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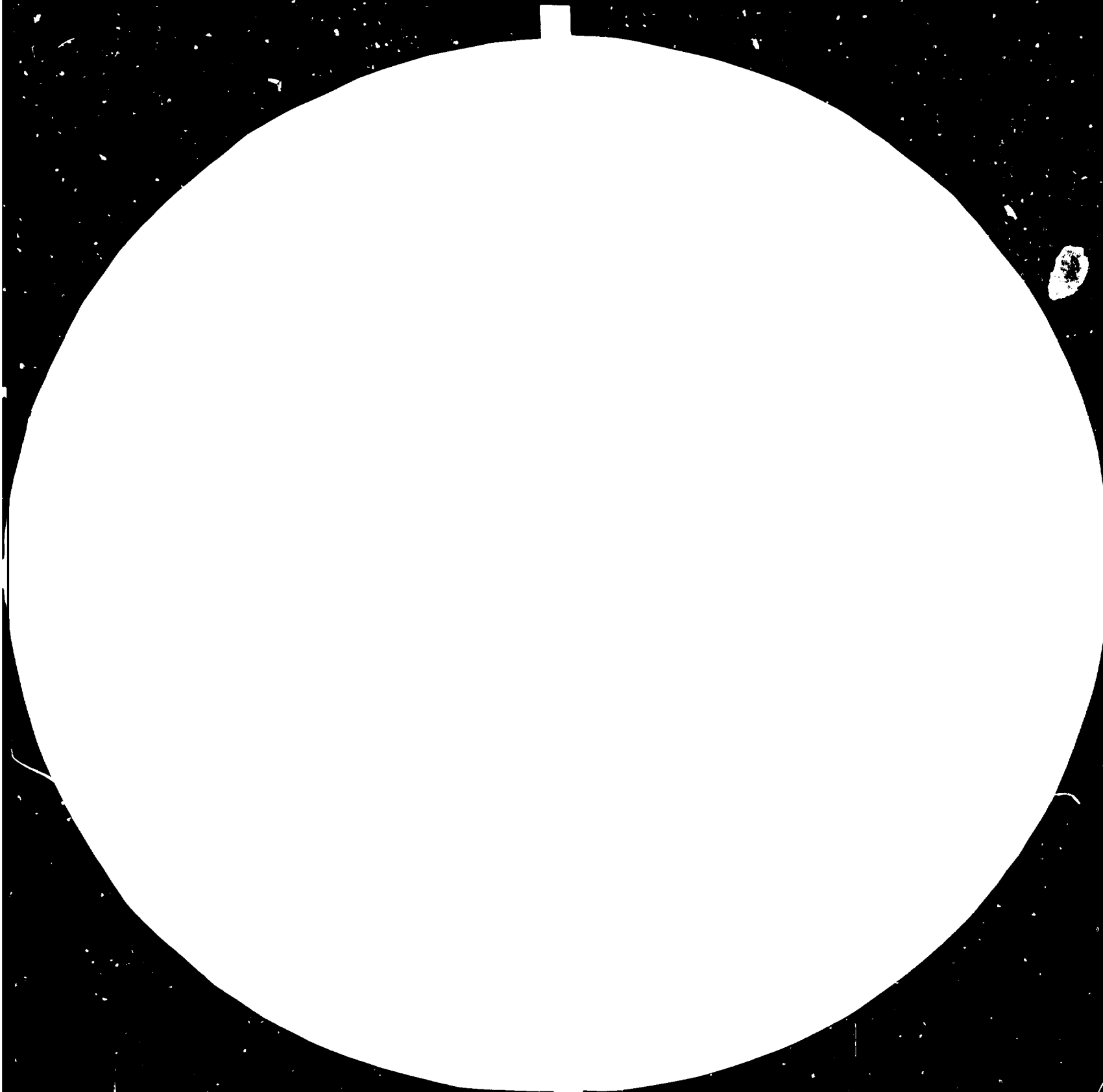


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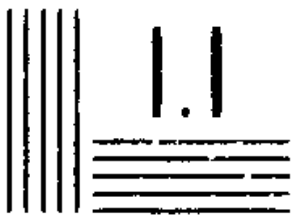
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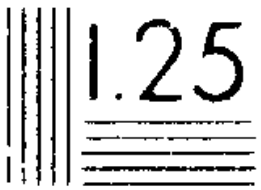
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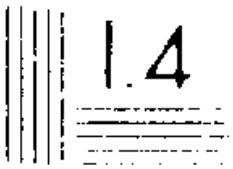
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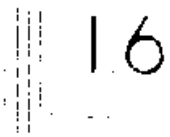
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DP/ID/SER.B/
January 1984
English

Sudan

ASSISTANCE IN PUTTING INTO OPERATION LABORATORY EQUIPMENT FOR THE SUDANESE TANNERIES

RP/SUD/83/005
(Further to US/SUD/78/267)

DEMOCRATIC REPUBLIC OF THE SUDAN

Terminal Report*

Prepared for the Government of the Democratic Republic of the Sudan by the United Nations Industrial Development Organization, acting as executing agency for the United Nations Development Programme

Based on the work of Roy G.H. Elliott,
expert on Quality Control

United Nations Industrial Development Organization
Vienna

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Explanatory Notes

During the period of the mission 1 US$ was approximately equivalent to £S 1.28 (£S = Sudanese pounds) or to 9.55 dKr (Danish Kroner).

ISO - International Standards Organisation
SLTC - Society of Leather Technologists and Chemists, U.K.
SATRA - Shoe and Allied Trades' Research Association, U.K.
IUP - Physical test method of IULTCS (Physical Test Commission).
IULTCS - International Union of Leather Technologists' and Chemists' Societies.
BLMRA - British Leather Manufacturers' Research Association.
FRG - Federal Republic of Germany.
ASMO - Arab Organisation for Standardisation and Methodology.

ACKNOWLEDGEMENT

During the mission to the Democratic Republic of the Sudan, the consultant expert was accorded extensive and willing co-operation by all those with whom he came into contact. In addition he would like to record his sincere appreciation of the generous hospitality shown to him on numerous occasions. Special thanks are due to Mr. El Sheikh M.A. Tambal, General Manager, Khartoum Tannery, to Mr. Abbas Yousef Abousalma, General Manager, White Nile Tannery and to Mr. M.E. Tayeb El Shayeb. General Manager, Gezira, and to their respective Technical Managers Messrs. Abdel Rahman Goda, Ibrahim Said Ahmed and Salih Awooda, also to Mr. El Fateh Abu Rafad, Assistant Technical Manager, Khartoum Tannery, for their kind assistance in enabling the consultant to complete his duties satisfactorily. The extremely helpful co-operation of Mr. Ahmed Hag El Sheikh Abbo, Director of the Hides, Skins and Leather Institute, Khartoum South was warmly appreciated, especially with regard to the valuable introductions to people and places of special interest to the consultant in his duties which Mr. Abbo made possible. Similarly, the consultant would like to record his appreciation of the very kind assistance provided by Dr. Farid Nawas, Senior Trade Promotion Adviser (ITC) based in the Ministry of Co-operation, Commerce and Supply. Thanks are also due to Miss Dionysia Capaya, Trade Documentalist (ITC) for her assistance to the consultant.

The guidance, advice and ready assistance received by the consultant from Dr. Paavo Harju, DRR/SIDFA (UNIDO) and Miss Cornelia Oimann, JPO is gladly acknowledged, with warmest appreciation. The support given to the consultant on many occasions in this way was material to the successful operation of the project.

The consultant has much pleasure in recording here the cordial relationship which developed during his mission with Dr. Saleh Mohamed Saleh (Egypt), the senior expert now working on project DP/SUD/79/010/11-09 concerned with planning the overall rehabilitation and development of the Sudanese leather industry. It was extremely encouraging to the consultant to discover such extensive accord between his own approach and that of so experienced an expert and to enjoy such a mutually helpful rapport with him.

Finally, the consultant wishes to pay a personal tribute to his counterpart, Mr. Mustafa Mahdi Acrag without whose co-operation and support the mission could not have been completed as satisfactorily.

ABSTRACT

The original project, US/SUD/78/267, was entitled "Assistance in putting into operation the laboratory equipment for the Sudanese tanneries" and had, as its overall objective, the assistance of the three public sector tanneries to improve the quality of their production by the application of process and quality control. That project began in Sudan on 6 April 1982 and concluded there on 16 June 1982.

The project now concluded, DP/SUD/83/005, was for the purpose of following up the earlier project in the report of which a recommendation was made to that effect. It began in Sudan on 2 November 1983 and concluded there on 30 November 1983.

The objective was to strengthen the impact of the assistance given under the original project and to examine possibilities for improving raw material supplies for the leather industry in the Sudan.

The expert on quality control was required to check the installation, functions and utilisation of the laboratory equipment provided under US/SUD/78/267, to assess the progress made in process and quality control and to propose corrective measures if required.

The expert was also asked to make recommendations for the further improvement of the leather industry in the Sudan, including hides and skins improvement.

It had been hoped to undertake some direct studies in the Southern Region but this proved not to be possible during the relatively short period of the mission and indirect sources of information were investigated instead.

In addition, the expert was requested to seek information which could be of material assistance in the preparation of documentation for the Third Consultation Meeting due to be held in 1984.

It is strongly recommended that all possible means should be investigated by the Government, in consultation with UNDP/UNIDO to create a Centre of Excellence for the Sudanese leather industry, using the present Hides, Skins and Leather Institute, Khartoum South, as the nucleus. The Institute should be upgraded and transformed so that it could better perform its current functions and expand and extend these to include all the necessary training requirements of the industry from raw materials improvement to chemical analysis and physical testing of leather of all types.

A further recommendation made is that urgent steps should be taken to put into full operative order certain items of equipment supplied under US/SUD/78/267 and to investigate the best site for the establishment of a Process and Control Laboratory for the two tanneries in Khartoum South, with provision of all essential equipment including a badly needed cutter mill and conditioning chamber as required under ISO and other official methods.

All possible steps should be taken also to prepare for the formulation of relevant specifications supported by applying officially recognised methods of chemical and physical testing to regular testing in the tannery laboratories.

In connection with process and quality control development, it is specifically recommended that opportunity should be found for one person to be known as the Quality Controller, to undertake a short course of about three months for the purpose of special instruction in test methods related to that development. It is further recommended that such training should constitute a UNIDO Fellowship which could be held at the National Leathersellers' Centre of Nene College, Northampton under the supervision of Mr. Peter Ellement.

C O N T E N T S

Annexes

INTRODUCTION

A. Background

The Government of the Democratic Republic of the Sudan is aware of the urgent need to establish process and quality control in the Sudanese leather industry. In order to achieve the optimum, desired improvement of quality in the output by that industry with consequently increased market acceptability of Sudanese hides, skins and leather and enhanced yield of foreign exchange, it must be recognised that needed improvements should begin with animal husbandry, continue through hides and skins improvement and process control in the production of leather, leading ultimately to the export of hides, skins and leather of acknowledged excellence. The final leather quality must, inevitably, reflect the status of the basic raw material.

It was decided that, in order to improve the quality of leathers produced by the three largest tanneries, Khartoum and White Nile Tanneries at Khartoum South and Gezira Tannery at Wad Medani, substantial improvement was essential in respect of process and quality control operated in these tanneries and that such control should be carried out in a systematic and well-organised manner. In order to facilitate this objective, certain specialised equipment and a supply of appropriate chemicals were provided under project US/SUD/78/267 with a total implemented input of US$ 71,216 including three months expert services. That project was successfully completed in June 1982.

One of the recommendations made by the expert was that a consultant should undertake a follow-up mission of one month's duration for the purpose of studying the progress made by the three tanneries along the lines initiated by the above project and to advise on further action as necessary. The project now concluded was formulated in response to that recommendation.

The consultant was also requested to study the possibilities of improving the quality and supply of hides and skins including those coming from the Southern Region and to investigate other matters relevant to the forthcoming Third Consultation Meeting due to be held in 1984.

Encouraging progress has been and continues to be made in the tannery laboratories along the lines proposed by the consultant during the operation of project US/SUD/78/267, but the establishment of process and quality control in the laboratories, however pertinent to the proper development of the industry, can only be regarded as a link in the chain of overall improvement and utilisation of an abundant, renewable natural resource, i.e. hides and skins and other related by-products. This chain must begin with measures to upgrade relevant animal husbandry, followed by an extensive programme to raise the status of all stages of hides and skins provenance, collection and abattoir or other slaughtering operations. Process and quality control in the tanneries will then become part of an integrated series of urgently needed measures designed to give the Sudanese leather industry its rightful place in the world industry.

Following the visit to the Sudan in 1975 of an FAO mission, TF/RAF 81 (NOR), of which the consultant was a member, recommendations were made for initiating development activities in the field of hides, skins and other animal by-products. During that mission, discussions held with the National Planning Commission recognised the strong incentive which existed (and still exists) for the maximal utilisation of all available local animal resources. For example, any protein-containing waste products which could be employed as components of animal feeds. This approach continues to be very relevant to the Sudanese economy in terms of cost reduction and increased supplies to the producers of meat, as well as making a desirable contribution to environmental improvement.

Specifically, topics to be considered in this context, include the greatly improved recovery of slaughterhouse by-products other than hides and skins, such as blood, fleshings and bones. In connection with potential auxiliary sources of feed, some investigation into the proper utilisation of the seeds of the gared (Acacia nilotica var. nilotica) tree on similar lines to those mentioned by the consultant in his interim report on this mission in respect of the seeds from Nigerian bagarawa pods.

B. Official arrangements

The expert, Mr. R.C.H. Elliott (United Kingdom), was selected for the project by the Government of the Sudan but his fielding had to be deferred because of his then existing commitments. He was eventually fielded in November 1983 (for post 11-01) and began his duties in the Sudan on 2 November. The project terminated on 2 December 1983 on conclusion of debriefing in Vienna.

The expert worked directly with the three tanneries and with Mr. Mustafa Mahdi Azrag (Quality Controller, Khartoum Tannery) as his counterpart (in continuation of Mr. Azrag's contribution to US/SUD/78/267) by agreement between the respective managements of the tanneries.

C. Objectives

The objectives of the project were as follows:

a) to check the installation, functions and utilisation of the laboratory equipment provided under US/SUD/78/267;

b) to assess the progress made in process and quality control and to propose corrective measures as seen to be necessary;

c) to make recommendations for further improvement of related aspects of the industry;

d) to study the raw material situation and obtain relevant data, particularly in respect of the situation in the Southern Region, if possible;

e) to undertake the on-the-job training of the counterpart.

RECOMMENDATIONS

The introduction of process and quality control in the three largest tanneries has clearly made a useful impact and its extension is seen to be progressive but it must be regarded as part only of an integrated plan for the overall rehabilitation of the Sudanese leather industry. In other terms, process and quality control can be said to have begun to make a valuable contribution to the acceptance by all concerned in the tanneries of the real need for a rational and systematic approach to raising standards both during production and for export.

It is, therefore, strongly recommended that the Government of the Sudan should:

1. in consultation with UNDP/UNIDO, investigate all possible means of furthering the objective of improving standards of production of hides, skins and leather including the further extension of control methods applied throughout production from the live animal to the final product. It is specifically recommended that serious consideration should be given (possibly by consultation with more than one UN Agency) to the integrated approach typified by taking the present Hides, Skins and Leather Institute as the nucleus for the development of a co-ordinated training centre covering all aspects of hides and skins improvement, quality control, tanning and leather goods production. This would largely continue the original concept related to project LA - SF 68/37 (FAO, Rome 1968). Similar recommendations were made in reports on UNIDO projects US/SUD/78/267 and SUD/79/010 among others.

2. consider, also in collaboration with UNDP/UNIDO, the desirability of resiting a process and quality control laboratory at Khartoum South, either in one of the two tanneries there (where facilities are rather limited, e.g. no cutter mill, no conditioning chamber for physical test samples) or in an upgraded Institute. The mill and the conditioning chamber are urgently required if the proper analysis and physical testing of tannery materials and production are to be carried out in accordance with established and internationally accepted procedure. The conditioning chamber, operating at constant temperature and humidity levels, and a cutter mill of the type specified in the official methods of ISO, British and other national specifications are basic requirements. It is urgently recommended that these should be installed.

3. take prompt steps to meet the clear need for technical training courses which could be based at the Leather Institute following its improvement and expansion. It would be particularly advantageous to use some part of the time of a Quality Controller based at either of the tanneries at Khartoum South to contribute to any courses concerned with process and quality control, in addition to any input by expatriate experts. Whoever was finally chosen to be Quality Controller, subsequent to present developments in those tanneries, he would have the special advantage of being able to communicate in the Arabic language.

4. give serious and early consideration to training a single Quality Controller to enable him to guide progress in quality and process control in both tanneries and to make the contribution identified in the previous recommendation.

To this end, a request should be made to UNDP/UNIDO to support a short-term UNIDO Fellowship to be held by the Quality Controller, for example, at the National Leather-sellers Centre, Nene College, Northampton, U.K. under the supervision of a nominated expert supervisor. The relevance of the Centre mentioned is that the Controller is likely to have a good understanding of English and to be most accustomed to the use of the Official Methods of the U.K. Society of Leather Technologists and Chemists.

5. take urgent action to seek assistance in restoring to full operational order those items of special equipment provided under project US/SUD/78/267. This is relevant to the Bally Penetrometer (held by White Nile Tannery laboratory), the SATRA Lastometer (held by Gezira Tannery laboratory) and all four sets of Kjeldahl apparatus (quoted cost exceeding US$ 4,000) which, as reported in the expert's terminal report of the 1982 mission, still lack the essential distillation component so that the extremely important determination of Hide Substance cannot, therefore, be made by any of the three laboratories. In respect of the two items of physical testing equipment, the services of a qualified technician sent by the producers of these instruments are required. There is serious doubt whether the tanneries could provide the money to pay for a technician to come from Europe.

6. in consultation with UNDP and all interested UN Agencies, examine the evident, potential advantages of improved handling of hides and skins at the slaughterhouse stage including improved flaying, efficient fleshing and utilisation of incidental by-products such as fleshings, blood and bones. Serious consideration is strongly recommended for the possibility of direct, controlled harvesting of such by-products at source, i.e. at the slaughterhouse, where the necessary infrastructure could sensibly be introduced, rather than this further resource should be dissipated and not used to best advantage in the national interest as at presently apparent in the case of fleshings which are mainly removed subsequent to leaving the central point.

7. to consider indigenous production of well-designed flaying knives, of which there appears to be a marked lack, but for which there is a ready demand. Local production could materially assist in the improvement of quality of hides and skins (more especially the former) and, consequently, of leather subsequently produced. Above all, it would also lead to conservation of vital foreign exchange.

8. to investigate, in consultation with UNDP/UNIDO, the efficient development and production of garad as a locally available vegetable tan upgraded to give a consistent quality of product thereby increasing its effective use in the Sudanese industry. From the standpoint of quality and process control it would be very necessary to standardise the product, either in the unextracted, milled condition, or preferably, as a spray-dried powder. In either form, the essential need is for consistency of product. Arising from such development of a Sudanese tanning extract industry, if only to a limited degree, economies in use of foreign exchange could be achieved. At least, the volume of hides and skins which could be taken to the crust stage (with consequent added value and reduction in transport charges per kilo of material carried) could be appreciably increased without proportionately increased production costs, while at the same time increasing foreign exchange earnings by the industry.

9. investigate the potential value of the utilisation of the ground, separated seeds from garad pods (other work having indicated that the seeds are likely to be almost tan-free and non-toxic) as components of animal feeds. The other work mentioned related to the seeds separated from Nigerian bagaruwa (Acacia nilotica), the ground meal from which was fed to rats without any apparent toxic reaction. Careful trials would need to be made to test the advisability of feeding the similar meal from garad (Acacia nilotica var. nilotica) to domestic ruminants even as a feed component. It should be noted here that separation of the seeds at the outset would immediately increase the relative concentration of tans in the remaining dry garad material before grinding.

10. seek financial assistance, via UNDP/UNIDO, for taking annual subscriptions to relevant technical journals, e.g. Journal of the U.K. Society of Leather Technologists and Chemists, to be made available to leather technicians by way of a convenient point of contact such as the renovated Leather Institute. This would assist in the context of the project concerned with process and quality control to a significant degree.

I. PRELIMINARY ACTIVITIES

A. Workplan

During briefing in Vienna it was understood that there would be a need to investigate any progress made by the tannery laboratories in the establishment of process and quality control as well as identifying further need in that context. Further, the status of equipment supplied either prior to the consultant's 1982 mission or subsequent to his departure on that occasion needed to be followed up.

Discussions on those aspects of this mission and enquiries regarding them were put in train with all the relevant people. The opportunity was taken, whenever occasion arose, to reinforce the advice and instruction given during the 1982 mission and to correct any misunderstanding of test methods procedure in the rare instances where this was evident.

The expert participated on two occasions, by invitation, in the course of training lectures organised by Dr. Saleh in collaboration with Mr. Abbo at the Hides, Skins and Leather Institute. Lecture topics covered related to process and quality control in general and to pickled production in particular.

Further to the main requirement of the mission with regard to process and quality control, the expert was requested, during briefing, to make the necessary enquiries on several topics including various aspects of collecting and purchasing of raw stock by the tanneries and related problems such as transport difficulties, the activities of the Hides, Skins and Leather Institute and of the Hides and Skins Improvement Section and the employee numbers, the regional distribution of livestock and abattoirs, the nature and potential importance of the locally available tanning material (garad) widely used in both rural (and more sophisticated) tanneries. Information on these topics has been supplied in the interim report by the expert.

B. Production by the three tanneries

The product mixes and outputs of the three tanneries remain much the same as that identified in the course of enquiries made in connection with US/SUD/78/267 in 1982. Dr. Saleh kindly supplied the consultant with figures covering the first nine months of 1983 and which he has reported elsewhere:

Production	Khartoum	White Nile	Gezira
Belting leather, ft^2	5,528	-	-
Upper leather, ft^2	888,189	644,614	767,361
Sole leather, kg.	27,753	1,523	-
Reptile leather, pieces	521	-	-
Suede clothing (sheep) leather, ft^2	54,278	-	-
Sheep skins, dyed and finished, ft^2	-	14,249	157,342
Goat skins, finished, ft^2	-	-	6,730
Sheep skins, pickled, pieces	26,313	1,000	1,200
Cattle hide, wet blue, ft^2	-	45,243	215,926

It was seen that, on occasion, there were no supplies of raw stock coming into the tanneries, causing a consequent break in production.

In the two tanneries at Khartoum South, in particular, production also continues to be interrupted, from time to time, by power cuts. The same problem has also hindered the performance of control testing in the laboratories where these are dependent on power or pumped water supply, on a number of occasions. It is understood that stand-by generators are to be installed in the near future and this should then provide the means of greater productivity in both tanneries and laboratories.

While in the Sudan, the consultant was informed that it had been decided to combine the large tanneries at Khartoum South. When this takes place, among other steps, the amalgamation of the laboratories should be considered.

C. The Hides, Skins and Leather Institute

As reported under US/SUD/78/267, the laboratory facilities are underutilised and remain in need of upgrading and rehabilitation after some twenty years have elapsed since their installation. Similar comment applies to the other components of the Institute. Nevertheless, in the experienced view of the consultant, also expressed by others in a number of earlier reports, the Institute could very suitably provide the nucleus for establishing a Centre of Excellence, including training facilities embracing hides and skins improvement (in conjunction with the Hides and Skins Improvement Section). It could possibly include also rationalisation of manpower in association with Omdurman Slaughterhouse, training in tanning processes, garad extraction technique, leather goods and footwear technology and overall training in all aspects of process and quality control.

Before the lattermost training could be introduced, however, the installation of necessary and essential facilities including an efficient conditioning room for physical test samples and a replacement for the present (but old) cutter mill for chemical analysis samples (or the complete overhaul of the existing mill) need to be instituted.

In the interest of future development in the leather industry and the improvement of relevant technology by encouraging the professional advancement of technical personnel in the industry, a small library should be installed in the transformed Institute and annual subscriptions to recognised leather journals encouraged. It would also be desirable to set up a reference index in the small library in respect of auxiliary materials e.g. chemicals and finishes utilised by the tanneries to assist wise buying and the optimum use of such materials. Both library contents and reference index would be made available to the leather industry as a whole.

II. FINDINGS AND OBSERVATIONS

A. The tannery laboratories and equipment provided

The general condition and cleanliness of the tannery laboratories has been much improved. This was particularly noticeable at the Khartoum Tannery and the White Nile Tannery laboratories.

There is still a shortage of basic equipment required for chemical analysis, e.g. flasks and beakers. There also remains the recurrent problem of power supply and it is essential that something should be done about this considerable obstacle to efficient and effective laboratory work.

In spite of an attempt by the consultant to make possible the provision of suitable rubber tubing for the laboratories, the consignment delivered after he had left the Sudan (and supplied under Order No. 15-2-G0586 by Kennedy International Traders) came in two sizes neither of which were of suitable internal diameter to fit the glass apparatus for which the tubing was intended. As an example of the consequence of the order not agreeing with the requisition, condensers for the Soxhlet apparatus could not be supplied with water from taps in the laboratory and the assembled apparatus could not be employed for the determination of grease content in leather.

None of the laboratories can operate the equipment for vacuum filtration of tan solutions because they do not possess simple water pumps which are standard equipment for creating reduced pressure for vacuum filtration in laboratories not possessing electric vacuum pumps.

In the absence of such equipment it is clearly not possible to carry out the official method for tanning analysis (e.g. SLTC Method SLT 2) which requires vacuum filtration of the test solution through ceramic "candles".

If steps are to be taken to use garad more effectively, tan content must be determined and an official method must be followed to determine the analytical quality of the tanning material.

Further to the original assemblage of special physical test instruments received in April 1980 including the Kjeldahl digestion apparatus lacking the distillation component, an additional, smaller group of test apparatus, five items in all, was received in October 1982 at about the same time as the chemicals which should have been delivered even before the consultant arrived in April of the same year. The new group of test instruments comprised one each of SATRA finish rub fastness tester (STM 102), SATRA lastometer (STD 104), SATRA dome plasticity apparatus and micrometer (STD 110), SATRA finish adhesion tester (STD 112) and a SATRA shrinkage temperature apparatus (STD 114). Of these extra instruments, all but the last one (STD 114) were retained at the Khartoum Tannery laboratory (see also Annex III). The shrinkage temperature apparatus alone went to the Gezira Tannery laboratory, but the integral thermometer is missing.

The special items of apparatus for physical testing held in the respective laboratories are said to be in regular use with the exception of the following items. The Bally penetrometer in the White Nile Tannery laboratory as well as the SATRA lastometer held at Gezira Tannery are not in use because they are not in full working order as was reported by the consultant last year. The SATRA sole adhesion tester (STD 185) has not been used by Khartoum Tannery laboratory - the purpose of this instrument is of more direct interest to a shoe manufacturing company than to the tannery.

The consignment of chemicals which also arrived late in 1982, after the consultant had departed, is said to have suffered some losses in transit owing to inadequate packing. The losses were, however, apparently comparatively small. The total net value of the chemicals supplied by

Struers K/S of Copenhagen, Denmark was 37,863.90 dKr with export charges of 4,000.00 dKr and freight charges of 5,340.00 dKr brought the gross costs to 47,203.90 dKr (C and F Port Sudan). At current rates of exchange, the net and gross costs are equivalent to US$ 3,949.57 and 4,942.82 respectively.

The consultant was pleased to find that, in spite of a number of difficulties, a serious attempt had been made, particularly in the Khartoum and Gezira Tannery laboratories, to establish a regular routine for following the tannery sequence of operations. The Quality Controller, Mr. Mustafa Mahdi Azrag, in pursuance of his obligations as counterpart, had prepared process control sheets (see Annex IV), with the approval of Dr. Saleh, based on the instructions left with the counterpart and other interested persons by the consultant and recorded in his report of 25 June 1982. These forms are also in use in the White Nile Tannery laboratory.

Further instruction and advice has been given by the consultant during the period of the mission, now completed, wherever this appeared appropriate. In particular, the significance of the results obtained by determination of shrinkage temperature has been again brought to the attention of all concerned with its use and interpretation. The opportunity was taken, when a production problem had occurred in one tannery, to show how such information could be of direct, practical assistance.

In general, the importance of repeat determinations on the same sample, of more than one person in each laboratory being involved with all determinations and the need to build up data at every stage of each tannery's process sequence have again been stressed. The flexibility in coping with a number of different test samples which can be achieved, in spite of absence of staff from the laboratory for any reason, by virtue of training everyone in the laboratory to perform all the possible tests has been impressed upon everyone involved, including both laboratory staff and Management. The point has also been made that this approach makes maximum use of the instruments and apparatus provided by UNDP.

It was reported by the consultant in June 1982 that he had demonstrated the effectiveness of a simplified shrinkage temperature apparatus. With the very helpful co-operation of the workshop staff at Khartoum Tannery, it was found possible to set up a more robust apparatus (excluding the use of a glass component) and to have a suitable metal component replicated. One of these components was passed on to the White Nile Tannery laboratory and the staff there have begun to instal a similar apparatus to that used in the Khartoum Tannery laboratory; the Gezira laboratory staff are also making one.

The tannery laboratories are still lacking the required metal cutters for taking standard test samples for the various physical test instruments in the laboratories.

3. Leather quality

The consultant has again (at some length and on several occasions) gone over the recommendations and advice which he gave previously to laboratory staff and management, additionally taking the opportunity of the invitation to him by Dr. Saleh to give two lectures to the tannery technicians on similar lines. It was felt that the wider the idea of process and quality control was spread the better would be the acceptance of the need for it in the tanneries.

Guidance on tests to be applied, particularly in the context of particular applications of leather, was given as set out in Annex I.

The importance of establishing data covering all parameters related to the process sequence employed in a given tannery cannot be over-stressed. In other words, there is a great need to establish working, practical norms for each stage of a given process such as chrome tanning where pH, chrome content in liquors and leather, float and shrinkage temperature all serve to provide real guidance as to the efficiency of the process employed and can help materially in the investigation of process problems which occur, on occasion, even in the best regulated tanneries.

The collection of reference data becomes even more important when the tannery process is completed and the end product, whether partially or completely processed, is ready for marketing.

During the mission, continual emphasis has been placed on the necessity to achieve consistency of production and the advantages this can bring in terms of the market response to a reliable product of consistently good quality.

A seminar on 'Export quality development and control was held in Khartoum between 12 and 17 March 1983 as reported by Dr. Farid Nawas, Senior Trade Promotion Adviser/Project Co-ordinator, in ITC/DTC/605 dated 25 May 1983. The importance attached to this topic in Sudan can be judged by the fact that the assembled participants were addressed on the first day by Mr. Abdel Wahab Tamim, Under-Secretary, Ministry of Co-operation,

Commerce and Supply and Mr. Garth ap Rees, Resident Representative, UNDP, in Sudan. The opening session of the seminar was attended by over 150 Government officials and business executives. There were over 75 participants and representatives of ISO, FAO and UNIDO (the latter including Dr. Roy Nield) made contributions to the seminar lecture programme.

One outcome of this seminar will be the establishment of SAQD - the Sudanese Association for Quality Development. One of the recommendations of the seminar was that the Sudanese Standards and Quality Department (SSD) should be recognised as the independent body responsible for co-ordination of all national standardisation activities and for Sudan's participation in the work of regional and international standards organisations such as ASMO and ISO.

Of particular relevance to the subject of quality control in the leather industry, was the recommendation that "one of the means of improving the export quality of Sudanese products, is the organisation of special training seminars in the fields of particular interest to Sudan's industry (e.g. textiles and leather)". This recommendation clearly strengthens the appositeness of the proposals made in this report and by Dr. Saleh regarding the present Hides, Skins and Leather Institute.

C. Reference facilities for technicians

There is a very obvious need for broadening the general technical knowledge of technicians within the leather industry with regard to the many aspects of chemistry, physics and other sciences involved in their field of interest.

There is a similar need for them to be made aware of developments in leather technology and to be kept up-to-date in respect of technical developments in ancillary materials such as dyes, finishes and fat liquors which lead to improvements in their leather and leather products.

From time to time, there also arises in the leather industry, as in others, the need to have a rapid means of identifying a suitable supplier of some ancillary material required in some urgency in order to meet a particular demand.

All these requirements could be provided if a relatively small information and reference library could be set up, for example as part of a renovated and enlarged Institute based on the present Hides, Skins

and Leather Institute. A card index would require to be organized and maintained by a clerical worker by whom the suppliers of equipment, chemicals and other materials used in the industry would be asked to supply relevant trade literature and price lists. A very useful service could be made available to the tanneries in this way. Through careful selection of suppliers there might be an opportunity of reducing costs as an additional benefit.

Even a small library containing some good technical literature could achieve a significant improvement of the standard of relevant knowledge of the tannery technicians and, in that way, improve their professional status and increased, active interest in their day-to-day work.

It would be particularly valuable for the technical library to include current issues of leather industry journals, e.g. Das Leder, the Journals of the American Leather Chemists Society and of the U.K. Society of Leather Technologists and Chemists. In order to obtain these journals, the library could become a corporate member of the respective societies. Alternatively, it could pay the annual membership subscription of an individual who would pass the respective journal to the library after reading it or, better still, seek the support of UNDP/UNIDO for financial assistance in purchasing journals relevant to a current UNIDO project in Sudan.

D. Hides and skins improvement

That there is enormous scope for the upgrading of the supply of rawstock in the Sudan is an indisputable fact. The corollary is that, for the same basic reason, a great deal of improvement is necessary before the Sudanese leather industry can occupy the position in the world of leather that its great reserves of cattle, sheep, goats, and camels should provide.

Much requires to be done during the lives of the animals by means of improved husbandry, even in the face of social customs which often appear to conflict with the more realistic approach of adequate off-take and consequent raising of the status of herds. This necessarily raises the issue of quantity versus quality.

The quality of hides and skins is determined, to a large extent, by what happens to the animals before slaughter, but their handling during the series of operations in the slaughterhouse, particularly in flaying, cleaning and fleshing, also has a very important impact upon quality.

From direct observation, the consultant has concluded that a great deal could be done, by more determined and officially-supported action by veterinarians and others concerned from husbandry to slaughter, to raise the standard of the rawstock produced.

In terms of raw hides and skins made directly available to the leather industry, it appears to the consultant that consideration of new schemes for collection, preservation and conversion to products of enhanced value would be well worthwhile. In Zaire, for example, Bata had a system working satisfactorily in 1975 by which the large tannery in Kinshasa district (which was directly concerned with their shoe production) sent out its own lorries carrying salt of an acceptable grade to collect and preserve its own rawstock supplies. Similarly, Bata in Zambia has been active in encouraging and assisting butchers and others to train effectively to carry out the post mortem operations, with great success.

A serious need has been recognised by the consultant for more effective fleshing at a much earlier stage than was recently observed at the Omdurman abattoir in spite of the fact that that slaughterhouse is classified Grade I. Such a change might well infringe upon the customary bonus 'meat' taken home by warehouse workers who 'flesh' the hides, in particular, some hours later, but, in the wider interests of the Sudanese leather industry, it needs to be made. The recovered fleshings or trimmings could be utilised by the slaughterhouse for by-product production which would reduce its own overheads.

In the context of measures to improve the quality (and availability) of hides and skins, it has been estimated that the global loss in the value of hides and skins due to ante-mortem and post-mortem damage in developing countries, generally, is of the order of US$ 2 billion annually. This estimate was given at the Second Consultation Meeting held in Cologne, F.R.G. which was attended by the consultant as a U.K. representative.

During that Meeting, considerable discussion took place regarding hide and skin improvement. Increased recovery was proposed through greater salvaging, prevention of wastage and reduction of uneconomic usage, where this obtained. Quantitative improvement was considered to be achievable through ante-mortem measures at farm level (improved feeding, maintenance/husbandry and disease control), through post-mortem action at slaughterhouse level (better flaying, cleaning, curing and preservation), through supportive measures at market level (centralised

collection, re-curing and better grading and selection) and through educational and informative measures, including training, demonstration and extension at all four levels. The point was also accepted that, as indicated above, cost reductions could be achieved through recovery and optimal utilisation of the abattoir-related by-products.

In most developing countries, the major renewable natural resource represented by their livestock and animal by-products, including hides and skins, constitutes a huge potential of national wealth. In that context, Sudan has a paramount need to use that potential to the maximum. A really determined campaign to make optimum use of animal by-products, beginning with improvement in hides and skins, could provide very considerable benefits.

Recommended Physical and Chemical Test Methods to be applied to leather: advisory comments

Group I - Acceptance tests: to ensure that the leather is of the correct quality for a particular use, e.g. in shoe construction.

A. Distension and grain strength by Lastometer test (SLTC Method SLP9/1UP9)

Values above 7 mm. distension at grain crack are acceptable; below 6 mm. the leather would be regarded as unsatisfactory.

For full-chrome upper leather Load (Kgf) at grain crack should be 40-60 and the distension at grain crack should be 7-12 mm.

B. Tear strength (tongue tear, slit tear) (SLTC Method SLP7/1UP8 and SATRA Method PM 30)

If the thickness of the leather is 1.5 - 1.6 mm (measured parallel or at right angles to the backbone line, the average tearing load should be 7.3 - 6.4 kg. If the thickness is 1.0 - 1.5 mm. the average tearing load should be 4.5 - 3.6 kg.

A suggested minimum value for this test is 2.3 Kg. This figure is equivalent to about 6 Kg. for unlined men's shoes.

C. Wet and dry rub test: Colour fastness; Use of Grey Scales for measuring change in colour and for assessing staining (SLTC Methods SLF 5; SLF 120; SLF 131; SLF 132).

D. Fastness to rubbing of light leathers wetted on the back with solvents (SLTC Method SLF 6).

E. Finish peeling tests; Adhesion tests (SLTC Method SLF 11; SATRA Method AM 8)

It was found by SATRA, in 1960, that peeling of finish which occurred during operations in the shoe factory or in actual wear was associated with peeling load figures of 350 g/cm. width. At values of 500 g/cm. width there were no problems.

F. Peeling load for direct moulded shoe (DMS) rubber soles SATRA Method AM 4)

A satisfactory average value for peeling load of rubber soles would be 9 Kg/cm. width and for full-chrome upper leather stuck to sole leather with neoprene adhesive an average value would be 8 Kg/cm. width.

G. Grease content

For satisfactory roughing and adhesion of a rubber sole, the grease content of the upper leather used should not exceed 6% and the free fatty acid content should not be greater than 3%.

H. Fastness to heat (SLTC Method SLF 2)

This test is important for coloured leathers used in shoemaking if ironing is carried out in the process. For satisfactory performance, leathers should not be badly affected when heated at 220 - 240°C. by passing an iron over it at that temperature.

I. Bally flexometer test (SLTC Method SLP 14/1UP 20)

The test is designed to simulate (i.e. reproduce the effect of) flexing during actual wear and to test whether the leather is 'pipey' (i.e. having a loose grain showing surface folds) and may cause finish breakdown. If the leather itself shows no damage after 150,000 flexes and the finish remains good until 100,000 flexes have been made, it can be expected that the leather will behave satisfactorily in wear.

J. Perspiration resistance of coloured leathers (SLTC Method SLF 10)

It may be desirable to check this and to compare the treated sample against the original sample using the Grey Scale.

Group II - Production control tests

A. Measurement of thickness (SLTC Method SLP4/1UP4)

This should be determined under a standard load. For some purposes such as measurement of thickness alone, without this being concerned with any other test, the sample need not be conditioned at standard temperature and humidity as for other physical tests. The appropriate thickness will vary with the type of leather and the use for which it is intended.

B. Shrinkage temperature (SLTC Method SLP 18/1UP 16)

This test provides a measure of the satisfactory tanning of a leather. There is some correlation between shrinkage temperature, Ts, and the chromic oxide level. For leather to perform satisfactorily in the direct moulded sole (DMS) process, the Cr_2O_3 content should be not less than 4.0 - 5.0% expressed on leather at zero moisture content (approximately 3.4 - 4.3% at 14% moisture content) and the Ts should be about 115°C. Leather to be used for that process should be resistant to boiling in water for 2-3 minutes without significant change occurring.

C. Tensile strength (SLTC Method SLP6/1UP6)

This test can be used to compare different batches produced in the same tannery and to establish a pattern of production and an expected standard in the tannery. The minimum value for upper leather should be not less than 130 Kg/cm^2 but values above 140 Kg/cm^2 would be desirable. Tensile failure is not normally found in shoe manufacture and percentage elongation (stretching) at a specific load is more useful.

Tests suggested for regular application to various types of leather

Physical tests

1.	Shoe upper leather	Grain crack (Lastometer), thickness
2.	Grain leather	Tensile strength, tear strength, thickness
3.	Suede leather	Tensile strength, burst strength (Lastometer), rub fastness, thickness
4.	Gloving leather	Lastometer, tear strength, stitch tear, light fastness, rub fastness, percentage elongtion at break (tensile test), thickness
5.	Belting leather	Tensile strength, joint adhesion, thickness.

Chemical tests

Chromic oxide content, grease, moisture, hide substance, water solubles, pH of water solubles, insoluble ash. For vegetable leathers calculate Degree of Tannage and Tanning Figure. For crust leathers calculate Leather Substance = 100 - moisture, grease, water solubles. For insole leather determine water solubles and sulphated ash of water solubles.

It is recommended that the UNIDO publication entitled "Acceptable Quality Levels in Leathers: Maintaining Quality Control in Semi-processed and Finished Leathers Produced in Developing Countries for Export" (1976) should be consulted. This publication, which was prepared by R.D. Higham is available for purchase as a U.N. Publication, Sales No.: E.76.II.B.6, price US$ 2.50 (or equivalent in other currencies) from UNIDO, Vienna.

List of recommended books and journals (with costs where known) to form the nucleus of a reference library for the Sudanese tanneries in the reorganised Hides, Skins and Leather Institute

A. Books	Estimated cost, US$
1. Official Methods of Analysis, 1965 with amendments (obtainable from S.L.T.C., 1 Edges Court, Moulton, Northants, NN3 1UJ, England)	50.00
2. Leather Technical Dictionary (with English and 5 other language sections) (obtainable from Eduard Roether Verlag, Berliner Allee 56, D-6100 Darmstadt, FRG	140.00
3. The Laboratory Handbook (including a section on the leather laboratory), Geo. Newnes, London, England	-
4. Hides, Skins and Leather Under the Microscope (obtainable from B.L.M.R.A., Leather Trades House, Moulton Park, Northampton, England)	25.00
5. Tropical Development and Research Institute reports*	
G86 The Tanning of Hides and Skins (Elliott and Lockhart-Smith), 1974	2.00
G123 Slaughter facilities for tropical conditions: A guide to the selection and costing of appropriate systems (Edwards, Hector, Norman and Silverside)	2.50
G134 The Manufacture of Upper Leathers (Tuck), 1981	9.00
G135 Gloving, Clothing and Special Leathers (Briggs), 1981	9.00
Books, total	237.50

* These publications may be made available free of charge to training institutions in developing countries.

Books, carried forward	237.50

A. Books (Cont'd)	Estimated cost, US$
6. The Manufacture of Sole and Other Heavy Leather (Jones and Humphreys) 1966, Pergamon Press, Oxford, England	40.00
7. Quality Control Handbook (Juran-Gryna), McGraw Hill Book Co. Inc., London, England.	100.00
B. Booklets	
1. Acceptable Quality Levels in Leathers: Maintaining control in semi-processed and finished leathers produced in developing countries (Higham) 1976 (from UNIDO Industrial Documentation Unit, Vienna; Sales No. E76.II.B.6)	2.50
2. Information Sources on Industrial Quality Control: Guides to Information Sources No. 6. Available from Industrial Documentation Unit, UNIDO, Vienna, Austria.	-
3. Technological Controls in Leather Manufacture (Bangaruswamy) 1980, NICLAI, Central Leather Research Institute, Adyar, Madras - 600 020, India	-
Books and Booklets, Total	380.00
C. Journals	
1. Journal of the Society of Leather Technologists and Chemists (S.L.T.C., 1 Edges Court, Moulton, Northants, NN3 1UJ, England)	30.00
2. Leather Science (Central Leather Research Institute, Adyar, Madras 600 020, India)	40.00
3. Leather (Benn Bros. Publications Ltd., Sovereign Way, Tonbridge, Kent TN9 4RW, England)	60.00
4. Das Leder (Eduard Roether Verlag, Berliner Allee 56, D-6100 Darmstadt, FRG)	60.00
Estimated overall cost	570.00

Further special test apparatus provided for the tannery laboratories

Five further items of special physical test apparatus were received in December 1982. The items concerned were retained at the Khartoum Tannery laboratory with the exception of the SATRA Shrinkage Temperature Apparatus (STD 114) which was sent to Gezira Tannery laboratory:

	Item		Quoted cost, US$
1.	SATRA Finish Rub Fastness tester	(STM 100)	1,986
2.	SATRA Lastometer	(STD 104)	2,441
3.	SATRA Dome Plasticity tester and micrometer	(STD 110)	452
4.	SATRA Adhesion of Finish tester	(STD 112)	738
5.	SATRA Shrinkage Temperature apparatus	(STD 114)	2,098
		Total quoted cost	7,715

When examined, all these items were found to be in good order.

Process control forms initiated (and now being used) in the tannery laboratories and based on the recommendations made to the counterpart by the consultant in the course of project US/SUD/78/267

A. Analysis of chemicals purchased by the tannery

B. Report on pickled sheepskin

C. Sequential process record through whole tannery operations

A

Khartoum Tannery — مدبغة الخرطوم

Control Laboratory — معمل التجليد

تقرير

Report on chemicals supplied — من الكيماويات الواردة لمخازن مدبغة الخرطوم

Report No. ( ) — رقم التقرير ( )

Date — التاريخ : / / ١٩٨٠

Type of sample — الصنف : .....

Result — نتيجة التحليل : _____

Remarks of the laboratory — ملاحظات المعمل : _____

Quality Control laboratory — معمل الكنترول

_____

Copy for Technical Mgr. — صورة للسيد / ..... /أ/...

Copy for Head of Section

تقرير مختبر عن الأنبوب المصنوع من الألياف الزجاجية والراتنج

تاريخ التقرير
Date when put in force

المصدر
Origin

تاريخ
Date

نتائج التحليل :
Analytical Result :

عدد العينات Number of Samples	نسبة الرطوبة Moisture content	نسبة الملح Salt content	نسبة الحامض Acid content	الرقم الايدروجيني pH of Water Extract	الجنس Type

ملاحظات :
Remarks

صورة للسيد : Copy for Technical Mgr.
صورة للسيد : Head of Section

رئيس قسم
Quality Control Lab.

(٥)

قسم ضبط الجودة
Quality Control

متابعة يومية
Daily [illegible]

C

مدبغة الخرطوم
Khartoum Tannery

التاريخ ________
Date

الخام
Raw material Section

ملاحظات Remarks	الوزن Weight	الكمية Quantity	الدرجة Weight grade	النوع Type of raw item*

* dry salted, wet salted, framed or fresh

التجهيز Beamhouse Section

التاريخ ________ Date

البل والغسيل Soaking and Washing

درجة الحرارة ________ °Centigrade

متوسط وزن الجلود ________ Av weight

الزمن ________ Time

الجير وإزالة الجير Liming and Reliming

درجة الحرارة ________ °Centigrade

نسبة الجير ________ lime (CaO)%

الرقم الايدروجيني ________ pH

متوسط الوزن ________ Av weight

الزمن ________ Time

متوسط الوزن بعد التشحيم ________ Av weight after fleshing

" " " الشق ________ " " " splitting

السمك بعد الشق ________ Thickness (mm) after splitting

إزالة الجير والتطهير :- Deliming and Bating

اختبار الفينول فثالين ________ Phenolphthalein test

الرقم الايدروجيني ________ pH

الزمن ________ Time

التحنيط :- Pickling

التاريخ

الرقم الايدروجيني ________ pH

نسبة الحامض ________ acid content %

لذ ° Bé ________ °Bé

الزمن ________ Time

ملح [illegible] ________ Salt content %

ملاحظات

ضابط الجودة
Name of technician responsible

اضاءة رئيس القسم
Head of Section (S)

الضباط المشرف [illegible]
[illegible]

مدبغة الخرطوم Khartoum Tannery

قسم ضبط الجودة Quality Control

متابعة يومية Daily sequence

الدباغة - والتشطيب Chrome tanning Section

التاريخ ______ Date

الكروم

Chromic oxide in liquor

نسبة اكسيد الكروم قبل الدباغة ______ [illegible] before tannage

الرقم الايدروجين لمحلول الكروم قبل الدباغة ______ pH before tannage

نسبة اكسيد الكروم بعد الدباغة ______ [illegible] after tannage

الرقم الايدروجين بعد الدباغة ______ pH after tannage

تجربة الغليان Shrinkage temperature ______ Boiling test

السمك بعد الدالتي ______ Thickness (mm) after [illegible]

ملاحظات Remarks

النباتي Vegetable Tanning

التاريخ رقم الدورة Date & number of set (pit) ______

عدد الاحواض - الرقم الايدروجين - الـ Bé°

No. of pit ______ pH ______ ______

ملاحظات Remarks

الضأن Sheepskin

Light Leather Section (pickled or tanned)

التاريخ :- Date

نسبة الرطوبة - نسبة الملح - نسبة الحامض - الرقم الايدروجين الـ Bé°

% water content ______ % salt ______ % acid ______ pH of [illegible] of leather ______ liquor ______

ملاحظات Remarks

التشطيب Finishing Section

التاريخ :- Date

النوع ______

الكمية Quantity ______

نسبة الرطوبة - الدهنيات - قاوة الشد - الاستطالة - الشق [illegible]

% moisture ______ % Fat ______ [illegible] ______ Elongation ______ [illegible] ______

ثبات اللون Colour change ______

ملاحظات Remarks ______

ضابط الجودة Technician   رئيس القسم [illegible] of Section   استاذ المدير الفني [illegible]

Annex V

Contacts made in Sudan by the consultant in the course of the project

Khartoum Tannery

General Manager: Mr. El Sheikh M.A. Tambal
Technical Manager: Mr. Abdalla Rahman Goda
Asst. Technical Manager: El Fateh Abu Rafad
Quality Controller and Counterpart: Mr. Mustafa Mahdi Azrag
Chemical Engineer: Mr. Abdel Gadir Mahmoud Hassan
Laboratory staff: Mrs. Heliti Eldawi Abdullah and Mrs. Awatif Abdel Gadir

White Nile Tannery

General Manager: Mr. Abbas Yousef Abousalma
Technical Manager: Mr. Ibrahim Said Ahmed
Laboratory staff: Mr. Ahmed Mekki El Fahel
Chemical Engineer: Mr. Abdelsalam Bushera (also concerned with the laboratory)

Gezira Tannery

General Manager: Mr. M. El Tayeb El Shayeb
Technical Manager: Mr. Salih Awooda
Asst. Technical Manager: Mr. Abbas El Amin
Laboratory staff: Mr. Idris Mukhtar
Chemical Engineer: Mr. El Sunni Hamid Ibrahim

Hides, Skins and Leather Institute

Director: Mr. Ahmed Hag El Sheikh Abbo
Deputy Director: Mr. Farouk S. Mahmoud El Hamouli
Technicians: Mr. Abbas Mustafa Gamil and Mr. Gaafar Abrahim Hassan

Hides and Skins Improvement Section

Head of Section: Mr. Gasim El Galal

Salim Tannery, Omdurman

Proprietor: Mr. Abdulla Awad Salem

Omdurman Leather Market

Skin (including fur and reptile) merchant: Mr. Mohamed El Sawi Ahmed

Hides and Skins Warehouse, Omdurman

Head, Chamber of Commerce/Proprietor: Mr. Mohamed Abdalla El Dieta

Embassy of the Netherlands

Mr. I.M. de Jong: Chargé d'Affaires