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THE
LIFE OF
SAMUEL JOHNSON
BY
JAMES BOSWELL
IN TWO VOLUMES
THE SECOND VOLUME
CONTAINING
HIS LAST YEARS
AND HIS DEATH
WITH
A HISTORY OF HIS
WRITINGS
AND A
CRITICAL APPRAISE
OF HIS
CHARACTER
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EXPLORATORY MISSION TO ASSESS THE
LEATHER AND LEATHER PRODUCTS INDUSTRIES,

TS/PNG/76/003

PAPUA NEW GUINEA

Prepared for the Government of Papua New Guinea by the
United Nations Industrial Development Organization,
executing agency for the
United Nations Development Programme

Based on the work of Mohamed Maher Abau El-Khair,
leather and leather products expert

id.77-425

Explanatory notes

During the period covered by this report, the following exchange rates were applicable in the conversion of country currencies to United States dollars:

<u>Country</u>	<u>Currency</u>	<u>Exchange rate per US dollar</u>
Australia	Australian dollar (\$A)	0.815
Papua New Guinea	kina	0.776

A slash between dates (eg., 1970/71) indicates a crop year, financial year or academic year.

A hyphen between dates (e.g., 1960-1965) indicates the full period involved including the beginning and end years.

A full stop (.) is used to indicate decimals.

A comma (,) is used to distinguish thousands and millions.

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ABSTRACT

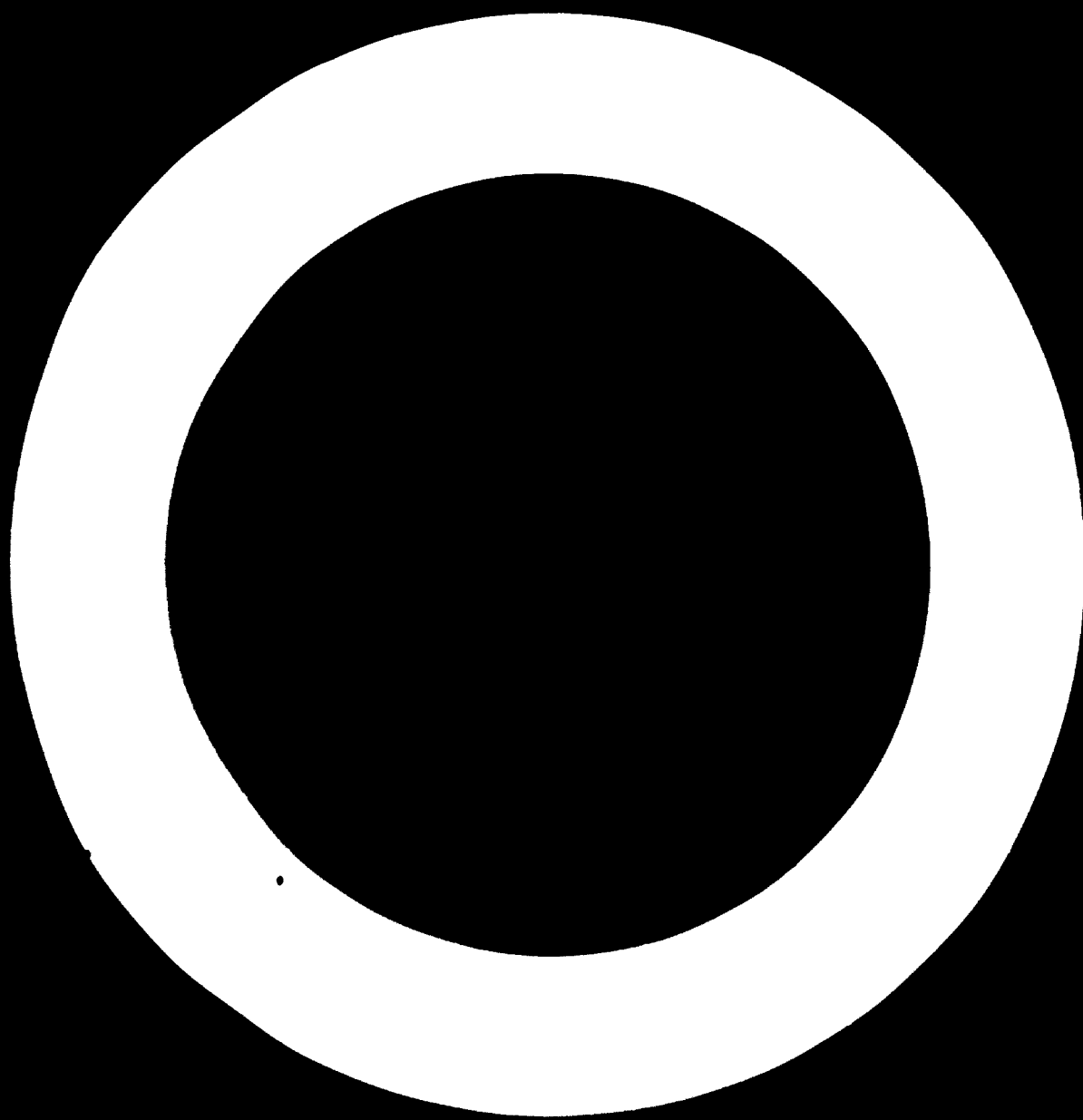
In response to a request from the Government of Papua New Guinea, the project "Exploratory mission to assess the leather and leather products industries" (TS/PNG/76/003) of the United Nations Development Programme (UNDP) was carried out from 18 October 1976 to 25 November 1976 by the United Nations Industrial Development Organization (UNIDO) acting as executing agency for UNDP.

The expert sent on the mission was responsible for assessing the situation of the leather and leather products industries in Papua New Guinea and advising the Government on the best approach to be taken in planning the establishment of small tanning units and small leather products manufacturing units in various parts of the country.

The expert found that the production of raw hides would have to be organized before a tanning industry could be established. During this preparatory period, the hides collected could be exported.

The expert recommended the establishment of medium-sized tanneries rather than small ones. Since local vegetable tannins would not be readily available, he advised that the tanning industry would have to depend on imported tanning agents for the time being.

The expert concluded that the manufacture of leather goods would be feasible at the small-scale level based initially on the use of imported leather.



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INTRODUCTION

In pursuance of its policy of developing the meat-processing industry, the Government of Papua New Guinea has launched a comprehensive plan to expand its cattle population, which at present is about 160,000, and to increase the number of abattoirs in the country. Central abattoirs have been established at Port Moresby, Lae, Goroka, Mount Hagen and Wadang with further establishments planned or under construction at Rabaul, Wewak, Kundiawa, Mendi and Popondetta. The Lae abattoir will be the largest in Papua New Guinea. About 19,000 cattle per year are currently slaughtered in Papua New Guinea. The ultimate aim is to increase this figure to 50,000-60,000 per year. It will thus be desirable and possible in the future to utilize the country's resources of cattle hides.

Leather tanning, including tanning of both cattle hides and reptile skins, has been declared a pioneer industry. A privately owned tannery was established in 1970 in Lae, but was not put into actual operation.

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In carrying out his assignment, the expert worked closely with the UNIDO expert of the project "Development of small-scale industries" (PNG/74/039).

The expert was attached to the Department of Business Development. Counterpart staff in this department were: Acting Secretary A.U. Nov, First Assistant Director Wekina, Assistant Director W. Wijenaike (UNIDO expert) and J. Brooksbank.

I. FINDINGS

Animal production

Cattle were introduced to Papua New Guinea in 1950, with a herd of 5,000. In 1976 the cattle population was estimated at 160,000. The owners in the country may be classified into three categories: large holders, institutions and small holders. The condition of the animals deteriorates from category one to three. The projected rate of increase is 15-40%, but it varies widely from one province to another according to the availability of the grazing pasture and the social and economic conditions of the district. The Development Bank in the country is contributing to the expansion of the cattle population by giving loans to the small holder.

The dominant cattle breed is Beef Brahman cross-bred with British breeds, characterized by a medium live weight and a negligible, low hump. This cross-breeding may explain the relatively medium thickness of the hides produced. A few dairy Friesians and buffaloes are on experimental farms. It is government policy to introduce them on a larger scale in suitable locations. The animals are fed only by grazing on pastures and the results seem to be quite satisfactory.

Veterinary service is provided by the Government and extended to villages through four qualified veterinarians and numerous field staff trained for this purpose. The general condition of the cattle is fairly good and the animals' skins are rarely damaged by the common skin diseases and parasites existing in other developing countries. The reported common skin defects on the living animal are limited to those caused by the screw-fly chrysomya, buffalo fly, haematobia and the fungi dermatophilus. The owners usually rely on the area veterinarian or the field officer for the necessary treatment.

The most serious and common mechanical defect in skins of living animals is caused by branding for identification rather than for curative purposes. Branding damages the most valuable part of the skin, the bends. Since the tradition of branding is not deeply rooted, the damage it causes could be easily avoided if the owners were given personal advice through the abattoirs and veterinarian assistants in the villages.

In addition to the cattle, there is a large population of pigs in the country, but their skins cannot be used by the leather industry for the time being because pigs hold a sacred position.

Sheep raising has been recently introduced on an experimental basis, with medium-wooled sheep cross-bred with temperate-zone breeds.

The Government has launched a comprehensive plan to establish crocodile farms to ensure a constant supply of the skins. At present 1,000 wet-salted skins per month are exported to France. The government policy is to increase the production up to 6,000 skins per month, with a view collaborating with a foreign company for the transfer of technology at this stage. The value added to the raw crocodile skins by tanning is limited to 20%. Consequently it is quite feasible to start this type of production on a large scale when the supply of skins is large enough to attract foreign investment.

Cattle slaughtering

Most cattle are slaughtered at the age of 2-2.5 years with live weight 300-450 kg. This practice is followed both by large producers on grounds of economics and by small producers on the basis of the prestige associated with slaughtering large animals. Slaughtering is carried out in well-equipped abattoirs established or licensed by the Government in the areas where herds are concentrated. The flayers are equipped with the proper knives and tools. The water supply in the abattoirs is abundant; the drainage system functions properly owing to the strict sanitary regulations; and the managers are qualified to carry out careful meat inspection. The slaughtering charge is 3 kina per head.

Production of hides

Quantity

The annual offtake for cattle varies widely from one province to another according to the information gathered from several provinces where the main abattoirs are located (annex II). It ranges from 2-25% with an average offtake of 12%. Consequently it could be inferred that 20,000 hides were available for processing. The actual figure seems to be higher than this

estimate, since about 25% of the animals are slaughtered in the villages unrecorded. Table 1 shows the rate of increase in the abattoir slaughtering during the last three years, which suggests an anticipated considerable expansion of production of hides during the next few years.

Table 1. Slaughtering in abattoirs, 1973-1976

Year	Total <u>abattoir</u> slaughtering	Rate of increase (%)
1973/74	11,287	-
1974/75	14,677	30
1975/76	18,993	30

The data in annex II indicate that the production in each abattoir is 26 hides per week, with the exception of the Lae abattoir, the production of which is well above the average - 134 hides per week - while most of the abattoirs' production is below the average. It would not be feasible to establish tanneries on the basis of this very low capacity. The alternative is to cure the hides in such a way as to improve their keeping quality for prolonged storage until a suitable stock is built up for economic transportation to the planned destination.

Quality

Owing to the direct government supervision of animal production starting from the grazing grounds, the cattle reach the abattoirs with skins in good condition, with the exception of the defects caused by branding and the rare skin diseases, which could be wiped out easily with the proper care. The abattoir facilities from the standpoint of construction, management, equipment and flayers give the possibility of producing hides of high quality and free from flaying defects. Since the hides are not used at present, the flaying is carried out without considering the resulting quality of the hides.

The expert gave on-the-spot advice regarding the correct methods of flaying to the managers of the abattoirs and flayers in some provinces and met with a good response.

Weights and measures

The expert carried out preliminary investigations on the hides produced in several provinces to clarify the specifications of the existing raw material. Table 2 gives the results.

Table 2. Weights, grades and dimensions of cattle hides

Weight grade	Average weight (kg/fresh hide)	Grade (%)	Dimensions: backbone length x maximum side width (cm)
A	11-19	15	180 x 75
B	20-24	30	190 x 90
C	25-29	30	200 x 95
D	30-40	25	210 x 100

Table 2 shows that of the hides produced most are classified as heavy grade (over 20 kg fresh weight), while few light hides (less than 15 kg fresh weight) are available. In view of this situation both chrome and vegetable tanning should be applied to different grades of hides to provide diversified types of products required for the footwear and leather goods industries. However, further study on production of the hides is necessary to provide accurate measures for the commercial grading of production and to lay the basis for the projected tanning industry. Classification of the hides into proper grades improves the commercial value of the hides either for export or for local utilization.

Handling

Most cattle are sold according to the carcass weight after flaying in the abattoirs. Usually, neither the cattle owner nor the butcher is interested in the hides, as is evident from the following quotation:

"Carcasses including kidney, livers, hearts, tails, tongues, thick skirts and hides remain the property of the owner. Hides not removed from abattoir on the day of slaughter may be destroyed without compensation to the owner".

Most of the hides in the country are burned outside the abattoirs, with the exception of the Lao abattoir, where the hides are collected by a private enterprise for wet salting and exported to Hong Kong. The expert observed that the piled, wet-salted hides prepared by this enterprise putrefied because of faulty techniques used, including the following:

(a) The salt is added after the hides have dried, which reduces the possibility that the salt will penetrate the material and thus lowers the keeping quality of the product;

(b) The stock is stored 2-3 months at a high temperature in Lae in the wet-salted state. The average temperature is 26.3°C and relative humidity 83%;

(c) Improper draining of water from the bottom of the pile of hides has caused discolouration of the stock in the form of "red heat", characterized by dense red colour in the lower layers of the pile and less density in those at the top.

The export f.o.b. price of these hides is approximately \$3.70 per piece, which is low compared with the world price. This relatively low price may be due to defects in the skins resulting from faulty flaying or curing coupled with careless handling (leaving the hides on the abattoir floor for 24 hours in hot and humid conditions before curing). Furthermore, the hides are not classified into weight or quality grades.

However, the hides at present have no value in the domestic market, since they are considered a waste product. Conversion of this material into a valuable product requires proper organization of the flaying, grading, curing and handling of the raw hides under direct and close supervision of the Government, through the established abattoirs. The shorter the time spent in channels of trade in the hides business, the better the quality of the hides. Such channels should be organized immediately to provide a solid ground for establishing the tanning industry.

Curing

The expert examined conditions in which the hides were cured throughout his mission. In suggesting the curing method to be used, he took the following into account:

(a) Most of the abattoirs have a relatively low output - an average of 26 hides per week or lower. Consequently, to build up enough stock to make transportation economic, most hides must be stored over a long period;

(b) The abattoirs are widely scattered and the means of transportation are poor. The temperature and relative humidity vary greatly in different provinces (see table 3);

(c) The abundant forests in the country provide shade and wood for frames for drying the hides.

Table 3. Climatic conditions in selected provinces

Location	Average temperature (°C)	Average relative humidity (%)
Port Moresby	26.8	78
Popondetta	26.4	84
Lae	26.3	83
Goroka	20.1	74
Mount Hagen	18.3	81
Madang	26.5	87
Wewak	26.7	86
Rabaul	27.1	84

Accordingly, the expert found dry salting of the hides on frames under sheds to be the curing method best suited to local conditions that would give hides of high quality either for export or use in the projected tanning industry. The expert explained the situation to the abattoir managers during the field trip.

Marketing

There is a ready market for the raw cattle hides either in neighbouring Hong Kong, Indonesia and Singapore or in western European countries, such as Italy, the Netherlands and Spain. The exemption of this commodity from the import duty in such countries will promote this export even though many countries prefer to import semi-processed or ready-to-finish leathers rather than the raw material. Establishing contacts with overseas tanneries or leather associations would be the best approach for marketing hides rather than dealing through intermediate agents. The close contact can lead to fruitful co-operation in the transfer of technology and identification of the buyers' requirements. Proper flaying, curing, handling and grading are of the utmost importance for penetrating foreign markets.

Feasibility estimates were worked out for production of hides for export. According to these estimates, a net profit of 2.50 kina can be obtained by curing one hide for export. Assuming that the total exportable quantity will be 20,000 hides per year, a total profit of 50,000 kina per year is anticipated at this stage.

The tanning industry

The tanning industry does not exist at any level, with the exception of a few individual attempts to set up tanneries, which failed because of the lack of knowledge of the principles of tanning. Since the number of hides annually available is estimated to be only 20,000, the foreign companies that could provide technical assistance would not be interested in forming joint ventures in this industrial sector for the time being. Consequently, an independent, step-by-step development of this industry is required, with careful planning of each step.

Improving the flaying techniques and introducing better methods of curing, grading and handling hides form the first step in the scheme of development. The required data on weights and measurements of the hides to be prepared throughout this operation will be necessary for calculating accurately the volume, number and capacity of the drums, the working width of some machinery and the types of the leather to be produced by the projected tanneries.

Additionally, collecting the raw hides for export in the earlier stages is advantageous from the standpoint of settling the trading channels of raw hides in the local market and assisting in providing funds for the foreseen tanning project.

Local vegetable-tanning material

Several studies have been carried out in Papua New Guinea on the availability of vegetable-tanning material in the forests for possible use by the leather industry. According to these studies, mangrove trees found in an area of 300,000 acres in the coastal regions are the most abundant species from which to obtain tanning material. The tannin content calculated on a dry-weight basis in the bark was found to be as follows, in the best four tannin-bearing mangrove species:

<u>Species</u>	<u>Tannin content</u> <u>(%)</u>
<u>Rhizophora mucronata</u>	21.6 - 33.3
<u>Rhizophora apiculata</u>	16.0 - 29.6
<u>Bruguiera gymnorhiza</u>	16.3 - 30.8
<u>Bruguiera parkiflora</u>	10.7

Tentative tanning tests were also carried out in the laboratory on small skin biopsies; leather of rather unsatisfactory properties resulted. Treatment with the tanning solution in these tests was carried out for four days, apparently too short a period to allow the tannin to penetrate through the leather section.

However, it seems that the above-mentioned mangrove bark cannot be readily exploited by the tanning industry at present for the following reasons:

- (a) The results of the tanning tests were based on quite a limited number of samples. The tests cannot be considered an actual survey on the suitability of the bark for the industry;
- (b) The mangrove bark could represent only a very low proportion (10-20%) of the vegetable-tanning blend;
- (c) The cost of collecting, transporting and leaching the bark will be very high owing to the high labour wages (27.00 kina per week) and the distance of the bark from the locations of the suggested tanneries;
- (d) The properties of the resulting leather, which was mainly of a dark reddish-brown colour and stiff were unsatisfactory;
- (e) The demand for vegetable-tanned sole leather has declined. However, the same hide could be converted into a more expensive leather upper by vegetable, synthetic or chrome tanning.

Furthermore, the moderate capacity of the projected tanneries and the quite limited proportion of the hides to be tanned for soles support the view that collecting and leaching of the mangrove bark will not be feasible. The wide variation in the tannin content in the mangrove bark means that careful control of the tanning process by skilled workers will be necessary, which may present difficulties to the industry in its early stages. Thus the mangrove bark may be omitted from consideration as a tanning agent for the time being unless the results of well-conceived, new experiments indicate the

suitability of the material or the availability of an equivalent, and studies show that costs of collecting, transporting and leaching make exploitation of the bark economic. It seems that the foreseen tanning industry will depend on imported tanning material for either vegetable or chrome tanning.

Size of the tannery

Several problems will arise in introducing the tanning industry on a cottage or small scale on the basis of the output of the abattoirs (26/week). These problems arise from the lack of experience in tanning. The transfer of knowledge to the small establishments would require foreign expertise for a very long time, which would be costly and impractical, and is therefore unlikely to take place, which means that production will remain unprofitable and probably inferior in quality. If techniques of treating and handling the raw hides are improved so that hides of good quality are obtained, such hides could be better utilized in units of medium size that would turn out a product of satisfactory quality than in cottage units, where the valuable raw material would be wasted. Production of leather of satisfactory quality requires a knowledge of technical details and semi-mechanization that the small producers cannot afford. The dominance of heavy hides will make it necessary to produce both upper and sole leather from the same hide, which will require expensive machinery such as a splitting machine. Such machinery could not be introduced in small establishments. Additionally, even in the countries where this industry exists on a small scale, family management is facing the problems arising from the reorganization and upgrading of this sector to support its existence.

A medium-scale tannery based on an annual capacity of 5,000 hides (approximately 150,000 kg green weight) would be the optimum size of the first establishment befitting the indigenous conditions.

Water supply

The quantity of water required for the tanning industry does not present any problems, since the water is abundant everywhere in the country, either from rivers or from bores. The quality of the water, however, varies widely from one area to another, which means that the water supply for the projected tannery must be carefully analysed. Table 4 shows the degrees of water hardness in selected locations of the country.

Table 4. Water hardness in selected locations of Papua New Guinea

Location	Total hardness CaCO ₃ (ppm)	German degrees of hardness ^{a/}	Description
Lae	210	12	Fairly hard
Wewak	190 - 200	11	Medium hard
Madang	50 - 170	3 - 10	Soft
Goroka	50	3	Very soft
Mount Hagen	45	3	Very soft
Port Moresby	Very low	Less than 2	Very soft

Source: Department of Public Works, Port Moresby.

^{a/} German degree of hardness = 17.9 ppm calcium carbonate.

The above-mentioned results underline the need to examine the constituents of water carefully before deciding upon the site of the tannery and the type of processing. Mount Hagen would seem to provide the best location for a tannery producing vegetable- and chrome-tanned finished leather, while at Lae the production could be oriented towards wet-blue leather for export without equipping the tannery with a special water softener. However, the softening of hard water is costly, and the softening method depends on the water analysis and the type of hardness. The tannery should be located in a site having a suitable water supply to save the costs of softening.

Location of tanneries and type of product

From the standpoint of availability of hides, climatic conditions and suitability of water supply, Mount Hagen is the best site for a projected tannery. The central position of the city in the highlands will facilitate the collection of hides from the south, west and east highland provinces and from Chimbu province, since all these provinces are connected by a good road. About 5,000 hides per year could be available for this tannery from the surrounding areas. The relatively low temperature around the year (average, 18.3°C) provides excellent conditions for leather processing. This advantage is coupled with the very soft water (average, 3 German degrees of hardness), which is abundant. The location of the tannery in this site would help to raise the percentage of slaughtering in the abattoirs in

the surrounding regions, which was found to be relatively low (offtake 4% and 11% in the South and West Highlands, respectively).

Accordingly, a site at Mount Hagen near the abattoir and Kum River should be given the first priority as a location for a tannery capable of producing diversified types of finished leather to meet the local market requirements. The types of leathers to be produced in this unit would be both vegetable-tanned soles and uppers and chrome-tanned uppers.

At Lae, near the abundant supply of hides from the province of Moroba, the establishment of a tannery with a capacity of approximately 10,000 hides per year would be appropriate. The hard water in this area caused by the limestone in its soil would orient the tannery production in the early stages to wet-blue, chrome-tanned leather for export.

A tannery at Lae was established with this goal by a private enterprise (G. Dang) in 1970, but since then has never functioned, possibly because of the lack of technical expertise. Located 5 km from Lae, it occupies a space of 2,500 m². The tannery has been adequately constructed to provide an efficient flow of production, an adequate water supply and a proper drainage system. The machinery and installations comprise:

- 4 drums, 2 . 4.5 m approximately
- 1 drum, 0.6 x 1.5 m approximately
- 2 soaking pits, 184 x 245 x 150 cm
- 2 paddles, 153 x 153 x 157 cm
- 5 draining horses
- 2 beams
- 2 fleshing machines, working width 165 cm
- 1 unhairing machine, working width 165 cm
- 2 shaving machines, working width 60 cm
- 1 splitting machine, working width 156 cm

The tannery is equipped with only second-hand machines that have had no maintenance for over five years. Quite costly reconditioning of these machines by specialized mechanics will be required to make this tannery function. A trial batch of 30 hides was processed into wet-blue leather, but the inefficient fleshing and unhairing operations damaged the hides on both the flesh and grain sides.

Leather products

The manufacture of leather products is non-existent with the exception of individual efforts to produce simple leather sandals in Rabaul, with used tires the material of the rubber soles. The School of Art and Design in Goroka has made a good start in training workers to manufacture by hand small leather goods such as handbags, belts, wallets, key-holders and watch bands using imported leather. The trainees use proper cutting patterns and are equipped with the proper tools for cutting, carving and hand sewing of the products. Despite the limited scale of this attempt, the results suggest that the production of hand-crafted leather goods has a promising future.

The Handicraft Development Centre, Department of Business Development, in Port Moresby has imported one each of the following machines for leather manufacture:

- Manually operated electro-hydraulic cutting press
- Riveting machine
- Line-marking machine
- Lock-stitching machine
- Flat-bed, single-needle sewing machine

This machinery has not been operated owing to lack of expertise. The rubber division of the Centre is equipped to produce rubber sheets suitable for sandal soles.

Imports and present demand

At present, leather products are imported from several countries with a total value of \$A 1,093,239. Annex III lists the items, which include shoes and boots, sandals, footballs, travelling bags and small leather goods, and gives the value of each.

Domestic production of leather products should give priority to the simple items, since less training will be required of workers. Table 5 lists items at present imported but that could be produced domestically as import substitutes. The corresponding estimated quantities have been calculated on the basis of the present retail price of goods displayed in shops located in several provinces as well as the total import price of such items.

Table 5. Products suitable for import substitution

Product	Retailer unit price (kina)	Number imported
Leather sandals	7.0	13,568
Watch bands	1.5	9,407
Belts	3.5	8,063
Handbags	18.0	1,558
Wallets	5.0	2,804
Purses	3.5	4,006

These rough estimates have been worked out as a guide for the present demand for such products. Detailed market research is required to determine the actual and projected domestic demand for leather products. The demand is expected to increase in future in parallel with the projected expansion in education and development in different fields in the country.

The rate of duty on the leather imports varies widely from one item to another, as also indicated in annex III. Such rates may have to be revised to protect domestic production in its initial stages.

Possibilities for domestic production

In contrast with the tanning industry, the manufacture of small leather goods and sandals could be begun on a small scale. Training for such production is easy; required tools are simple; and the goods can be sold on the domestic market.

A common service centre equipped with simple machinery would supply the workers at cottage level with cut parts ready for assembling. Providing the Handicraft Development Centre with additional equipment and tools would enable the Centre to start this activity and to train workers. The production in the Centre could start on the basis of imported leather.

Production cost estimates for two leather products are given below.

(A) One pair of simple sandals with leather upper, leather insole and cemented rubber sole:

<u>Item</u>	<u>Cost (kina)</u>
Imported upper leather	1.30
Imported insole leather	1.00

<u>Item</u>	<u>Cost (kina)</u>
Locally produced rubber sole	0.20
Other material (adhesive, rivets)	0.20
Direct labour	1.00
Overheads	<u>0.30</u>
Total production cost	4.00
Estimated sale price	5.00
Profit = $\frac{5-4}{4} \times 100 = 25\%$	

(B) One simple, hand-sewn handbag of vegetable-tanned carved leather without accessories:

<u>Item</u>	<u>Cost (kina)</u>
Imported leather (5 ft ²)	6.50
Direct labour (cutting, carving, sewing, finishing)	5.40
Overheads	<u>0.10</u>
Total cost	12.00
Estimated sale price	18.00
Profit = $\frac{18-12}{12} \times 100 = 50\%$	

These estimates have been calculated on the assumption that the machinery in the Handicraft Centre is to be used for producing the sandals, while the handbag is to be entirely manufactured by hand. The relatively low profit rate for sandals as compared with that for handbags could be balanced through higher production of sandals.

Training

Realizing the need for training in the production of leather and leather products, the Government sent a candidate to Japan for training in this field in 1976.

In the meantime, steps have been taken to send another candidate to be trained in rural tanning at the Central Leather Research Institute, Madras, India, for one year through the UNIDO project "Establishment and extension of small-scale industries" (PNG/74/039). To obtain the maximum benefit from this training to meet the specific requirements of the foreseen industry, the training should be oriented as follows:

Practical training in vegetable and chrome tanning and in the finishing of heavy and medium-heavy cattle hides for the production of leather for soles and uppers. Training should also include working with different tanning machines such as fleshing, unhairing, shaving and splitting and machines used in the finishing operations. It is proposed that the duration of this training be 10 months. Two months of training in the Leather Goods Demonstration Centre, Madras, in the following operations is also required:

Sample making

Cutting

Skiving

Stitching

Assembling

Finishing

II. RECOMMENDATIONS^{1/}

1. First priority should be given to the production of raw cattle hides for export, and with this goal in mind the following measures should be adopted:

(a) Providing continuing veterinary and husbandry services to the small-scale cattle holders who should be advised in particular to avoid branding the hides on the bends and instead to limit it to the lower part of the legs, the cheeks or the ears of the animals;

(b) Improving the flaying methods in the abattoirs through instructions to the flayers and cash incentives based on the resulting hide quality;

(c) Establishing a curing annex to each abattoir to minimize the duration between the flaying and curing and to provide a suitable place for building up enough stock to make transportation economic;

(d) Carrying out weight and quality grading of hides and recording the weights, measures and grades;

(e) Curing by the dry salting method;

(f) Organizing the collection and transportation channels for the export of raw hides;

(g) Establishing contacts with the overseas importers of raw hides.

2. Three years of preparation should be devoted to organizing and fixing the trading channels of raw hides in the country under the operation and close supervision of the Government before the tanning industry is introduced.

3. The agricultural institutes and technical colleges in Popondetta, Lae and Mount Hagen should be encouraged to include the subject of flaying and curing of cattle hides in the courses they give.

4. The tanneries to be established should be medium-sized rather than small, since that is the size most suitable for local conditions. The capacity of each of the tanneries will be determined by the supply of hides in its location.

5. The suitability of the water supply either from rivers or bores should be examined carefully before the decision on the sites of the tanneries is taken.

6. The tanning industry should depend on imported tanning agents either for vegetable or for chrome tannage and postpone exploitation of the locally available barks until studies prove they are suitable and exploitation is feasible.

^{1/} Detailed recommendations regarding these aspects are contained in annex IV.

7. The site of Mount Hagon is suggested for a pioneer tannery to produce full-grain vegetable- and chrome-tanned leather for uppers and soles. The site of Lae is recommended for a tannery producing wet-blue leather for export.

8. The manufacture of leather products should be introduced initially on the basis of imported leather.

9. The leather division of the Handicraft Development Centre should be fully equipped and begin to function to enable the Centre to carry out its expected role in production and training. The following products should be given the first priority:

Sandals

Belts

Ladies' handbags and purses

Mens' shoulder bags and purses

Watch bands

10. Manufacture of leather sandals and small leather goods should be introduced at the small-scale level through the trainees of the Handicraft Development Centre at Port Moresby, which could act as a production, common services and training centre. Other institutes, such as the School of Arts and Design at Goroka, should also be encouraged to play an active role in training. The production of leather goods and sandals should be oriented to the domestic market.

11. UNIDO should be requested to provide technical assistance for 12 m/m with the possibility of extension, through the follow-up project that was suggested by the Government and the UNDP resident representative.

In the light of the present project findings, it is suggested that the job description be amended to enable the expert:

(a) To provide on-the-spot advice on the production of hides for export through visits to the production units;

(b) To carry out a detailed study on the establishment of medium-scale tanneries with multi-purpose production;

(c) To assist in the additional equipping and operation of the leather unit in the Handicraft Development Centre;

(d) To work out a training programme on the manufacture of leather and leather products starting from the raw material up to the finished products;

- (e) To carry out a market survey for the projected production of the leather products unit and the tanneries;
- (f) To train a counterpart to carry on the above-mentioned activities.

Annex I

JOB DESCRIPTION

Post title: Leather Industry Adviser

Duration: One month

Date required: October 1976

Duty station: Port Moresby, with travel within the country.

Purpose of project: To assess the situation of the leather and leather products industries in Papua New Guinea and advise the Government on the best approach to be taken in planning the establishment of small tanning units and small leather products manufacturing units in various parts of the country.

Duties: The adviser will be attached to the Department of Business Development, Port Moresby, and will specifically be expected to:

1. Assess the actual situation in the country concerning leather production and leather products manufacturing, including availability and quality of various types of raw materials, hides and skins;
2. Advise on the best approach to be taken in planning the establishment of small tanning units and small leather products manufacturing units in various parts of the country;
3. Make recommendations for the most appropriate distribution and marketing of the products to be manufactured by these units.

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.

Annex II

CATTLE DISTRIBUTION AND SLAUGHTERING IN THE
MAIN PROVINCES, 1975/76

Province	Animal population	Abattoir location	Slaughtering		Offtake (%)
			Weekly	Yearly	
Central	14,000	Port Moresby	40	2,067	15
Milne Bay	3,375	Alotau	4	180	5
Northern	7,000	Pati	5	260	20
		Kokoda	22	1,144	
Morobe	75,000	Lae	134	7,000	11
		Bulolo	25	1,270	
		Goroka	49	2,530	25
Eastern Highlands	10,500				
Western Highlands	16,400	Mount Hagen	35	1,820	11
Southern Highlands	3,500	Koroba	3	128	4
Madang	10,000	Madang	7	350	5
		Dylup	3	150	
East Sepik	10,000	Wewak	33	1,716	
		Maprik	4	208	19
East New Britain	2,000	Rabaul	2	120	6
			—	—	—
Total	151,775				
Average			26	1,353	12

Annex III

IMPORTS OF LEATHER PRODUCTS IN 1975

<u>Description</u>	<u>Rate of duty</u> <u>(%)</u>	<u>Value</u> <u>(\$A)</u>
Clothing and clothing accessories of leather or composition leather belts, gloves (including sporting), watch straps	5-10	141,119
All-leather sport shoes, football, golfing		49,507
Leather-soled boots and shoes		563,221
Leather-soled sandals, men's and boys	5	41,886
Leather-soled sandals, women's and girls	5	53,091
Leather balls with inner bladders, footballs, basketballs and similar		69,056
Leather or bovine cattle and equine leather; leather of sheep, lamb, goat and kid skins; chamois-dressed and parchment-dressed leather; patent and metallized leather; reconstituted and artificial leather fibre; other leather		8,917
Machine leather belting and other articles of leather for use in machinery		32,364
Manufactures of leather; parts of footwear (including uppers, soles and screw-on heels) of any materials except asbestos or metal		15,638
Trunks, suitcases and travelling bags	17.5	62,352
Handbags, wallets, purses	17.5-50	56,088
Total value		<u>1,093,239</u>

Annex IV

DETAILED RECOMMENDATIONS ON PRODUCTION OF HIDES FOR EXPORT

Techniques of slaughtering

Make a vertical bleeding incision between the breast and the throat of the cattle.

Allow the animal to bleed properly for five minutes at least, or until the bleeding stops.

Techniques of flaying

Open the animal's hide in a longitudinal straight line dividing the hide into two halves starting from the bleeding incision along the middle of the dewlap and the belly passing through the middle of the under to the tail, to produce a symmetrically shaped hide (see figure I).

Make the ribbing lines on the head in such a way as to leave the ears on the head while the cheeks should comprise a part of the resulting hide (see figures I).

Make the cross ribbing lines of the fore and hind legs meet the longitudinal line at the point of the breastbone and at the middle point between the udder and the anus, respectively.

Exercise great care when flaying by knife; sever only the connecting tissues between the hide and the carcass and leave the meat and the fat on the carcass rather than on the skin.

When flaying the sides, keep the knife always in a horizontal position parallel as much as possible to the flesh side of the hide while stretching the hide towards the flayer.

Avoid flaying the backbone area while the animal is on the flaying bed. Hoist the animal to complete flaying along the backbone area.

Flay the area around the tail root carefully with the knife and then pull off the hide downwards to the hump to avoid putting cuts in the most valuable part of the hide, the bends and butts.

Directly after flaying, take the hide to the curing shed; do not leave it on the abattoir floor.

Curing requirements

Requirements for curing 50 hides per week are outlined below.

The suggested size of the curing shed may be amended according to the abattoir output.

Construction

Drying shed. Construct as an annex to the abattoir a shed 7 m wide, 10 m long and 5 m high and with open sides for washing, salting and drying. Within the shed, set up 30 frames in a fixed position in a space of about 7 m x 5 m. The frames can be made of local material, i.e. wood or bamboo, with dimensions of 350 x 300 cm. A suitable space between

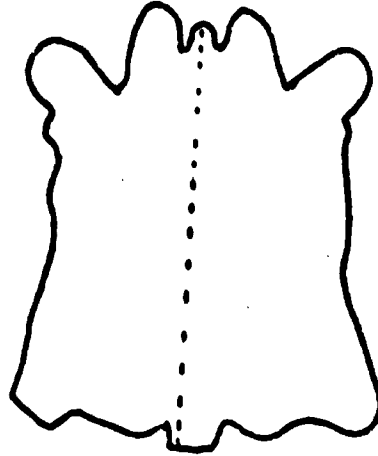
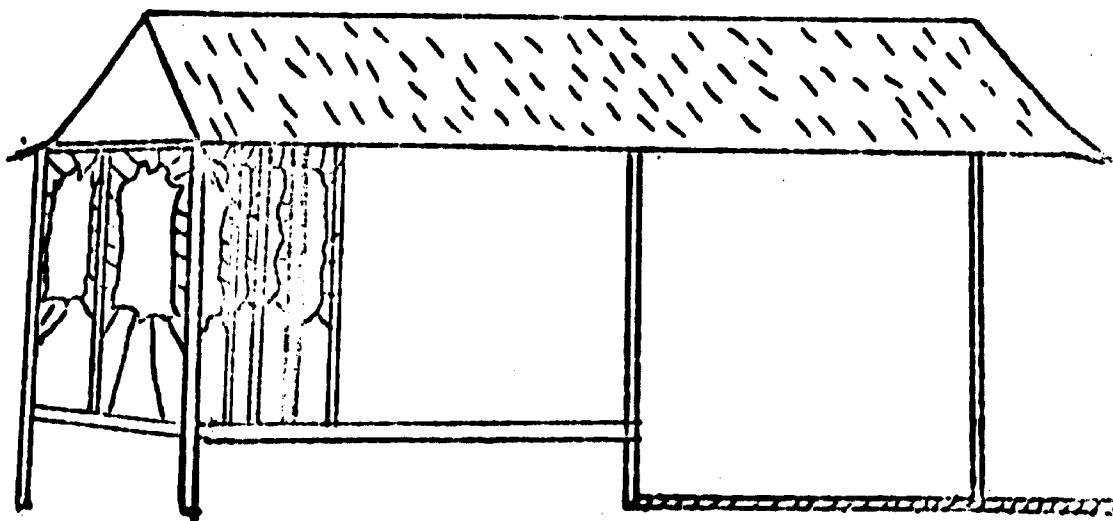


Figure I. Symmetrically shaped hide



← Drying section → Washing and draining section →

Figure II. Curing shed with fixed frames

the frames should be left to permit the movement of air. The other part of the shed, to be used for washing, draining and salting, should have a gently sloping concrete floor with a drain. The roof should be constructed from local wood and bush material and should provide proper protection from the rains (see figure II).

Store for hides. Construct a store for the dry-salted hides near the drying shed with a capacity for holding 300 hides. An area of 50 m² will do. The store should have a concrete floor and good ventilation as well as wooden racks on the floor to protect the hides.

Equipment

The following equipment is required:

- Wooden racks (2-3 for salting and 4 for storage)
- Washing table (1)
- Draining horses (2)
- Marking hammer (1) (see figure III)
- Cords for stretching

Material

- Commercial salt, 5 tons (2-3-mm particle size)
- Naphthalene, 50 kg
- DDT or similar powder

Curing method

Curing should begin not later than 2-3 hours after flaying.

Lay the hide on the washing table, flesh side up, and wash properly with water and scrubbing brush to remove blood and dirt. Use a sharp flaying knife to remove the remnants of fats and flesh while the hide is spread out on the table.

Put the hides on the draining horse to allow draining of the excess water (2-3 hours). Hides should not be left until they become completely dry.

Record the hide weight after draining as well as the dimensions (backbone length x maximum side width).

Grade the hide according to weight and freedom from flaying defects according to the grades suggested below. Then stamp the hides with the weight and quality grade on the flesh side of the tail.

Lay the hide on the wood rack flesh side up and spread evenly commercial salt equal to one third of the hide weight that has been mixed with 1% naphthalene based on the salt weight. If the salt becomes wet in humid areas, it may be mixed with anhydrous sodium sulphate (5-10% on the basis of salt weight) to keep it dry. Three % soda ash or 5% soda crystals may also be used.

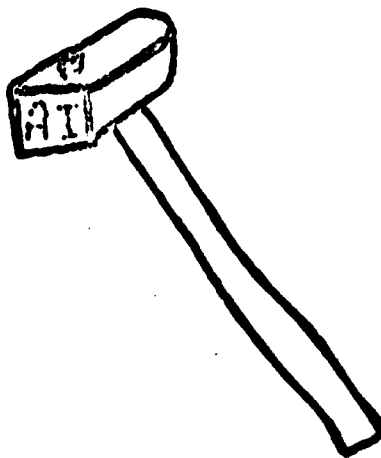
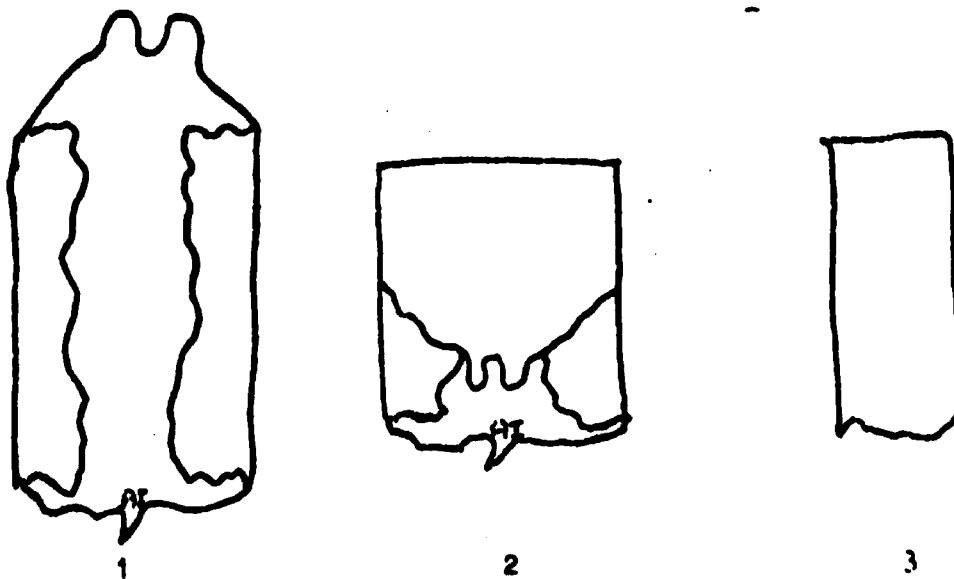


Figure III. Marking hammer for stamping weight and quality grades



Marking position
on flesh side

Figure IV. Folding the hides in 3 folds

On the first salted hide, a second hide is spread flesh side up and salted in the same way. Up to 40 hides may be piled in that way and left for 2 - 3 days to permit the water to drain and the hide to absorb the salt.

Shake off salt from the hides and stretch them firmly and evenly on the frames under the shed. Used salt should not be reused for curing fresh hides.

Allow the hides to dry in the frames under the shed for approximately one week. Then, remove them from the frames and store them on wooden racks in the suitably ventilated store. For long storage, hides should be dusted with DDT powder or similar on the hair side to protect them from rats and insects.

To fold the dried hides for transport, lay the hides flat outside the store in the early morning or late afternoon to absorb some moisture, which facilitates folding.

Fold the hides in three folds according to the illustrated diagram to facilitate baling and shipment (see figure IV).

Suggested quality and weight grades

Weight grades

- A Up to 19 kg fresh, or green, weight
- B 20 - 24 kg
- C 25 - 29 kg
- D 30 - 40 kg

The fresh, or green, weight is the hide's weight after washing, scraping off and preliminary draining before salting.

Quality grades

- I Symmetrical and regular shape; freedom from cuts and knife corrugations
- II Symmetrical and regular shape; not more than one knife cut in each side, provided that the length of the cut is not more than 10 cm near the edges
- III Symmetrical and regular shape; not more than three knife cuts in each side, provided that the length of the cut is not more than 10 cm near the edges

Hides with more flaying defects than those mentioned above should be considered rejects.

Feasibility estimates

Feasibility estimates for a curing annex and store for an abattoir of 50 hides output per week as well as production cost for three months for exported dry-salted hides are given below.

<u>Item</u>	<u>Cost (kina)</u>
(a) Fixed capital	
Drying and curing shed	375
Store	425
Equipment	<u>100</u>
Total	900
(b) Materials (salt, naphthalene, DDT)	200
(c) Direct labour (2 workers, kina 27/week)	650
(d) Transportation and handling	300
(e) Flayers' incentives	350
(f) Estimated price of fresh hides (kina 2/hide)	1,200
<u>Cost assessment</u>	
Production cost (b+c+d+e+f)	2,700
Depreciation of construction and equipment (2.5%/3 months)	<u>20</u>
Total production cost	2,720
Anticipated export price (f.o.b.) (kina 7 per hide)	4,200
Profit related to production cost	$\frac{4,200 - 2,720}{2,720} \times 100 = 54\%$

Cost assessment for one hide

<u>Item</u>	
(a) Hide price	2.00
(b) Material for curing	0.33
(c) Direct labour	1.10
(d) Transportation	0.50
(e) Indirect labour	0.58
(f) Depreciation interest	<u>0.03</u>
(g) Total curing cost	4.54
(h) Anticipated export price	7.00
Profit per hide (h-g) = 2.46, or 54%	

Suggested importers

International Leather B.V.
Stationsstraat 62 - 64, Rijen, The Netherlands

Tannerie - Megisserie A.T.T.M. S.A.
122, Rue de Provence, 75008 Paris, France

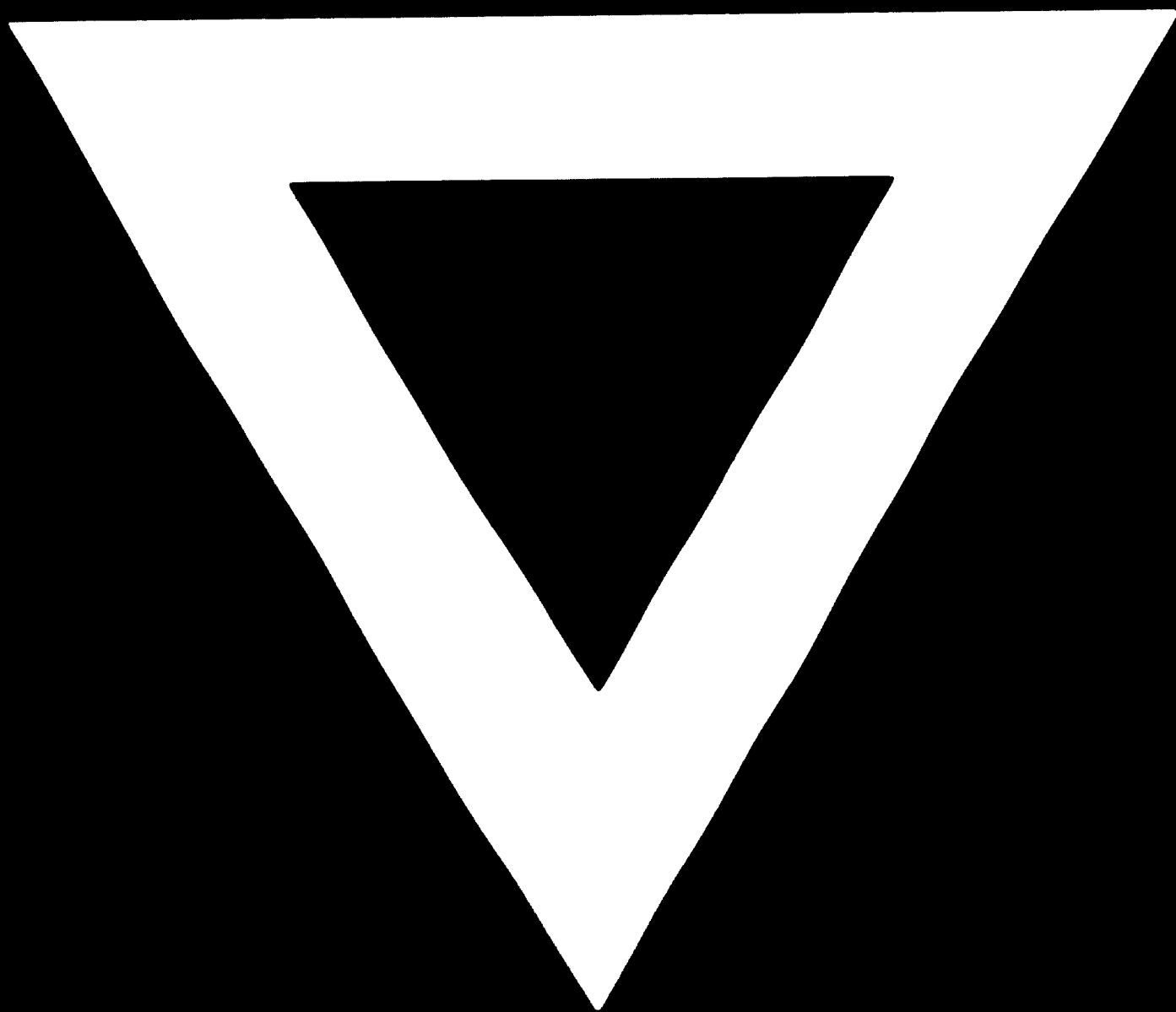
Unione Nazionale Industria Conciara
Via Brisa 3, 20123 Milan, Italy

Indonesian Leather Association
19 Jalan Kedungsani
Surabaya, Indonesia

The Model Tannery
El Basateen, Cairo, Egypt



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