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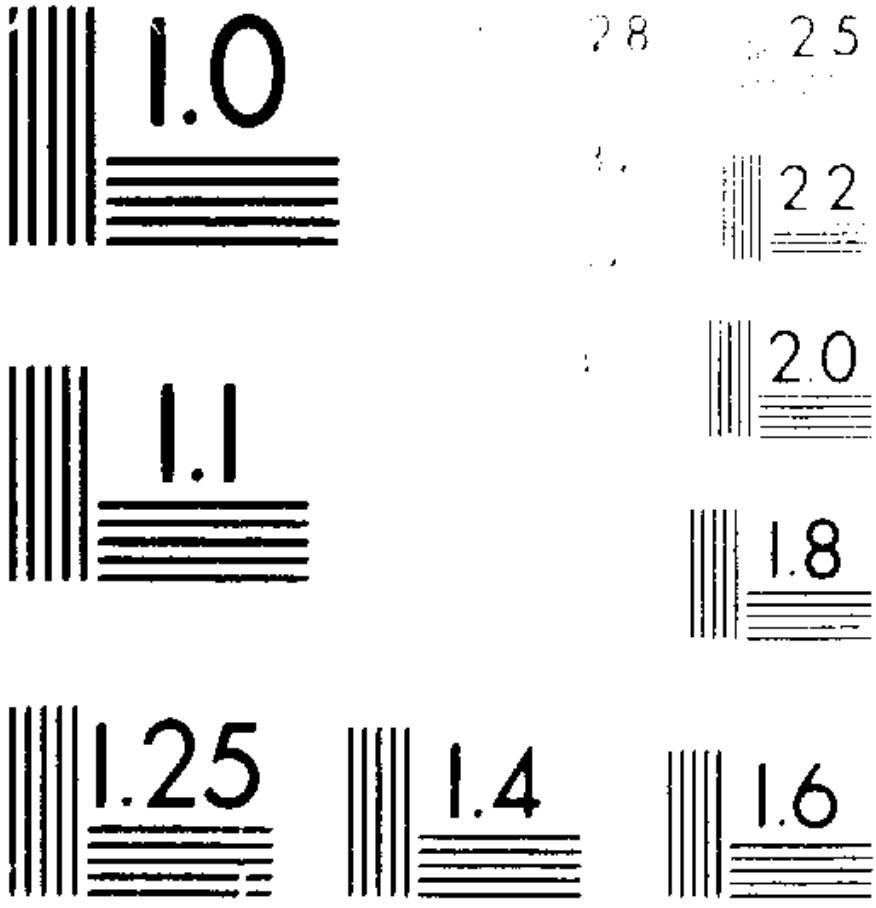
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Kenya.

ESTABLISHMENT OF A LEATHER QUALITY CONTROL LABORATORY

US/KEN/78/204

KENYA

Terminal report

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

Based on the work of Marton Berci, leather industry consultant
and Chief Technical Adviser

V.84-93154
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Explanatory notes

Reference to dollars ($) are to United States dollars.

The monetary unit in Kenya is the Kenyan shilling (KSh). During the period covered by this report, the mean value of the Kenyan shilling in relation to the United States dollar was $US 1 = KSh 13.05.

A point (.) is used to indicate decimals.

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

The following symbols have been used in tables:

Two dots (..) indicate that data are not available or are not separately reported.

A dash (--) indicates that the amount is nil or negligible.

Abbreviations of organizations

AHITI	Animal Health and Industry Training Institute
FAO	Food and Agriculture Organization of the United Nations
KBS	Kenya Bureau of Standards
KIE	Kenya Industrial Estates
KIRDI	Kenya Industrial Research and Development Institute
PISIE	Politechnico Internationale per lo Sviluppo Industrial ed Economico, Jesi-Ancona, Italy

Economic and technical abbreviations

CTA	Chief Technical Adviser
c & f	cost and freight
f.o.b.	free on board
Run	term applied to grade I-III raw skins
sq ft	square foot, trade unit of measurement for leather (1 sq ft = 0.0929 m^2)

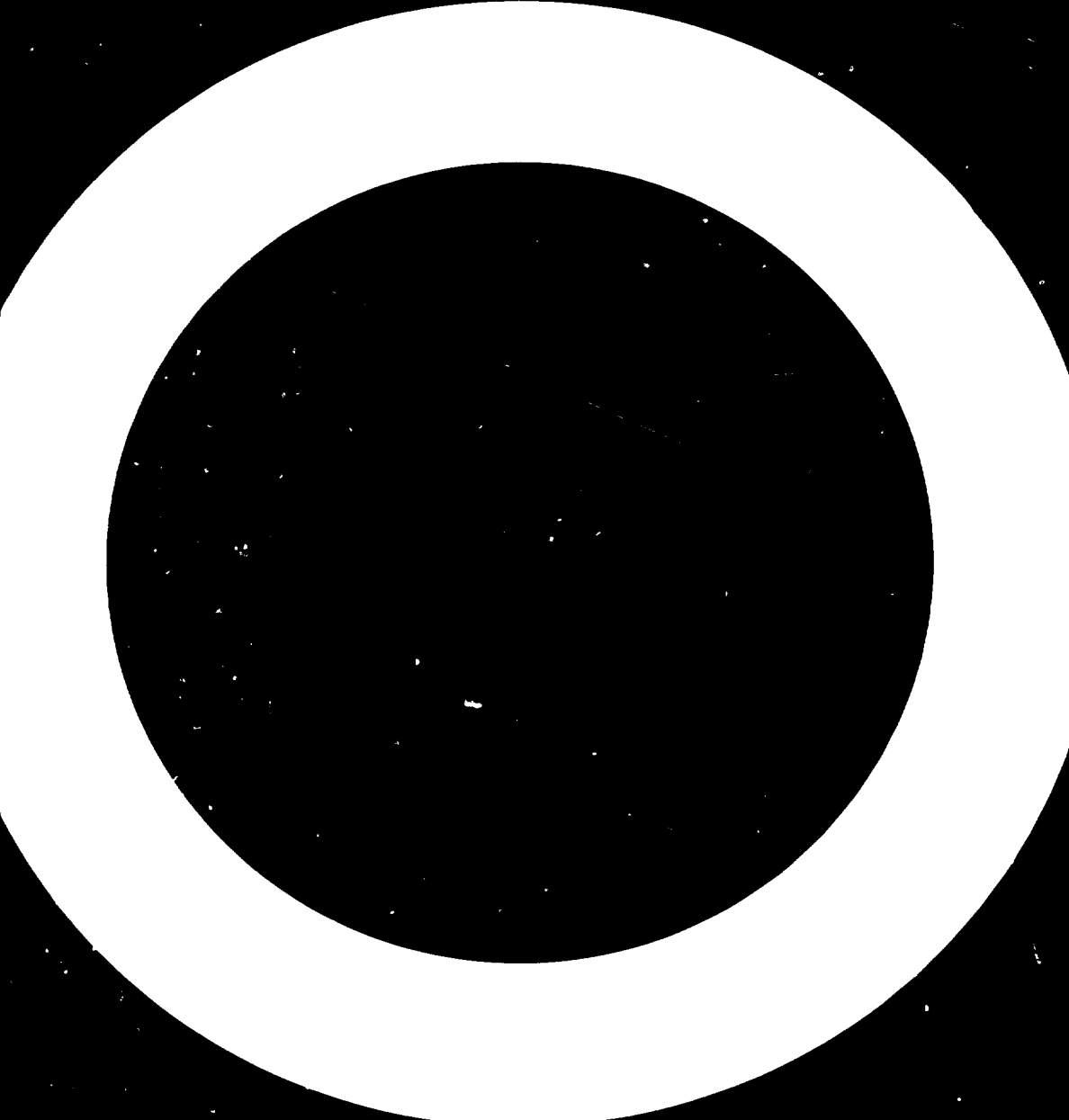
Mention of firm names and commercial products does not imply the endorsement of UNIDO.

ABSTRACT

The leather and leather products industry in Kenya is considered to be one of the most important of those industries which are domestic-resource based. Currently this sector is poorly developed. The Government of Kenya requested assistance from the United Nations Industrial Development Organization (UNIDO) to improve the sector using the special purpose contribution offered by the Government of the Federal Republic of Germany. The Government of Uruguay agreed to collaborate within the framework of Technical Co-operation among Developing Countries (TCDC). The project, "Establishment of a Leather Quality Control Laboratory" (US/KEN/78/204), was set up in 1978. This document is the terminal report on the project.

The report describes in detail the recent situation of the Kenyan leather industry, studies the possibilities of increasing its output by improving quality, and the services to be rendered by the Kenya Industrial Research and Development Institute (KIRDI).

The recommendations include measures required to increase the supply of raw hides and skins for further processing, extending the services of KIRDI, training programmes and a proposal for setting up a leather processing pilot plant. A feasibility study on the further expansion of the KIRDI leather section is included.



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INTRODUCTION

This project, "Establishment of a leather quality control laboratory" (US/KEN/78/204), has been carried out for the Government of Kenya by the United Nations Industrial Development Organization (UNIDO) using the special purpose contribution offered by the Federal Republic of Germany. The Government of Uruguay agreed to collaborate within the framework of Technical Co-operation among Developing Countries (TCDC). The contributions made by the Kenyan Government to this project are described in detail in annex I.

The immediate objective of the project was to establish a leather quality control laboratory in Kenya and thus assist the manufacturers of leather products to meet and maintain international quality standards. The long-term objective of the project was to conduct a systematic programme of applied research in the leather sector and thereby support the Kenyan Government in implementing its strategy for the leather sector.

Project background

Kenya's current industrial-development strategy calls for the industrialization of those sectors of industry which are domestic-resource based. The leather and leather products industry is considered to be foremost amongst these. Hides and skins, an abundant agricultural by-product in Kenya, are among the few agricultural raw materials capable of being significantly developed, with high-quality finished leather as the final product. However, the leather and leather-products industrial sector is poorly developed. Only about 20 per cent of the hides and none of the skins are processed by modern procedures into crust or finished products, which means that only about four per cent of the total production of hides and skins is turned into finished products.

To date, international assistance to the leather sector in Kenya has been geared to upgrading quality standards of the raw materials. To this end, there was a project of the Food and Agriculture Organization of the United Nations (FAO) at the Animal Health and Industry Training Institute (AHITI) under the auspices of the Kenyan Ministry of Agriculture. The major aim of the project was the training of hide and skin inspection personnel.

Current government policy recognizes the need to concentrate on the industrial processing of the improved raw materials. In line with this policy, the establishment of the leather quality control laboratory was proposed. It was intended to ensure that leather products attain acceptable international quality standards. The laboratory is to devote itself to the industrial-processing aspects of the sector and to complement AHITI, which continues to be responsible for the raw materials.

Project activities

The project proposal was submitted in March 1979 and the project started in April 1980 when a consultant, D. Winters (United Kingdom) was fielded. It was through his recommendations that the Government decided to locate the project at the Kenya Industrial Research and Development Institute (KIRDI) instead of at the Kenya Bureau of Standards (KBS). In the same year, R.<Boccone (Uruguay) was selected for the post of quality-control expert and was fielded for one month to initiate the training of the fellows in Uruguay. He continued his split mission in June 1981 in Kenya and was debriefed in January 1982. M. Berci (Hungary) was appointed as Chief Technical Adviser (CTA) and arrived in Nairobi to start operations on 12 January 1981. In the

initial ten-day mission, agreement was reached with the counterpart co-manager Dr. R. Arunga, Director of KIRDI, concerning the location of the laboratory and pilot plant, the detailed list of the equipment to be ordered, and the project timing. The CTA returned to Nairobi in May 1981 on a contract extending to 28<October 1982.

R. Schubert was selected for the post of leather technologist. During his three-month assignment (January to April 1982), he prepared a study on phase two of the expanded tannery pilot plant (see Documentary Outputs of the Project). His report has not been attached to this report, since it has already been distributed to all the relevant authorities and institutions. Based on that report, UNIDO advised the partners in the project to extend the contract of the CTA for another year in order to (a) consolidate the results already achieved; (b) give further assistance to the industries within the sector; (c) elaborate standards for leather and leather products; (d) prepare the plan for the second phase of the project including a complete pilot plant; and (e) prepare a study including recommendations for a long-term strategy for the leather industry. The contract of the CTA was extended by 12 months up to October 1983. The revised UNIDO contribution amounted to $US 420,059, including overheads. Utilizing the uncommitted balance of the funds from the project, a short follow-up mission by the CTA took place from 9 July to 8<October 1984.

The objectives of the follow-up mission were:

(a) To extend the training programme of the counterparts, consolidate the results already achieved and reinforce further the industrial linkage;

(b) To install and put into operation the shaving and buffing machines ordered during the last phase of the project and to up-grade the operations of the experimental plant to produce leather in the crust state;

(c) To carry out preparatory work for starting up the third phase of the project, including discussions with the Government and with industry about financing the operations of the planned pilot plant.

A timetable of all the project activities is given in annex II and a list of all the documents and papers left with the counterpart at the end of the CTA's mission is given in annex III.

Achievement of project objectives

In general, the long-term development objective of the Kenyan Government is to increase foreign-exchange earnings from exports by utilizing the natural resources of the country so as to maximize the possible added-value of its raw materials. This project was designed to carry out this long-term objective within the leather sector and the immediate objectives, as outlined in the project document, were to set up the organizational structure, facilities and personnel to work towards achieving the long-term objectives. The achievement of these project objectives are assessed in the following paragraphs.

Together with counterparts from KIRDI, the international team has established the laboratory and the small pilot plant which are both fully operational and are assisting the manufacturers to meet international quality standards.

The laboratory for leather is fully equipped and serviced by personnel capable of conducting tests according to international standards for leather

and leather products. The counterparts are able to assist the leather and shoe industry with all kinds of quality problems after analysing the problems in the laboratory.

A statistical data bank has been initiated with the necessary continuous linkage to the sources of data. The library for the leather sector could not be adequately established as envisaged because of the scarcity of funds. A quality-data bank has been established.

The national team of leather chemists and technologists has improved considerably, mainly during the period for which the contract of the CTA was extended. However, as the facilities are only available for processing up to wet-blue state, the training has not been able to go further than this. To extend the training programme, the full pilot plant should be completed. This would also ensure the improvement of the quality of finished leather and leather products and not only that of the semi-finished products. This in turn should lead to an increasing volume of production of leather and leather products with higher added value, i.e. finished leather and leather products rather than the current exportation of raw material and wet-blue leather.

The project outputs have been improved by the extension of the project period. Besides the completion of the training of counterparts in laboratory and pilot-plant work up to wet-blue, a draft proposal for the establishment of standards in the leather sector was completed and the actual standard for wet-blue hides and skins will soon be put into operation by the KBS.

The main output during the extension, has been the feasibility study of the complete pilot plant (see the appendix) which is one of the most important tools for achieving the objectives of the project.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions are given for the different topics dealt with in this report and these are followed by numbered recommendations.

Raw materials

It is shown in this report that the production of raw hides and skins is decreasing without the expected improvement in quality.

The decrease in the production of hides and skins corresponds to decreasing livestock populations. According to the official statistics from the Ministry of Livestock Development, from 1980 to 1981 the cattle population dropped by about 300,000 head, that of goats by about 750,000 head. During the same period, the sheep population increased by about 230,000 head. The main reason for the decrease in livestock numbers and therefore in hides and skins is thought to be the drought. However, there may also be a number of additional reasons for the declining hide and skin production.

1. It is recommended that a meeting of all the interested parties be convened to recommend suitable measures to be implemented to reverse this trend.

It has been shown by model experiments that the intrinsic quality of the raw materials is very good. Two steps are recommended to help realize this potential.

2. The flaying and curing facilities in the whole country should be reviewed.

3. The Animal Health and Industry Training Institute (AHITI) should redirect its activities to concentrate more on problems of raw-material quality.

The leather and leather-products industry

Although there is a great deal of enthusiasm for further investment in leather industries, most of the proposed projects were found not to be feasible because of the lack of raw materials.

The facilities and the technical skills in the existing factories are good but the bulk of the capacity only goes up to semi-finished products. The capacity for manufacturing leather shoes is good but not fully utilized, that for leather goods and garments is non-existent, except for a small modern leather-goods factory which started operating just recently. The consumption of leather shoes in Kenya is about 0.1 pairs per capita while that for non-leather shoes is about 0.5 pairs per capita. Even the combined figure of 0.6 pairs per capita is fairly low and experience shows that considerable increases in consumption can only be considered as a long-term target.

The lack of raw material (raw hides and skins in case of tanneries and finished leather in case of manufacturers) has been partly solved by the new increased rate of taxation imposed on the export of hides and skins with effect from 1 July 1983. Some other problems remain to be tackled.

4. It is highly recommended that the import taxes on chemicals and spare parts should be removed and that taxes on tanning and manufacturing machinery should be reduced.

5. Efforts should be made to ensure that major chemicals used in the leather industry are readily and continuously available.

The spatial distribution of tanneries in Kenya is lopsided, most of them being located in the triangle Athi River-Nairobi-Thika. The rivers in this area are therefore overloaded with the discharge from the tanneries.

6. In future, location of tanneries in this area should be discouraged and investment in tanneries should be directed towards the Nyanza and Western Provinces where livestock production is highest.

Because of the large number and variety of sponsors even the relevant government ministries are sometimes not aware of the existence of certain enterprises. The existing directory of enterprises is not adequate because only the names (e.g. Allied Leather Ltd.) of the enterprises are listed without any indication of the nature of their activity.

7. A directory of all the existing factories, and approved and proposed projects should be compiled.

8. All sponsors of new leather projects should be compelled to register the projects with the Industrial Promotion Department of the Ministry of Industry.

Economic aspects

Many investors came to KIRDI for advice. They were discouraged from investing in wet-blue skins because of the existing excess of installed capacity. There is, however, room for processing hides to wet-blue and for all kinds of finished leather and leather products. In this context there are some recommendations.

9. In the future, incentives should be instituted to direct the flow of investment so that it is in keeping with the Government's long-term strategy in the leather sector.

10. It is advisable to introduce incentives for investors varying according to the degree of finishing of the manufactured products and the level of employment of the projected factory.

11. Top priority should be accorded to small modern shoe and leather-goods factories.

From export figures, the potential for foreign-exchange earnings and increased added value is encouraging.

12. It is evident that all the external markets should be examined and explored and a plan developed to implement a step-by-step exploitation of the potential added values.

13. Since marketing is of major importance, the role of the Chamber of Commerce and Industry should further be enhanced in the following ways:

(a) The Chamber should commission a study on the inter-African marketing possibilities and later on another on the marketing possibilities among other developing countries;

(b) The Chamber should establish, as soon as possible, a marketing office in Europe. This office would have the following responsibilities:

(i) To give up-to-date price and market information;

(ii) To place advertisements for the industry;

(iii) To organize participation of Kenyan producers in the international leather shows and exhibitions.

14. If this proposal is not feasible, then a contract should be made with one of the existing enterprises dealing with the above activities.

It should be noted here that a temporary decrease in foreign-exchange earnings will occur during the transition from raw-material trade to semi-finished trade.

15. The Chamber of Commerce and Industry should consult with its partners in India and Argentina who have implemented similar measures with considerable success after long periods of transitional problems.

Kenya Industrial Research and Development Institute (KIRDI)

16. The medium and small-scale factories should be assisted in creating minimum facilities for in-factory quality control (thermometers, portable pH meters, barkometers, beakers etc.).

17. In the field of standardization, draft standard proposals for crust, finished leathers and shoes should be prepared for common use.

18. Testing of the overall quality of Kenyan leather products should be repeated. Sampling should be done by the Kenya Bureau of Standards (KBS).

19. Model experiments with hides should be continued. Later on, the skin experiments with 100 pieces each and hide experiments with 20 pieces each should be repeated to consolidate and confirm the results on the quality of Kenyan hides and skins.

20. Factory training in finishing should be organized (Bata Shoe Ltd.).

21. At least three short-term training fellowships should be provided in 1984 and 1985 for suitable candidates for two weeks each (CIBA-GEIGY, STAHL, BASF).

22. The feasibility study for Gesonso Tanners should be finished and delivered.

23. Every month at least one factory should be inspected.

24. The research programmes should be continued as follows:

(a) Physical and chemical properties of finished and semi-finished materials should be compared;

(b) Costs of lime and chrome-liquor treatments with their investment costs should be calculated;

(c) Methods of pickling, chrome-tanning and rinsing should be developed to give the correct pH values and low amounts of water-soluble salts in wet-blue state leathers.

25. Effluent-treatment analysis should start after the incubator has been purchased.

I. RAW-MATERIAL SUPPLY SITUATION

A. Raw hides and skins

Figures relating to the supply of hides and skins are presented in table<1. An attempt has been made to assess the available quantities of hides and skins and to make a forecast for 1990. Official figures from the Ministry of Livestock Development have been used for hide and skin production and figures from the Ministry of Finance for imports and exports in 1980 and 1981. The rest of the figures are estimates. The figures for non-official imports are very rough estimates, but the quantity of raw materials consumed (export plus production of wet-blue, crust and finished) tallies well only by assuming the indicated quantities of non-official imports. It should be emphasized that a sudden stop in the "walk-in" of animals (or raw materials) would have a strong impact on the supply of raw materials in Kenya and consequently on the whole leather sector. The quantities available for processing forecast for 1990 may not be completely accurate but this could as well apply to 1980, 1981 and 1982 figures. Comparing the production figures of tanneries with those "available for processing" in this table, it would appear that in 1981 and 1982 there were higher non-official imports of hides and skins.

Despite the contradictory figures for 1981 and 1982, the official figures and the moderate estimates for non-official imports have been adopted mainly because the total figures for material available for production in the three consecutive years 1980, 1981 and 1982 (2,052,000 hides, 9,218,000 skins) correspond fairly closely to the figures for actual production for these years taken from annex VII (1,550,000 hides, 9,277,000 skins).

The impact of the drought has badly affected production in 1983. The figures for 1984 will be worse. In the last few months about ten thousand animals have been starving even though herdsmen have been trekking with their herds hundreds of kilometres looking for pastures everywhere including the National Parks. The abattoirs are now working to their full capacity. It is not unusual to see the animals collapse in the front yard of an abattoir before being killed.

Non-official imports have been in existence for several years, although they cannot be guaranteed. The moderate estimated figures could drop or almost disappear due to unexpected events.

Discussions with several officials did not indicate any hope that trends would change resulting in increases in raw-material production in the future. Even the relative lack of growth shown in the table is probably optimistic. The figures forecast for 1990 as being available for processing should be considered highly optimistic.

As seen in the table, no raw exports are expected in 1990. In fact, this situation could be reached already in 1984, considering the new taxation law which came into effect on 1 July 1983 (see chapter III).

Quality of the basic raw materials

In order to assess the quality of the available raw materials, two programmes were initiated:

(a) A letter was sent to all the tanneries asking them about their experiences with raw-material quality;

Table 1. The supply of hides and skins
(Thousand pieces)

Raw material	1976/77	1979	1980	1981	1982	1990 a/ forecast
1. Production						
Hides	1 350	1 313	1 263	1 203	1 081	1 000
Skins	4 000	4 430	4 683	3 327	3 070	3 000
goat		2 675	2 915	2 041	1 783	1 800
sheep		1 755	1 768	1 286	1 287	1 200
2. Official imports						
Hides	10 a/	10 a/	10	21	21 a/	21
Skins	13 a/	13 a/	13	24	24 a/	24
goat	10 a/	10 a/	10	24	24 a/	24
sheep	3 a/	3 a/	3 a/	--	--	--
3. Non-official imports						
Hides	500 a/	500 a/	500 a/	500 a/	500 a/	500
Skins	1 500 a/	1 500 a/	1 500 a/	1 500 a/	1 500 a/	1 500
4. Total available (1 + 2 + 3)						
Hides	1 860 a/	1 823 a/	1 773 a/	1 724 a/	1 602 a/	1 521
Skins	5 513 a/	5 943 a/	6 196 a/	4 851 a/	4 594 a/	4 524
5. Exports						
Hides	731 a/	731 a/	1 731	1 158	1 158 a/	--
Skins	1 529 a/	1 529 a/	1 529	2 447	2 447 a/	--
goat	987	987 a/	987	1 613	1 613 a/	--
sheep	542 a/	542 a/	542	834 a/	834	--
6. Available for processing (4-5)						
Hides	1 129 a/	1 092 a/	1 042 a/	566 a/	444 a/	1 521
Skins	3 984 a/	4 414 a/	4 667 a/	2 404	2 147 a/	4 524

Source: Production of hides and skins - Data supplied by Ministry of Livestock Development, Veterinary Department, Nairobi-Kabete; Import/export figures (1980-1981) - Data supplied by Ministry of Finance, Customs and Excise Department, Statistical Branch.

a/ Estimates.

(b) Batches of hides and skins of an average raw-material quality were collected from most of the provinces of the country and processed up to finished products.

From the above programmes, it was concluded that cattle hides and goat and sheep skins have natural grain damages such as thorn scratches, tick and pox marks, and that most of the raw materials suffered from putrefaction damage (bad drying or curing), bad flaying resulting in many cuts and holes, and brand marks (particularly on cattle hides) sometimes covering 30-40 per cent of the hide area.

The natural damages cannot be eliminated, even in the long term. Curing damages have only marginally decreased despite the efforts of the Animal Health and Industry Training Institute (AHITI). The big abattoirs in Nairobi and Mombasa are the two places where flaying and curing are properly carried out. Only about 20 per cent of these wet-salted hides and skins reaches the local tanneries, the rest is exported. Data received from the tanners show that nearly all hides and skins coming from smaller collectors are affected by damage to some extent. Badly down-graded hides and skins represent 25-30 per cent and the average lime loss is 20 per cent in the soaking-liming procedures.

Details about the processing experiments will be given later in this report. It should, however, be mentioned here that these experiments support the data provided by the tanners. On the other hand, the experiments have proved that the intrinsic quality of the Kenyan hides and skins (except for that of a small quantity from the North-Eastern region) is very good and, when they are processed using the correct selection and procedures, the materials give very good quality finished leather.

The hides-and-skins trade is far from being controlled by the tanners. Neither the quality, the quantity, nor the price can be influenced by them. The collector prices for skins are stable while the prices of dry hides and chiefly those of wet-salted ones have increased considerably. The scarcity of raw materials regularly causes stoppages in the tanneries and this is the main reason why the whole sector works below capacity.

B. Auxiliary materials, equipment, services

Auxiliary materials

Kenyan industry can only produce a few auxiliary materials for the tanneries, such as lime, salt, mimosa extract and some organic and inorganic acids. Therefore, almost all auxiliary materials are imported.

The main international manufacturers of chemicals are represented in Kenya. However, the prices are very high because of both the transport costs and high import tax which for most of the chemicals is 40-60 per cent. The imports have also to be licensed, which causes big delays. Stoppages due to the non-availability of sodium sulphide and chrome-tanning salts have occurred several times in the last two years.

In July 1983, many factories expressed the wish to increase their wet-blue production, but the quantity of chromium salts which was available was far below what would have been needed. Considerable improvement occurred in this field in 1984. From the beginning of this year, there has been a constant supply of chemicals. The Government is issuing import licences for a large variety of chemicals. This will undoubtedly help to improve the quality of the leather products.

There are also a number of problems with equipment. The import duty on machines and spare parts is 40 per cent. Stoppages have occurred because of the non-availability of emery stones and fleshing or shaving blades. Only wooden drums and small tools are produced locally. Tanning machinery as well as spare parts can now be imported easily. These new arrangements are mainly to the advantage of the big and medium tanneries who are exporters and whose planned production was often previously disrupted by lack of materials and spare parts.

Services

The local servicing facilities are good. The country is fairly industrialized and has very good mechanics who, even if not specifically trained for the leather machines, are capable of handling them. The maintenance in the big factories is very efficient, while that in the small factories is acceptable.

The electricity supply is good. The water supply is not the best. In factories around Nairobi, tanners are often compelled to stop operating because there is no water. Some of them continue with operations, but they spoil the quality of their products by skipping some steps of the process technology which require the use of water.

To summarize, the tanners are not effectively supported by the present system governing raw-material production and the provision of chemicals and equipment. These conditions make it difficult to maintain programmed factory production. This situation is not in keeping with the government's long-term strategy for this sector. When, as at present, the main export products are raw materials and wet-blue, this situation results in major losses in earnings. If only hides and skins are sold, then the earnings cannot be affected dramatically. However, the present policy is to process to increase value added as much as possible with the available facilities. The growth of this industry in the competitive world market can only be ensured through programmed production and selling of finished and manufactured products.

II. THE LEATHER AND LEATHER-PRODUCTS INDUSTRY

A. The leather industry

In Kenya, one can find the whole range of processing methods from the most ancient to the most sophisticated ones.

In the rural tanneries, soaking, liming and vegetable tanning are conducted in pits using chalk and wattle bark (sometimes sodium sulphide and wattle extract), drying is done on rods, mechanical operations are done by hand knives and slickers. The quality of the products is very poor, mainly in the appearance (cobblers' repair material).

The small-scale tanneries use pits, paddles and drums. The main products are vegetable-tanned hides and skins for sole, insole and lining. Some of them produce wet-blue as well. Very old fleshing, shaving and buffing machines in poor condition can be seen in these tanneries.

The medium-scale tanneries are mostly equipped up to wet-blue and process by chrome tanning, using pits, drums, fleshing and sammying machines and modern materials and procedures. Some of them are making finished chrome and vegetable leather as well. The quality of the products is acceptable but only the wet-blues are marketable in Europe and elsewhere.

The large-scale tanneries are fully equipped up to finished leather (all kinds) using the most sophisticated modern machines, materials and procedures. Their wet-blue, crust or finished products are marketable worldwide. The list of the tanneries with their addresses is given in annex<IV.

Figures showing the volume of leather production are given in table 2.

Table 2. Production of leather, 1980 to mid-1984

Year	Upper and light leather (million square feet)			Heavy leather (tons)
	Finished hides	Semi-finished hides	Semi-finished skins	
1980	4.71	10.79	15.71	214.6
1981	5.59	6.22	15.79	156.2
1982	5.27	6.18	10.25	180.5
1983	2.91	5.67	9.06	156.5
1984 (January-June)	3.42	3.65	13.08	29.0 a/

Source: Central Bureau of Statistics.

a/ First quarter only.

It can be seen that leather production has decreased in this period up to 1984. Large decreases can be seen with respect to finished hides. The main factories with finishing capacity are Bata Bulleys and Sagana. Bata and Sagana have worked below their installed capacity because the demand for finished leather is small. There were problems in Tiger Shoe which resulted in the change of the whole management and after several months of low productivity they are just beginning to increase productivity again.

Some smaller tanneries which are wet-blue producers have also been working below their installed capacity. Alpharama (Athi River), which was formerly known as Double Diamond, underwent a big reconstruction which has tripled the godown area and doubled the number of drums, resulting in a temporary capacity under-utilization. Nakuru Chrome Tanners were using only about 25 per cent of their capacity.

However, the trend has considerably improved as from January 1984. If one projects the figures for the half year to a year, one could expect record figures for 1984 especially in semi-finished skin production. These production results are the consequence of the new export-taxing system which started on 1 July 1983 and became effective in 1984. The reality of this trend can be visualized by comparing the quarterly figures from the same source.

(million square feet)

	1984 First quarter	1984 Second quarter
Hides, semi-finished	1.13	2.52
Skins, semi-finished	5.74	7.34

Some medium and small tanneries have increased their capacity, for example, New Market Leather Factory and Kamiti Tanners. Some raw hide and skin traders have become wet-blue producers, for example, Penta Taucom (with 98,000 pieces of wet-blue hides) and Blutan (with 59,319 pieces of wet-blue hides).

Bulleys in Athi River has been bought by the firm Babarzin and they started with 500 pieces of hide a day processed to wet-blue. Their quality is very good because they are provided with fresh wet-salted hides by the Kenya Meat Commission (Athi River Abattoir). The tannery in Kitale started operations within the year. The Aga Khan (IPS) factory will start operating next year with the most sophisticated machines and technology. Since they will produce finished leather for the United States of America and Western Europe, it is expected that improvements also occur in the marketing system.

The capacity utilization of the tanneries is summarized in table 3.

It is important for the elaboration of the future strategy of the Government, to compare the existing and projected capacities against the available hides and skins. As shown in table 3, the established capacity for processing hides is 608,500 pieces a year, and for skins is 5,459,000 pieces a year.

Table 3. Existing and projected production capacity
(Pieces per annum)

Establishment	Hides			Skins		
	Wet-blue	Crust	Finished	Wet-blue	Crust	Finished
(a) Existing capacity						
Bulleys		200 000	100 000	2 250 000	375 000	375 000
Bata			200 000		10 000	
Sagana			25 000			
Nakuru Chrome Tanners				1 200 000		
Nakuru Tanners			15 000			
East Africa Tannery			1 500			14 000
Aziz Din			10 000	25 000		
Kamiti Tanners				240 000		
New Leather Market				200 000		
Alfa Rama	50 000			750 000		
Rural tanneries			7 000			20 000
Total	50 000	200 000	358 500	4 665 000	385 000	409 000
Total hides, skins		608 500			5 459 000	
(b) New capacity (Projected or idle)						
Kisii Gesonso Tanners			125 000			125 000 a/
Mbuni Tanners	125 000					125 000 a/
Kitale Tanners	125 000					
Aga Khan			375 000			
Kamiti Prisons			25 000			
Orembic (Ruiru)				100 000		
African Trade						125 000 a/
Total	250 000		525 000	100 000		375 000
Total hides, skins		775 000			475 000	

a/ Starting from wet-blue.

There are three ways of assessing the quantity of raw materials available for processing and each of these compared to the figures for capacity gives a different outcome.

(a) Available raw materials as taken from the average of three years (1980, 1981, 1982):

Hides
Available: 684,000
Capacity: -608,500
75,500 hides remain available for new capacity

Skins
Available: 3,072,666
Capacity: -5,459,000
-2,386,334, excess capacity in the tanneries for skins

(b) Available raw materials as taken from the forecast figures (1990):

Hides
Available: 1,521,500
Capacity: - 608,500
913,000 hides remain available for new capacity

Skins
Available: 4,524,000
Capacity: -5,459,000
-935,000, excess capacity in the tanneries for skins

(c) Raw materials available after removing the so-called non official imports:

Hides
Available: 913,000
Capacity: -500,000
413,000 hides still remain for new capacity

Skins
Available: -935,000
Capacity: -1,500,000
-2,435,000, excess capacity in the tanneries for skins

Actually the situation in (b) is the most realistic and further analysis is based on it.

In order to draw any final conclusions, a closer examination of the structure of leather production is needed, and this is presented in table 4.

Two points should be noted in connection with the figures in table 4:

(a) The marketable products in the whole range of processing are raw material, wet-blue, crust, and finished leather. It is evident that capacity for higher levels could produce the lower ones in the same quantities but only to the detriment of production at the higher quality levels;

(b) The production capacities given in the table are limited in their facilities to the quantities and type of processing indicated. Some convertibility of hide and skin equipment could be considered.

The following conclusions can be made regarding the quantities of raw materials:

Hides. As already shown, some 913,000 pieces of hide will be surplus to present capacity and available for new production units. All the projected new units plus capacity at present lying idle would need some 775,000 pieces. Therefore the raw material supply in hides is sufficient for all present and projected requirements.

Skins. The existing capacity for processing skins is geared to producing 7.6 per cent finished, 7.0 per cent crust, and 85.4 per cent wet-blue leather. It has already been shown that Kenya has at present the capacity to process 5,459,000 pieces of skin per year. However, the available quantity of skins is only 4,524,000 pieces. This means there is an excess production capacity of 935,000 pieces a year, or about 21 per cent over the number of skins actually available.

Table 4. Kind and quality level of leather produced

Stage of finishing	Hides (pieces)	Hides (percentage)	Skins (pieces)	Skins (percentage)
Wet-blue				
(a) Modern procedures	50 000		2 250 000	
(for world market)			1 200 000	
			240 000	
			750 000	
Total	50 000	8.2	4 440 000	81.3
(b) Middle quality	--		25 000	
(local market)			200 000	
Total	--		225 000	4.1
Crust				
Modern procedures				
(for world market)	200 000		385 000	
Total	200 000	32.9	385 000	7.0
Finished leather				
(a) Modern procedures	100 000		375 000	
(for world market)	200 000			
Total	300 000	49.3	375 000	6.8
(b) Middle quality	25 000		--	
(local market)				
Total	25 000	4.1	--	--
(c) Poor quality	15 000		14 000	
(only local	1 500		20 000	
market and cobblers)	10 000			
	7 000			
Total	33 500	5.5	34 000	0.8
Grand total	608 500	100	5 459 000	100

It is therefore clear that no more capacity for wet-blue skins should be installed at present.

Production strategy. There is a willingness to invest in the leather field. Several potential investors have asked for advice from KIRDI. They have been discouraged from investing in skin-to-wet-blue processing. They have instead been advised to start small units processing either raw to wet-blue to ready-finished hides, or wet-blue to ready-finished skins. This is a flexible solution and it is feasible because the hide finishing capacity (with small adjustments) is convertible for skin finishing, and if wet-blue can be purchased in Kenya this solution is also profitable economically. To reach the target with the available skins will be very difficult. The wet-blue production should be transformed step by step into ready-finished production.

The desirable distribution of production capacity would be 15 per cent semi-finished leather and 85 per cent fully-finished, i.e. just the opposite of the present situation.

Without entering into details two major problems should be mentioned:

(a) At present, mainly fashionable and slightly lower-standard commodities are manufactured from the finished skins. This requires more sophisticated processing and marketing work as very quick adaptation is needed to keep up with the steady change in fashions;

(b) The competition is heavy in this kind of market and very good products are sold at fairly low prices.

The proposed strategy is feasible, but it requires steady hard work over 10 to 20 years, during which time the recommendations of this report or of other professional bodies should be continuously followed.

B. The shoe industry

According to figures from the Ministry of Finance, Customs and Excise Department, Statistical Branch, the production of footwear was:

	1980	1981	1982
	(number of pairs)		
Leather footwear	1 613 753	1 641 076	1 607 065
Non-leather footwear	3 046 437	8 570 302	8 444 033

The list of shoe manufacturers with their production capacities is given in annex V.

In the rural training centres and other artisanal workshops, sandals and leather goods are made by ancient methods. In the small-scale workshops (400<pairs or less a day), mainly those in the Kenya Industrial Estates (KIE), fairly advanced machinery and processing methods are in use and the quality of the products is acceptable. The medium-scale factories are well equipped and make acceptable products, while the large-scale factories possess all the modern facilities for shoe making and use sewed, cemented and vulcanized methods.

Many factories intend to increase their production and new entrepreneurs want to start investing in new factories, but there is a scarcity of finished leather. One of the entrepreneurs intends to create a vertical complex (leather-plus-shoe factory).

C. The leather-goods industry

In 1982, the production of leather goods was 199,771 pieces.

The leather-goods industry is poorly developed in Kenya. There are artisanal workshops like Kamiti Prisons, Crock of Gold and Young Men's Christian Association (YMCA), all in Nairobi, which are worth mentioning. The first medium-scale industrial factory started operating in July 1982 and is known as the Leather Masters Ltd. This is sponsored by the KIE, Nairobi. The equipment is up to date, the management is good and skilled workers have been employed. There is a possibility of starting production for export this year. The factory needs about 0.5 million sqare feet of finished leather a

year. They display nice, modern leather bags in the city centre in their shop, Leather Emporium. However, they have not yet succeeded in getting buyers abroad nor started working to their full capacity.

D. Quality aspect of the sector

Leather

The raw materials available locally could produce a better range and quality of leather than has been the case. There are various reasons for this:

(a) The best quality hides and skins are exported in the raw state;

(b) The second-best quality is processed to wet-blue and crust for export;

(c) The selection of third-class raw hides for ready-finished types of leather is overstrained by the need to provide sufficient quantity;

(d) There is scarcity even in this third category of raw material;

(e) There are many entrepreneurs proposing to begin shoe manufacture who hesitate because of the fear of lack of sufficient leather for production;

(f) There is no competition to maintain quality as would be the case if about half of the raw materials appeared as finished and ready-made products;

(g) There are no standard specifications;

(h) Outside of two big factories, there are generally no facilities for quality control.

In order to have accurate comparative data, the KIRDI laboratory facilities were used for three months to analyse the chemical, physical and visual characteristics of Kenyan leather products. The results are given in detail in annex VI. These results are compared with the acceptance levels of the European Economic Community standards in tables 9-13 in annex VI. According to custom in the European leather branch, the contracts between trading parties are more important than the standard specifications. However, these acceptance figures are frequently included in the contracts and all the institutes involved in quality control use them for evaluation, if no other standard specifications are mentioned in the relevant contract. As the European products frequently comply with these levels, it was thought useful to find out how the Kenyan products compare with these specifications.

There are no remarkable variations in the quality of finished leather. The products of Bata, Bulleys and Sagana are reliable and the analyses carried out in KIRDI showed compliance with the accepted standards.

A small improvement in the quality of semi-finished leather was observable in 1984. Some medium-size wet-blue tanners have engaged skilled technical management and have improved their quality control. Examples are Aziz Din, New Market Leather Factory and Blutan.

Footwear

The leather shoes tested in the laboratory were satisfactory and no major defects were detected. The auxiliary materials such as insoles from local

sources or the imported ones are inferior to the texon types. The factories are making major efforts to rectify this. The visual evaluation of shoes covered thousands of pairs in several factories and in the shops. The quality of the leather shoes can be considered as moderate. The choice in sizes (especially width) could be improved and the proportion of the full-grain fashion shoes could be higher.

Production of non-leather footwear such as textile sport shoes and other textile shoes is very high. The quality is acceptable, no complaints were received by the Institute. Rubber-boot production is low. After the analysis of soles and sheets in the KIRDI laboratory, the producers agreed that the abrasivity of the rubber-boot soles should be improved.

Kenya Bureau of Standards (KBS)

This institution is under the Ministry of Industry. It is equipped with modern testing instruments and has a good library. A very good relationship has been established between KBS and KIRDI. Many staff members of KIRDI are members of the technical committees of KBS. The leather section of KIRDI has contributed to the elaboration of the standards for rubber knee boots and to drawing up testing methods for rubber products.

In 1981, the leather section, at the request of KBS, prepared and presented a study on the steps necessary for standardization in the leather branch. The proposal also covered shoes and leather goods. The management of KBS accepted the paper and have requested KIRDI to prepare a second paper entitled "Justification of standardization in the leather section".

The next draft was the standard specifications for wet-blue which was presented early in 1984. The technical committee had its first meeting in July 1983 and it is hoped that the standard will be operational within 1984. It should be noted here that, when the wet-blue standard takes effect, about 78 per cent of the normal Kenyan leather production (i.e. the proportion of wet-blue) will come under the quality control of the KBS, who will mainly be using the leather laboratory facilities at KIRDI. The leather section has recently been working on the draft standard for ready-finished leather. The proposal put forward by KIRDI is to start with optional standards in the first place, thus giving the producers time to adjust and to establish qualitative competence within the factories.

The co-operation between the KBS and the leather section at KIRDI has been very good and useful and is based on the agreement outlined in the previous interim report.

Quality Data Bank

All the current data concerning the current quality of Kenyan leather as evaluated by visual and analytical methods, has been given in annex VI. As agreed between KBS and KIRDI, this complete exercise should be repeated every year, thus enabling the interested parties to follow the progress in the sector. The data was distributed to the producers in an anonymous way (the producer could see all the results including the poor results but was only able to identify his own products). Because of the confidential nature of particular commissioned contracts to test products sent in by the producers, the results will only be distributed in cases where there is a common interest and then only with the consent of the commissioning producer.

This data bank is very useful, for it shows up the weak points in the quality of Kenyan leather and it is being used to assess realistically the requirements in the Kenyan standards.

Library

A list of the books purchased and periodicals taken by the project team is given in the inventory. After conclusion of the project, the counterparts will continue ordering the periodicals and any new relevant books. In order to expand the data facilities, a collection of pamphlets on leather production and brochures of the local chemical enterprises has been initiated.

E. Statistical data bank

It proved quite impossible to achieve the objectives described in the project document, i.e. to create an up-to-date data bank where data requested by the members of the branch could be found and issued automatically. But it was possible to make the necessary contacts and to provide counterparts at KIRDI with key coefficients so that they can compile the actual data when required. The difficulties in setting up such a data bank are well known. The main reasons in this case are the unreliability and the heterogeneity of the data provided by the factories and traders and the big amount of non-official importation.

Apart from KIRDI, the other sources of statistical information in the sector are:

Ministry of Livestock Development, Veterinary Department, Nairobi
Ministry of Finance, Customs and Excise Department, Statistical Branch, Nairobi (Treasury).

The officers of these institutions were very helpful, although an input of two weeks work was needed to complete, for example, the questionnaire on the leather and leather products industry requested by UNIDO and the reported figures can only be interpreted by reading the accompanying notes, i.e. they require careful analysis.

III. ECONOMIC ASPECTS

A. Exports of leather

Annex VII gives statistical data on the country's export of hides, skins, semi-finished and finished leather (code numbers 211 and 611). Variations in the volume, value and structure of the exported commodities can be observed by analysing the figures in this annex, as shown in tables 5, 6 and 7.

A steady decrease from 1981 up to and through 1983 can be observed which seems to end in 1984. The figures for January to April 1984 (four months) are not definitive and complete, but any change by the time of closing of the computerized data could only be towards an increase.

There were no drastic changes in the average prices. The variations are caused mainly by the volume and structure of the exports. Table 7 has been calculated from annex VII to show all the detailed prices.

Table 5. Total exports of commodities coded 211 and 611

Period	Volume (kg)	Value (thousand KSh)	Comparative value if 1979-1981 = 100 (%)
1979-1981 (average)	..	216 820	100.0
1981	14 207 547	225 400	103.9
1982	12 259 353	193 063	89.0
1983	9 561 556	151 486	69 9
1984 (January-April)	3 837 568	69 859	(estimate for 1984 = 96.6) a/

a/ If 1984 maintains the trend of January to April, the whole year is likely to reach about the level of the average for 1979 to 1981.

Table 6 Average export sale prices (KSh/kg)

Period	For the total of 211 + 611	For raw materials	For semi-finished and finished
1981	15.86	11.67	23.54
1982	15.75	13.33	19.58
1983	15.84	13.60	18.53
1984 (January-April)	18.20	..	..

Table 7. Unit prices for different types of leather
(KSh/kg)

Type	Code number	1981	1982	1983	1984 January-April
Bovine, dried hide	211101	10.96	12.84	15.53	--
Bovine, wet-salted hide	211103	6.57	9.17	9.60	--
Bovine, pickled	211102	--	8.93	14.98	--
Bovine, wet-blue	211104	6.17	8.11	8.35	--
Calf, dried skin	211201	6.64	16.51	20.97	--
Calf, wet-salted	211202	17.19	--	--	--
Goat, dried skin	211401	23.53	21.93	13.92	12.60
Goat, pickled	211402	--	--	23.43	--
Goat, wet-blue	211403	23.98	23.36	20.37	19.57
Sheep, dried skin	211701	13.89	9.82	11.76	--
Sheep, pickled	211702	--	140.54 a/	30.16	--
Sheep, wet-blue	211703	39.11	23.74	20.13	--
Bovine, crust	611402 611502 611612	44.76	46.60	61.80	64.26
Dressed leather	611401	4.50 a/	6.80 a/	57.75	--

a/ These data appear erratic. Otherwise the relationship between the price of the commodities and their time trend is consistent.

The variations in the structure of the trade are economically most important. As is known, the aim of this project in line with the strategy of the Government is to change the raw materials step by step into higher amounts of semi-finished and finished leather and manufactured products. The most important development in this connection has been the increase of the export taxes on raw materials in the middle of 1983. This strongly encouraged a trend towards increasing production of finished and semi-finished leather products. The proportion of semi-finished and finished goods as a percentage of the available raw materials rose from 35.3 per cent in 1981 to 45.5 per cent in 1983. The data for 1984 are not complete but they indicate a further substantial increase due to the successful impact of the new tax system in favour of higher degrees of finishing.

This is the most important cause of the upturn in the value of exports in 1984.

B. Model experiments on production and costs

Model experiments were set up in the whole range of production up to finished leather, as part of the systematic programme of applied research work. The preliminary steps of the process were done in the KIRDI pilot plant and then finishing was done in the Bata factory.

With the time and facilities available, skins (goat and sheep separately) were processed from six provinces and hides from the Rift Valley Province (Narok District). The results are shown in annex VIII for skins and annex IX for hides. The average yields in United States dollars per square foot are shown in annex X. The experiments were performed so as to ensure comparability, i.e. all the steps of the procedures and the materials were kept constant for all the batches and the only varying factor was the place of origin of the skins. The experiments with the hides will be continued on the same principles.

The prices used in the calculations were the actual prices of the raw materials and the chemicals, converted using the exchange rate at the time (27<July 1982) of 10.82 Kenyan shillings to the United States dollar. The cost figures for the raw materials were compared to those given in the periodical Leather (August 1982). Figures for labour and overhead costs were taken from one of the local big factories.

Quality

The model experiments give the following results on the quality of the products:

(a) The finished products were graded following international practice. Selection was made into four (I, II, III and IV) grades. Proper grading depends on good assessment of the material, which in actual practice in the tanneries means accurate selection, piece by piece, of the raw and semi-finished material for its suitability for various finished products. For example (see annex X), the pieces selected for suede gave grade III suede-clothing leather, while if these had been selected for clothing nappa, they would have been rejects;

(b) An attempt has been made to compare the quality of skins by provinces. The results shown in annex X seem to indicate that with proper handling the skins of all the provinces give fairly similar results. The yields of goat skins are better than those of sheepskins and this is in conformity with overall experience in the leather branch and is similarly reflected in the higher prices of the raw material. The results do not necessarily show that there are no differences between the provinces. It should be emphasized that one of the aims of these experiments was the training of the counterparts and elementary introduction to applied research work. The initial experiments were done with 40-40 pieces of goat and sheep skins taken in situ in the respective provinces, but the experiments should be repeated with 100-100 pieces.

(c) The percentage of lime losses is lower than that normally found in the sector. The reason is that, for our batches, average qualities were selected and obviously bad skins were rejected.

Value added

From the data in annexes VIII, IX and X, the following analysis can be made in connection with added value:

(a) Hides From an input of hides worth $US 17.40 (100%), an output of $US 166.55 (951.7%) for leather in a finished state, or of $US 58.92 (338.6%) for leather in the wet-blue state, can be obtained. Using the same figures, if the total production cost is taken as the base, from $US 115.31 (100%), an output of $US 166.55 (144.4%) in finished state can be obtained. In the case of wet-blue, against the production cost of $US 51.49 (100%), an output of $US<58.92 (114.4%) can be obtained;

(b) Skins. From an input of skins worth $US 40 (100%), an output of $US<234.02 (585%) in finished state or one of $US 123.2 (308%) in wet-blue state can be obtained. Using the same figures, if the total production cost is taken as the base, from $US 145.14 (100%), an output of $US 234.02 (161.2%) in finished state can be obtained. In the case of wet-blue, against the production cost of $US 90.16 (100%), an output of $US 123.2 (136.6%) can be obtained.

It should be noted that economists consider that, in the leather sector, processing from the raw materials up to finished state produces earnings in terms of profits and employment which increase by an arithmetical progression. Whereas, starting from a ready-finished state and processing up to the various manufactured products (shoes, garments, leather goods etc.) produces earnings in terms of profits and employment which increase by a geometric progression.

It has been necessary to elaborate a bit on this aspect of the leather industry because there are many misconceptions on the added value and profitability of the sector. Nevertheless, these calculations cannot replace case studies when actual investments are made. It is hoped that the levels of profitability shown will help Government bodies in making future decisions.

C. Trade

Raw materials

Raw hides and skins are produced in three mechanized abattoirs, 22 urban non-mechanized abattoirs, about 1,800 rural non-mechanized units and on many private farms. The big abattoirs produce mainly wet-salted hides and skins which have been well flayed and cured. Selling is done at auctions where tanners, local dealers and even European dealers compete. Hence, prices approach world-market levels. A few collectors, who are close to tanneries, use wet-salting methods. The rest of the raw material in the country is dried, a big part being dried on the ground. The number of registered stores is about 2,200 in the country which means that there are about the same number of licensed buyers.

These data show that the trade in raw hides and skins is efficient and well-developed in the country. Except for very short periods, a continuous competition in purchasing raw material occurs between tanners and dealers and the dealers are usually the winners. The small buyers (collectors) accept the technical advice of AHITI inspectors, but in terms of price they rely on their regular clients, who are the leaders in the market. The biggest ones are Abdul Wadood Tanners Ltd., Deras Ltd., Hamada Ltd., Interafrica Ltd., Inferfico Ltd. Most of them have contracted small or medium wet-blue tanners and so are able to implement a very flexible export programme, offering raw or wet-blue according to internal and external conditions. From the above, it is evident that the prices are fairly high and close to world-market prices.

The official import of hides and skins is low, on the level of about 20,000-30,000 pieces a year. The main sources are Uganda, Zaire, Tanzania and Sudan, in that order. The export figures are shown in annex VII. The main destinations for both hides and skins, in decreasing order are Italy, Greece, Spain, France, the Netherlands, Yugoslavia and Romania. The value of the exported raw hides and skins amounts to $US 10 million a year.

Wet-blue

The trade in wet-blue is also well established at a value of about $US 7 million a year. The import of wet-blue is negligible. The main destinations of wet-blue exports, in decreasing order are, Italy, Spain, France, China and the Republic of Korea. The earnings on wet-blue could be improved by establishing standard specifications. Neither the test methods nor the grading systems have been standardized and they show considerable variations.

Crust and finished products

The crust and finished products have a well-established trade. Imports in the last few years were fairly low (worth about $US 100,000 a year), but the yearly earnings from exports amount to about $US 3.5 million. The main destinations are Italy and Yugoslavia. It is remarkable that the main destination for all kinds of exports is Italy (in the case of crust, about 80<per cent) This is an indication of the good quality of the materials.

There have been fluctuations of trade in both raw and semi-finished materials, but there have been no major claims or marketing problems recorded.

There is moderate trade in the export and import of manufactured products like shoes and leather goods. For example, 2,724 pairs of leather shoes were imported in 1981 from the Federal Republic of Germany and China and 1,642<pairs of shoes were exported to Uganda. Both production and trade are dominated by non-leather shoes. In 1981, 515,046 pairs of non-leather shoes were imported and 179,342 pairs exported.

Production of leather shoes in 1981 was 1,641,076 pairs. As this is practically equal to the pairs available for the local market, the consumption of leather shoes was 0.1 pairs per head in 1981. The comparable figure for non-leather shoes was 0.5 pairs per head. This means that considerable marketing work will have to be done to increase the local trade in these products. According to discussions held with professionals in commerce, there are good chances of increased inter-African and European trade. It has been noticed that most of the investors and entrepreneurs in the leather-manufacturing sector are not acquainted with prices and possibilities in the foreign markets.

It is advisable that the Chamber of Commerce and Industry should consider establishing a marketing service office in Europe. This would be a very important tool for implementing the future strategy in this sector. The kind of service needed, even in this very early stage of development, relates to price information, advertisement and shows.

The most important international show in the leather branch, called Semaine du Cuir, is held yearly in September in Paris. Entrepreneurs (or their representatives) dealing in raw materials, semi-finished and finished leather, machinery, chemicals and even manufacturers of finished leather products either exhibit their products or distribute their publicity material

every year. Leather (Benn Publications Ltd., England)*, the main periodical of the branch, gives most of the details about this show in its September and October issues. The number of advertisers in this periodical and the number of exhibitors in the show, while they cannot replace international statistical data, provide a good indicator of the trade's activities. Figures on the number of advertisers and exhibitors extracted from the September 1982 issue of the periodical, subtitled "Semaine International Du Cuir; Preview", is given below in table 8, by continent of origin.

Of the nine advertisements originating in the continent of Africa, all of them were placed by South African enterprises. The one and only exhibitor at the show was from Zimbabwe (Angus and Kevin Faarsweld, suppliers of wet-salted crocodile belly skin. These figures further emphasize the need for a marketing office to promote the Kenyan leather sector in international circles.

It is encouraging to note among both advertisers and exhibitors, the fairly high share of raw and semi-finished materials being marketed.

D. Financial background and incentives

The problem of import licences is related to the problem of foreign exchange. This problem affects all the stages within the sector. One of the largest cost components requiring foreign exchange is imported chemicals, as shown below.

	Thousand KSh	Percentage
Inputs other than raw materials and investment	879.0	100
Estimated input in chemicals	334.0	38
Estimated input in imported chemicals	298.8	34
Actual value of imported chemicals (less 40% import tax)	213.5	24.2
Expected profit on income	389.4	
Expected output in wet blue	667.8	

It can be seen that the profit will more than cover, in Kenyan currency, the expected import expenditure. But not only in Kenyan currency, because the wet-blue is actually marketable as exports and the expected income of KSh 668 million will be in foreign currency.

The capacity for wet-blue in 1987 will cover the quantities of available raw materials, but as today about 70 per cent of all the raw material is covered by the existing wet-blue capacity, there is expected to be a balance of foreign exchange after taking care of the running costs.

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*Issues of the periodical, Leather, are available in the Ministry of Industry and KIRDI libraries.

Table 8. Trade advertisements and trade fair exhibitors, September 1982
(Number)

Continent of origin	Advertisements Type of product				Exhibitors Type of product			
	Raw	Semi finished	Finished	Manufactured	Raw	Semi finished	Finished	Manufactured
Asia	7	30	34	10	3	16	19	7
Europe	15 a/	22 a/	25	3	7 a/	14 a/	48	25
Australia (and New Zealand)	9	11	10	--	6	14	16	1
South America	4	6	6	1 b/	--	13	16	5
North America	1	3	4	--	--	9	14	4
Africa	3	4	2	--	1	--	--	--

a/ Most of these are big dealers.

b/ Manufacturer of wattle back.

The other major component of expenditure requiring foreign currency is the investment in imported machinery. For tanning machinery to process from raw material up to the finished state, an investment of 8 million Kenyan shillings per 10,000 square feet per day is considered to be an up-to-date coefficient. The value of exported hides and skins (KSh 217 million) represents 56 million sqare feet per year. Allowing 250 working days, this corresponds to a daily output of 225,021 sqare feet. Using the coefficient given, to transform this daily quantity into finished leather requires a machinery investment of KSh 180 million. This investment in imported machinery divides up according to process stage as follows:

40 per cent up to wet-blue	=	KSh 72 million
60 per cent up to finished state	=	KSh 108 million
Total		KSh 180 million

Clearly, the total machinery investment up to finished state is needed once only while the imported chemicals are a recurring cost amounting to KSh 213 million every year.

A comparison between a theoretical alternative and the situation expected to actually occur in 1987 can be made:

(a) Theoretical alternative

Given the conditions that all the exported hides and skins are turned into ready-finished leather and all the machinery imports are purchased in a year, the production of a year would require:

	Million KSh
Foreign currency for imported chemicals	213.5
Foreign currency for imported machinery up to finished state	180.0
Total	393.5
Income (in foreign currency) if raw is turned only into wet-blue	667.8
Income if raw is turned into ready-finished leather	2,117.6

(b) Expected situation in 1987

Capacity: Hides 77% finished + 23% wet-blue (= 100% in wet-blue)
Skins 14% finished + 86% wet-blue (= 100% in wet-blue)

This leaves 53 per cent of the total 56 million square feet = 30.2 million square feet to be processed from wet-blue to finished involving a corresponding investment in imported machinery of KSh 60 million.

	Million KSh
Foreign currency for chemicals	213.5
Foreign currency for imported machinery up to finished state	60.0
Total	273.5

Income (in foreign currency) if raw material is turned into wet-blue	667.8
Income (in foreign currency) If 30% of ready-finished leather is sold for foreign currency (30% of Ksh 2,117 million)	635.2

If one considers the marketing possibilities, in either alternative (a) or (b), selling wet-blue at the level of actual raw material exports is possible in 1984, and selling at the level of KSh 600 million will be possible from 1985. In alternative (b), the selling of 30 per cent of the ready-finished leather will be possible from 1987 onwards. Whatever the proportion of production of wet-blue to ready-finished turns out to be, it is firmly believed that the income of the sector will increase from next year onwards. Meanwhile, the income from foreign exchange earnings will break even in 1984 and will result in excess earnings of about KSh 120 million a year in 1985 and 1986, and about KSh 500 million a year from 1987 onwards.

The investment policy of the Government has a lot of advantages for the sector. This can be seen by examining the financing facilities and the government incentives. The main financing institutions for the leather branch are listed below:

Development institutions:

Industrial and Commerical Development Corporation
Kenya Industrial Estates (KIE)
Industrial Development Bank (IDB)
Kenya Meat Commission
Lake Basin Development Authority

Financial intermediaries:

Central Bank of Kenya (CBK)
Kenya Commercial Bank (KCB)
National Bank of Kenya (NBK)
Kenya Commercial Finance Corporation
East African Development Bank
Development Finance Company of Kenya
Industrial Development Bank Ltd.

The conditions for investors are very favourable. A deposit of about 20-30 per cent is required for the investment. The financing institutions also contribute towards the running costs. The incentives given by the Government include restricting the relevant exports or imports and suitable taxation measures. In the past, the export of raw hides and skins was restricted and a selective taxation system was imposed. In 1981, the raw hides and skins dealers succeeded in having the limits raised but not withdrawn. In 1983, the Legal Notice No. 96 of the Sales Tax Act came into operation on 1 July. The new rates of taxation can be compared with the previous ones as follows:

Category of product	Tax imposed as a percentage of the f.o.b. value: Up to 1 July 1983 (%)	From 1 July 1983 (%)
(a) Raw cattle hides, camel and horse hides, raw calfskins, sheepskins and goatskins (hair and wool on), whether wet-salted, dry-salted, suspension-dried, wire dried or ground-dried	20	40
(b) Hides and skins, processed, pickled	15	15
(c) Hides and skins processed to wet-blue or chrome-tanned stage	10	5
(d) Hides and skins processed to vegetable-tanned crust leather	--	5
(e) Hides and skins processed to chrome-tanned crust or other mineral-tanned crust stage	5	3

The tanners now enjoy an export compensation of between 10 and 25 per cent. Following the above legal notice, the raw-hide dealers sent a letter to the Ministry of Livestock Development objecting to the imposition of tax on raw hides and skins at the rate of 40 per cent under the new rules. It is however known in the sector that their objection has been turned down The Kenya Tanners Association has written to the Government in support of the new system and pressing for its retention. It appears that this time the case of the tanners is likely to succeed. The first reactions of the sector (as detected in July 1983) indicate firm prices in raw materials, increasing production of wet-blue and a growing inclination towards new investments.

It could happen that a temporary drop in foreign exchange earnings will occur initially for a maximum of 5-6 months after the raw-hide dealers have fulfilled their present contracts. It is also possible that at first the programmes of the tanners may be adversely affected by lack of chrome-tanning salts. However, the long-term result of the new tax system will evidently improve the prospects for achieving more added value.

IV. KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI)

A. The Institute

KIRDI is the successor to the East African Industrial Research Organization of the defunct East African Community. It is a parastatal body under the Ministry of Regional Development, Science and Technology. (Up to 1<April 1982, it was under the Ministry of Industry). The organizational structure of KIRDI is presented in the following figure. It will be seen that it covers all branches of industrial activity.

Some of the sections are in the formative stages but most of them are already operating and producing excellent outputs in research. The activities of KIRDI include the adaptation, absorption and development of appropriate technologies. The Institute would be specifically intended:

(a) To identify and develop appropriate process technologies to suit local resource endowment, market and ecological system, and develop export potential by scaling down or modifying available technologies in whole or part;

(b) To explore the possibility of replacing imported raw materials and intermediate products for industry by indigenous materials with or without modification of the manufacturing process;

(c) To design, develop or adapt machinery, tools, equipment, instruments, products and processes suitable for introduction in the rural areas;

(d) To set up pilot plants where necessary to demonstrate the efficacy of identified technology.

It can be seen that the present leather project corresponds exactly with the objectives of KIRDI.

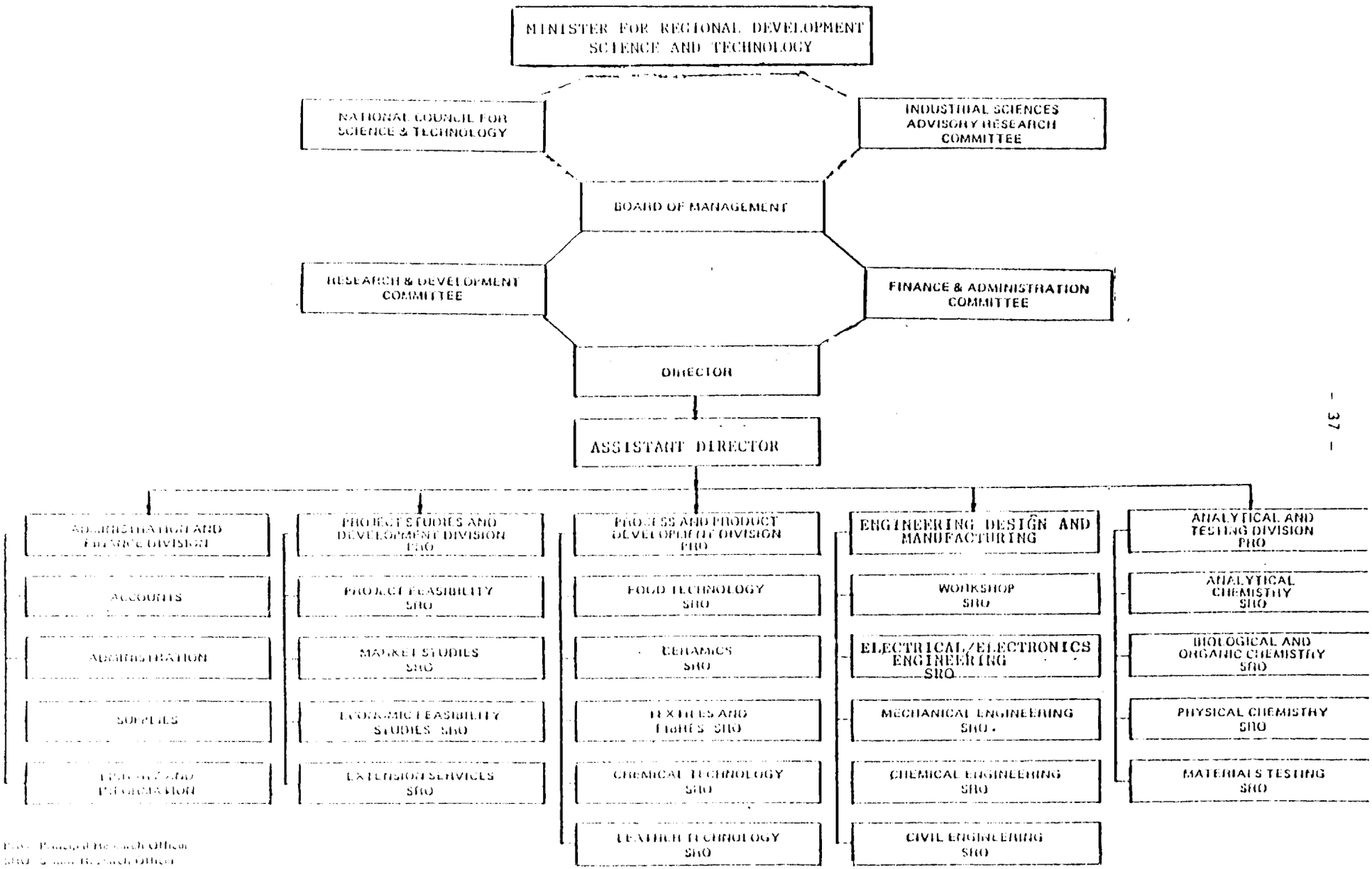
Mention ought to be made of the work on the barites project, which will help the leather sector in future by producing sodium sulphide. Kenya produced 400 tonnes of barites in 1976 and was supposed to produce about 50,000 tonnes in 1979. One of the experiments carried out at KIRDI was the preparation of barium carbonate and sodium sulphide from barites, charcoal and soda ash. It was found that out of every kilogram of barites with 94.67 per cent barium sulphate, 0.77 kilograms of barium carbonate and 0.38 kilograms of sodium sulphide were obtained. There is therefore a possibility that the imported sodium sulphide will be replaced in a few years by local material. The actual import of this material is about 250 tonnes a year.

The analytical and testing division proved to be very important and useful to the leather project. It was, for example, possible, in keeping with the stipulations in the project document, to use all the chemical-analytical facilities of the institute and to spend the funds of the leather project on physical testing and pilot-plant facilities only.

B. The leather section (laboratory and pilot plant)

Four local specialists were sent to Uruguay in 1980 to get acquainted with leather processing. The laboratory was equipped with the apparatus shown in the inventory (in annex XI) and started operating in October 1981. The pilot plant was equipped with machinery shown in the inventory and started operating in April 1982. The consulting services started in January 1982 and

Organizational structure of the
Kenya Industrial Research and Development Institute



PRO - Principal Research Officer
SRO - Senior Research Officer

consisted mainly of in-factory consultations and laboratory-level experiments. In December 1981, the document attached at annex XII, showing the range of the activities of the section, was distributed. In fact, in the period between January 1982 and July 1983, ninety-one commissioned pieces of work were carried out by the laboratory and the results submitted to the clients.

In the pilot plant, a total of 80 pieces of skin have been processed in co-operation with one of the medium-scale tanners. The tanner supplied KIRDI with the skins, chemicals and machinery services. KIRDI carried out all the procedural steps to produce the requested kinds and colours of leather and at the end the added value was shared. The purpose of this exercise was to train the five members of the counterpart team. Soaking, liming, fleshing, tanning, retanning, and dyeing were done in the pilot plant, further mechanical and finishing steps were done in the large tanneries. Other commissioned work such as dyeing 40 sheepskins for clothing leather, crusting wet-blues for a medium tanner (wet-blues sent back from Italy as claim), several analytical tests, and small experiments (up to 40 pieces each) with raw materials up to wet-blue or crust, have been completed. As previously mentioned, model experiments with skins totalling 240 pieces from six provinces have also been completed. From the resultant garment leather, eight jackets have been made in co-operation with a tailor. These have been distributed for wearing tests. Each wearer has been provided with a booklet where he can enter his comments and observations to be analysed after a year. The rest of the leathers have been sold to enable the purchase of raw materials and chemicals for the next experiments. During the period January 1982 to July 1983, the leather section earned KSh 63,000 from laboratory tests and pilot-plant work on behalf of clients. A feasibility study has been completed for a new factory and another is being carried out for a factory to be located in Kisii District. The number of free consultancies was more than 60 during the same period.

C. Personnel of the section

One graduate in chemistry and four leather or chemical technicians were assigned to the project until mid-1982. Three of the technicians were trained in Uruguay with fellowships under this project. The chemistry graduate, after a probationary period, is expected to be the chief of the section. The fifth member is a leather technician and graduate from Nene College, Northampton, England. Two of the five members possess leather-processing certificates from AHITI or Nene College, and three other members are just learning the processing of leather.

The personnel situation of the leather section may be evaluated as follows:

(a) All of the counterparts are able and willing to stay with this section and with the institute;

(b) They possess the basic qualifications for their jobs;

(c) All of them have had in-factory training with Bata or elsewhere;

(d) All of them are familiar with the chemical and physical testing methods for leather and leather products;

(e) All of them are familiar with the basic principles of leather making and the CTA has demonstrated by practical experiments most of the steps of the procedures, some of them up to finished leather;

(f) All of them are able to evaluate analytical results or to give efficient in-factory assistance to tanners on the steps of the process up to wet-blue.

The testing facilities, even in the best factories, are poor compared to those of the leather section. Production managers will be able to use the laboratory either by requesting data only and evaluating the results themselves, or by asking for full reports with comments.

It is well known that leather processing needs long experience to achieve good results. The kind of training given by the international experts can be considered as mid-way between factory experience and academic training.

By further training in this systematic manner, combining practical demonstration with theoretical explanation, it is to be expected that within one or two years the counterparts will have mastered the finer points of the relevant technology. Parallel to this, they may require some further training abroad. Training offered by chemical enterprises could be considered the best, being low-cost, short-term and very practical.

Between October 1983 and October 1984, one more research officer has been added to the team. The distribution of staff is as follows:

Personnel	1983	1984
Co-manager	1 a/	1 a/
Research officer (B.Sc)	1	2
Technicians	4	4
Laboratory assistants	2	2
Administrative assistant	1 a/	1 a/
Typist	1	1
Driver	1	1
Messenger	1 a/	1 a/

a/ Part-time staff.

There has been a marked overall improvement in the section. The second research officer is a B.Sc. in chemistry. His speciality is water analysis so it was very easy to include the effluent analysis in the profile of the laboratory. The first research officer was sent in September 1983 to Nene College, Northhampton and has recently returned after successfully completing the course. One of the technicians had earlier been trained for two years in Northhampton. The other one was trained at AHITI in Nairobi. In addition, all the technicians and one of the laboratory assistants have received short practical training at the tannery of the Bata Shoe Co. Ltd.

Recently the CTA has made a new arrangement for the assistants. One of them will go to Bulleys Tannery to be trained on shaving machines and the other to Bata for training on buffing machines.

D. Progress in 1983-1984

Reviewing the period from 1 October 1983 to 1 October 1984, appreciable progress has been made. Most of the recommendations made in the interim report of the expert were followed.

The model experiments have been regularly repeated with batches of 50 pieces of skin from Nyanza and the Central Provinces. A total of 588 pieces have been processed up to crust (without shaving and buffing) and then finished at Bata Shoe Co. Ltd. within the framework of the existing agreement. Very high quality standards have been attained and the yields correspond to the previous ones.

The factories have been inspected monthly. The laboratory has handled 32 commissions for the leather industry, testing a total of 21 samples. The total income of the section in the period was KSh 31 000.

In the field of standardization, two more standards drafted by KIRDI entered into effect: "Specification for wet-blue goat and sheep skins" and "Specification for wet-blue hides (bovine)". Recently the standard for crust from hides has been drafted and forwarded to the Technical Committee. Meanwhile, all the necessary data for a standard for ready-finished leather are available and it is expected that a draft standard will soon be formulated.

As agreed last year, some intermediate facilities were to be completed as the first steps of the next phase:

(a) The shaving and buffing machines have been installed and are operational. The reported damage to the shaving machine during shipment has been repaired, with costs being covered by the insurance;

(b) A dyeing drum has been installed out of the government contribution of KSh 52,000;

(c) The spray unit was also installed using a government input of about KSh 30,000 (spray cabin and star dryer with a spray gun). The spray gun ordered by UNIDO has also been received by KIRDI;

(d) The incubator (Gallenkamp) has been purchased from government funds for KSh 38,000 and effluent-analysis programmes have been initiated;

(e) Further research work was carried out in testing locally-made Turkey red oil and testing the physical properties of finishing binders;

(f) The leather section participated in the Nairobi Show of October 1983 and will display again at the show beginning on 25 September 1984.

E. The new site

The decision to move KIRDI to a new site has been taken at all levels. After many discussions, the Board of Directors and the Ministry of Commerce and Industry decided to construct the leather and the mechanical sections as the first phase of developing the new site. The Treasury has indicated that it will allocate KSh 20 million for two consecutive budget years for the construction. Prospective plans are ready for all the new buildings of KIRDI, but detailed technical plans are ready for the two sections mentioned. For the leather section, alternative A of the feasibility study has been adapted. (see appendix). The new buildings of KIRDI will be constructed next to the Kenya Bureau of Standards on a plot donated by the city council.

There have been many discussions with the architects about the size and shape of the two sections to be built first. In 1983, a two-storey building was envisaged. Now it has been definitely agreed that a one-floor building will be constructed as shown in annex XIII which gives a cross-section of the plan as in revision A of July 1984. The area of the pilot plant will be 704<m^2. (It was 616 m^2 in the feasibility study.) The office area will be 132 m^2. (It was 100 m^2 in the feasibility study.) This area includes the reception, four small rooms (Administrative office, the design room, a showroom and the finished-leather store) toilets and an unloading bay with ramp and unloading beam.

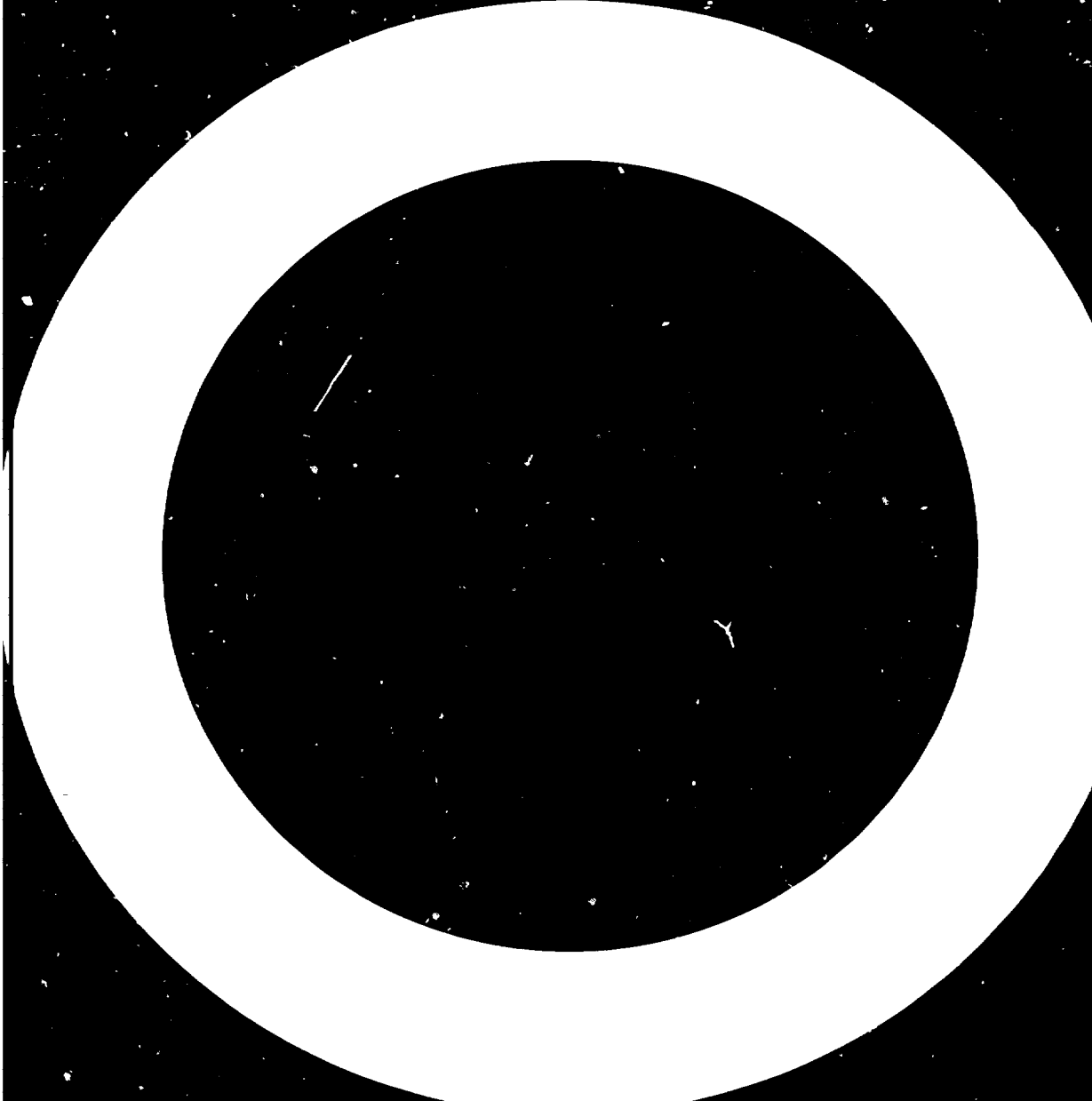
This lay out differs slightly from the one in the feasibility study (see appendix figures I and II). The facilities to be included in the new building are shown in the keyed plan in annex XIV.

The laboratory will remain at the present site of KIRDI and will move to the new site during the second phase of the KIRDI project.

The water, steam and electricity supply will not be changed although later, when the whole institute moves to the new site, some central supplies will be added.

The list of the machines has been revised, after collecting offers from various firms. This list is given in annex XV. It has been further decided to buy the bulk of the machines from one place, thus ensuring a better after-purchase supply of spare parts. No more reconditioning of machinery is being planned. In terms of budget, the building on the new site completely corresponds to the equipment budget line of the feasibility study and that of the project document proposal for the Leather Development Centre.

After the detailed plans have been accepted, a tender will be advertised in October 1984. It is hoped that the successful tenderers will be selected as soon as possible and that work will start in December 1984. When the financial sources are identified, the phasing presented in annex XVI could be implemented.



Appendix. FEASIBILITY STUDY FOR THE ESTABLISHMENT OF A COMPLETE PILOT PLANT FOR LEATHER PROCESSING IN KIRDI

INTRODUCTION

Background and justification

Kenya is a significant producer of hides and skins. However, the potential of this raw material has not been, as yet, fully exploited. Several tanning units exist, but currently they produce mainly semi-processed hides and skins (to wet-blue and crust states). Only about 5 per cent of the available raw material is transformed into finished leather. The footwear industry is fairly developed. Other finished-leather industry such as leather-garment and leather-goods manufacturing is still in an embryonic stage.

The strategy of the Kenya Government aims at maximizing the added value which is potentially there in the raw material through increased industrial treatment leading to complete processing into finished states. As part of the programme to achieve the above objective, an agreement was reached between all the parties concerned to start a joint project with the assistance of UNIDO (Project US/KEN/78/204) based at the Kenya Industrial Research and Development Institute (KIRDI). During the first phase of this project, the leather section of KIRDI, including a complete Quality Control Laboratory and a Pilot Plant (processing to the wet-blue state) was established.

This study examines the feasibility of establishing the complete Pilot Plant as requested by the Government of Kenya, i.e. equipped with all the facilities to process raw material into finished leather. The economic justification for the establishment of this second phase is given in detail in chapter III of the terminal report. The other reasons for establishing the complete pilot plant involve solving the technical-skills problem and the need for applied research and high-level training by demonstrations and seminars.

As mentioned, most of the tanneries produce semi-processed hides and skins. Only two big factories are well equipped and have skilled technicians for leather finishing. Many small or medium tanneries needing technical assistance will be commissioned in the very near future. In the past, there has not been any applied research work in Kenya in the leather field. With the establishment of the KIRDI leather laboratories, a certain amount of research work has been initiated in the following main areas: topographical quality distribution of Kenyan hides; comparison of the unit value of skins from different provinces; improvement of leather-board products; and ageing experiments on leather replacement of plastic materials. This research was partly achieved through excellent co-operation with the tanneries, where the experimental semi-finished products of KIRDI were transformed into finished products. However, although very useful, even with this kind of assistance it was not possible to set up programmed and continuous research and demonstration work. For this type of work, high-level training consisting of courses in the most up-to-date technology and technical procedures, where the most fashionable leathers are made using modern machinery and modern chemicals, is necessary. This kind of training facility does not exist in Kenya. It is, moreover, not the aim of the leather section at KIRDI to develop into some kind of training school. That is another field of activity at a completely different level requiring very specialized facilities.

Objectives and project output

The long-term objective of this phase of the project is to develop the leather section at KIRDI to grow to the level where it could be described as a demonstration centre for processing leather and leather products. The word "demonstration" here is used in its widest sense, but in practice implies that after establishing the necessary facilities and skills, the KIRDI leather section will work as the main advisory body for:

(a) Quality control of leather and leather products;

(b) Drafting of standards for leather and leather products;

(c) In-plant assistance for leather factories;

(d) Technology services for leather factories;

(e) Feasibility and viability studies for investors;

(f) Development and transfer of applied research results to the sector (development function);

(g) Conducting studies for relevant Government bodies on request.

The KIRDI leather section should also be able to hold programmed seminars and demonstrations in the fields indicated above.

A. Implementation

Implementation can be divided into two distinct parts:

(a) Setting up the quality control laboratory and pilot plant;

(b) Development of the software and the relevant skills.

The quality control laboratory has been established. Taking into account the chemical facilities already in existence within the other sections of KIRDI, it can be considered modern and complete. Instruments like the gaschromatograph, automatic-absorption spectrograph and various spectrographs including an ammino-acid analyzer are available to the leather section, and can be used for sophisticated research work. Some supplementary instruments should however be installed. For example, a third incubator (type JNF 600 Gallenkamp) should be purchased as soon as possible with government funds for water-effluent analysis (BOD) since the two incubators already purchased are in continuous use. Some grips for tearing tests on shoe soles and heels and dishes for the testing of water-vapour penetration have already been ordered using the same funds.

The pilot plant which has been established covers only a few steps of the leather-making procedure. The equipment in this part was actually very modest. The equipment component of the first phase of the project cost $US 100,000, broken down as follows:

		United States dollars
Project car and bureau facilities		11 000
Laboratory		50 000
Equipment:		
Already installed	28 000	
Purchased	8 000	
Planned (buffing machine)	3 000	
Total equipment		39 000
Total		100 000

The total cost of a complete pilot plant at current prices with new sophisticated machinery could be around $US 1 million, whereas with some key new machinery and some reconditioned machinery, the cost will be about $US 500,000. In the first case, the pilot plant equipment component amounts to 3.9 per cent of the total and in the second case to 7.8 per cent.

In the complete pilot plant one should be able:

(a) To process all kinds of raw materials (cow, horse and camel hides, goat and sheepskins) into all kinds of semi-finished and finished leather (pickled, wet-blue, ready-finished, vegetable-tanned, chrome-tanned etc.);

(b) To run small and medium-size batches following the scheduled research programme;

(c) To carry out commissions from the trade;

(d) To present demonstrations for about 10 fellows at a time on all the steps of the process;

(e) To present demonstrations on effluent treatment.

B. Planning of the pilot plant

1. Site

For the site, several variants such as Athi River, Kisumu and Nairobi have been discussed. The first two suggestions were based on the possibility of being able to make use of idle godowns and machinery, but it has not been possible to join private entrepreneurs or to acquire KIE facilities in these areas. Actually, the best site is Nairobi because of the big concentration of existing factories and facilities within and around the city. It will be seen that the research and demonstration programmes of KIRDI are not comparable to some kinds of production. Because of the low quantities of production, no pollution problems will arise as a result of research activities in the KIRDI leather section. For example, the amount of effluent will be about 2 m^3 per week, which could joint the municipal sewage even without the effluent treatment, normally consisting of sedimentation, oxidation of sulphide and precipitation of chromium salts.

A project for the movement of KIRDI to a new site, close to the KBS, has been approved by the Government. The envisaged cost is about 120 million Kenyan shillings. The briefs and sketch drawings are ready. The total area of the leather section in the present premises is 200 square metres, whereas in the new site it will be about 700 square metres, excluding the area of the laboratory. The decision of the Government has not been backed by the necessary financial investment required for the completion of the project, so it is difficult to forecast when the project will be completed. In this study, a five year project period has been considered, but as shown in the plan and drawings, the project could start with the construction of the leather section, with an input of only 5 per cent of the total cost. This means that one can predict that the leather section will be ready by 1985. The budget for 1983/84 has demonstrated the willingness of the Government to invest in this project since 300,000 Kenyan shillings have been voted for the leather project for the purchase of non-expendable equipment needed during the interim phase. Based on the above factors, three alternatives which would allow the work of the leather section to continue without a break have been studied.

Alternative A (see figure I) Condition: KSh 6-10 million given in the budget for 1984/85 for KIRDI project and the rest given in 1985/86. The complete pilot plant will be moved to the new site.

Phasing: 1984 - ordering and purchasing of the equipment (UNIDO)

1985 - start building the pilot plant in the new site (Government)

1985 - (second half year): placing and erecting of the "dry" machinery in its definitive place (staking, buffing, ironing, spraying, measuring machines)

1986 - (first half year) moving of the rest of the machinery to its definitive site

1987 - moving of the laboratories to the site

Alternative B (see figure II) Condition: Government budget allocations for moving KIRDI delayed for several years. One and a half million Kenyan shillings budgeted for a new godown on the present site in 1984/85. KIRDI and the leather section would remain on the present site for an indefinite period. Since KIRDI intends to keep its present site even if it moves to the new site, leaving here some of the pilot plants, the leather section could also remain here.

Phasing: 1983 - start building symmetrical part of the pilot plant, building of the star drier and the spraying cabin in KIRDI (Government, interim phase)

1983 - erecting of spray cabin, star drier, milling drum in pilot plant site of KIRDI. Installing of the shaving machine and buffing machine in the leather pilot plant (Government interim phase)

1983/84 - ordering and purchasing of the rest of equipment (UNIDO)

1984 - (second half year), building of new godown starts

1984/85 - erecting of the machinery (UNIDO), all in the present site of KIRDI

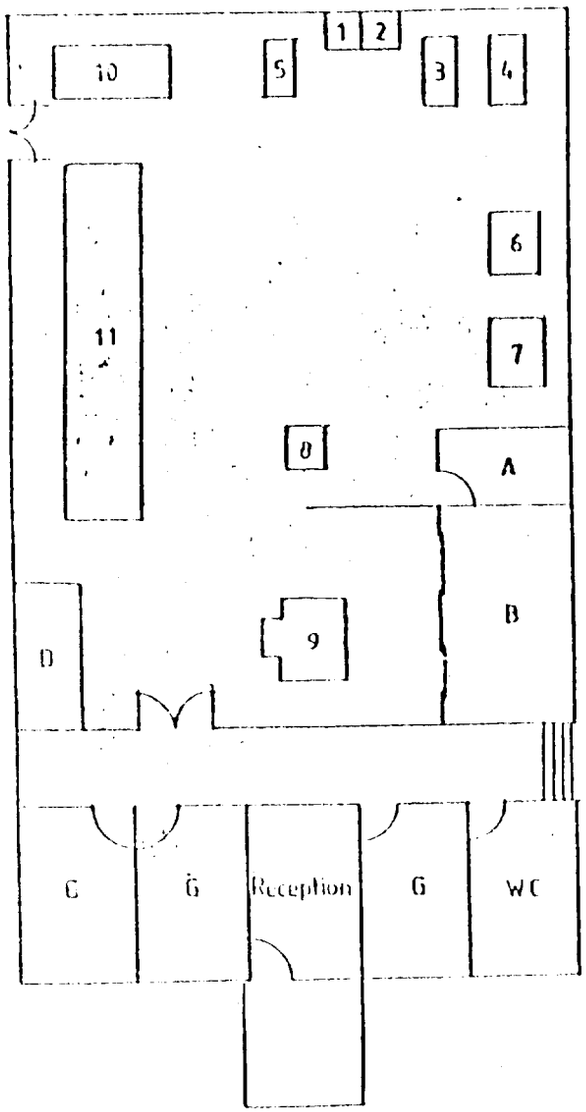
Alternative C Condition: Government will budget about KSh 1 million in the financial year 1984/85 or later for a building and some equipment. This alternative is in fact a logical continuation of the present project. This implies the establishment of a garment and leathergoods design workshop for pattern making and demonstration only. With this alternative, if the new KIRDI premises are later completed, it will contain only this part of the section and a small show room and of course later on, the testing laboratory.

Phasing: Pilot plant: As alternative B

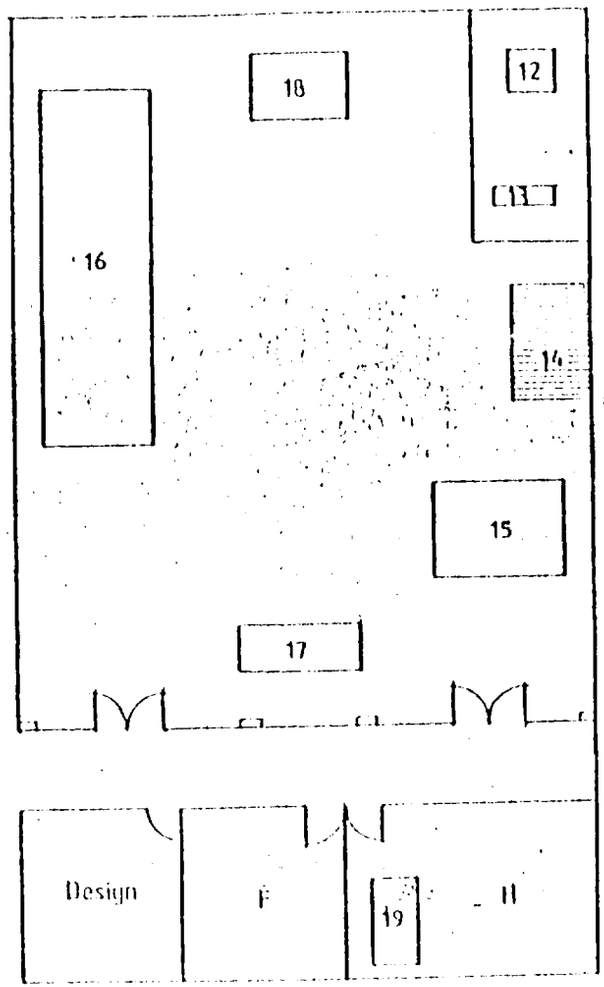
1985 - start building the room for designers on the present site or start building room for designers and the show room on the new site (Government)

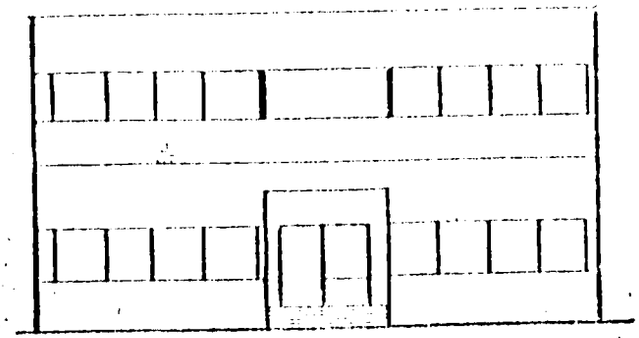
Figure I. Alternative A - layout
(Not to scale)

Ground Floor



First Floor

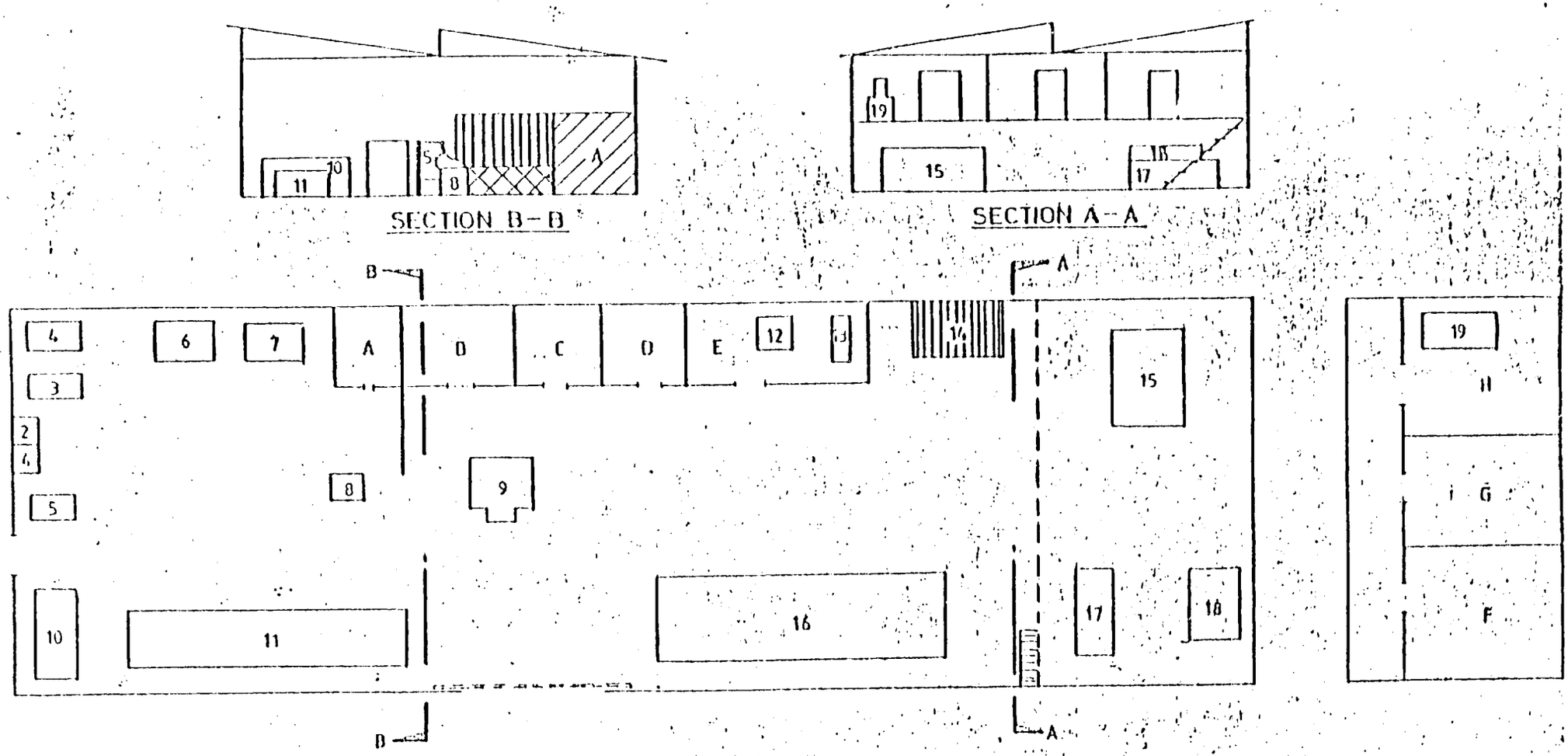




KEY TO FIGURES I and II

1	SOAKING PIT	19	MEASURING MACHINE
2	SOAKING PIT	A	STORE FOR CHEMICALS
3	DRUM FOR TANNING	B	DRYER
4	DRUM FOR LIMING	C	BOYLER
5	DRUM FOR DYEING	D	STORE FOR DYESTUFF
6	FLESHING MACHINE	E	BUFFING ROOM
7	SAMMING MACHINE	F	SHOW ROOM
8	SHAVING MACHINE	G	OFFICE
9	SPLITTING MACHINE	H	STORE FOR FINISHED LEATHER
10	SETTING MACHINE		
11	VACUUM DRYER		
12	BUFFING MACHINE		
13	DRUM FOR MILLING		
14	TOGGLE DRYER		
15	STAKING MACHINE		
16	FINISHING UNIT		
17	IRONING MACHINE		
18	IRONING PRESS		

Figure 11. Alternative B - Layout
(Not to scale)



Note: Key to numbers is given on Figure 1.

1986 - ordering and purchasing of the equipment for design (cutting machine, three sewing machines, skiving machine, tools and accessories; in all about $US 50,000 (UNIDO or Government).

The shape and cost of buildings are very different for alternatives A and B, inspite of the equivalent areas of 600 m^2 for both. In alternative A on the new site, there would be a two-storey modern building with the finishing part on the first floor and the rest on the ground floor. With alternative B, there would be a long ground-floor godown of a practical, but simple construction with a raised area for office, store and showroom at one end. In alternative A, the services, power, water and hot water (steam) will come from central supply plants. In alternative B, power will come from the existing power supply, but water and steam supply have to be separately built for the pilot plant.

All of the alternatives shown allow the work of the leather section to continue without a significant break. They would all permit the leather section to achieve the targets described in the terminal report and in this study for the pilot plant. Alternative B is feasible in the shortest time.

A look at the map of Nairobi shows that the old and the new sites of KIRDI are only two kilometres apart (five minutes by car). The other positive point is that the sites are very close to the existing factories.

2. Equipment

The proposed pilot plant is not intended for continuous production. Production will be carried out in the pilot plant to fulfil the programmed research work and commissions will be accepted to cover the expenditure as far as possible. An input of 100 pieces of skin and 20 pieces of hide a week (amounting to an output of about KSh 470,000 and a profit of KSh 160,000 a year) is envisaged.

Consequently in the selection of the equipment, factors such as productivity, automation and concurrence in the capacities of the various machines, have not been taken into account. The principle followed for the selection was to install a few modern and sophisticated machines, which are not yet available in Kenya, to ensure high-level demonstration standards. On the other hand, some less-sophisticated reconditioned machines have been recommended as well to carry out the better-known routine work. This combination makes possible a fairly low total input for equipment. (A detailed list of the equipment is given in the table at the end of the appendix.)

Office and transport equipment

The office and transport equipment is listed in the appendix table. It is only necessary to discuss here the matter of the project cars. The Peugeot 504 Estate Wagon, bought in the first phase, has clocked up 70,000 kilometres to date and the mileage by May 1984 will probably be over 100,000 kilometres. It is in fairly good condition but it cannot last up to the end of the project. In addition, the raw-hide dealers and some small tanners are in very remote places, not accessible with the Peugeot. Therefore, a Land Rover is needed. The number of tanneries to be inspected is also increasing and they are located in far away places, like Kisii, Kitale and Mandera.

Equipment for production and demonstration (leather machines)

These are commented on below following the sequence of the technology.

The installed machinery and facilities up to the wet-blue stage are adequate. These include two pits, two drums and a fleshing machine. However, some small equipment such as a time switch for the tanning drum, two balances (200 kg and 20 kg) and the relevant spares (line 17) should be purchased.

Splitting. The French-made Scimatic XMS 1850 splitting machine fits the purposes of the project. Besides the high accuracy, the machine make possible splitting in the lime, in the pickled state, in the sammed-tanned condition and in the dry-tanned condition. There is a programmed modification of the settings, so the different structures of the various areas of the hides or skins can be considered. This machine allows the production of very thin fashion leathers and very good manipulation of the splits. It is an excellent piece of equipment for demonstration purposes.

Sammying is necessary before shaving and splitting. This kind of machine, because of the high pressure of the rollers, is fairly expensive.

Shaving can be properly done by the reconditioned machine already purchased as it will complement the splitting machine.

A dyeing drum and a milling drum (made in Kenya) will be required for this project.

Setting out. This is a routine procedure the equipment for which should be installed because it is used in combination with the vacuum drier.

Vacuum drier. The Turner TH (two plates) will be a new machine in Kenya. As the bulk of the experiments will run with skins, direct setting out on plates will improve the quality of the new finished products.

Staking. Except for some reptile skins, the old-fashioned staking machines are outdated. The vibration type (Mollisa) is suitable for the pilot plant.

Toggling. Even the newest types of toggling machines work on the old principle, so a reconditioned machine is being proposed.

Spraying. Classical sprayguns (2), coating table and pads, vacuum cleaner and other items should be purchased against the Government budget given for the interim phase (KSh 300,000). A new finishing line will complete the finishing works.

Ironing plating. Very small quantities of corrected-grain leather will be made. However, facilities for doing all kinds of finishing should be provided. For this reason, a rotary type and a classical type of ironing machine should be installed.

Measuring. Since economic calculations will be made, a measuring machine should be installed.

Small equipment

A list of small machines and tools (worth $US 1,000 or less per item), which can be purchased locally, is given below.

Palettes for pelt, tanned leather and dyed leather (tanners call them "horses") with rubber wheels are needed to carry the pieces inside the pilot plant (about 10 pieces).

Baskets for pelts for keeping the pelts together after removing them from the drum (two pieces).

Small track. One piece is needed for carrying the semi-finished products.

Scales (capacity 200 kg) are needed for measuring raw material and semi-finished products.

Balance (capacity 20 kg) for measuring chemicals.

Micrometers for in-factory purposes are needed (three pieces).

Leather tongs and other grips specially shaped for the tanneries are needed (10 pieces).

Time switch for the tanning drum, allows automatic on-and-off switching of the drum motor.

Vacuum cleaner will replace dedusting machines.

Other small tools which are not specified will also be purchased locally.

Spare parts

Generally, some of the most important spare parts are delivered with the machines. Tanners usually buy spare parts for two years. The wear-out time in KIRDI will be longer. However, it is advisable to order spare parts for about 10 per cent of the value of the leather machines.

It should be mentioned here that the equipment already discussed (office equipment, leather machines, small equipment and spare parts, items under 1, 2, 6 and 7 in the table) are the same in specification and value for alternatives A and B. Services like water, hot water (steam) and electricity supply for alternatives A and B will differ both in construction and cost.

Water supply

At the present site of KIRDI, there is sometimes a shortage of water. In the last few months, the municipal supply has improved. Some of the leather machines, such as the vacuum dryer, need fairly big quantities of water (5-10 m^3/h). The existing inlet pipe from the municipal mains is very small (1.5 inches in diameter). When the pressure is low, this mains pipe cannot deliver more than about 10 m^3/h for the whole institute. To solve this problem, an underground tank (20 m^3), which works jointly with an elevated tank (5 m^3) using a booster water pump, has been proposed. The underground tank will be fed by a new mains inlet from the municipal pipe. By means of another booster pump, the outlet water of the vacuum pump will be recirculated to the upper tank.

Hot water and steam supply

There is available in KIRDI a small steam boiler, type Parkins Patomatic 500. It can supply steam for heating the dryer and the star dyer in the interim phase. The new installation will consist of an oil-injection

boiler, type NUWAY, capacity 20,000 kcal/h, providing steam at 110°C. It will be combined with a water heater with a capacity of 500 l/h at 60°C. There will be excess steam capacity, but it should be pointed out that the Parkins boiler is 30 years old. This means that the surplus of the newly-installed steam capacity will be used for the other pilot plants at KIRDI.

Electrical equipment

There is a substation in KIRDI with the parameters 11/0.4 kV, 1 x 100 kVA. Since the pilot plant is not programmed for continuous production, the diversity factor will be about 30 per cent. The installed machinery represents a consumption of about 100 kVA, so the remaining 70 kVA will suffice for the other needs of KIRDI. The electrical circuitry consists of a motor-driving system with distribution boxes and indoor and outdoor lighting with a suitable protection system and earthing.

C. Development of the software and skills

It has already been mentioned that the aim of the leather complex at KIRDI is not to develop into an academic or practical training institution. The main idea is to transfer any software or skills developed through research to the tanners and other leather processors. Consequently training has to be discussed under two headings: the training of KIRDI staff, and the training of other tannery technicians.

1. Training of KIRDI staff

The present technical staff of the leather section consists of five members (a chemistry graduate and four technicians). All of them have been trained in all the activities of the section. However, some kind of specialization occured during the two years of training.

Two of the technicians have achieved fairly high levels of competence in testing leather and leather-replacement materials such as rubber and plastics. The other two are fairly competent in the technology of leather-making (one of them has also a good aptitude for chemistry and standardization) and in conducting negotiations with clients. The number of the technical personnel should be increased by five technicians as soon as this project receives the necessary financial backing. Four of the additional staff should be chemists, and one a mechanic.

Two UNIDO experts should be included in the project, each for 12 months. One of them should be an expert in leather manufacturing and marketing, the other should be an expert in tannery equipment and maintenance. It is also advisable to include later on a UNIDO design expert for two to three months.

The programme of training for the 10 leather section staff members should be as follows:

Post	Kind and place of training	Period
BSc (future leader of section)	Nene College, Northampton. Higher Diploma in Leather Technology	12 months

4 technicians (staff in post)	Leather technology. Training at KIRDI from UNIDO expert.	each 12 months
	Short fellowships with CIBA-GEIGY and/or Stahl and/or BASF	each 2 weeks
5 new technicians: 1 mechanic	Erection and maintenance of training machines. Training at KIRDI from UNIDO expert	12 months
1 chemist	Laboratory testing and technology. Training at KIRDI	Continuous
1 chemist	Technology and laboratory testing. Training at KIRDI	Continuous
1 chemist	Testing and technology. Training at KIRDI.	6 months
	Leather-garment design. Training at PISIE Italy	6 months
1 chemist	Testing and technology. Training at KIRDI.	6 months
	Leather-goods design. Training at PISIE, Italy	6 months

A bar chart for the training programme has not been included in this presentation because the indicated periods will commence simultaneously with the start of this phase of the project.

Changes can be made in the above programme with regard to selection of personnel for external fellowships. However the main point is that continuous training of the staff of the leather section should be provided to make sure that the level of competence already achieved is not adversely affected.

2. Training of local technicians

Seminars and demonstrations for personnel from the leather branch to be conducted at KIRDI:

Kind of training	Number of trainees	Period	Starting date
Laboratory testing	10	2 weeks in each quarter	1984
Technology up to wet-blue state	10	2 weeks in each quarter	1984
Technology up to finished state	20	2 weeks in each quarter	1985 or 1986
Design of garments and leathergoods	3	4 weeks in each quarter	1986

The syllabus and programme of training should be distributed two months before the start of the training. A convenient charging system will be instituted. Individual training programmes could also be accepted, with higher charges. Technicians from rural tanneries who are sent for training could be trained without charge.

D. Cost and budgeting

1. Land and building requirements and costs

Building requirements (see figures I and II) for the proposed pilot plant, laboratory and offices would be as follows:

	(Square metres) Alternative A	Alternative B
Pilot plant area	616	616
Laboratory area	150	55
Office area	100	100
Total	866	771

The total areas do not differ considerably. In alternative A, 866 m^2 of building would be erected. In alternative B, a laboratory area and 50 m^2 of office space is already available. Therefore, only 666 m^2 would have to be built.

In alternative A, the construction should match in style with the other buildings of the new compound (one store building, concrete frame, brick-masonry and concrete blocks). At current prices, this kind of building would cost about 4,000 KSh/m^2 (including civil engineering).

In alternative B, the plant will match the existing buildings in KIRDI consisting of steel frame, partial concrete block, block walls and translucent PVC sheets. At current prices, this kind of building will cost about 2,000<KSh/m^2 (including civil engineering). The total cost of buildings in both cases would be:

Alternative A = KSh 3,464,000
Alternative B = KSh 1,332,000

Costing of land is not included because it is expected that the city council will donate land in both cases.

2. Equipment and services

The relevant cost figures are given in the table. As already mentioned, only services like water, steam and electricity supply will differ in costing between the two alternatives. However, it was not possible to separate the share of these items in the new premises of KIRDI, from those of other sections, because of the planned central supply. It can therefore be assumed that these costs will be the same for the two alternatives. The total cost of equipment as shown in the table, for either alternative, would be:

Purchase of new equipment	$US 510,300	(UNIDO contribution)
Transport and clearance (Mombasa to Nairobi)	KSh 285,000	(Government)

3. Installation

Installation should be carried out by the UNIDO expert in tannery equipment and maintenance. He should be assisted by the KIRDI mechanical technician, two fitters and four labourers.

Alternatives A and B:

	Duration (m/m)	Cost per month	Cost per year	Contributor
UNIDO expert	12	$US 7,000	$US 84,000	UNIDO
2 fitters	24	KSh 5,000	KSh 120,000	Government
4 labourers	48	KSh 1,500	KSh 72,000	Government

4. Training new staff

The UNIDO expert in technology and marketing will be the Chief Technical Adviser of the project. Among other functions, his job will include the training of the new staff members and, together with the Director of KIRDI, arranging for the fellowships. If complementary alternative C is approved, it would be necessary to engage the services of an UNIDO expert in design for a short period of 3 months.

Training of new staff and fellowships, alternatives A, B and C:

	Duration	Cost per month	Cost per year	Contributor
UNIDO expert	12 m/m	$US 7,000	$US 84,000	UNIDO
5 new technicians (salaries for 1 year)			KSh 360,000	Government
2 fellowships at PISIE (garment and leather goods)	12 m/m	$US 2,000	$US 24,000	UNIDO
travel fees			KSh 14,000	Government
4 short fellowships	2 weeks each			
travel fees			KSh 56,000	Government
UNIDO expert in design	3 m/m	$US 7,000	$US 21,000	UNIDO

5. Total cost requirement

Item	Alternative A		Alternative B		Alternative C	
	UNIDO ('000 $US)	Government ('000 KSh)	UNIDO ('000 ($US)	Government ('000 KSh)	UNIDO ('000 $US)	Government ('000 KSh)
Building	--	3,464	--	1,332	--	300
Equipment	510.3	--	510.3	--	50	--
Transport and clearance of equipment	--	285	--	285	--	30
Installation	84	192	84	192	--	10
Training	84	360	84	360	21	--
Fellowship	--	56	--	56	24	14
Total	678.3	4,357	678.3	2,225	95	354

In terms of financing, the UNIDO contributions for both alternative B + C and alternative A + C amount to $US 773,300, while the Government contribution is KSh 4,711,000 for A + C and KSh 2,579,000 for B + C.

It should be noted that running costs (chemicals, overheads etc.) and profitability have not been elaborated. Sensibly, the aim of this project will not be continuous production, nor profit making in the normal way. However, it is estimated that the laboratory will be expected to produce an income of about KSh 100,000 per year and the pilot plant about KSh 500,000 per year, since experience shows that the experimental leathers are easily marketable.

Estimated cost of equipment

		United States dollars
1.	Office and transport	
1.1	Typewriter (2), IBM	2 000
1.2	Computer, Hewlett Packard	1 000
1.3	Miscellaneous office equipment	2 000
1.4	Project car, Peugeot 504 Estate Wagon	9 000
1.5	Project car, Land Rover	11 000
	Total	25,000
2.	Leather machines	
2.1	Splitting machine, Scimatic XMS 1800 mm Mercier	100 000
2.2	Sammying machine, Polypress 1800 mm Aletti	40 000
2.3	Dyeing drum, local (Kenya)	6 000
2.4	Milling drum, local	6 000

	United States dollars
2. Leather machines (continued)	
2.5 Setting machine, Optima Re.la 1800 mm Moenus	34 000
2.6 Vacuum dryer (2 plates), Turner-TH 1800 x Moenus 3200 mm Turner	38 000
2.7 Staking machine, Mollisa RL 1500 1500 mm Investa	42 300
2.8 Toggle dryer, Norris	12 300
2.9 Finishing line, SR 180/4P + 4NE + R Carlessi	34 600
2.10 Ironing (rotary), Flamar 1800, 1800 mm Flamar	34 800
2.11 Ironing press, Sheridan 650 x 1100 mm Hampton	26 500
2.12 Measuring machine, Turner 155, 1600 mm Norris	4 460
Total	378 960
3. Hot water supply	
3.1 Boiler (oil inj.), NUWAY (local) Safari Ing. Ltd.	20 000
3.2 Water heater (local) Safari Ing. Ltd.	5 000
3.3 Steam distributor pipes (local)	1 000
Total	26 000
4. Water supply	
4.1 Water tank with fittings, 20 m^3 (local)	5 000
4.2 Water tank with fittings, 5 m^3 (local)	2 000
4.3 Booster water pumps, RG 50 Boostomatic, 3 pieces Stuart Turner Ltd.	6 000
Total	13 000
5. Electrical equipment	
5.1 Motor-driving system (local)	20 000
5.2 Lighting (in- and outdoor) (local)	5 000
Total	25 000
6. Small equipment	4 450
7. Spare parts 10% on leather machines listed under (2)	37 890
Grand total	510 300

Note: Non-local equipment is given with f.o.b European port terms. Some slight change in the specifications would produce a saving of about five per cent to cover transport from a European port to Mombasa.

Documentary outputs of the project

Draft report by D. Winters. (English, May 1980)

Technical report on a one-month mission resulting in the re-drafting of the project proposal. Circulated in draft form.

Draft report by R.L. Boccone. (English, December 1981)

Technical report covering all the methods and results of leather testing and the establishment and application of suitable norms. Circulated in draft form.

Draft report by R. Schubert. (English, April 1982)

Feasibility study on the expanded tannery pilot plant, phase II. Circulated in draft form and, after clearance, distributed to the Government of Kenya, Ministries of Livestock, Industry, and Regional Development Science and Technology.

Establishment of a leather quality control laboratory. Terminal report by M. Berci. (English, November 1984)

Annex I

GOVERNMENT INPUTS TO THE PROJECT,
MAY 1981-OCTOBER 1983

	Scheduled	Actual	Scheduled period (m/m)	Actual period (m/m)	Salary allowance (KSh)	Total (KSh)
1. Personnel						
(a) Counterpart staff						
Co-manager			29.5	7.1	73 940	
Research Officer			22	20	108 220	
Technologists (up to 1982, 3 persons) (from 1982, 4 persons)			124.5 a/	124.5 a/	624 585	
(b) Support staff						
Laboratory assistants	2	2	25.1	15	20 490	
Administrative assistants	1	1	29.5	22	63 000	
Typist	2	1	29.5	25	63 740	
Driver	1	1	29.5	29.5	53 160	
Messenger	1	1	29.5	25	29 700	
(c) Subsistance allowances					14 070	
Total personnel input						1 050 905
2. Equipment						
Instron 1122 model						716 400
Clearance and freight charges						154 005
Purchases						35 029
3. Buildings, land (space of laboratory)						295 000
4. Cash support						
Fuel + car maintenance						142 313
5. Other expenditure						
Chemicals, stationery etc.						75 526
						1 969 178

a/ Including 14 months fellowship in Uruguay.

Annex II

TIMETABLE OF PROJECT ACTIVITIES

Activity	Timetable scheduled	Timetable Actual
1. Start of organization and operation of the laboratory for leather	10/81	10/81
2. Purchase of tools, equipment	7/81-10/82	5/82 (last item purchased)
3. Training of counterparts		
(a) Quality control global	11/81	10/81
(b) Quality control chemical	7/81	7/81
(c) Quality control physical	8/81	8/81
(d) Plan controls	11/81	10/81
(e) Technology phase 1	1/82	4/82
4. External training of counterparts (In-factory)	1/82	5/82
5. Research work		
(a) In quality control (leather board)	6/82	12/81
(b) In technology (effluent treatment)	6/82	4/82
6. Quality certification system	-	starts only with phase 11
7. Statistical data bank	-	4/82
8. Assisting the counterpart to give direct in-plant technical assistance to raise the quality	-	5/82
9. Systematic applied research to evaluate the procedures and the raw materials from different provinces	-	started with wet-blue should be continued in phase 11
10. Feasibility study for the second phase	9/83	9/83 (see appendix)
11. Standardization	8/83	8/83 (wet blue)
12. Strategy of the Government	10/83	see relevant parts of this report
13. CTA's follow-up mission to the field	1-4/84	6-9/84

Annex III

DOCUMENTS AND PAPERS LEFT WITH COUNTERPART

1. How to prevent accidents in the laboratory and in the pilot plant.

2. Methodology:

   Official methods of testing leather
   Methods of testing rubber soles, heels and sheets for shoes and rubber boots
   Methods of testing leather board
   Methods of testing fabrics, textiles for shoe upper and lining
   Methods of testing used lime liquors
   Methods of testing retanning materials
   Methods of testing fat liquors
   Methods of determining the surface activity of semi-finished products

3. Specifications:

   For all kind of leather
   For shoe upper and lining fabrics (textiles)
   For rubber soles, heels and sheets

4. Files:

   One file for each item of the equipment, with copies of invoice, bill of lading and packing list
   One file with details about books and periodicals

5. Manuals:

   For each piece of apparatus, original manuals and maintenance books

6. Inventory:

   A detailed inventory has been compiled covering all accessories and spare parts with their catalogue numbers to enable accurate ordering when needed.

Annex IV

URBAN AND RURAL TANNERIES

Alpharama	Athi River Tel: 746097
Aziz Din	Nairobi, Nanyuki P.O. Box 41075 Tel: 20676
Bata Shoe Company Ltd.	Limuru P.O. Box 23 Tel: 251,534
Bulley Tanneries Ltd.	Thika P.O. Box 15 Tel: 21941
Chrome Tanners	Nakuru P.O. Box 225 Tel: 2645
East Africa Leather Factory	Nairobi P.O. Box 46227 Tel: 22672
Kamiti Tanners (Ruaraka)	Nairobi P.O. Box 48861 Tel: 2251, 2319
Nakuru Tanners	Nakuru P.O. Box 225 Tel: 2645
New Market Leather Factory Ltd.	Nairobi P.O. Box 14307 Tel: 556170
Sagana Tanneries Ltd.	Sagana P.O. Box 8094 Tel: 29
Masai Rural Training Centre	Isinya, Kajiado
Rural Tannery	Gesima, Kisii
Rural Tannery Kinunga	Nyeri, Kinunga

Annex V

SHOE FACTORIES

		Maximum leather shoe production (pairs per day)
Bata Shoe Company Ltd.	Limuru P.O. Box 23 Tel: 251	10 000
Dragon Ltd.	Thika P.O. Box 404 Tel: 22213	100
Farucci Marketing Ltd.	Mombasa P.O. Box 84356 Tel:	50
Gellams (Changamwe)	Mombasa P.O. Box 84356 Tel: 433395	100
Joy Shoe Ltd.	Nairobi P.O. Box 40460 Tel: 555980	400
Kenya Shoe Factory Industries Ltd.	Nairobi P.O. Box 11244 Tel: 41894	100
Macqueen Shoe Factory	Mombasa P.O. Box 82512 Tel: 26015	100
Nairobi Handbag Manufacturing Ltd.	Nakuru P.O. Box 7233 Tel: 41894	80
Tiger Shoe Company Ltd. (Lunga-Lunga Rd)	Nairobi P.O. Box 74572	2 000
United Shoe Factory	Nairobi (Kikuyu) P.O. Box 54602 Tel: 335817	400

Annex VI

RESULTS OF TESTS ON KENYAN LEATHER

A. Wet-blue and crust

The wet-blue, a chrome-tanned hide or skin, is a trade product sold chiefly by the hide and skin collectors and sellers to the European market.

Table 9 shows the results of the tests on wet-blues. Those figures which do not comply with the acceptance level are underlined. Although complaints about the quality are rare, the variability of quality may affect the business. There is big competition in the world market and it is easier to sell high-quality products.

Visual examination of wet-blues revealed defects originating from the raw material, such as wrinkles and flesh-side cuts. The shade of the products was generally uniform and the grain was fairly smooth.

The major variations in the appearance of the products and in the important specifications (e.g. mineral salts, chromium-oxide content and tensile strength) reflect differences in the processing methods employed.

Crust, made from hides or skins, is also a semi-finished product, but at a higher level of processing. There are two producers in Kenya. Both of them are producing crust with very good appearance and high quality which is sold in foreign markets.

B. Sole and insole leather

These are finished products prepared by vegetable-tanning procedures for local shoe production and repair.

The laboratory test results are shown in table 10. It can be noted that the major variations are in water absorption (sole), water-vapour penetration (soles, insoles) and strength properties.

In appearance, the products show two very different quality levels. The large-scale factories produce small quantities of these products which can be sold anywhere in the world market (after slight improvement). The same cannot be said for the medium and small-scale factories and the rural tanneries. Their products are of very inferior quality because they are very soft with drawn grain, loose fibres, and flesh cuts. These products can not be considered as finished, since the chemicals and mechanical procedures are entirely omitted or are haphazardly done. These products are only marketable because of the scarcity existing against a relatively high demand.

C. Lining leather

These are finished products prepared by vegetable tanning, mostly from skins. They are used in the home market for shoe making and for rural leather goods. The laboratory test results in table 11 show that generally the strength properties are low. This indicates that the mechanical procedures are not properly done and that there are chemical deficiencies as well.

Under visual examination, only very few of these products could be considered acceptable, although, for the targeted usage, the lining leathers are better than the soles and insoles.

Table 9. Quality evaluation of wet blue leather

Sample mark	Kind	Water content (%)	Sulphate ash (%)	Cr_2O_3 (%)	Mineral salts (%)	Fat (%)	pH	Tensile strength (kg/cm^2)	Tear strength (Kg/cm)	Shrink temperature (°C)
A	Hide	Pass	6.1	3.90	2.2	0.7	3.3	200	52	105
B	Hide	Pass	16.1	3.14	13.0	1.3	3.5	207	47	105
C	(Calf)	Pass	11.5	3.48	8.0	1.7	3.4	213	23	101
D	Goat	Pass	18.5	4.17	14.3	1.7	3.5	152	16	110
E	Goat	Pass	20.2	4.64	15.6	1.0	3.3	130	21	109
F	Goat	Pass	19.6	5.02	14.6	1.7	3.6	156	25	110
G	Goat	Pass	11.6	2.39	9.2	1.9	3.1	210	22	92
K	Goat	Pass	30.4	-	27.7	-	3.5	-	-	-
L	Goat	Pass	14.0	2.4	11.6	1.9	2.9	190	30	100
M	Goat	Pass	26.0	2.3	23.7	1.9	2.9	165	21	95
H	Sheep	Pass	17.6	5.75	11.9	1.4	3.2	186	17	109
J	Sheep	Pass	15.9	1.70	14.2	1.9	3.4	169	27	88
Acceptance level	Hide	>50		2.0 5.0	<10	<2	>3	>200		100
	Skin	>60		2.0 5.0	<10	<2	>3	200 (goat) 140 (sheep)		100

Note: Values underlined do not comply with the acceptance level for that factor.

Table 10. Quality evaluation of sole and insole leather

Property tested	Sample mark and kind A Sole	B Insole	C Insole	D Sole	Acceptance level
Humidity (%)	12.1	11.7	10.7	12.5	
Magnesium salts ($MgSO_4 7H_2O$) (%)	1.4			1.9	Sole: <3
Water solubles (%)					
Total	1.9			2.6	Sole: <20
	-	2.0	0.9		Insole: <15
Organic	1.2			1.3	Sole: <18
		1.2	0.7		Insole: <13
Inorganic	0.7			1.3	Sole: <2
		0.8	0.5		Insole: <2
pH	4.92	3.90	3.32	3.56	Sole: >3
					Insole: >3.5
Diff. number	0.12	0.72	0.68	0.45	<0.7
Water absorption (%)	53-54			42-44	Sole: 2h <35
					24h <45
		98	52		Insole: 8h >35
Water evaporation (%)		9.8	10.5		Insole: 16h (abs)
		10	20		>40% of absorption
Water vapour absorption ($mg/cm^2/8^h$)	20.3	5.2	7.6	8.9	>20
Stitch tear strength (kg/cm)	59	40	96	78	>80

Note: Values underlined do not comply with the acceptance level for that factor.

Table 11. Quality evaluation of lining leather

Property tested	Sample mark and kind A Goat	B Sheep thick	C Sheep thin	D Sheep	E Sheep	F Sheep	Acceptance level
Humidity (%)	11.6	11.2	9.5	10.4	10.8	13.2	--
Water solubles (%)							
Total	2.6	1.4	3.0	0.7	0.8	0.4	<6.0 vegetable <3.0 chrome
Organic	1.3	0.5	1.5	0.3	0.3	0.5	
Inorganic	1.3	0.9	1.5	0.4	0.5	0.5	
Sulphate ash (%)	14.5	10.4	17.3	4.7	4.0	2.7	<3.0 vegetable <2.0 chrome
Cr_2O_3 (%)	0	0.54	0	0	0	0	0.6 or 0
Fat (%)	11.6	11.2	9.5	10.4	10.8	13.2	4-8 vegetable 5-11 chrome
pH	4.45	3.80	4.55	3.94	3.96	3.83	>3.5
diff.	0	0.56	0	0.74	0.87	0.89	(<4.0/07)
Water absorption (%)	103 116	97 103	164 193	175 234	243 287	196 241	2h >75 24h >100
Tensile strength (kg/cm^2)	205	115	94	92	115	150	>150
Tear strength (kg/cm)	13.8	8.0	6.8	15.8	18.5	19.5	>15
Rub fastness dry leather/ dry felt 50 tours	5/5	5/5	5/5	5/5	5/5	5/5	>3
Dry-leather/ wet felt 20 tours	5/5	5/5	5/5	5/5	5/5	5/5	>3
Stitch tear strength (kg/cm)	46	22	18	43	53	52	>40

Note: Values underlined do not comply with the acceptance level for that factor.

D. Garment and upholstery leather

These are finished products prepared by chrome tanning. Garment leather is usually from skins, while upholstery is usually from hides.

They are produced by medium and large-scale tanneries for the home market. The upholstery leathers are fairly good according to the analytical laboratory and visual test results. The garment leathers are good in appearance but are inferior in their most important property, which is the stitch strength. Some of the garment leathers are also inferior in rub fastness.

The test results are given in table 12.

E. Shoe upper leather

These are finished products made by chrome tanning for shoe production in the home market. The laboratory test results are given in table 13. Although only a few of the values are below the acceptance level, they are very important ones. For example, those connected with the hygienic properties, like water-vapour absorption and water penetration. Some pieces are also inferior in their rub fastness. These faults could also be detected by visual examination which indicated that some leathers had thick finished coats. Because the raw hides have plenty of surface faults (scratches, partly-rotten surfaces) the factories cannot produce large quantities of the modern full grain leathers and they are compelled to cover with thick coats the defects of the raw hides. Despite all these deficiencies, the shoe upper leather products are relatively the best ones in Kenya.

Table 12. Quality evaluation of garment and upholstery leather

Property tested	Sample mark and kind A Sheep clothing	B Nappa cloth	C Upholstery	D Upholstery	Acceptance level
Moisture (%)	11.2	11.0	10.9	17.4	
Sulphate ash (%)	7.3	8.6	4.6	8.2	
Cr_2O_3(%)	6.61	3 96	3.43	5.56	>2.5
Mineral salts (%)	0.7	4.6	1.2	2.6	<2.0
Fat (%)	5.6	16.6	6.5	3.6	Garment <18 Upholstery 5-11
pH	3.8	4.4	3.4	3.7	>3.5
Rub fastness dry leather/dry felt					
Garment 20 tours Upholstery 50 tours	5/5	2/1	5/5	5/5	>3
Dry leather/wet felt: Garment 10 tours Upholstery 20 tours	5/5	1/1	4/3	5/3	>2
Flexibility upholstery			pass	pass	>50.000
Finish adhesion (g/cm)	800	500	580	500	>200
Tensile strength (kg/cm^2)	177	179	158	138	>100 aimed at 120
Tear strength (kg/cm)	13.4	39.1	37.7	18.1	Garment >15 Upholstery >20
Stitch tear strength (kg/cm)	37	85	77	45	>100
Wettability (minutes)	60	17	60	60	Garment >5 min Upholstery >10 min.

Note: Values underlined do not comply with the acceptance level for that factor.

Table 13. Quality evaluation of shoe upper leather

Property tested	Sample mark and kind A Corrected grain smooth	B Corrected grain embossed	C Hunting	D Corrected grain smooth	E Corrected grain smooth	F Corrected grain smooth	Acceptance level
Moisture (%)	10.4	13.7	13.2	12.4	12.9	12.5	
Sulphate ash (%)	4.9	5.3	6.3				
Cr_2O_3(%)	3.66	4.39	4.91	5.6	5.6	5.5	>2.5
Mineral salts (%)	1.2	0.9	1.4				<1.5
Fat (%)	3.9	3.6	4.0	5.1	4.4	5.7	<16 or <7
pH	3.9	3.8	3.6	3.9	3.9	3.8	>3.5 (<4.0/0.7)
Flexibility (Bally flexo-meter)	pass pass	pass pass	pass pass	pass pass	fail pass	pass pass	dry 50 000 wet 10 000
Finish adhesive (g/cm)	1 380	1 300		540	1 170	840	>500 dry
Rub fastness: dry leather/dry felt: 50 tours	4/3	5/5	5/5	5/5	5/4	5/5	>3
dry leather/wet felt: 50 tours	2/3	5/4	2/3	5/4	5/5	5/5	>3
Hot ironing (°C)	175	80-100	--	140	240	200	>80
Lastmometer test (mm)	6.9	9.1	8.4				>6.7
Tensile strength (kg/cm^2)	62	55	59	33	54	38	>15 (abs)
Tear strength (kg/cm)	17.5	19.8	23.5	14.5	21.0	17.5	>3.5 (abs)
Stitch tear strength (kg/cm)	23.3	21.4	24.8				
Water vapour absorption ($mg/cm^2/8h$)	7.5	8.3	24	9.2	8.0	11.2	>10
Water penetration: time (min. and sec.)	9.27	4.05	2.50	3.00	5.30	3.30	>5
Percentage	58	68	85	44	40	43	<50

Note: Values underlined do not comply with the acceptance level for that factor.

Annex VII

Statistical data on export of domestic hides, skins, semi-finished and finished leathers (codes 211 + 611)

Code number	Type of product	1981 Weight (kg)	1981 Value (KSh)	1082 Weight (kg)	1082 Value (KSh)	1983 Weight (kg)	1983 Value (KSh)	1094 January-April Weight (kg)	1094 January-April Value (KSh)
211	Hides and skins	12 964 381	184 123 039	11 136 403	158 032 600	9 157 924	126 578 929	3 548 093	51 257 778
2111	Bovine and equine	8 730 310	86 049 182	7 985 918	91 512 928	6 122 832	72 952 671		
211-101	Dried	6 651 687	72 907 159	5 464 815	70 193 037	2 790 518	43 330 756		
211-103	Wet salted	708 727	5 246 609	789 503	7 241 749	1 198 915	11 508 909		
211-102	Pickled			37 484	334 790	44 896	672 770		
211-104	Wet-blue chrome	1 279 896	7 895 414	1 654 116	13 743 352	2 088 503	17 440 236		
2112	Calf and kip skins	15 200	248 002	2 678	44 210	4 993	104 739		
211-201	Dried	1 263	8 388	2 678	44 210	4 993	104 739		
202	Wet salted	13 937	239 614						
2114	Goat and kid skins	2 691 088	67 176 059	2 268 360	51 693 803	2 167 349	39 249 301		
211-401	Dried	806 606	18 979 904	907 511	19 898 379	801 247	11 159 947	39 432	653 002
402	Pickled					82 827	1 941 409		
403	Wet-blue chrome	1 884 482	45 196 155	1 360 849	31 795 424	1 283 275	26 147 945	487 793	9 508 138
2117	Sheep skins without the wool	1 230 238	32 359 028	858 500	14 553 413	816 619	13 837 388		
211-701	Dried	625 501	8 706 080	508 449	4 991 424	372 243	4 377 110		
702	Pickled			10 749	1 506 534	51 418	1 551 223		
703	Wet-blue chrome	604 737	23 652 948	339 302	8 055 455	392 958	7 909 055		
211600	Sheep skins with the wool on	297 530	1 288 438	12 108	116 075	46 131	434 830		
611	Crust and dressed leather	1 243 166	41 277 141	1 122 950	34 030 094	403 632	24 907 496	289 475	18 601 571
611402 + 502 + 612	Crust (undressed leather)	886 272	39 671 065	663 262	30 906 458	394 922	24 404 459	289 475	18 601 571
611401	Dressed leather	356 894 (178 447 m^2)	1 606 076	459 688 (229 844 m^2)	3 123 636	8 710 (4 355 m^2)	503 037		

Source: Ministry of Finance, Customs and Excise Department, Statistical Branch.

Annex VIII

MODEL EXPERIMENTS ON PRODUCTION AND COSTS

A. Sheep skins from the North Eastern Province

Composition of sample: 40.2% clothing nappa
30.8% suede
29.0% bag leather

Element of the production cost	Actual cost (United States dollars)	Cumulative total (United States dollars)
1. Raw material (40 pieces of A/D sheepskins, 4-8 sq ft; 50% run + 50% IV.VI)	40.00 (1.00 per piece)	40.00
2. Chemicals (up to wet-blue)	18.00	58.00
3. Clothing (12 pieces, 62 sq ft, 40.2%)		
Raw material + chemicals up to wet-blue	23.32	23.32
Additional chemicals up to dried crust	8.73	32.05
Additional chemicals up to finished	3.90	35.95
Labour	2.48	38.43
Overhead	11.16	49.59
Tax: 15%	5.70	55.29
Total production cost	55.29	
Income (finished, grade III at $US 2.25/sq ft)	139.50	
Added value (% of total cost)	(152.3%)	
4. Suede (10 pieces = 47.5 sq ft, 30.80%)		
Raw material + chemicals up to wet-blue	17.86	17.86
Additional chemical up to finished	18.39	36.25
Labour	1.90	38.15
Overhead	8.55	46.70
Tax: 15%	5.37	52.07
Total production cost	52.07	
Income (finished, grade III at $US 1.10/sq ft)	52.25	
Added value (% of total cost)	(0.34%)	
5. Bag leather (18 pieces = 44.5 sq ft, 29.0%)		
Raw material + chemicals up to wet-blue	16.82	16.82
Additional chemicals up to crust	4.48	21.30
Additional chemicals up to finished	2.80	24.10
Labour	1.78	25.88
Overhead	8.01	33.89
Tax: 15%	3.89	37.78
Total production cost	37.78	
Income (finished grade II at $US 0.95/sq ft)	42.27	
Added value (% of total cost)	(11.9%)	

continued

Annex VIII (continued)

Element of the production cost	Actual cost	Cumulative total
	(United States dollars)	
6. Added value on finished leathers		
Total cost (3 + 4 + 5)	145.14	
Total income	234.02	
Added value (% of total cost)	61.23%	
Profit (value $US)	88.88	
Profit (%)	(37.9%)	

7. Added value on wet-blue state compared to finished

		Wet-blue	Finished
(a)	Raw material + chemicals	58.00	96.30
(b)	Labour + overheads proportionate to (a)	20.40	33.88
(c)	Tax: 15%	11.76	14.96
(d)	Total production cost	90.16	145.14
(e)	Income (154 sq ft at $US 0.8)	123.2	234.02
(f)	Added value (% of total cost)	(36.6%)	(61.2%)
(g)	Profit (value $US)	33.04	88.88
(h)	Profit (%)	(25.0%)	(37.9%)

Annex IX

MODEL EXPERIMENTS ON PRODUCTION AND COSTS

B. Hides from the Rift Valley (Narok)

Composition of sample: 53.5% shoe upper
14-1% lining
32-4% suede (split shoe upper)

Element of the production cost	Actual cost (United States dollars)	Cumulative total (United States dollars)
1. Raw material (5 pieces of A/D hides 6/8 kg, total 30 kg)	17.40 (0.58 per kg)	17.40
2. Chemicals (up to wet-blue)	13.39	30.79
3. Shoe upper (77.7 sq ft, 53.5%)		
Raw material + chemicals up to wet-blue	16.47	16.47
Additional chemicals up to crust	10.89	27.36
Additional chemicals up to finished	4.89	32.35
Labour (at $US 0.063/sq ft)	3.00	35.35
Overhead (at $US 0.04/sq ft)	13.98	49.33
Tax: 15%	7.40	56.73
Total production cost	56.73	
Income: 30.5 sq ft grade I at $US 1.65	50.32	50.32
18.7 sq ft grade II at $US 1.60	29.92	80.24
28.5 sq ft grade III at $US 1.50	42.72	122.96
Total 77.7 sq ft at average $US 1.58	122.96	
Added value (% of total cost)	(116.7%)	
4. Suede split (shoe upper, 47.1 sq ft, 32.4%)		
Raw material + chemicals up to wet-blue	9.98	9.98
Additional chemicals up to crust	13.30	23.28
Additional chemicals up to finished	2.96	31.24
Labour (at $US 0.063/sq ft)	1.88	33.12
Overhead (at $US 0.04/sq ft)	8.50	41.62
Tax: 15%	6.24	47.86
Total production cost	47.86	
Income: 33.1 sq ft grade I at $US 0.62	20.52	
14.0 sq ft grade II at $US 0.55	7.70	
Total 47.1 sq ft at average $US 0.60	28.22	
Added value (% of total cost)	(-41.0%)	
5. Lining (20.5 sq ft, 14.1%)		
Raw material + chemicals up to wet-blue	4.34	4.34
Additional chemicals up to crust (finished)	1.10	5.44
Labour (at $US 0.01/sq ft)	0.20	5.64
Overhead (at $US 0.18/sq ft)	3.69	9.33
Tax: 15%	1.39	10.72
Total production cost	10.72	
Income (20.5 sq ft grade I at $US 0.75)	15.37	
Added value (% of total cost)	(43.4%)	

continued

Annex IX (continued)

Element of the production cost	Actual cost	Cumulative total
	(United States dollars)	
6. Added value on finished leathers		
Total cost (3 + 4 + 5)	115.31	
Total income	166.55	
Added value (% of total cost)	(44.4%)	
Profit (value $US)	51.24	
Profit (%)	(30.7%)	

7. Added value on wet-blue state compared to finished

	Wet-blue	Finished
(a) Raw material + chemicals	30.79	69.03
(b) Labour + overheads (proportionate to (a))	13.98	31.25
(c) Tax: 15%	6.72	15.03
(d) Total production cost	51.49	115.31
(e) Income (98.2 sq ft at $US 0.6)	58.92	116.55
(f) Added value (% of total cost	(14.4%)	(44.4%)
(g) Profit (value $US)	7.43	51.24
(h) Profit (%)	(11.6%)	(30.7%)

Annex 4

MODEL EXPERIMENTS ON PRODUCTION AND COSTS

C. Average yields

1. Hides

Province	Number of pieces: Original	Lime loss	Effective	Shoe upper leather: Grade I (sq ft)	(%)	Grade II (sq ft)	(%)	Grade III (sq ft)	(%)	Lining (sq ft)	(%)	Suede split: Grade I (sq ft)	(%)	Grade II (sq ft)	(%)	Total (sq ft)	(%)	Yield ($US/sq ft)
Rift Valley	5	-	5	30.5	21.2	18.7	12.9	28.5	19.6	20.5	14.1	33.1	22.8	14.0	9.6	145.3	100	1.15

2. Goat

Province	Number of pieces: Original	Lime loss	Effective	Garment (sq ft)	(%)	Shoe (sq ft)	(%)	Bag (sq ft)	(%)	Total (sq ft)	(%)	Yield ($US/sq ft)
North Eastern	20	2	18	--	--	90.50	100	--	--	90.50	100	1.90
Central	21	--	21	35.00	33.2	27.25	25.9	43.00	40.9	105.25	100	1.63
Nyanza	20	1	19	23.25	26.2	20.50	23.0	45.10	50.8	88.85	100	1.51
Rift Valley	20	--	30	79.25	57.2	--	--	59.25	42.8	138.50	100	1.69
Western	10	--	10	16.50	79.3	--	--	4.30	20.7	46.30	100	1.98
Eastern	20	--	20	12.50	13.2	49.75	59.7	20.75	25.1	82.5	100	1.71

3. Sheep

Province	Number of pieces: Original	Lime loss	Effective	Garment (sq ft)	(%)	Shoe (sq ft)	(%)	Bag (sq ft)	(%)	Total (sq ft)	(%)	Yield $US/sq ft)
North Eastern	40	1	39	62.00	40.2	47.50 a/	30.8	44.50	29.0	154.00	100	1.52
Central	20	--	20	49.50	49.9	10.00	10.00	39.75	40.0	99.25	100	1.62
Nyanza	20	--	20	27.00	30.1	14.24	15.9	48.50	54.0	89.75	100	1.38
Rift Valley	30	1	29	36.25	26.3	--	--	101.75	73.7	138.00	100	1.29
Western	10	--	10	19.50	38.6	15.50	30.7	15.50	30.7	50.50	100	1.53
Eastern	20	--	20	30.75	39.1	--	--	47.25	60.6	78.00	100	1.46

4. Prices ($US/sq ft)

Type of leather	Hides	Goat	Sheep
Shoe upper			
I	1.65		
II	1.60		
III	1.50	1.30	
Suede split			
I	0.62		
II	0.55		
Lining	0.75		
Garment III		2.25	2.25
Bag II		0.95	0.95
Suede III			1.10

a/ Suede.

Annex 51

CERTIFIED INVENTORY OF THE LEATHER QUALITY CONTROL LABORATORY
(31 December 1981)

PAO Req. Ref.	Item No.	Qty.	Unit	Description	US Dollar Equivalent	P.O./Shipping Advice Ref.	Received			Condition	Qty. on hand	Remarks
							Qty.	M	Y			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
81/1	1	1	EA	PRINT CALCULATOR 97A	825.-	15-1-00309	1	5	81	G	1	
81/1	19	1	EA	VEHICLE: PEUGEOT 504 BERLINE CHASSIS NO.: 3580 675 ENGINE NO.: - " - REG.NO.: 40 UN 390 K	7,100.-	15-1-00313	1	6	81	G	1	
81/4		2	EA	DRUMS EXPERIMENTAL WOOD	5,737.-	15-1-00416	2	10	81	G	2	
81/3	10	2	EA	STOPWATCHES TYPE TKM-390-T m	89.-	15-1-00440	2	6	81	G	2	
81/3	2	1	EA	RUB FASTNESS TESTER "FEK-VESLIC" NO.356 COMPLETE	3,587.-	15-1-00458	1	6	81	G	1	
	2a	1	EA	THERMO TESTER UNIT "FEK-VESLIC" NO.234 COMPLETE	1,497.-	- " -	1	6	81	G	1	
81/3	5	1	EA	BALLY FLEXOMETER NORMAL WITH 12 TEST STATIONS	3,253.-	15-1-00459	1	7	81	G	1	
	6	1	EA	BALLY PENETROMETER NORMAL WITH 4 TEST STATIONS	2,698.-	- " -	1	7	81	G	1	
81/3	1	1	EA	C-108/109 HYDRAULIC SWING ARM CUTTING MACHINE COMPLETE	2,800.-	15-1-00465	1	1	82	G	1	Claim not yet settled
	2	2	EA	METAMID CUTTING BOARDS	320.-	- " -	2	1	82	G	2	
81/3	1	2	EA	LEATHER THICKNESS GAUGES	178.-	15-1-00466	2	1	81	G	2	
81/3	3	1	EA	FINISH RUBFASTNESS TESTER STM 102	2,071.-	15-1-00484	1	8	81	G	1	
	7	1	EA	LASTOMETER STD 104	2,546.-	- " -	1	8	81	G	1	
	9	1	EA	APPARATUS FOR LEATHER SHRINKAGE TEMP DETERMINATION STD 114	2,180.-	- " -	1	8	81	G	1	
	18	1	EA	DOME PLASTICITY APPARATUS WITH MICROMETER STD110	428.-	- " -	1	8	81	G	1	
	20	1	EA	SHAKING MACHINE FOR LEATHER ANALYSIS STM 145	1,253.-	- " -	1	8	81	G	1	

PO Req. Ref.	Item No.	Qty.	Unit	Description	US Dollar Equivalent	P.O./Shipping Advice Ref.	Received Qty.	Received M	Received Y	Condition	Qty. on hand	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
81/4		1	EA	RECONDITIONED TURNER HIGH SPEED MODEL 205 FLESHING MACHINE WITH SPARE PARTS	9,790.-	15-1-00115	1	11	81	G	1	
81/3	8	1	EA	TENSION COMPRESSION CELL 0-5KN COMPLETE	2,603.-	15-1-00493	1	10	81	G	1	
82/2	1	1	EA	PLUNGE PUMP	683.-	LP	1	3	82	G	1	letter of authorization 13-2-4801
81 /1	1	1	EA	IBM SELECTRIC MODEL 835 ENGLISH KEYBOARD S/N 6902972	760.-	15-1-00310	1	7	81	G	1	
81/3				LABORATORY EQUIPMENT:								
	1	1	EA	POWER POD, STEREOZOOM 4	588.-	15-1-00629	1	11	81	G	1	
	2	1	EA	STAND B	241.-	- " -	1	11	81	G	1	
	4	1	EA	LEDS ATTACHMENT, 0.5X	69.-	- " -	1	11	81	G	1	
	5	1	EA	LEDS ATTACHMENT, 2X	69.-	- " -	1	11	81	G	1	
	9	2	EA	PH METER, MODEL 3D	330.-	- " -	1	11	81	G	1	
												expendable
	8	1	EA	WILEY MILL, 120/240V, 50HZ	4,498.-	- " -	1	11	81	G	1	
	3	1	EA	BIL 31-27-03 ELEVATOR	43.-	- " -	1	11	81	G	1	
	6	1	EA	ILLUMINATOR	211.-	- " -	1	11	81	G	1	
81/6	2	1	EA	ABRASION RESISTANCE TESTER 11565 COMPLETE WITH ACCESSORIES	2,889.-	15-1-00907	1	6	82	G	1	
	2a	1	EA	HARDNESS TESTER 38008	117.-	- " -	1	11	82	G	1	
81/6	3	1	EA	RUBBER FLEXING TESTER 5301 TOGETHER WITH ALL OPTICS	7,287.-	15-1-00908	1	3	82	F	1	Claim has been settled.
81/6	4	1	EA	BOSCH REFRIGERATOR MODEL KS318 ZL	423.-	15-1-00909	1	3	82	G	1	
81/6	1	1	EA	OVEN, DS, FAN CONVECTION, 300°C MAXIMUM SIZE NO. 2	1,291.-	15-1-00910	1	3	82	G	1	
	1A	1	EA	DIAL THERMOMETER	49.-	- " -	1	3	82	G	1	
82/2	1	17	EA	MINOR EQUIPMENT(BUILT IN THE PILOT PLANT)	5,000.-	LP	17	3	82	G	17	Letter of authorization 13-2-4801

Annex XII

FUNCTIONS OF THE LEATHER AND LEATHER PRODUCTS TESTING AND RESEARCH LABORATORY

The laboratory can carry out the following operations.

1. Leather testing

(a) Chemical analysis on leathers, hides and skins:

Volatile matter (moisture)
Soluble substances (in dischoromethane, petroleum ether etc.)
Total ashes, sulphated ashes and water insoluble ashes
Water soluble matters
Hide substance
Chromium oxide
pH value and difference figure
Sodium chloride

(b) Physical and mechanical testing of leathers:

Measurement of thickness
Tensile strength, elongation at break and at a specified load, tear strength and stitch-tear strength
Permanent and elastic elongation
Resistance to grain cracking
Set in lasting
Flexing endurance of leathers and their finishes
Shrinkage temperature and area shrinkage
Water absorption properties under dynamic conditions
Water vapour absorption and penetration

(c) Finishes testing:

Flexing resistance of finishes (dry and wet)
Colour fastness of leather to rubbing (dry and wet)
Adhesion of finish to leather (dry and wet)
Fastness to rubbing when wetted from the back with water or organic solvents or perspiration
Resistance to marring caused by sharp-edged objects
Resistance capacity to colour changes when buffing
Hot pressing fastness
Fastness of finish to spirit and alkali marring;

(d) Visual testing and grading of hides and skins, semi-finished and finished, leather

(e) Effluent analysis

2. Leather products testing

(a) Chemical analysis of all components such as dyestuffs, adhesives, finish resins and the like

(b) Physical and mechanical testing:

Shoe testing; adhesion of leather, rubber or plastic soles and heels to the shoe (testing of the cementing); testing of the lacing; testing of lacing threads and cords; testing of other components of the shoes as rubber soles and uppers, testing of plastic uppers; complete textile analysis (upper or linings); complete rubber analysis (tensile strength, tear strength, remanent and elastic elongation, hysteresis, cycling, hardness abrasion, solvent resistance, efficiency of the vulcanization, flexion etc.); wear testing; resistance to water penetration; visual evaluation of products

Other leather products; as under leather testing and shoe testing above

3. Consulting services

(a) Improvement of leather-processing procedures in all stages (wet-blue, crust, finished leather) through:

Technological advice
Advice on quality-control systems
Help with layout or other installation problems

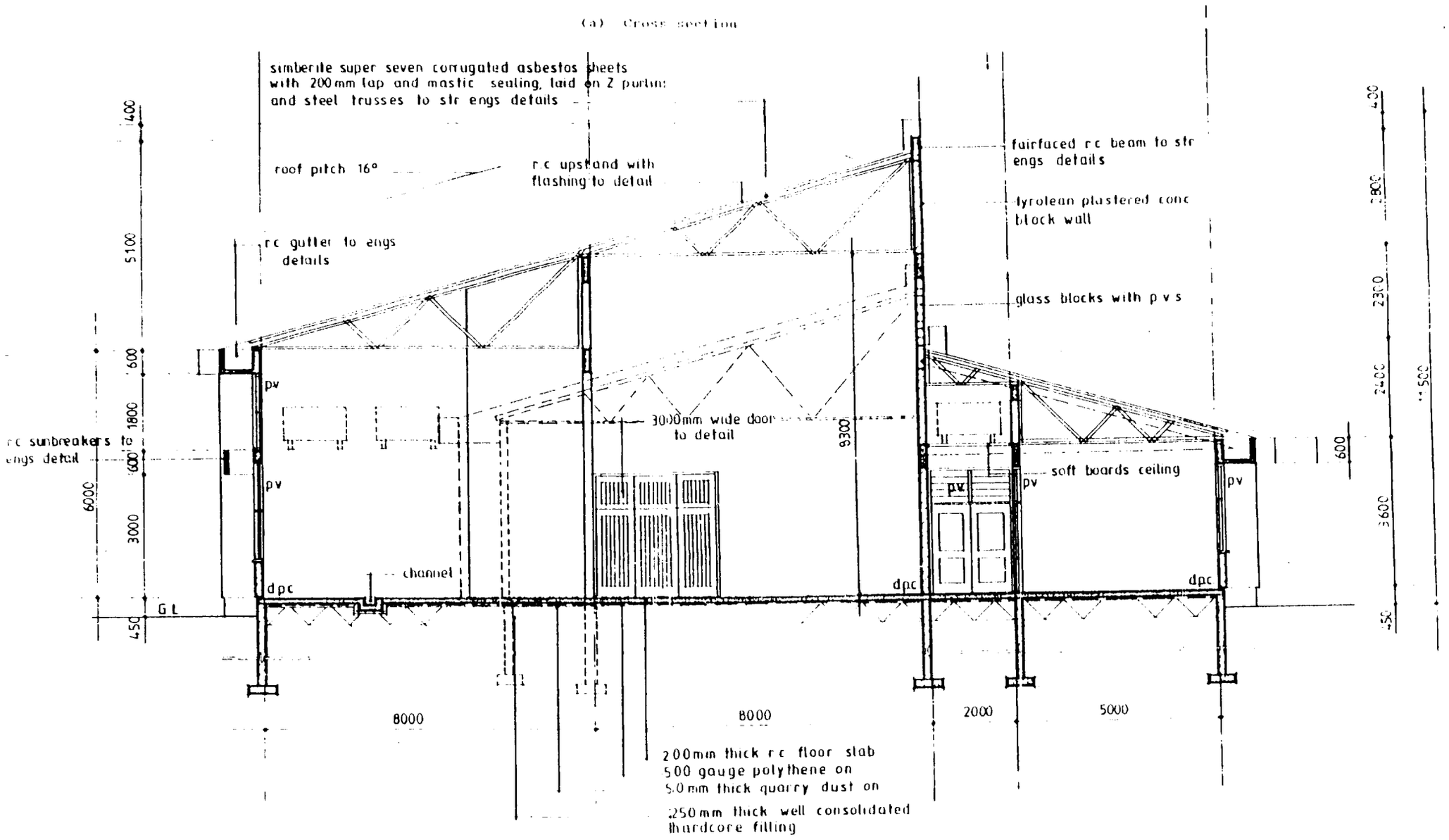
(b) Improvement of the quality of leather products through provision of the services listed under (a)

4. Research services

These are connected with all the above services under 1, 2 and 3, but mainly are concerned with experiments for new technologies which are done in the laboratory and in small experimental drums.

Annex XIII THE PROPOSED BUILDING FOR THE LEATHER SECTION OF KIRDI

(a) Cross section



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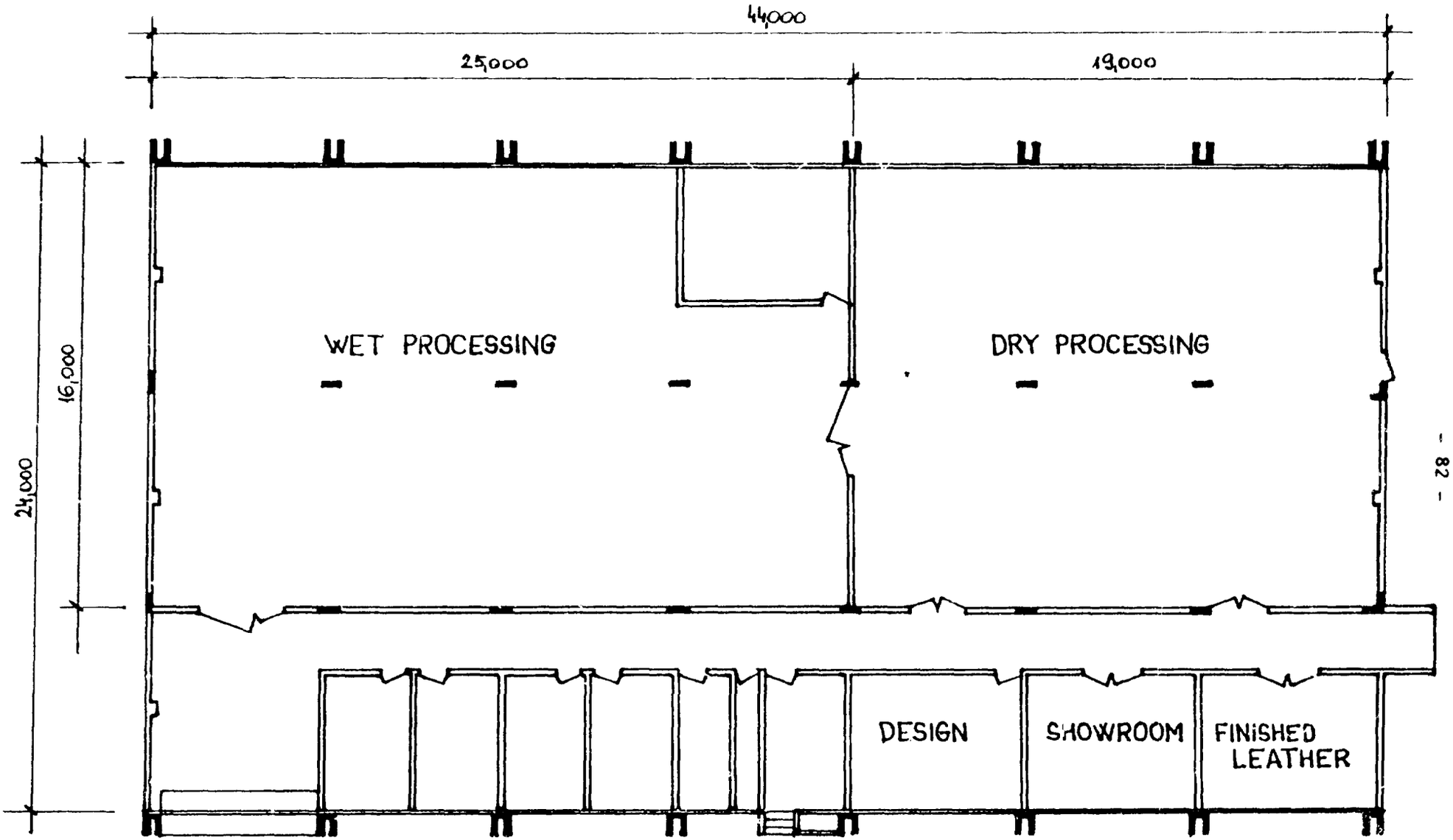
SECTION A – A

Annex XIII (continued)

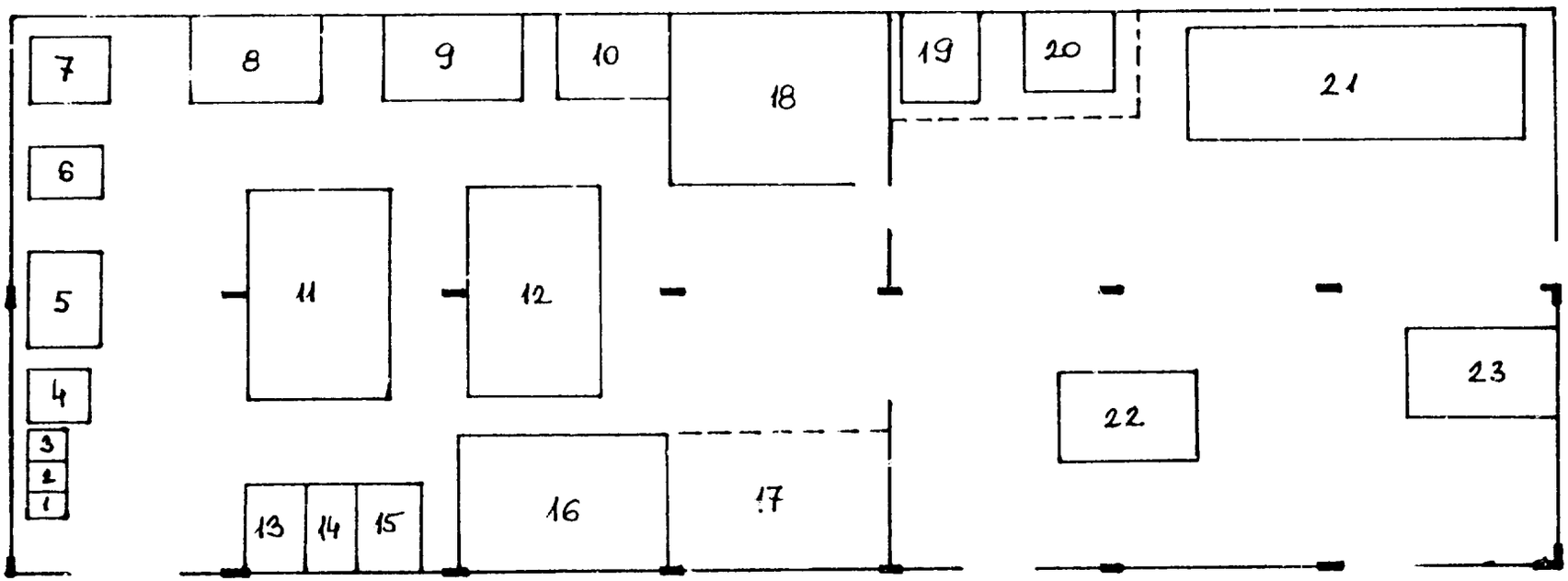
b. Floor plan



SCALE 1:200

Annex XIV

FACILITIES INCLUDED IN THE LAYOUT OF THE NEW BUILDING



Scale 1:200

1, 2, 3. Soaking pits
4. Liming drum
5. Fleshing machine
6. Tanning drum
7. Dyeing drum
8. Sammying machine
9. Shaving machine
10. Setting out machine
11. Splitting machine
12. Vacuum dryer
13,14,15. Spares and chemical stores
16. Toggle drier
17. Drying room
18. Cloakroom
19. Buffing machine
20. Milling drum
21. Finishing unit
22. Staking machine
23. Plating machine

Annex XV

LIST OF EQUIPMENT TO BE SUPPLIED

		Cost in $US	
1.	Office and Transport		
1.1	Typewriter IBM (2)	2 000	
1.2	Video recorder set complete with camera and tapes	1 000	
1.3	Misc. office equipment	2 000	
1.4	Project car, Peugeot 504 Estate	9 000	
1.5	Project car, Land Rover	11 000	
		25 000	25 000
2.	Leather Machines (c & f Mombasa)		
2.1	Splitting machine, universal Moenus Turner Type 537 with section roller and gauge roller, 1 800 mm	92 790	
2.2	Sammying machine, trough-feed Moenus Turner Type 594, 1 800 mm	48 650	
2.3	Milling drum, local purchasing	6 000	
2.4	Setting machine, hydraulic Moenus Turner OPTIMA RELLA Type 357, 1 800 mm	34 800	
2.5	Vacuum dryer, Moenus Turner Type 111/1 (one plate) 3 500 mm x 2 000 mm	23 880	
2.6	Staking machine, trough-feed Moenus Turner "Adura" Type 530 1 600 mm	39 510	
2.7	Toggle dryer, 10 frame bookcase Moenus Turner	14 200	
2.8	Rotary spraying machine with optomat spray head, 4 guns Moenus Turner, TTH, 1 800 mm 3 dryer cells	55 000	
2.9	Hydraulic ironing and embossing machine, Moenus Turner, Type 633 with 600 tons cap. 650 mm x 1 100 mm	60 390	
2.10	Measuring machine, Moenus Turner, Type 155 Primesma 1 625 mm	7 000	
		382 220	382 220

		Cost in $US	
3.	**Hot Water Supply**		
3.1	Boiler (oil inj.) NUWAY, local: SAFARI ING Ltd.	20 000	
3.2	Water heater, local: SAFARI ING Ltd.	5 000	
3.3	Steam distributor pipes, local	1 000	
		26 000	26 000
4.	**Water Supply**		
4.1	Water tank with fittings, 20 m^3, local	5 000	
4.2	Water tank with fittings, 5 m^3, local	2 000	
4.3	Booster water pumps RG 50, Boostomatic (set of 3) Stuart-Turner Ltd.	6 000	
		13 000	13 000
5.	Electrical equipment (local)		
5.1	Motor driving system	20 000	
5.2	Lighting (in- and outdoor)	5 000	
		25 000	25 000
6.	Small equipment		4 450
7.	Spare parts (9 per cent on leather machines)		34 630
8.	Design equipment (to be specified)		50 000
		Total	560 300

Annex XVI

GOVERNMENT INPUTS FOR THE YEARS 1984/85 AND 1985/86

	Phasing	Thousands KSh
Appointment of counterparts	(1984) 1985 partly 1986	
(2 BSc chemists, 9 technicians 2 clerks, typist, 2 drivers)		1 536
Provision of local transport for counterparts	As above	100
Fellowship travel fees	As above	070
Infrastructure (share of the leather section)	1985	1 854
Start construction of building at the new site, including pilot plant and design workshop	1985	3 464
Placing and erecting the "dry" machinery at its designated site (staking, buffing, ironing, spraying, measuring machines):	1985 second half	
Equipment (transport and clearance fees)		285
Installation (all the machines)		192
Moving of the rest of the machinery to its designated site	1986 first half	
Moving of the laboratories	1987	
Operating costs of facilities	(1984) 1985	
Fuel and car maintenance	1986	350
Chemicals, stationery		150
Total for the period		8 001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