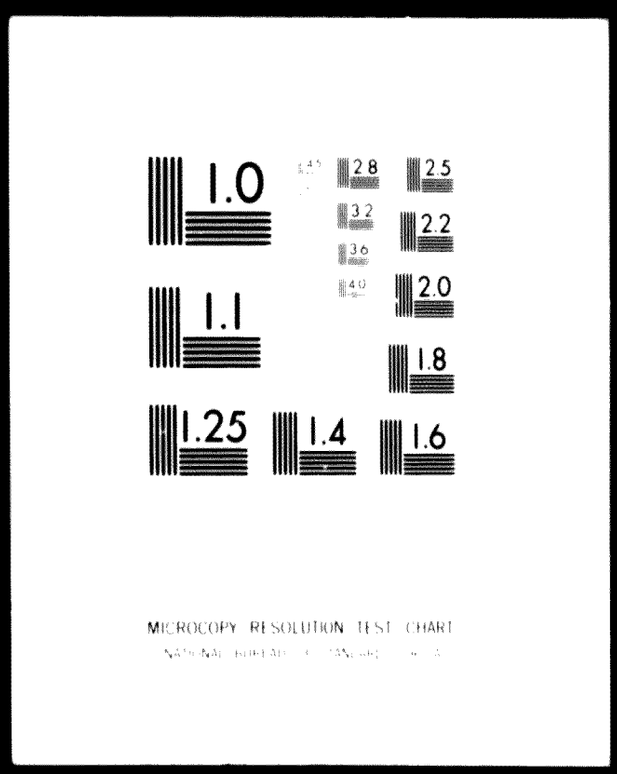

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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REPORT

ON THE PROSPECTS FOR CASHEW NUT PROCESSING IN DAHOMEY

(SIS 6)/C11 DAH(3))

PREPARED IN SEPTEMBER 1969 BY

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0 Synopsis

At the request of the Government of Dahomey UNIDO has prepared a feasibility study for a plant processing 3,000 tons of raw cashew nuts annually. It has been found that a very high percentage of cashew nuts are damaged due to insect attacks which would mean a low yield of kernels and additional processing costs. The calculations show that the proposed plant is not feasible. It is recommended that the project be shelved at the moment, and that efforts should be made to improve the quality of the cashew nuts. When the quality has improved a new study should be performed, preferably based on a larger quantity processed.

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ASPECTS FOR CASHEW NUT PROCESSING IN DAHOMEY

(SI/ 63/11 DAH(3))

1. Introduction

In a letter dated 25 August 1963 the President of the Republic of Dahomey requested the assistance of UNIDO in establishing a cashew nut factory in Dahomey. On 3 September 1963 UNIDO decided that a UNIDO staff member should assist the Government of Dahomey to assess the conditions prevailing in the production of cashew nuts, their quality, quantity, location and other relevant factors necessary for the recommendations concerning the industrial processing of these nuts and the further technical assistance required for industrial development.

Mr Åke Rusck, Senior Inter-regional Adviser, spent the time 10-14 September in Cotonou collecting the necessary information for making a feasibility study. Most of the information was obtained through the Ministry for Economics and Finance by Mr I. Ascar, UNIDO Adviser to the Ministry and Mr R. Loko, Director for Studies and Documentation. Information concerning quantity and quality of raw cashew nuts was provided by Mr C. Ott, FAO Adviser to the "Office de Commercialisation Agricole du Dahomey." The matter was also discussed with the Minister for Economics and Finance, Mr Stanislas Koogmon, the Director General for Economic Affairs Mr Barnabe Bidouzo, the Minister for Foreign Affairs Mr Dadarou and Mr A. Lappartient, UNIDO Adviser to the Ministry for Planning.

In the report below the information collected is used for a feasibility study on cashew nut processing in Dahomey.

2. Feasibility Study on Cashew Nut Processing in Dahomey

2.1 General information

The cashew nut has a kidney shape. It is composed of a shell and a kernel. The shell contains Cashew Nut Shell Liquid (CNSL) which is mainly composed of phenol but also higher phenols as cardol. Some of the phenols have been broken down to anarcadic acid. The kernels are surrounded by a skin containing tannin.

The following figures give an approximate idea of the composition of cashew nuts:

Kernels:	Peeled kernels	27%
	Skin	3%
Shells:	CNSL	22%
	Wooden content etc.	48%
		100%

The cashew nuts vary in size and have a complicated shape which makes it difficult to design a decortication machine. The CNSL can contaminate the kernels and special precaution has thus to be taken to avoid contamination. The skin contains tannin which has a bitter taste. The kernels have thus to be peeled efficiently. The kernels are rather brittle and are easily split into halves or are broken. As whole kernels fetch a considerably higher price than splits and broken ones the kernels have to be handled carefully. The kernels vary considerably in size and they have to be sorted out into various grades. Kernels damaged by insect or fungus attacks have to be kept separate.

The normal method for processing cashew nuts has until recently been a pure hand process. The raw nuts are after humidification roasted in a bath of CNSL at a temperature of 180-200 degrees Centigrade. In this process about 6-8% CNSL (calculated on the weight of the raw nuts) is recovered. The main reason for roasting is to reduce the danger of contamination of the kernels. The roasted nuts are opened by hand. The kernels are peeled by hand or knife and graded. Sometimes the shells are collected and the remaining CNSL extracted in a solvent extraction plant.

The manual processing of cashew nuts is very labour intensive. The work, especially the decortication, is dirty and monotonous. In some African countries it has been found difficult to get workers to accept this kind of work. It is normally also difficult to compete with India where the main manual decortication takes place due to the low wage level.

Some years ago mechanization of the cashew nut processing started. The main efforts have been directed to the design of decortication and peeling machines. Work has been done in several quarters and the situation is that several types of decortication machines are available giving a satisfactory result. Also quite efficient peeling machines have been developed as well as other necessary equipment.

The Italian company, Oltremare S.P.A., Bologna, has developed an integrated plant. The first installation was a pilot plant in Bologna. In 1965 a plant for processing 3,000 tons of raw nuts started operation in Tanzania and later a plant for 13,000 tons was established in Mozambique. Thus four years of industrial experience is available from the Oltremare method.

In the Oltremare method the raw nuts, after cleaning, are put through a grader dividing the nuts into small, medium and large. The reason for this grading is to fix the appropriate roasting time, each grade being roasted separately. Before the roasting the moisture content of the nuts is being increased to about 14%. The roasting takes place in an oil fired kiln where the nuts are roasted at about 200 degrees Centigrade for about two minutes. After the kiln the nuts pass a centrifuge. In the kiln and the centrifuge about 6-8% CNSL is obtained calculated on the weight of raw cashew nuts. After cleaning, the nuts pass through calibraters where they are divided into several grades. The calibrated nuts are passed to decorticating machines. Each machine is adjusted to a single grade and used only for nuts of that particular grade. The opened nuts leaving the decorticators are passed to a shaker and cyclon for separation.

After the separation the kernels are dried and then passed through a peeling machine. The output from the peeling machine is fed to tables where the peeled kernels are separated from the not-completely peeled ones, then the latter are peeled by hand or, in difficult cases, with a knife. The separation of peeled and not-completely peeled kernels can also be done automatically by an electronic device. The peeling is the most labour intensive part of the operation. After peeling the kernels are graded, inspected and packed in 4-gallon tins in CO_2 atmosphere. Two tins are packed together in a cardboard box.

After the decortication the cashew nut shells can be passed through a solvent extraction plant where an additional recovery of CNSL of 10-15% can be reached.

During the last few years a new method for processing cashew nuts has been developed by the Japanese firm, Cashew Company, Tokyo. The main difference from the Oltremare process is that the nuts are decorticated without prior roasting which means somewhat less investment costs. Pilot tests have indicated high quality products with a limited use of manpower. CNSL is recovered by passing the ground shells through expellers. A factory for

3,000 tons of raw nuts according to the Japanese method went into operation in Tanzania at the end of 1968. This factory will, in stages, be increased to 20-30,000 tons. At present we do not have official information concerning investment costs, yield of kernels and CNSL and processing costs.

2.2 Availability and quality of cashew nuts in Dahomey

The systematic plantation of cashew nuts in Dahomey was started in 1962. By the end of 1965 3,000 ha. were planted. This figure had increased to 8,000 ha. by the end of 1967 and the figure is expected to pass 10,000 ha. during 1970. A cashew tree bears fruit first 3-4 years after plantation but the first crop yields are normally low. A good average crop for a mature plantation is around 1 ton of nuts per ha.

The cashew nut crop harvested in Dahomey has been the following:

1965	25 tons
1966	55 "
1967	185 "
1968	305 "
1969	410 "

A projection made by Mr C. Ott has shown that the crop would be about 3,000 tons in 1973 and would gradually increase to 6,500 tons in 1980. There is no reason to doubt the possibility of reaching these figures.

The quality of the raw nuts has been tested twice by Oltremare. The result from the first test is given in a letter dated 7 July 1967 and is summarized below.

(a) Humidity 6%
(b) Void nuts 8%
(c) Spotted kernels 30%, much too high value
(d) Dimensions of nuts good to very good
(e) Colour of kernels excellent

The result from the second test is given in a letter of 8 November 1968. This test has been carried out on 182 tons which was the entire crop for 1967. A test before starting the processing gave the following result:

(a) Humidity of nuts	6.45%
(b) Humidity of kernels	6.34%
(c) Floating nuts	3%-4%
(d) Void nuts	10-14%

The most important quality test is the result from the processing of the 182 tons which is reported according to the following:

(a)	Yield of kernels	1[illegible].5%
(b)	Whole kernels	57.87%
(c)	Splits, butts and large pieces	33.51%
(d)	Small pieces and baby bits	8.62%

Oltremare makes the following comments: "The reason for the low yield of kernels is exclusively due to the fact that the percentage of void nuts is slightly increased (above normal) and that the percentage of spotted kernels has been much higher than normal. In order to utilize the spotted kernels which were not saleable as such we had to break them so as to recover small pieces and baby bits but with a considerable percentage of waste represented by the black parts of the spotted kernels."

When Mr Rusck arrived in Cotonou the 1960 crop had been sold and shipped and there was only a small amount of nuts available in the warehouse. Mr Rusck was presented with a sample of 10 kg. of which he took a sample of 1 kg. which was brought to Vienna for testing. On Mr Rusck's request Mr Ott carried out a floating test on the rest of the sample 9 kg. Mr Ott has reported that 35% of the nuts (by weight) floated on water while 65% were sinking.

A floating test carried out on the sample brought to Vienna showed the following result:

	g.	%
Floating nuts	575	56
Sinking nuts	450	44
	1,025	100

The length of the nuts was measured with the following result:

Length mm	Floating nuts %	Sinking nuts %	Total %
22-24		1	0.5
24-26	11	6	9
26-28	21	9	16
28-30	23	31	26
30-32	24	26	25
32-34	19	18	18
34-36	2	9	5.5

The size of the nuts is good to very good. The size of floating and sinking nuts are about the same. The average weight, however, varies, mainly due to the fact that all void nuts are floating.

	Weight g.	Number	Weight per nut g.
Floating nuts	575	126	4.55
Sinking nuts	450	89	5.05
	1,025	215	4.77

A cutting test has been carried out on the same sample of nuts. All nuts have been cut along the natural line of cleavage and the nuts have been segregated into sound nuts, void nuts (without kernel) and damaged nuts (spotted or discoloured kernels).

	Weight g.	%
Sinking nuts		
Sound nuts	350	78
Damaged nuts	100	22
	450	100
Floating nuts		
Sound nuts	180	31
Damaged nuts	345	60
Void nuts	50	9
	575	100
Total		
Sound nuts	530	52
Damaged nuts	445	43
Void nuts	50	5
	1,025	100

From the tables we find that not less than 48% of the nuts in the sample are damaged and void nuts. Normally a maximum of 10% is allowed without reduction of the price. If the figure should exceed 15% a buyer normally has the right to refuse to take delivery.

In the table below the three investigations have been summarized.

	Oltremare Investigation 20/7/67	7/11/67	UNIDO 1969
Floating nuts	-	3-4%	5%
Sound nuts	62	-	52%
Void nuts	8	10-14	5%
Damaged nuts	30	-	43%

It can rightly be said that the test made by UNIDO is made on a small sample which might not be representative. However the tendency is the same as in the other test with a very high percentage of damaged and void nuts.

The result of the quality test seems to be the following. The nuts are delivered dried to a humidity which is suitable for storing. The size of the nuts is good to very good and the colour of the kernels is excellent, but the number of void and damaged nuts is extremely high, mainly due to insect attacks. That means that the yield of kernels will be very low and the percentage of whole kernels will be less than normal.

As a processing test has been made by Oltremare on such a large quantity as 182 tons and the yield and quality figures are known we will use these figures in the profitability study. It would not be realistic to base the study on better figures.

2.3 Price of raw cashew nuts

If a cashew nut processing factory should be run without subsidies it should pay for the raw cashew nuts not less than the export price at the harbour in Dahomey.

The 1969 crop of 410 tons was shipped in September to India at a price per ton of £76 cif Cochin.

Price cif Cochin £76			US$ 182.-
Deduct	Sea freight	US$ 42.-	
	Insurance, export duty and expenses	US$ 9.-	
	Loss on weight and quality 5%	US$ 9.-	
	Loading and harbour fees etc.	US$ 13.-	73.-
Price per ton at factory			US$ 109.-

The price paid to the growers is Fr.CFA 17,000/ton. The transport cost to the harbour, bags and various expenses have been calculated at Fr.CFA 7,750/ton. The minimum cost price at the harbour will then be Fr.CFA 22,750/ton corresponding to US$ 83/ton. This is the absolute minimum price if the Government would abstain from any profit on the sale of raw cashew nuts.

2.4 Investment costs

As earlier reported the crop of raw cashew nuts has been calculated at 3,000 tons in 1973 and it will gradually grow to about double in 1980. A processing plant should not in the first stage be designed for a higher capacity than 3,000 tons/year. On the other hand this seems to be the smallest unit which should be considered.

We will then base the calculations on a capacity of 3,000 tons/year. We will also base the study on the Oltremare method as investment and operating data are available.

As a basis for the cost of machinery and equipment, as well as certain other data, we will use an offer from Oltremare dated 1 April 1969 as well as an Economic Study by Oltremare of the same data. The rate of exchange used in the offer is LIT 2.10 = 1 Fr.CFA and Fr.CFA 270 = US$ 1.

We have assumed that the plant should be located in or in the near neighbourhood of Cotonou. A location up country will mean a decrease of the freight costs as the weight of the material to be transported to the harbour will be reduced to about one third. On the other hand with a location up country additional costs will occur which probably will offset the gain in transport costs. However, before a final decision to establish a plant is taken, a special location study should be made.

There is plenty of suitable land available in Cotonou. The price of land is about Fr.CFA 500 equal to US$ 1.90 a square meter. A plot of 10,000 sq.m. is needed. The cost of the land will then be US$ 19,000. For the preparation of the site we calculate US$ 20,000. The factory will have an area of 3,000 sq.m., the cashew nut store 1,500 sq.m. and for office and service buildings about 500 sq.m. is required. The area of the buildings is thus 5,000 sq.m.

The building costs are rather high in Dahomey. All cement, steel and other building material is imported from Europe except for wood. The estimate for

for a textile mill has its own a cost per sq.m. of Fr.CFA 22,000 (before devaluation). Another estimate was Fr.CFA 31,000. We have visited a bleaching and printing mill at present under construction in Cotonou. The building is of about the same size and quality required for a cashew nut processing plant. It is made from pre-fabricated concrete elements and blocks manufactured at the site. The resulting cost seems to be Fr.CFA 25,000. In our calculations we will use the cost of Fr.CFA 25,000 per sq.m., equal to about US$ 90. It might be possible that a building of corrugated alluminium or steel on a steel frame may be somewhat cheaper but that cannot be decided until suitable comparative designs have been made and the cost has been estimated.

The cost for the buildings will then be 5000 x 90 = US$ 450,000. For services, water and electricity we estimate US$ 20,000 and for contingencies 10%.

The total cost for land and buildings will be the following:

		US$
Land, 100,000 sq.m. at	US$ 1.80	18,000
Site preparation		20,000
Buildings, 5,000 sq.m. at	US$ 90.-	450,000
Services		20,000
Contingencies 10%		52,000
	TOTAL	US$ 560,000

The machinery and equipment including freight and installation has been offered by Oltremare according to the following:

	US$	US$
Oltremare machinery and equipment	314,000	
Electronic equipment	17,000	
Various equipment	40,000	
Tin manufacturing plant	23,000	
Electric installation	32,000	434,000
Contingencies at least 6%		26,000
	TOTAL	US$ 460,000

The total investment will be the following:

	US$
Land and buildings	[illegible]0,000
Machinery and equipment	[illegible],000
Total investment	US$ 1,020,000

For calculation purposes we assume the following capital structure:

	US$
Share capital	400,000
Long term loan	620,000

The sum shown as long term loan can be partly a long term credit from the suppliers. We will use an interest rate of 7% which means an annual interest on the long term loans of US$ 43,500.

2.5 Operating costs

Oltremare has estimated a requirement of 320 workers. The low quality of the raw cashew nuts may require some increase in the number of workers. However we will use the figure 306.

We have been given the following hourly wages for various types of workers. We have also been told that the figures should be increased by 35% to take care of social costs and fringe benefits. The annual cost per worker has been based on 2,000 working hours per year.

	Hourly wage Fr.CFA	Hourly wage +35% Fr.CFA	Annual cost per worker Fr.CFA
Unskilled labour	52	70	140,000
Semi-skilled labour	64	86	172,000
Skilled labour	74	100	200,000
Foremen	183	247	494,000
Clerks etc.	179	242	484,000

We have estimated a composition of 85% unskilled, 10% semi-skilled and 5% skilled labour. The average annual cost per worker will then be Fr.CFA 146,200 equal to US$ 532.

Salaries for staff have been estimated by Oltremare in the following way:

	Fr.CFA
1 General Manager	2,160,000
1 Assistant General Manager	1,440,000
1 Accountant	960,000
3 Clerks	1,200,000
2 Plant Managers	2,160,000
4 Supervisors	2,880,000
8 Mechanics	2,880,000
TOTAL	Fr.CFA 13,740,000

Some of these salaries seem to be somewhat on the low side. According to information obtained in Cotonou the total cost for an expatriate is on average Fr.CFA 4,500,000. If we assume that the General Manager and the two Plant Managers at least in the initial period are expatriates and the other staff is recruited locally we will arrive at the following figures, provided the General Manager is costed at Fr.CFA 4,500,000 and the Plant Managers at Fr.CFA 3,000,000:

	Fr.CFA
1 General Manager	4,500,000
1 Assistant General Manager	1,500,000
1 Accountant	1,000,000
3 Clerks	1,500,000
2 Plant Managers	6,000,000
4 Supervisors	4,000,000
8 Mechanics	4,000,000
TOTAL	Fr.CFA 22,500,000

The total figure for salaries Fr.CFA 22,500,000 is equal to US$ 82,000.

Maintenance and repair is estimated at 1% of building costs and 2% on machinery and equipment which means US$ 15,000.

The price of water is Fr.CFA 42 per cu.m. Agreement has been reached with Ghana about delivery of electricity at the boarder 288 km. from Cotonou at a price of Fr.CFA 2.50. It has been estimated that it will be possible to supply electricity to industries in Cotonou at a price of Fr.CFA 5-10/kWh. At present the tariff is Fr.CFA 13.50/kWh. We will use

Fr.CFA 10/kWh. Fuel oil is calculated at Fr.CFA 20,000/ton. The cost for water, electricity and fuel will then be the following:

	Fr.CFA
Water, 25,000 m^3 at Fr.CFA 42	1,050,000
Electricity, 240,000 kWh at Fr.CFA 10	2,400,000
Fuel oil, 75 tons at Fr.CFA 20,000	1,500,000
TOTAL	Fr.CFA 22,500,000

The cost for water, electricity and fuel is Fr.CFA 31,050,000 equal to US$ 43,500.

Various administrative costs including insurance is estimated at Fr.CFA 2,500,000 equal to US$ 3,000.

For packing the kernels 52,000 tins and 26,000 cartons are required. The cost for the packaging material can be estimated in the following way:

	Fr.CFA
52,000 tins at Fr.CFA 120	6,250,000
26,000 cartons at Fr.CFA 10	2,800,000
TOTAL	Fr.CFA 9,050,000

The cost for packaging material, Fr.CFA 9,050,000 is equal to US$ 33,000.

The depreciation rates allowed according to the tax laws is 5% on buildings and 10% on machinery. When applying these rates we arrive at the following annual depreciation:

	US$
Buildings, 5% on US$ 760,000	28,000
Machinery, 10% on US$ 460,000	46,000
Total depreciation	US$ 74,000

The supply of raw nuts for a whole year has to be bought immediately after the harvest. That means that for this purpose a maximum working capital of US$ 330,000 is required. Furthermore about two months of operating expenses are required as working capital estimated at US$ 70,000. The maximum working capital is US$ 400,000 and the minimum US$ 70,000 which

means an average of US$ 23[illegible],000. The interest for a bank overdraft is 9% which means that the interest on working capital will be US$ 21,000.

2.6 Summary of operating costs

In the table below we have summarized the operating costs:

	US$
Raw cahsew nuts, 3,000 tons at US$ 109	327,000
Labour costs, 326 at US$ 532	173,000
Salaries	[illegible],000
Maintenance and repair	1[illegible],000
Water, electricity and fuel	43,[illegible]00
Various administration costs	[illegible],000
Packaging material	33,000
Depreciation	74,000
Interest on long-term loan, 7% on US$ 620,000	43,[illegible]00
Interest on working capital	21,000
TOTAL	US$ [illegible]21,000

2.7 Yield and price of products

According to what has been said in chapter 2.2 we will base the study on the results obtained by Oltromare when testing a batch of 1[illegible]2 tons. The yield of kernels will thus be calculated at 1[illegible].5% and the percentage of whole kernels to 5[illegible]% which is considerably lower than the normal figures 24% and 65%.

The total yield of kernels will then be 0.195 x 3,000 = 585 tons.

If we assume 30% damaged nuts and that 10% of the kernels are being scorched during roasting the White Whole kernels (WW) can be estimated at 65 x 0.7 x 0.9 = 41%. As the total percentage of whole kernels is 58% the Scorched Wholes (SW) and the Dessert Wholes (DW) will be 58 - 41 = 17%.

The White Pieces (WP) have been estimated to 80% of 42%, viz. 34% and the Scorched Pieces (SP) and Dessert Pieces (DP) to 42 - 34 = 8%.

In the table below the price of White Whole kernels, 320 kernels/lb., cif New York has been listed:

Year	Maximum	Minimum	Average	
1958	49	44	46	US cents/lb
1959	50	43	46	
1960	59	49	54	
1961	55	43	50	
1962	47	40	44	
1963	69	44	49	
1964	70	50	61	
1965	65	57	61	
1966	70	61	70	
1967	65	73	29	
Average 1958 - 1967	60.9	47.3	54.3	US cents/lb

Even if the kernel price during 1968 has surpassed 70 c/lb we do not find it realistic to base the study on a higher price than 60 c/lb which is the average price 1963 - 1967.

The relation between the price for various kernel grades has, according to experience, been estimated in the following way:

White Wholes	100
Scorched Wholes) Dessert Wholes)	70
White Pieces	70
Dessert Pieces	60

The average price for the produced kernels can then be calculated in the following way:

			%
WW	0.41 x 100	=	41.0
SW + DW	0.17 x 70	=	11.9
WP	0.34 x 70	=	23.8
SD + DP	0.08 x 60	=	4.8
Average price			81.5%

The price of White Whole kernels 60 c/lb is equivalent to US$ 1,320 per ton and the average price will be 0.815 x 1,320 = US$ 1,080 per ton.

We have no indication of the amount of CNSL which can be produced without solvent extraction. However a yield of 6% should be a reasonable figure. Solvent extraction of the rest of the CNSL will probably not be economically justified with such a limited unit of 3,000 tons of raw nuts. The production of CNSL will be 180 tons.

The price of CNSL cif New York in US$ per ton has, according to ITC, been the following:

1960	200 - 275 US$ per ton
1961	200 - 275
1962	225 - 300
1963	225 - 325
1964	265 - 375
1965	300 - 400
1966	250 - 350
1967	200 - 300
1968	175 - 275

In the ITC market survey it is stated that a price level of US$ 150-180 is not an unrealistic target even with the present sharp increase in production but it should be noted however that as a result of oversupply, prices could well fall temporarily below even this level. As the output of CNSL will be comparatively small we will base the study on the relatively low price of US$ 150 per ton.

2.8 Annual sales

Gross Annual Sales		US$
Kernels, 585 tons at US$ 1,000		632,000
CNSL, 180 tons at US$ 150		27,000
	TOTAL	US$ 659,000

Sales and Transport Costs		
Sales commission, 2.5% on US$ 659,000		16,000
Transport, 765 tons at US$ 54		41,000
	TOTAL	US$ 57,000

Net Annual Sales		US$
Gross Annual Sales		669,000
Sales and Transport Costs		37,000
	TOTAL	US$ 632,000

2.9 Profitability

Net Annual Sales	632,000
Operating Costs	821,000
Loss on the Operation	US$ 214,000

The result of the profitability study shows an annual loss of US$ 214,000. In order to make the plant feasible it should have been a profit of at least 15% on the share capital of US$ 400,000 which should have meant a profit of US$ 60,000.

If the raw cashew nuts were obtained at the minimum price indicated in chapter 2.3 of US$ 93 per ton the loss would be decreased by US$ 72,000.

If the raw nuts had been of normal quality the loss would have been reduced by US$ 142,000.

If the raw nuts had been both of normal quality and available at the minimum price we should have broken even but with no profit.

The conclusion that can be drawn is that the main reason that the plant is not economically feasible is the low quality of the raw nuts. Secondly, the plant size of 3,000 tons is too small.

3. Conclusion

As shown above the study shows a large loss which cannot be substantially reduced even with a subsidized price on raw cashew nuts. It seems very unlikely that any foreign investor at the present stage should be interested in the project. We therefore recommend that the project be shelved for the moment. However, efforts should be made in order to improve the quality of the crop. As such measures do not fall within the competence of UNIDO we abstain from any other suggestions than that the Government of Dahomey could approach FAO in order to get a view on how to improve the quality of the crop.

When the crop quality has improved sufficiently and preferably increased to a higher volume than 3,000 tons a new profitability study should be performed. At that time probably official figures will be available from the Japanese method so that a fair comparison can be made between the two methods.

As the results of the study are negative we have not made any investigation of the influence of the project on the national economy and the balance of payment and further no cash flow calculations have been prepared.

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7. Etude concernant le choix d'une usine pilote de traitement de fruit au Dahomey, I. Ascar, UNIDO, Cotonou July 1969.

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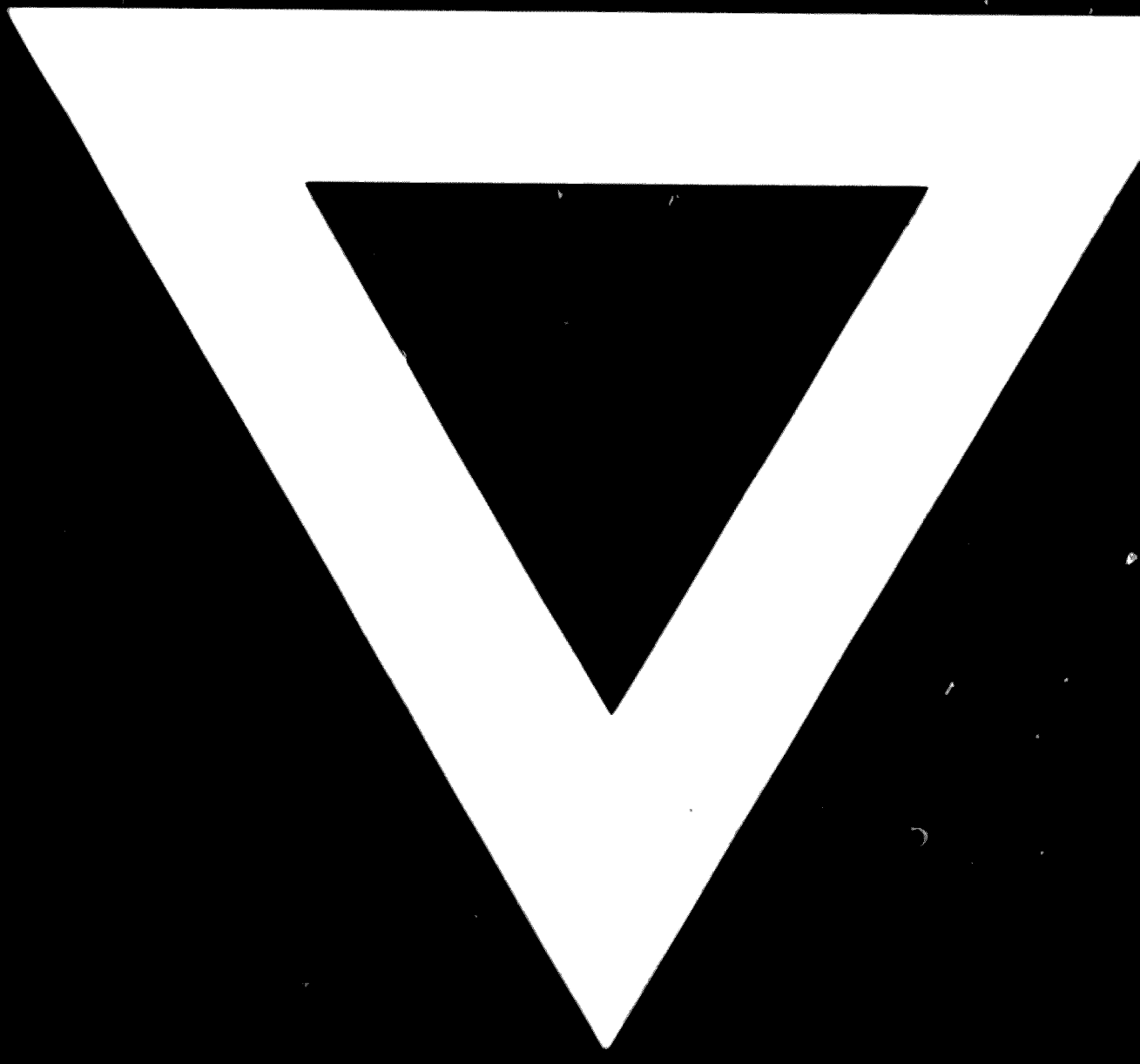

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