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(R) DEVELOPMENT OF THE LEATHER INDUSTRY  
RP/GAM/77/002  
GAMBIA

24 JUN 1978

Feasibility study for the establishment of a tannery

Prepared for the Government of the Gambia by the  
United Nations Industrial Development Organization

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

### Explanatory notes

References to dollars (\$) are to United States dollars.

The monetary unit of the Gambia is the dalasi (D), which is divided into 100 batutes (B). During the period covered by the report, the value of the dalasi in relation to the United States dollar was \$1 = D 2.32.

A slash (/) between dates representing years indicates a fiscal year, e.g. 1971/72.

A hyphen (-) between months or years signifies the full period involved, including the beginning and end months or years, e.g. March-June, 1973-1977.

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

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

References to tons are to metric tons.

Totals may not add precisely because of rounding.

Besides the common abbreviations, symbols and terms, the following have been used in this report:

#### Economic abbreviations

c.i.f. cost, insurance and freight  
f.o.b. free on board  
GDP gross domestic product

#### Equivalents

1 pound (lb) = 0.4536 kg  
1 square foot (ft<sup>2</sup>) = 0.093 square metres (m<sup>2</sup>)  
1 mile = 1.609 km

#### Organizations

GAMC Gambian Artisans' Marketing Co-operatives  
GHS Gambia Hides and Skins Export Co.  
LMB Livestock Marketing Board

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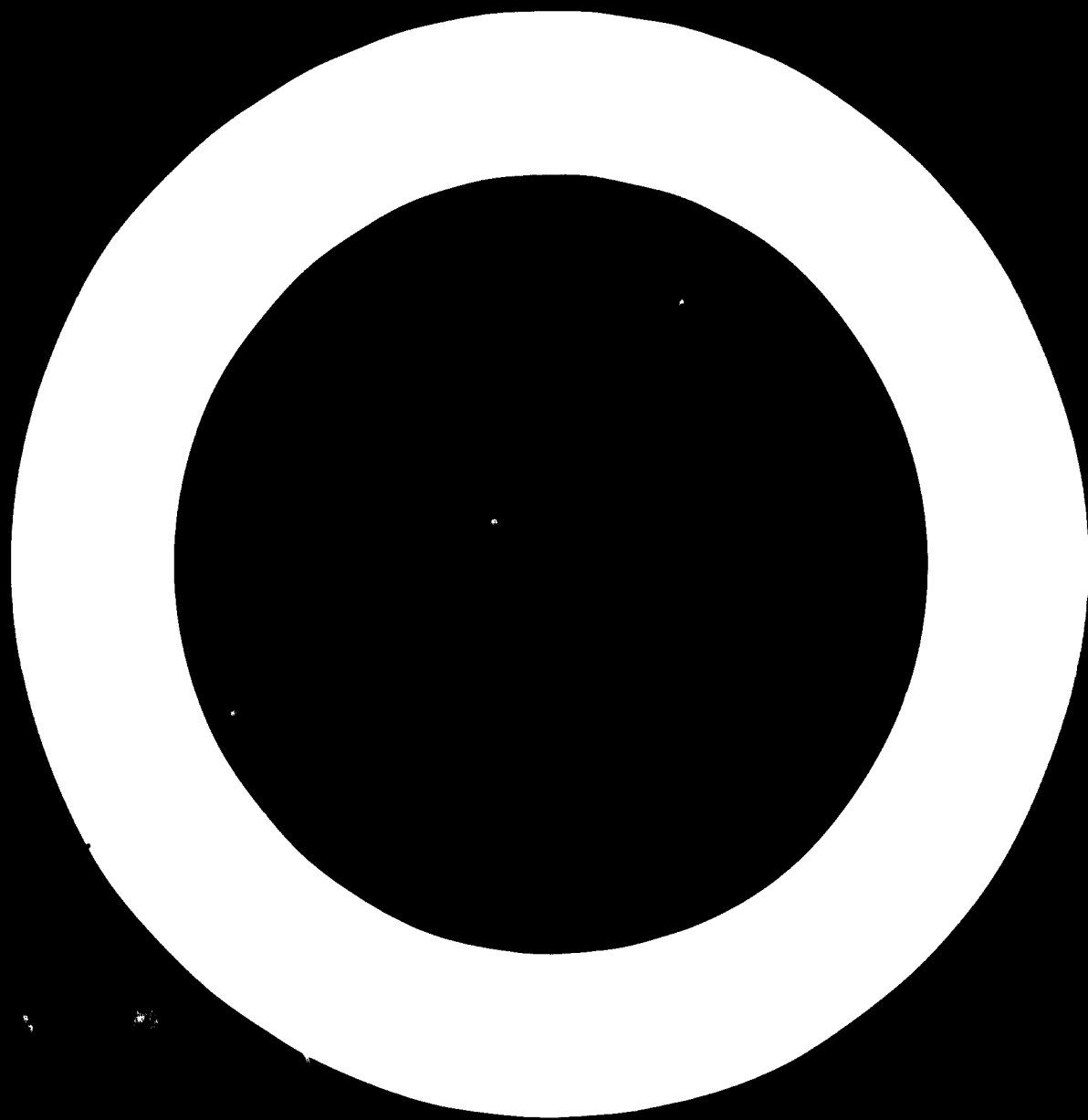
ABSTRACT

The present report covers a one-and-a-half-month mission, "Development of the Leather Industry" (RP/GAM/77/002), carried out by an expert of the United Nations Industrial Development Organization (UNIDO). The object of the mission was to explore the availability of raw hides and skins, bearing in mind the recent ban on trade in reptile and game skins and its effect on manufacturers and traders in the tourist market; to advise the Government on the type of leather industry to be developed and its viability; and to help devise a training programme.

It was recommended that a development plan for the leather industry be adopted for setting up an integrated centralized establishment to produce mainly semi-processed hides and skins for export, the export rejects to be finished for sale in the domestic market and subsequently manufactured into leather goods oriented towards the tourist market. A training plan was suggested that could be implemented parallel to the development stages.

A preparatory stage of development was suggested in order to establish a small-scale leather goods centre providing training and demonstration facilities to the manufacturers. The centre is expected to prepare a suitable base ready for the utilization of the projected tannery leather production and to introduce improved technologies and designs for the tourist market. During this preparatory stage, a finalized defined project for the suggested integrated establishment should also be prepared for immediate investment decision and further stages of development.

The expert concluded that the leather tanning would be feasible at a centralized, integrated level, while leather goods manufacture could be developed and upgraded at the small-scale level and be mainly oriented to the tourist and domestic markets.



CONTENTS

<u>Chapter</u>	<u>Page</u>
INTRODUCTION.....	6
I. FINDINGS.....	7
Livestock.....	7
Slaughtering.....	9
Hides and skins.....	10
The present situation of leather and leather goods.....	15
The projected tannery.....	19
Training.....	23
II. RECOMMENDATIONS.....	25
Development of the leather industry.....	25
Production of hides and skins.....	26

Annexes

I. Job description.....	29
II. Feasibility estimates for the integrated tannery unit.....	31
III. Terms of reference for a follow-up project.....	37
IV. Recommended training plan.....	39

Tables

1. Estimated present and projected availability of cattle hides...	12
2. Average annual exports of hides and skins.....	12
3. Quality-grade proportions of exported hides and skins.....	13
4. Weight grades and dimensions of hides and skins.....	14
5. Exports of raw hides and skins.....	15
6. Prices of various leather goods on the domestic market.....	17
7. Parameters of leather products consumption.....	18
Production flow-chart of the projected integrated tannery.....	21

## INTRODUCTION

In pursuance of its policy for better utilization of its natural resources, the Government of the Republic of the Gambia has considered the processing of the hides and skins, which are now being exported as raw material.

An important event occurred in the Gambia which signalled the intention for the development of the leather industry in the country. This event was the issuance of the Presidential Banjul Declaration on 18 February 1977 for wild-life conservation and an eventual ban of trade in reptile and game skins and their products, to be effective from 1 September 1977. This ban is having a deleterious effect on the traditional manufacture and trade of many articles that were primarily oriented towards the tourist market.

The Government is endeavouring to find an alternative material to wild animal skins that can be processed and used to meet the tourist market demands by exploring the possibilities of processing other types of hides and skins that are available in the country and are being exported in the raw state.

The Government's official request for the project was submitted on 17 November 1976 through the President's office to the Resident Representative of the UNDP; the project RP/GAM/77/002 was approved on 24 February 1977 by the United Nations Industrial Development Organization (UNIDO). The expert was assigned to carry out a one-and-a-half-month mission starting 16 August 1977. During his assignment he was attached to the President's Office. His technical counterpart staff were members of the Ministry of Agriculture, Department of Animal Health and Production, Industries Division.

The job description (annex I) outlines the expert's duties with regard to exploring the possibilities and investigating the feasibility of processing several types of skins in the country. In the light of the new limitations on the availability of certain types of skins, the consultation service provided was adjusted to meet the new situation, and considerable attention was given to the manufacture of leather articles for the tourist market. However, the expert was briefed by both the substantive section of UNIDO and the UNDP Resident Representative with regard to the deletion of lizard skins from the terms of reference.

## I. FINDINGS

### Livestock

#### Domestic animals

The livestock contribution to the country's total gross domestic product (GDP) was estimated to be 1.5% in 1974/75, and this percentage is projected to be increased to 2.0% by the year 1979/80. The domestic animal species of interest to the leather industry at present are cattle, sheep and goats.

The raisers of these animals are smallholders organized in small associations all over the country at the village level. The latest estimates of the livestock population are as follows:

Cattle	270 000
Sheep	300 000
Goats	300 500

The basic cattle breed is the N'Dam, which is characterized by low live weight, long, sharp horns and the absence of a hump, which is advantageous. These cattle are reared mainly for meat; the breeding system seems to be haphazard, and the animals are poorly fed, especially during the dry season (March-June) when pasture is inadequate. The marketing of cattle is organized by the Livestock Marketing Board (LMB) of the Ministry of Agriculture. The present cattle price has been fixed by the LMB at 50 batutes (B)/pound (lb) (22.5 B/kg) live weight.

The country's projections for agricultural development will have positive impact by increasing the size and value of the cattle herd through the intended policies for close integration of field crops and animal husbandry.

Veterinary service is provided by the Government and is extended to the villages through 9 veterinarians and 35 trained field staff. At present the general condition of the hides of live cattle is only fair and includes several grain defects, caused by ticks and mange. The plan for the extension programme should lead to the marked improvements required in this area.

The most serious and common mechanical defect in the skins of living animals is caused by branding, which is done mainly for identification. The planned national identification scheme that would substitute ear tagging



will eliminate branding, which damages the most valuable part of the skin, namely the bends. Horn raking was noticed to be common on the belly and flank, caused by sharp horns during grazing or transportation. The introduction of cattle dehorning appears to be essential to eliminate this ante-mortem defect.

Sheep and goats are reared primarily for slaughter on ceremonial occasions, and there is no formal marketing system for them. The animals are indigenous short-haired breeds, and their skins are usually in fairly good condition from the standpoint of ante-mortem defects. Their characteristic short-haired skins would be preferable to the tanning industry for the production of fine-grain leathers; this suggests that hair-saving technology would be unnecessary in the early stages of sheep and goat skin processing.

#### Wild animals

Reptile and game skins were available in only limited quantities in the country because of the indiscriminate killing of wild animals, and their skins were cured or processed in a primitive manner, with adverse effects on the quality of potentially valuable raw material. However, the Government has banned the hunting of wild animals and the display of and trade in their skins. An integrated programme is being carried out with regard to wildlife conservation. Within the framework of this programme, it seems that the anticipated developments along the Gambia River would have a deleterious effect on the rate of crocodile reproduction. It might be possible to increase the crocodile population by rearing them in farms for their skins. Such crocodile farming would provide incentives for collecting baby crocodiles left in the river, thus systematically opening up new raw material resources and creating additional employment and income.

#### Shark skins

Sharks are caught and collected by about a dozen collectors along the Atlantic coast and exported in dry-salted condition. The latest estimate of the volume of this trade is about 2,000 tons/year. The sizes of these fish vary widely, but definite information on this is lacking. The collectors salt the sharks with their skins on, cutting them up during the salting process, which severely limits the availability of the skin for tanning. Furthermore, the handling channels after the sharks have been

caught are lengthy, and refrigeration facilities are lacking, which further affects adversely the suitability of the skins for processing. These problems would have to be investigated in depth before shark skins could be considered as material for the projected tannery.

#### Slaughtering

Most cattle are slaughtered at the age of 5 or 6 years at live weights from 500 to 600 lb (approximately 225 to 270 kg). This situation apparently explains the low offtake percentage and the consequent limited production of hides and skins, as well as the dominant heavy class weight among the collected cattle hides.

Visits to several slaughtering sites revealed that the majority of the cattle are slaughtered under adverse conditions with the exception of the killings in the Banjul abattoir. In the villages, draining, hoisting and shelter facilities are poorly provided to the slaughter floors and records of slaughterings are lacking.

The abattoir in Banjul has an average daily output of 12 cattle and 12 sheep and goats. The water supply and drainage system are fairly good. Flaying is carried out on the ground by trained hands. Straight, pointed knives are still in use by the flayers, with resultant flaying damage, although the improved curved knives are provided. Hoisting the animals after killing for a period not less than 5 minutes is not practised, since the mechanical hoisting equipment is inoperative. Hoisting after killing is essential for the proper bleeding required to improve the keeping quality of hides and skins.

However, a project for the establishment of a modern central abattoir in Abuko, 11 miles (about 17 km) from Banjul is supposed to become operational within a year under the supervision of LMB. The projected abattoir will have a capacity of 8,000 to 10,000 cattle and 7,000 sheep and goats yearly. In the new project, it is planned that the hides and skins will remain the property of the abattoir, which would thus have direct control over the further handling of the hides and skins.

Hides and skins

Production

Since they are by-products of the meat industry, the hides and skins are produced in the country on three levels: in the Banjul central abattoir, in slaughter floors in the villages, and in the homes on ceremonial or private occasions. The conditions of flaying deteriorate progressively from the first to the third of these levels.

In 1969 the Government launched a hides and skins improvement programme that was implemented under the supervision of the Animal Health and Production Directorate, Industries Division, Ministry of Agriculture. A hides and skins improvement officer who was well trained on the job, assisted by 11 field staff, provide on-the-spot directions to butchers at the slaughtering sites and centres of collection in the country for applying improved flaying and curing methods. Improved curved flaying knives are being made available to the butchers in the villages at a reasonable price, transportation facilities for the collection of the hides are being provided and insecticides are being supplied for treatment during curing. The commercial value added to hides and skins by proper flaying and curing have been publicized throughout this activity.

Cattle, as well as sheep and goats, are flayed on the ground, and the operation is carried out with a straight or curved knife. Introducing case flaying after inflation in the case of sheep and goats would reduce the flaying defects.

Hides and skins produced by the Banjul abattoir are washed, slightly defatted while hanging on a rope, rinsed in an insecticide solution and then stretched on frames for air drying under a shed annexed to the Gambia Hides and Skins Export Co. (GHS). The drying period varies from 3 to 10 days according to the climatic conditions. It was noticed that the defatting of some hides was incomplete and inadequate; equipping the curing annex with a special table for defatting would improve this operation, which is important for perfection of the drying and curing.

The cost of curing by air drying in this shed is estimated to be B 50 for a hide and B 25 for a skin. After curing, the hides and skins are weighed and classified into weight and quality grades; the butchers are paid for the hides according to their resultant weight and quality. Storage is

carried out under fairly reasonable conditions. The curing annex is advantageous, since in addition to its role in the improvement of the commercial value of the cured hides, it is considered as a demonstration facility for the collectors who bring in hides and skins from the country.

Frame-drying is the predominant curing method applied in the country by the hide and skin collectors. This method was introduced through the hides and skins improvement programme and could be considered satisfactory under present conditions. The hides and skins are purchased from the collectors by GHS according to their dried weight and grade; most of them are in the frame-dried condition, while limited amounts are supplied in the ground-dried state.

The projected tannery will depend mainly on the projected central abattoir for its supply of raw material. The abattoir will be able to provide approximately 70% of the hides and skins. The supply of air-dried hides and skins to the tannery would cause difficulties in the process control, particularly in the soaking operation, as well as increased production cost owing to the higher consumption of water, preserving chemicals and power, coupled with the lengthy period required for soaking.

To avoid these difficulties, the replacement of air-drying by wet-salting could be considered for the new abattoir production, considering the availability and price of salt by that time. The smaller proportion of hides and skins supplies from up-country could continue to be air-dried.

According to the average green weight of hides and skins (33 lb (15 kg) and 4 lb (1.75 kg) respectively), the salt requirements for curing would be approximately 11 lb (5 kg)/hide and 2.2 lb (1 kg)/skin, with total requirements of 60 tons/year for the anticipated output of the projected abattoir. At its present price, salt is considered too expensive to be used for curing.

A report on salt-production prepared by a UNIDO salt expert indicated that salt is not readily available in the domestic market; the country imports 90% of its needs at a price of 178 B/lb (80 B/kg) (c.i.f., duty free). A project for salt-works expansion in Kerewan might provide the required salt for curing purposes at a reasonable price. However, this situation should be investigated in the light of probable conditions by the starting time of production at the tannery. In all cases, the collection and curing of the hides and skins produced by the central abattoir should be its responsibility, so as to provide the proper foundation for the tanning industry.

Quantity

Assessment of the availability of hides and skins in the country must be based on the tentative estimates of slaughterings of cattle alone, since such data are not available for sheep and goats.

Table 1 indicates the present marked low offtake percentage, since such percentages should be 10% to 12% for cattle reared under present conditions. This low offtake could result from the prestige associated with rearing the animals rather than commercial considerations, with a resultant high proportion of slaughterings of full-grown-animal killings and a reluctance to slaughter calves.

Table 1. Estimated present and projected availability of cattle hides

Year	Animal population	Estimated or projected slaughterings	Offtake <sup>b/</sup> (%)
1975	270 000	20 000	7.4
1980	310 500 <sup>a/</sup>	26 000	8
1985	357 075 <sup>a/</sup>	35 000	10

<sup>a/</sup> Calculated on the assumption of 3% annual rate of increase in the animal population.

<sup>b/</sup> Calculated.

Hides and skins collected for export are accurately recorded through GHS, and such exports represent the actually available raw material for the projected tanning industry. Average annual exports of hides and skins throughout the five years 1972-1977 are indicated in table 2.

Table 2. Average annual exports of hides and skins

Animal species	Population	Offtake <sup>a/</sup> (%)	Estimated slaughterings	Exports (average number of hides and skins per year)	Recovery (%)
Cattle	270 000	7.4	20 000	15 000	75
Sheep	300 000	20.0	60 000	5 000	8
Goats	300 500	20.0	60 000	12 000	20

<sup>a/</sup> Based on estimated offtake for cattle and assumed comparable offtake for goats and sheep reared under the same conditions.

The percentages of recovery shown in table 2 indicate the efficiency in collecting the raw material that would be available for further utilization. The percentage is apparently high and satisfactory in the case of cattle hides, while it is seriously deficient in the case of goats, while sheep showed the lowest percentage of collection. The tradition of private slaughtering of the ovines on ceremonial occasions as well as attempts to tan a few skins at the cottage level restrict the skins' availability either for export or for the projected tannery. Continuing efforts of the hides and skins improvement programme as well as the increased realization of the commercial value of such skins would lead to an increase in the number of skins available for the projected tannery. Assuming 50% recovery, this would provide the tanning industry with about 60,000 sheep and goat skins per year instead of the present supply, which is no more than 17,000 per year. The required efforts in this connection would be encouraged by the growing interest of the international market in the ovine skins to meet the demands of the leather garment and glove industries.

#### Quality

In the Gambia, hide and skin quality is assessed by quality and weight grades. The quality of air-dried raw material is classified into three grades. A fourth grade, rejects and ground-dried raw material, constitutes only a small quantity. Classification according to quality classes throughout the last five years showed a steady trend; no marked change was noticed in the proportions of classes. The average proportions for the exported hides and skins during the last five years are shown in table 3, which indicates the low proportion of cattle hides in grade I, while such proportions are higher for goats and sheep.

Table 3. Quality-grade proportions of exported hides and skins (Percentage)

Type of raw material	Quality grade		
	I	II	III
Cattle hides	12	40	48
Sheep skins	50	30	20
Goat skins	45	32	23

Grading according to weight is carried out on the dried cattle hides; they are classified into three classes: up to 8 lb, 8-12 lb and 12 lb and more (up to 3.6 kg, 3.6-5.4 kg and 5.4 kg or more). Data obtained regarding the weight grades and corresponding average dimensions are given in table 4, which shows that cattle hides of weight grade 12 lb and higher (5.4 kg or more) predominate, while hides of lower weight grades are widely variable. This suggests that a subdivision of this grade into two grades, namely 12 to 16 lb and 16 to 22 lb (5.4 to 7.2 kg and 7.2 to 10 kg), would be preferable. Such precise classification would improve the commercial value of the hides and facilitate their subsequent processing into batches of uniform hide weights, which could be considered for application in the new abattoir production.

Table 4. Weight grades and dimensions of hides and skins

Kind of hide or skin	Weight grade		Proportion in grade (%)	Dimensions: backbone length x maximum side width (cm)	Average weight per piece (air dried)	
	(lb)	(kg)			(lb)	(kg)
Cattle	0.8	0-3.6	10	172 x 72	6.5	3
	8-12	3.6-5.4	35	175 x 79	11	5
	12 +	5.4 +	55	186 x 89	15.5	7
Goat	-	-	-	80 x 35	1	0.5
Sheep	-	-	-	97 x 46	2	0.9

#### Marketing

Production of hides and skins in the Gambia is mainly for export in air-dried state through GHS, which is a public-sector company that operates independently on a commercial basis under the supervision of the LMB.

As shown in table 5, exports of raw material during the last three years showed steady declines in both quantity and value. These declines resulted from several problems reported by GHS; they result mainly from the high unit cost of handling and exporting the limited available quantities. The latest purchasing price of raw material by GHS (average 0.73 D/kg cattle hides and 1.41 D/kg sheep or goat skins, air-dried), reveals the narrow profit margin obtained. The problems of GHS are complicated by difficulties that stem from irregularity of shipment, which leads to long storage periods with resultant deterioration in quality and added storage costs. The large volume of the raw material in the air-dried state also represents another obstacle, since the use of a baling press would not be feasible.

Table 5. Exports of raw hides and skins

Year	Amount (tons)		Value (thousand D)		Average unit price (air-dried) (D/kg)	
	Hides	Skins	Hides	Skins	Hides	Skins
1972/73	73	10	114	28	1.56	2.8
1973/74	76	10	88	32	1.15	3.2
1974/75	68	9	53	27	0.78	3.0
1975/79	60	3	43	9	0.72	3.0
Average	69	8	75	24	1.05	3.0

Trade in fresh hides and skins is usual, since the butchers cure the raw material from their own slaughtering for subsequent supply to GHS. However, there are a few collectors who have suggested the flat prices of D 1.50 for fresh cattle hides and D 0.50 for fresh sheep or goat skins. It seems that the actual prices would be higher, since such purchases are normally made of mixed batches that are subject to further sorting and rejection. The purchase price of the air-dried supplies to the GHS would indicate the actual cost of the raw material that would be available for the tannery.

Raw material purchasing and selling is carried out according to classification rules issued by GHS, which specifies fairly the weight and quality grades. Additional specifications for flaying damage, and particularly for the permissible number and length of flaying cuts in each grade, are required to facilitate the judgement of quality.

#### The present situation of leather and leather goods

The tanning of hides and skins is carried out at the cottage level by a few tanners who are engaged mainly in agricultural and other activities. The old pit-tanning method is applied, utilizing some local vegetable tannin-bearing material. The process of liming, tanning, oiling and finishing, as well as the mechanical operations, are inadequate, so the resultant leather is of inferior quality. This situation applies to all of the available raw material and mainly the reptile and game skins. Since the trade in wild animal skins has been banned, the tanners' activity would be limited to sheep and goat skins to produce light materials for shoe uppers and leather goods as well as cattle hides for soles and insoles for sandals.



Leather goods production in the country is mainly oriented to sales in the tourist market. Approximately 100 workers around Banjul are engaged in handicraft manufacture, using the domestic production of leather, mainly from reptile and game skins. The articles produced, such as handbags, clutch bags, shoulder bags, wallets, purses and belts, as well as sandals, are of poor quality and limited design and could not be considered as souvenirs by the tourists since, with the exception of a few articles which are ornamented with interwoven raffia, they do not bear the traditional stamp of the country.

Methods of manufacturing leather goods are unsatisfactory. The attempts of the workers are seriously hampered by the lack of tools and equipment as well as of the proper auxiliary facilities throughout all the manufacturing stages. Lack of awareness was noticed to be common regarding the proper methods of production as well as of several simple technologies, such as ornamentation, carving and embossing, required for saleable tourist articles. The markedly low capacity was also noticed, since the production is carried out without a division in labour; for example, one worker will take three days to produce an entire leather brief-case, so its price must be high.

These leather goods are mainly displayed in the tourist market in Banjul as well as in other handicraft display sheds near the main hotels. The previously displayed goods made from reptile and game skins would be saleable due to their rarity, notwithstanding their poor quality. In the meantime, such products bring low prices, so the profit margin is quite limited. The same products could bring several times their present prices if properly prepared all the way from the raw material to the end-product.

Since the ban on reptile and game skins, the displays and manufacture have been limited to the articles of regular leather of sheep, goat or cattle, and their saleability has become low. The consumer judgement in this case is concentrated on the quality and design as well as the price, which is relatively high when the present level of quality is considered (table 6). Improving the leather quality, upgrading the manufacturing methods and creating a wide range of diversified tourist goods would be the solutions for the problems of this sector.

Table 6. Prices of various leather goods  
on the domestic market

Item	Average unit price (D)
Brief-case	30
Sandals (pair)	7
Handbag	20
Shoulder bag	25
Man's wallet	15
Purse	20
Coin purse	5
Clutch bag	20
Cigarette box	5
Wristlet	5

A programme jointly administered by the UNDP, the International Labour Organisation (ILO) and the Ministry of Economic Planning and Industrial Development, has established the society of Gambian Artisans' Marketing Co-operatives (GAMC), which is performing marketing activities to assist the manufacturers of several products, including leather goods. The society includes twelve leather goods manufacturers. It aims to improve the production level and the product design when provided with the required equipment and expertise. The body, with its allocated functions and aims, would be a suitable sponsor for a demonstration and training centre to be equipped with the facilities needed to help the handicraft manufacturers to improve labour skills and production levels. Such a centre would contribute to the establishment of small organized workshops for leather goods production that would be well prepared for the utilization of the production of the projected tanning industry.

Different parameters were reviewed (table 7) to determine the marketing possibilities of the foreseen improved production of leather goods and sandals in the domestic market, mainly for tourists. The relatively high per capita consumption of all types of footwear, almost all of which is imported, supports the possibility of the domestic market absorption of leather sandals. Most people in the main cities wear shoes or slippers. On the basis of these parameters, it should be quite feasible to encourage the leather goods and

sandals manufacture in the country to meet the demands of both the tourists and the domestic market. This sector could be established on a small but organized scale, since the required machinery and equipment could be afforded at that level.

Table 7. Parameters of leather products consumption

Total number of tourists						
Year	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75
Number of tourists	5 301	9 875	15 166	20 688	24 766	23 805
Rate of increase (%)	80	86	54	36	20	-4

Imports of leather goods			
Year	1972/73	1973/74	1974/75
Value (dalasi)	147 787	188 042	183 391

Imports of footwear (total)			
Year	1972/73	1973/74	1974/75
Value (dalasi)	1 527 526	1 091 738	3 469 981
Quantity (pairs) leather and synthetic	2 530 293	2 107 184	3 293 274
Population	497 000	511 000	525 000
Per capita consumption	5.1	4.1	6.3

Number of nonmilitary employees and projections			
Year	1975/76	1976/77	1977/78
Number of employees	4 481	5 882	7 676
Rate of increase (%)	-	31	30

Number of students (total)				
Year	1972/73	1973/74	1974/75	1975/76
Number of students	25 212	26 721	28 585	31 235
Rate of increase (%)	-	6	7	9

### The projected tannery

The export of raw hides and skins during the last decade has contributed to the establishment of channels for trade and the collection of the raw material. The implementation of the projected central abattoir would lead to marked improvements in both the quantity and quality of the hides and skins, which would provide a reasonable foundation for the projected tanning industry.

The available quantities of raw hides and skins would not be attractive to foreign companies that could provide technical assistance through joint ventures. Consequently, an independent approach for the development of this industry would be required, with careful preparation at each step.

### Size of the tannery

Upgrading the existing tanneries and encouraging the establishment of new cottage industries in the rural areas is unlikely, for several reasons. Problems arise from the difficulty of introducing process control at the cottage level, since the production of leather of satisfactory quality requires a knowledge of technical details and semi-mechanization that the small producers cannot afford. Consequently, these hides and skins could be better utilized in a centralized tannery of moderate size, since its products would be of a more satisfactory quality than those of cottage units, where the raw material would be wasted and the process control as well as future modernization would be difficult.

The hides and skins available for export provide a reliable estimate of the raw material for the projected tannery, bearing in mind the anticipated improvement in the quality and higher percentage of recovery after the establishment of the new central abattoir. Such estimates would be 15,000 cattle hides and 17,000 sheep and goat skins annually (that is, 70 tons of cattle hides and 8 tons of sheep and goat skins, air-dried). Such a scale would not appear to be economic for the establishment of a modern tannery to produce finished leather for export, owing to the need for sophisticated machinery, especially for the finishing operations. This situation would influence the type of products to be manufactured and necessitate flexibility in production.

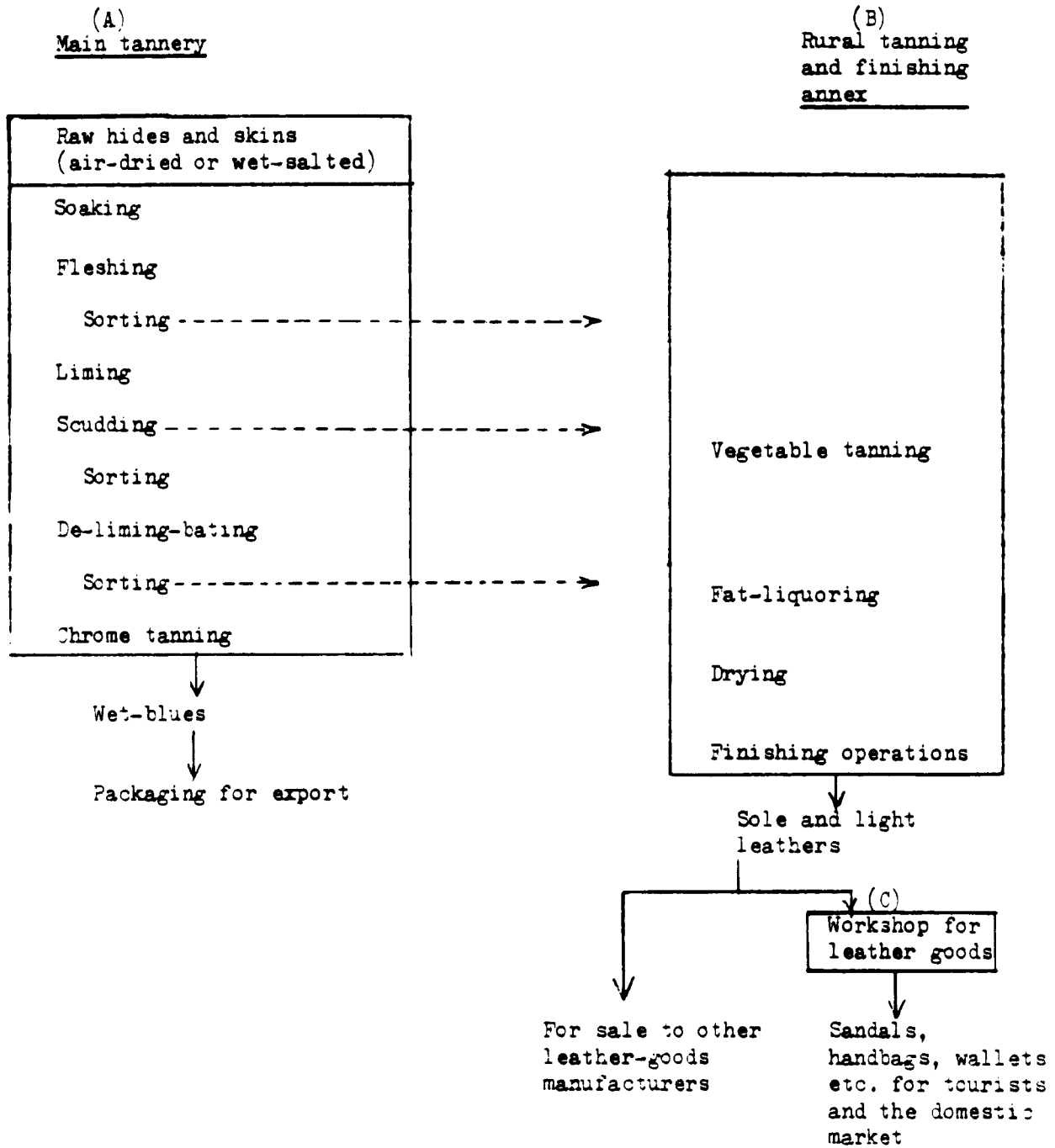
Type of establishment and production

Converting the hides and skins into semi-processed material for export would be the type of production that would be best suited to the prevailing conditions, since the machinery requirements would be quite small. Exports in the wet-blue state would have better saleability in the international market.

The raw material characteristics indicate that processing into the wet-blue form would increase the percentage of rejects, since the grain defects would be detected easily during inspection by the importer. Such rejects are estimated to be 20%, which could not be exported and should be processed in the Gambia into finished leathers. The rejects could be sorted during the stages of production prior to chrome tanning and directed to an annexed small-scale unit for further processing and finishing into vegetable-tanned leather. Vegetable tanning is more easily carried out on a small scale with minimum mechanization, since many operations can be done by hand, and good-quality leathers can be produced when the process is centrally controlled. Processing and finishing the rejects into vegetable-tanned leather would have the advantage of covering many surface defects. These leathers could be used for a wide variety of finished goods, such as soles and insoles for slippers, belts and handbags, and they are suitable material for carving and printing. The carving and printing of such leathers would also assist in covering the grain defects, while the goods would be suitable for sale in the tourist market owing to their ornamentation.

Attaching a simple leather-goods workshop to the vegetable tanning and finishing unit would improve the economics of the project considerably, since the manufacture of leather goods fetches a high added value and profit margin. Such a workshop would utilize part of the tannery production of leather; the rest could be available for sale on the domestic market to the small-scale manufacturers. Training and demonstration facilities could also be extended to these manufacturers for upgrading their level of production.

The accompanying figure outlines the main divisions of the projected integrated tannery as well as its principal products. Such integration will achieve maximum utilization of the product and overcome the disadvantages of small size.



Production flow-chart of the projected integrated tannery

### Water supply

In the Gambia, the large amounts of water required for the tanning industry could be obtained either from the river or bored wells.

The river water suffers from variability in salt content owing to saline encroachment from the sea during the dry season, which reaches 165 miles (about 265 km) up the river. This salt content can cause serious defects in the quality of the products, while treatment of the water would be expensive, which obviates the possibility of using river water for the tannery.

The municipal water supply around Banjul is available at a reasonable price (22 B/m<sup>3</sup>), which suggests the advisability of depending mainly on it.

Chemical analysis of this municipal water, which was carried out by Banjul Breweries Limited, proved its suitability for the tanning industry (2.5 German degrees of hardness, i.e. very soft). The tannery can depend partially on provisions for saving the rain-water during the rainy season, June-October (the average annual rainfall is 240 mm).

The integrated tannery producing 80% of the capacity up to wet-blues and 20% up to vegetable-tanned and finished leathers will require 6,000 m<sup>3</sup> of water per year, assuming that the raw material is supplied in the air-dried state. Supplying the raw material in the wet-salted state as well as using collected rain-water would lead to considerable reduction in water consumption and cost.

### Site of the tanning

Several sites for the tannery have been suggested and their suitability has been investigated. A site near Denton Bridge (near Banjul) appears to be the most advantageous, for the following reasons:

- (a) It is near the Banjul municipal water system;
- (b) It is only 12 miles (18 km) from the central abattoir;
- (c) Workers are available in the area;
- (d) It offers good marketing possibilities;
- (e) It is located on high ground; waste can be easily directed to a nearby swampy area to dilute effluents before disposal into the sea.

However, since tannery effluents and odours might have unfavourable effects on the surroundings, it was suggested that the decision on location be subject to more extensive investigations, in consultation with the physical planning authorities, regarding the long-term projections for the expansion of the city and the effects on the tourism industry.

### The building

For the capacity of the proposed integrated tannery, a simple building, 65 m x 20 m, would be required. It would consist of a corrugated asbestos roof supported by iron pillars, since high walls would hinder proper lighting and ventilation. Its floors should be of roughened concrete and should be contoured for proper drainage.

It would be preferable for the production flow to follow the U pattern, with the partitions between the main divisions, walls 1.5 m above the ground level. Provisions should be considered for constructing concrete soaking, liming and tanning pits, as well as concrete cisterns for saving the rain water and settling tanks for the effluents. Constructing the building in this way would facilitate future expansion when the anticipated increase in the supply of raw hides and skins is realized.

### Machines and equipment

Given the high cost of electricity (0.25 D/kW), non-electrical machinery should be used. Pits and paddles are to be used for all the operations except for tanning, where drums are preferable. Small drums have been chosen to suit the limited supply of raw material and to provide flexibility in production. In general, in the feasibility estimates (annex II), it was found preferable to economize on machines and power rather than on labour.

It was found that all of the machines, equipment, chemicals and auxiliaries as well as the main construction material have to be imported.

### Training

The implementation and operation of the projected integrated tannery through an independent approach requires the provision of experts as well as extensive training for the national cadre at all levels (managers, supervisors and workers), since trained personnel are not yet available in the country.

For the tanning operations, the training activities have begun at the managerial level. The Government has selected a national permanent counterpart for training abroad on leather technology for one academic year



in England (Nene College, Northampton). The trainee has acquired a good foundation for his foreseen training through his experience as a hides and skins improvement officer, and he has become familiar with the present project activities. This background should permit him to give special attention to the characteristics of the local industry during his studies. Upon the completion of this training, he would be able to contribute to the future development of the industry as a counterpart to an expert. The services of such an expert, which will be necessary throughout all phases of the project implementation up to the full operational stage, would also provide continuous on-the-spot training at the managerial level.

At the levels of the supervisors, technicians and workers as well, the training could be begun partially in a neighbouring country, while the basic training, both theoretical and practical, could be effected on the job. A visit to the Bata tannery in Senegal showed that full training could not be given there, since the technology applied there is different from that which is projected for the Gambia. However, the management in the Bata tannery has expressed willingness to provide partial training that would cover the main aspects of the tanning industry, including various mechanical operations.

According to the present pattern of leather goods production, the existing manufacturers could be considered as a good nucleus for further training. Since production would be mainly oriented towards the tourist market, training within the country would be optimal with the advantage of providing the workers with training tailored to the local conditions. This objective could be achieved through the establishment of a workshop, equipped with simple machines and tools, as a training centre to assist the small-scale manufacturers in up-grading their production methods. Such training would precede the establishment of the tannery so as to prepare the manufacturers to use the tannery production of finished leather to supply the domestic market.

## II. RECOMMENDATIONS

### Development of the leather industry

It is recommended that the Government support a complete national plan for the development of a leather industry in the country in the form of an integrated centralized unit, closely associated with the projected central abattoir but independently operated on a commercial basis.

The projected central abattoir should act as the main collector and supplier of raw hides and skins, and should perform the curing and grading. GHS should plan to direct its activities to the export of the anticipated production of semi-processed cattle hides and sheep and goat skins in the form of wet-blues.

In view of local conditions and the requirement for acceptable quality, the development of hide and skin tanning and finishing on the small-scale or cottage levels should be discouraged. These operations should be carried out in a medium-sized centralized unit rather than in small, scattered units.

The suggested integrated unit should comprise three lines of production in the following forms:

A main sub-unit to convert the local supply of raw hides and skins wet-blues for export

An associated sub-unit for processing the export rejects into vegetable-tanned and finished leather for uppers, soles and insoles for sale in the domestic market

An annexed small-scale workshop to develop and manufacture leather goods for the tourist and domestic markets

Since the projected production is mainly for export, the site of the integrated unit should be near Banjul, and preferably near Denton Bridge.

Special attention should be given to the up-grading of the small-scale manufacturers of leather goods through improving their production methods as well as introducing new designs and simple technologies required for a limited number of tourist articles. The following products should be given the first priority: sandals, ladies' handbags, wallets and purses, clutch bags and belts.

Three stages of development for the leather industry are recommended: preparatory, construction and start-up of operations.

One year should be devoted to the preparatory stage for carrying out the following activities:

Establishing and equipping a small-scale centre to provide training and demonstration facilities for the leather goods manufacturers to prepare a suitable base for the industry. During this stage this centre should depend on imported leather and eventually, in later stages, be transferred and attached to the projected integrated unit as a sub-unit for utilizing some part of the tannery leather production. Placing it within the framework of GAMC is recommended.

The preparation of a finally defined project for the projected integrated tannery unit, suitable for practical and immediate investment decision. This project should be based on the feasibility estimates arrived at in the present study and be justified by firm quotations for the machines, equipment and chemicals in conjunction with detailed investigations on the civil engineering work construction in a finally decided site.

Further technical assistance is recommended throughout the preparatory stage activities. The terms of reference are contained in annex III.

A training plan should be scheduled and implemented parallel to the development stages of the leather industry. A detailed recommended training plan is presented in annex IV.

#### Production of hides and skins

The wildlife conservation programme should investigate the possibility of rearing crocodiles in farms for their skins. Assistance of a specialized international agency such as the Food and Agriculture Organization of the United Nations (FAO) or the World Wildlife Fund might be sought to assess the viability of such project.

The collection and handling of shark skins should be thoroughly investigated in consultation with the collectors and fishery authorities with a view to making this material available to the projected tanning industry.

The hide and skin improvement programme should give special attention to the following aspects:

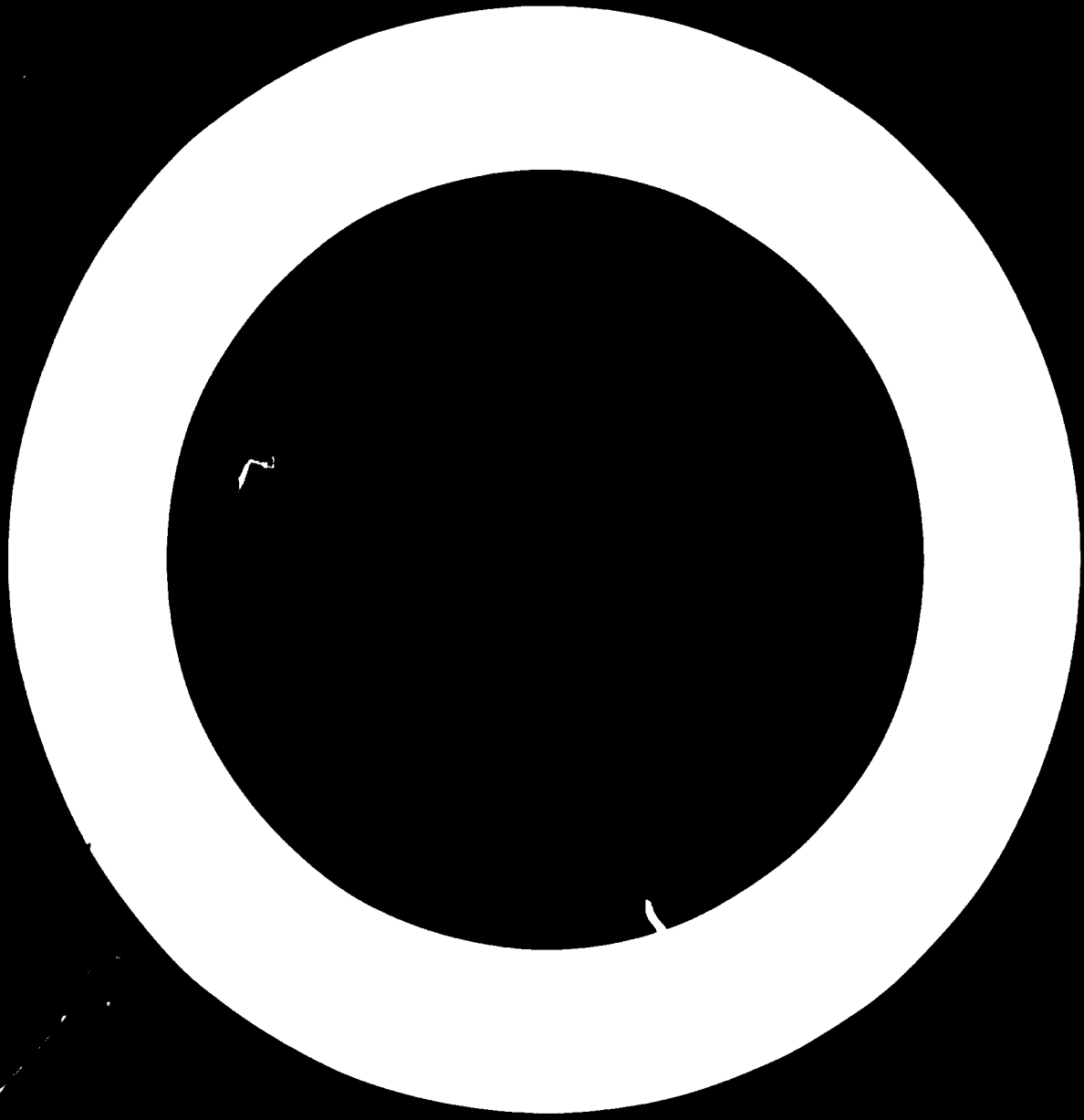
Encouraging the national livestock identification scheme to eliminate branding and to introduce de-horning to the cattle raisers.

Providing drainage, hoisting and shelter facilities to the slaughter floors in the villages.

Attempting to increase the volume of sheep and goat skins collected by publicizing their commercial value and providing collection facilities.

Legislating a minimum period of five minutes for hoisting the animals after slaughter as well as promulgating quality grades for the hides and skins according to a quantified freedom from flaying cuts.

An incentive/penalty system should be considered and based on the resulting quality of hides and skins.



Annex I

JOB DESCRIPTION

Post title: Leather industry expert (skin tanning)

Duration: One and half months

Date required: As soon as possible

Duty station: Bathurst, with travel within the country

Purpose of project: To advise the Government on the possibilities for the skins of sheep, goats and sharks, in particular, the availability of skins in the Gambia and in the surrounding regions of the Senegal (Casamance), the most appropriate processing technique of the skins, marketing possibilities and the economic feasibility will be studied. Also the needs for assistance in the training of tanning/tawering techniques are to be evaluated.

Duties: The expert will be expected to:

1. Draw up the terms of reference of a techno-economic feasibility study for a small-scale skin tannery unit based on a survey of:

The availability and quality of skins of sheep, goats and sharks in the Gambia  
Factor costs applicable in the Gambia

2. Carry out a complete feasibility study which inter alia would include analysis of:

Location  
Appropriate processing techniques  
Production costs and investment  
Cost-benefit evaluation.

3. Prepare public tenders for the equipment needed.

4. Assess the need for training in the proposed tannery techniques.

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

Qualifications: Extensive practical experience in tanning of skins from sheep, goats and sharks. Previous experience in preparing feasibility studies for small leather producing units is essential.

Language: English

Background information:

UNIDO experts have studied the development of leather production in several developing countries. Implementation of their proposals have shown the technical viability of relatively unsophisticated tanning methods for small production units, while at the same time high quality standards are obtained. For such units also the economic viability has been proven. The Government of the Gambia wants to study the possibility of benefiting from these experiences.

Annex II

FEASIBILITY ESTIMATES FOR THE  
INTEGRATED TANNERY UNIT

Basic Considerations and assumptions

The annual capacity of the projected integrated tannery unit is determined initially by:

15,000 cattle hides (70 tons air-dried) and  
17,000 sheep and goat skins (8 tons air-dried).

The unit is divided into three sub-units:

- A. Main unit for the manufacture of wet-blue hides and skins for export (80% of the raw material)
- B. Vegetable tanning and finishing unit for the manufacture of the export rejects for the domestic market (20% of the raw material). The major part of the finished leather (70%) to be made available for sale to the leather goods manufacturers, while the rest (30%) to be retained for manufacture into leather goods in sub-unit C.
- C. Small-scale workshop for the manufacture of leather goods for the domestic market.

The following estimates of the yields of leather are based on investigation of the local raw materials and information on the processing of similar batches at the Bata tannery at Dakar. On these bases, the production of the three sub-units is estimated to be:

- A. 12,000 cattle hides x 30 ft<sup>2</sup> (2.8 m<sup>2</sup>) average yield per hide = 360,000 ft<sup>2</sup>  
(33 480 m<sup>2</sup>) wet-blue  
13,600 sheep and goat skins x 5 ft<sup>2</sup> (0.47 m<sup>2</sup>) average yield per skin =  
68,000 ft<sup>2</sup> (6,324 m<sup>2</sup>) wet-blue
- B. 1,500 cattle hides (heavies) x 15.4 lb (7 kg) average weight per hide x  
1.4 lb (1.4 kg) average yield per lb (kg) = 32,340 lb (14,700 kg) vegetable-  
tanned sole leather



1,500 cattle hides (lights) x 36 ft<sup>2</sup> (3.35 m<sup>2</sup>) average yield per hide =  
54,000 ft<sup>2</sup> (5,025 m<sup>2</sup>) vegetable-tanned cattle uppers

3,400 sheep and goat skins x 7 ft<sup>2</sup> (0.65 m<sup>2</sup>) average yield per skin =  
23,800 ft<sup>2</sup> (2,213 m<sup>2</sup>) vegetable-tanned sheep and goat skins

Assuming that 70% will be sold on the domestic market, the rest being retained for manufacture in sub-unit C, the production for sale of sub-unit B would be:

22,867 lb (10,290 kg) sole leather

37,800 ft<sup>2</sup> (3,515 m<sup>2</sup>) vegetable-tanned cattle uppers

16,600 ft<sup>2</sup> (1,544 m<sup>2</sup>) vegetable-tanned sheep and goat skins

- C. If 30% of the output of sub-unit B is retained for the production of leather goods, the supply to this unit would be:

9,800 lb (4,410 kg) sole leather (soles and insoles)

16,200 ft<sup>2</sup> (1,507 m<sup>2</sup>) vegetable-tanned cattle uppers

7,140 ft<sup>2</sup> (664 m<sup>2</sup>) vegetable-tanned sheep and goat skins

Assuming that these leathers will be manufactured into three main products, the output of this sub-unit would be:

6,000 sandals (pairs), 1,700 handbags and 4,000 wallets.

The latest purchase price of air-dried raw hides and skins is adopted basically as the raw material cost. However, it is anticipated that the cost structure of hides and skins will be liable to changes after the erection of the new abattoir with expected improvements in the quality and increases in the costs.

Costs of machines and chemicals are tentative estimates according to the current prices, since no quotations have been sought. The indicated estimates are for equipping sub-units A and B with reconditioned machines, while new machines are suggested for sub-unit C. If reconditioned machines are not acceptable, the indicated estimates would increase by approximately 100%, with resultant effects on the economics of the project. The indicated estimates for the reconditioned machinery include 10% for spare parts.

The export prices of wet-blues are based on purchases of similar material in Europe, while the sales revenues in the domestic market are guided by the current prices in Banjul.

Consistency in product qualities and achievement of the calculated profit would not be reached before three years from the start of operations, and then only provided that the necessary expertise and training throughout the phases of project implementation will be available.

The costs of building and civil construction are based on tentative information provided by the Building Control Authority.

The present study is considered as a prefeasibility estimate outlining the tentative costs and profits, according to the information obtained and the investigations carried out during the mission of the expert. The findings could form the basis for further steps in the development of the integrated tannery project.

Cost estimates

<u>Fixed capital</u>	<u>(D)</u>
Preliminary expenses	3 000
Land	50 000
Building, including pits, drainage, settling tanks, lights and fittings	160 000
Machines and equipment	241 000
Cost of erection	5 000
Vehicles	25 000
Laboratory	15 000
Maintenance shop	<u>25 000</u>
Total	524 000

Working capital

Raw hides and skins (one month's stock)	8 125
Chemicals and auxiliaries (three months' stock)	41 200
Work in progress/finished stock (three months)	<u>150 125</u>
Total	199 450
(i.e.	200 000)

Machines and equipment c.i.f.

A. The wet-blue tannery sub-unit	
2 Drums (2.4 x 2.4 m) 8-12 rev/min	37 000
4 Paddles	16 000
1 Fleshing machine (210 cm)	25 600
1 Dehairing machine (185 cm)	18 000
1 Platform scale	1 400
1 Boiler	17 000
Auxiliary tools and equipment, draining horses, beams, etc.	<u>10 000</u>
Total	125 000
B. The vegetable tanning and finishing sub-unit	
1 Drum (2.4 x 2.4 m) 6-12 rev/min	18 500
1 Shaving machine (120 cm)	26 000
1 Glazing machine	16 000
2 Spraying guns with compressor	2 500
Auxiliary tools and equipment	<u>10 000</u>
Total	73 000
C. Workshop for leather goods sub-unit	
2 Sewing machines - flat-bed, single-needle	6 900
2 Sewing machines - column-bed, single-needle	16 000
1 Skiving machine	3 500
1 Sole-attaching press	4 200
1 Embossing press (plate 40 x 40 cm)	3 000
Tools and auxiliaries	6 500
Sundries (tables, shelves etc.)	<u>2 900</u>
Total	43 000
Total machines and equipment cost	241 000

Personnel: (yearly salary)

1 Manager	9 000
3 Supervisors/technicians	21 000
3 Maintenance staff	15 000
3 Stores staff	6 000
1 Cashier/accountant	3 500

1 Clerk	3 000
2 Watchmen	5 000
24 Skilled workers	77 000
15 Unskilled workers	<u>24 000</u>
Total	163 500

Chemicals and auxiliary materials (per year)

30 kg soaking auxiliaries	300
15 tons liming agents	15 000
25 tons common salt (NaCl)	20 000
5 tons de-liming agents	9 000
1 ton bating agents	2 000
5 tons organic and inorganic acids	8 000
1 ton neutralizing agents	11 500
35 tons chrome tanning agents	60 000
6 tons vegetable tanning agents	15 000
3 tons fat-liquoring agents	9 000
Dyes and finishing auxiliary materials	<u>20 000</u>
Total	169 800

Auxiliary materials for leather goods  
(threads, adhesives, accessories etc.) 5 000

Total chemicals and auxiliary materials 174 800

Production costs (240 working days/year)

Raw hides and skins	97 500
Chemicals and auxiliary materials	174 800
Power, steam and water	15 000
Personnel	163 500
Managerial cost	4 000
Depreciations:	
5% on buildings	8 000
1% on machines	24 100
Interest on capital outlay (8%)	16 000
Maintenance and repair	5 000
Packaging	<u>5 000</u>
Total	512 900

Sales/year

A. Wet-blues for export (f.o.b.)  
360,000 ft<sup>2</sup> cattle hides x 0.80 D/ft<sup>2</sup> 288 000  
68,000 ft<sup>2</sup> sheep and goat skins x 0.95 D/ft<sup>2</sup> 64 600  
Total 352 600

B. Finished leather for the domestic market  
10,290 kg sole leather x 3.0 D/kg 30 870  
37,800 ft<sup>2</sup> cattle uppers x 1.80 D/ft<sup>2</sup> 68 040  
16,660 ft<sup>2</sup> sheep and goat x 1.50 D/ft<sup>2</sup> 24 990  
Total 123 900

C. Finished goods for domestic market  
6,000 sandals (pairs) x D 7.0 42 000  
1,700 handbags x D 25.0 42 500  
4,000 wallets x D 10.0 40 000  
Total 124 500

Total sales 601 000

Gross profit

Total sales 601 000  
Total production cost 512 900  
Estimated profit (17%) 88 100

Annex III

TERMS OF REFERENCE FOR A FOLLOW-UP  
PROJECT

Request from the Government of the Republic of the Gambia

- Post title: Leather and leather products industry adviser
- Duration: One year
- Duty station: Banjul with travel within the country
- Purpose of project: To assist the Government (Ministry of Economic Planning and Industrial Development/Ministry of Agriculture) in establishing, equipping and operating a leather goods training and demonstration centre within the framework of the Gambian Artisans' Marketing Co-operatives. This centre is to improve the manufacturing methods of leather goods and to prepare a suitable base for utilizing some part of the leather to be produced by a projected tannery, as leather goods for the tourist market. The assistance is required to be extended for the preparation of a finalized project suitable for immediate investment decision and guided by previous studies on the establishment of an integrated tannery unit in the country for processing the available raw hides and skins mainly for export but also for the local market.
- Duties: The adviser will be attached to the Ministry of Economic Planning and Industrial Development/Ministry of Agriculture, and will be expected to:
1. Assist in selecting the machines, tools and equipment as well as auxiliary supplies and materials required for establishing and operating a leather goods training and demonstration centre.
  2. Develop a training programme for the local cadre on leather goods production.
  3. Provide advice to leather goods manufacturers for equipping their production units and upgrading their production methods.
  4. Introduce improved technologies and knock-down designs for leather goods adopted to tourist market in the country.
  5. Prepare a completely defined project suitable for an investment decision for the establishment of a leather industry integrated unit based on previous studies and justified by firm quotations for machines, equipment

and chemicals in conjunction with detailed investigations on the civil engineering work at a designated site.

6. Advise on further stages of development and training aspects as well as further actions throughout these stages.
7. Train a national counterpart on the above-mentioned activities.
8. Develop a brief theoretical course on tanning operations projected in the country for the national cadre

	<u>Cost</u> <u>(\$)</u>
Supplies and provisions:	
Machines and equipment	18 500
Auxiliaries	5 000
Material for demonstration (imported leather)	8 000
Total	<u>31 500</u>

Annex IV

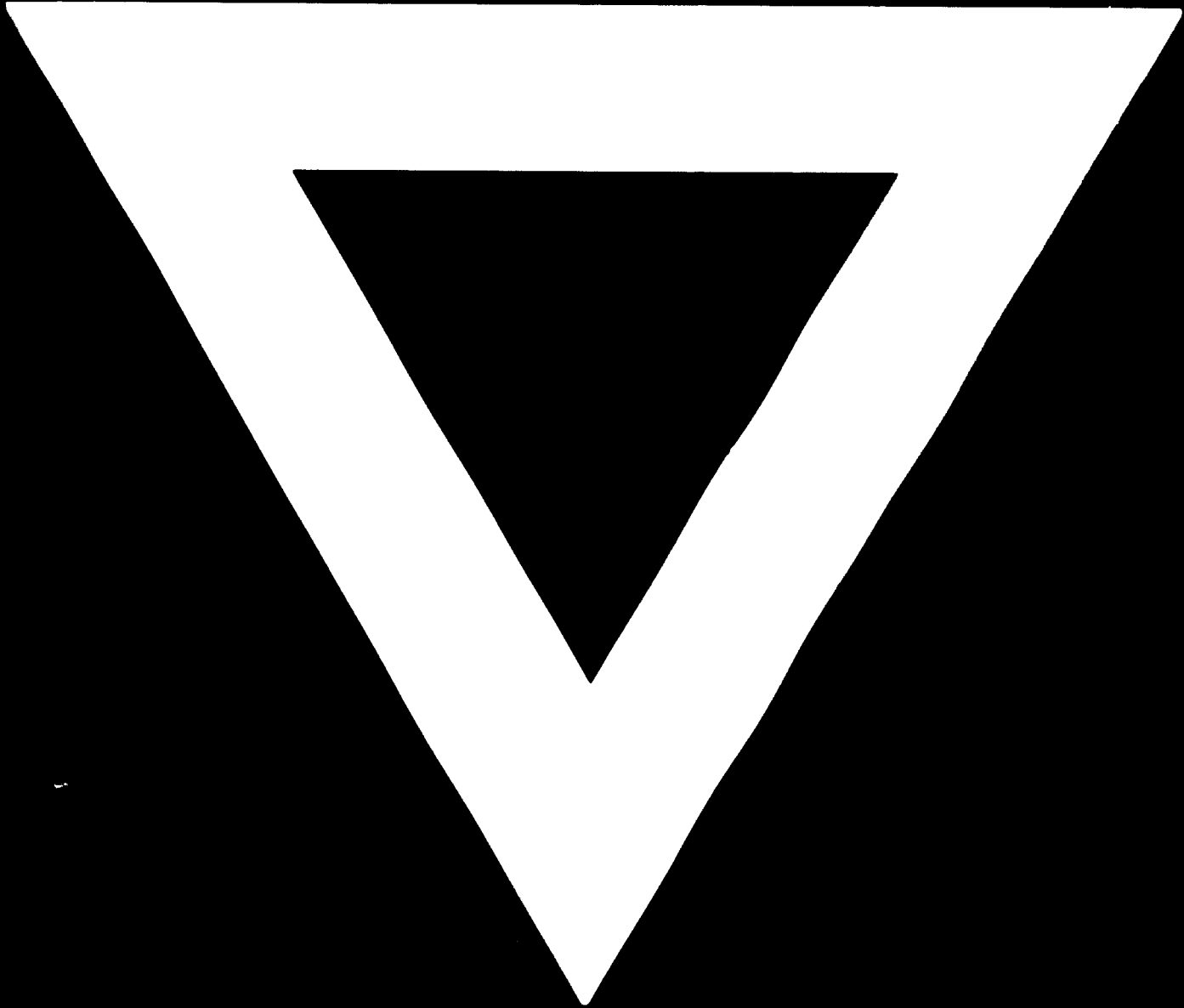
RECOMMENDED TRAINING PLAN

Level	Number of trainees	Timing	Duration	Type	Site
Managerial	1	Already started and followed through all development stages	1 year and 2 to 3 years	Leather technology On the job as a counterpart to an expert	Nene College Northampton, England Locally
	2	Late preparatory stage	3 months	Theoretical tanning operations	Locally
Supervisors/ technicians	1	Preparatory stage	8 months	Practical leather goods	Locally (training centre)
	2	Construction stage	6 months	Practical tanning operations	Neighbouring country (Senegal or Morocco)
	2	Operation stage		Practical tanning operations	Locally, on the job
	10	Construction operation	4 months	Practical chrome tanning (wet-blues) mechanical and manual operations	Neighbouring country (Senegal), followed by local training on the job
Workers	10	Construction operation	4 months	Practical vegetable tanning and finishing, mechanical and manual operations	Neighbouring country (Morocco), followed by local training on the job
	4	Preparatory construction operation	8 months	Practical leather goods	Locally (training centre)





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