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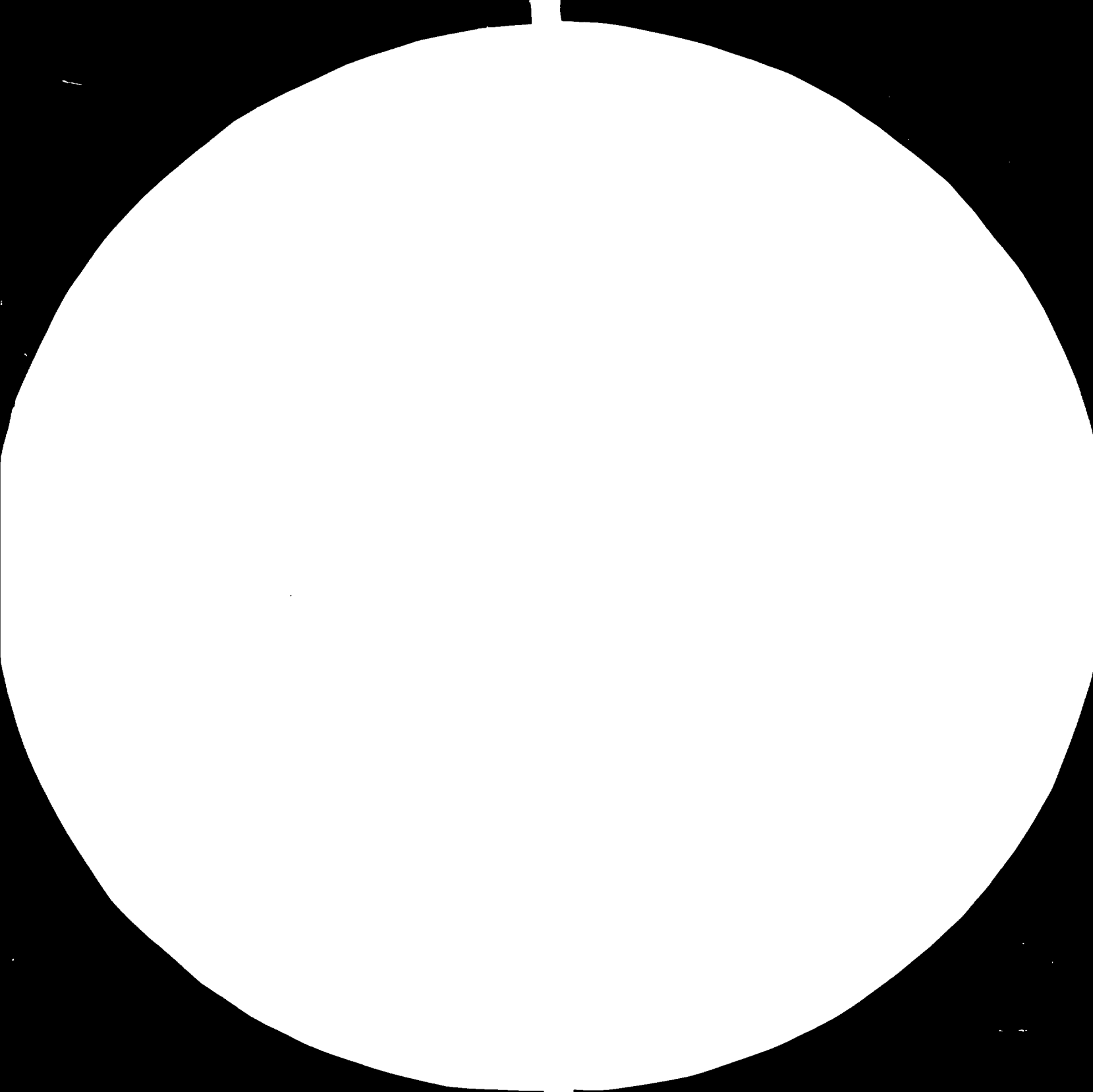

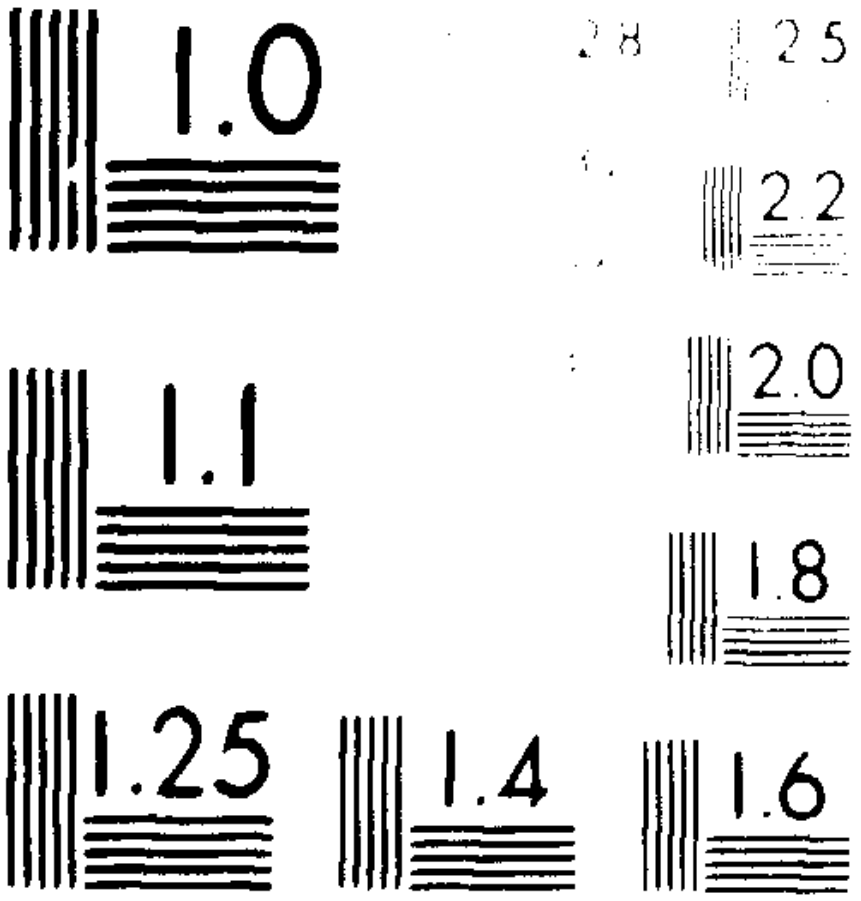
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RESTRICTED

16 February 1983

English

Tanzania.

LEATHER AND LEATHER PRODUCTS INDUSTRIES DEVELOPMENT

(DP/URT/78/010/11-52/31.7.D.)

UNITED REPUBLIC OF TANZANIA

* TERMINAL REPORT

TECHNICAL REPORT: Assistance to Tanzania Institute of Leather Technology, Mwanza, towards identification and preparation of suitable training programmes and R & D activities for the leather industry and proposals for establishment of a central information unit.

Prepared for the Government of United Republic of Tanzania by United Nations Industrial Development Organization executive agency for the United Nations Development Programme.

Based on the work of T. S. Krishnan
Consultant in Leather Industry/ Training Expert

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
VIENNA

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* This report has not been cleared with United Nations Industrial Development Organization, which does not therefore share the views presented.

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ANNEXURES:

I. ACKNOWLEDGEMENTS:

Warm appreciation is recorded for assistance provided by:

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II. SUMMARY

For the low efficiency and productivity in the state owned leather and leather products units of United Republic of Tanzania, the major constraint identified is lack of suitable qualified technical personnel at all levels. The Government realising the need, decided to establish the Tanzania Institute of Leather Technology (TILT) at Mwanza, adjacent to Mwanza Tanneries one of the three state owned large mechanised tanneries. The purpose of the institute is to:

a) provide Tanzania Leather and Leather products industry with well trained key-workers, middle management cadre technicians, technologists, quality controllers, maintenance staff etc.

b) do research and development (R & D) to aid the industry

c) establish a central information unit to help the clients with techno-economic information.

The buildings are likely to be completed by mid 1983 and part of the equipment and machinery under UNIDO assistance has already been received.

The Training Expert in Leather Technology fielded by UNIDO under the project of Leather and Leather Products Industries Development (DP/URT/010) for a period of three months, after assessing the needs of the leather industry and the education system, has identified and prepared suitable training programmes for different levels in the various aspects of leather manufacture. The Table at the end indicates at a glance the various courses. In addition the organisation of an information unit, R & D programmes to be initiated and the administrative set-up and organisational structure for the institute have also been prepared.

For efficient functioning of the institute to attain its objectives, various measures have been suggested both to the Government and to the institute. Continued assistance of UN organisations like UNIDO is particularly required for:

a. fielding a group of Experts in the initial stages of running the institute so as to train the counterparts, supplement the local staff and carry out the objectives of the institute.

b. providing fellowship programmes for selected national personnel employed in TILF to be sent abroad to similar research cum training institutes to get exposed and trained in research and training activities.

c. installation of machinery and equipment in tannery and footwear pilot plants of the institute.

TABLE

S.NO.	Description of training courses	Duration in weeks	Entry level of participants	Annexure
1.	Quality control and standardisation	12 - 20	Science graduates/existing personnel in tanneries	2
2.	Theory & practice of leather manufacture and quality control			
	a) Raw to wet blue	12	Middle management cadre of inspector/ foreman/ supervisory grade in tanneries	3
	b) Wet blue to crust	12		
	c) Finishing	12		
3.	Assorting and grading	2	Tannery staff	4
4.	Processing games skins, reptiles and other exotics	4-6	Tanners and entrepreneurs	5
5.	Operative's certificate course			
	a) Beam House	8 -12	Unskilled & skilled workers	6
	b) Wet tan yard work	8 -12		
	c) Retanning, dyeing & fatliquoring	8 -12		
	d) Finishing	8 -12		
	e) Sole and other heavy leathers	8 -12		
6.	Hide and skin improvement	8	Hide inspectors & assistants and personnel connected with hides & skins	7
7.	Tanning machinery maintenance	12	Maintenance staff in tanneries	8
8.	Material management	2	Stores/purchase staff in tanneries	9
9.	Utilization of animal & tannery by-products	4-6	Entrepreneurs and tanners	10

T A B L E (cont)

S. NO.	Description of training courses	Duration in weeks	Entry level of participants	Annexure
10*	Diploma course in Leather Technology	3 years	School leavers who have passed Form IV with science subjects.	11
11	Orientation courses	1-2	Senior level staff in tanneries	
12.	Extension lectures by senior level persons from industry, management institute, visiting scientists, technologists etc.		Participants/Staff/trade	

10.* Subject to implementation.

III. INTRODUCTION: PROJECT: DP/URT/78/010/11-52/31.7.D

1. BACKGROUND:

The Leather Industry Sector in United Republic of Tanzania is considered to be one of the country's major agro-based industries both for domestic consumption and for export. In view of its importance, a parastatal organisation viz. Tanzania Leather Associated Industries (TLAI), a subsidy of Ministry of Industry was formed in early 1979 to coordinate the state owned units into an integrated national industry and to promote the optimum development and expansion of leather and leather products industry sector in the country.

The TLAI which is located in Dar es Salaam coordinates the following units in leather and leather based industries.

a. Tanzania Tanneries Co. Ltd., at Moshi ..... Established in 1967
b. Morogoro Tanneries Ltd., at Morogoro ... Established in 1975-78
c. Mwanza Tanneries Ltd., at Mwanza ... ... Established in 1977-79
d. Tanzania (Bora) Shoe Co. at Dar es Salaam
e. Morogoro Shoe Co. at Morogoro ..... Established in 1980
f. Morogoro Leathergoods Factory at Morogoro.. Established in 1981
g. Morogoro Leather Board Plant at Morogoro .... (under advance stage of construction)

Apart from these state owned large mechanised units, there are a few small and medium scale manufacturing units in private sector, producing leather and leather products and new units are also likely to be installed throughout the country. A new unit for leathergoods is under establishment by the Small Industry Development Organisation (SIDO).

Realising the potentials of this leather industry sector in this least developed country, there were a number of short term expert commissions under various UN agencies in the early stages to survey, plan and suggest for the growth of this industry. Since November 1979 a large scale project 'Leather and Leather Products Industries Development' (DP/URT/78/010) under the United Nations Industrial Development Organization (UNIDO) has been functioning and the project is concentrating mainly in providing international experts services to advise and assist in the operation and future planning of the activities of the existing tanneries and shoe factories concerning technology, design, maintenance of machinery and marketing. In

addition it also helps in carrying out fellowship programmes abroad for selected national personnel and also in conducting short term practical courses at different levels in the units.

Despite the fairly large livestock population as well as the local labour available providing favourable conditions for the growth of this leather industry, it is seen that the capacity utilisation in the existing factories is below 50% and the quality of the products manufactured also needs improvement. Though there are many constraints like lack of collection and availability of raw materials, uneven supply of imported chemicals and auxiliaries, imbalance in machinery, lack of maintenance etc. the major constraint identified is lack of suitable qualified technical personnel at all levels. This was also the view and finding of the present Training Expert who had come on earlier occasion under UNIDO mission for a period of three months (1980-81) as Training Expert in Leather Technology (DP/URT/78/001) under Industrial Training Project to conduct training programme for the middle management cadre personnel of the state owned tanneries.

The Government recognising the need to have a national training centre for the leather and leather products industries, decided to establish the Tanzania Institute of Leather Technology (TILT) at Mwanza, adjacent to the existing Mwanza Tanneries and earmarked 24 million Tanzanian Shillings for its establishment. The purpose of the institute is:

a. to provide the Tanzania leather and leather products industries with well trained key-workers, middle management cadre technicians, technologists, maintenance personnel etc.
b. to provide the industry with extension services such as industry planning, technology improvements and quality control.

Further objectives are to establish a central information unit and initiate R & D programmes to suit to the specific needs of the industry. The preparatory phase regarding TILT was completed in September 1980 and the construction work started immediately. Owing to some difficulty of allocating funds from the Government, the progress somewhat slowed down for some time but the buildings are likely to be ready by middle of 1983. The necessary laboratory equipments and machinery for the tanning and footwear pilot plants of TILT are being supplied by UNIDO under project (US/URT/79/240) financed from a special donor contribution of Government of Italy

to UNIDF, amounting to US $ 533,126. Some of the equipments and machinery have already been received.

OBJECTIVES:

With the above background the Government of Tanzania requested the assistance of United Nations Industrial Development Organization under the present project of Leather and Leather Industries Development (URT/78/010) for fielding two Experts, specialised in training requirements, one for the leather industry and the other for footwear and leathergoods industries, for a period of three months duration each, to prepare syllabi for the various training courses to be organised and conducted by TILT and also to suggest initial programmes in quality control and R & D activities to be envisaged by TILT.

The Leather Industry Consultant/Training Expert under the UNIDO project (DP/URT/78/010/11-52/31.7.D.) was appointed on 24 November 1982 and was provided with the following job description.

i. To analyse and evaluate the training needs of the national leather industry with special reference to the local conditions, existing manufacturing techniques and the basic education systems of the country.

ii. To work out syllabi for the training activity to be undertaken by TILT in Mwanza, specifying the levels of the training, the content and the ratio of theoretical and practical training as well as the kind of certificate to be issued.

iii. To give proposals for technical literature, training aids and didactic methods to be used in the training processes and give advice on staff requirements.

iv. To give advice on the organisation of an information unit in TILT, recommend technical information, books, journals etc. to be obtained and later systematically to be collected.

v. To analyse the needs of the leather products industry for R & D programmes and recommend a suitable initial technical development programme to be carried out by TILT, paying special attention to the availability of raw materials and the quality problems of the local leather products.

The detailed job description (original) under terms of reference is attached as Annexure-1.

The Expert who was attached to TLAI carried out his mission under the Chief Technical Adviser and in close cooperation with other team members of UNIDO leather project.

IV. TRAINING COURSES FOR LEATHER INDUSTRY:

FINDINGS, ANALYSIS AND EVALUATION:

1. Livestock and availability:

The animal population (estimated), the availability (estimated) and the actual collection and commercialisation as in 1980 are as follows:

	Animal population (estimated)	Availability (estimated)	Collection commercialisation as in 1980
	in million pieces	in million pieces	in million pieces
Cattle	11.00	1.10 (10%)	0.60 (5.45%)
Goat	4.50	1.30 (29%)	0.60 (13.33%)
Sheep	3.00	0.70 (23.33%)	0.30 (10%)

2. Installed capacity of the three state owned tanneries is given below:

	Cattle hides (wet blue + crust + finished leather) in million Sq.ft.		Goat skins (wet blue) in million pcs.	Sheep skins (wet blue) in million pcs.
a) Tanzania Tanneries	8.00		0.80	0.50
b) Morogoro Tanneries	8.00		0.80	0.50
c) Mwanza Tanneries	8.00	Upper-6.00 Sole -2.00	Nil	Nil
Total	24.00		1.60	1.00

3. Actual capacity utilisation:

According to UNIDO survey the available annual processing capacity of the three tanneries is about 28 to 30 million sq.ft of leather but in 1982 the actual capacity utilised has been only to the extent of 45%.

4. Raw hides and skins:

4.1 The country's greatest basic natural hindrance to good leather production is the inadequate quantity, quality and reliability of supply of raw hides and skins despite the fairly large livestock population. Wide geographical dispersal, antemortem defects like animal diseases, branding etc. bad flaying and curing, collection, handling and transport besides illicit smuggling are the various short comings encountered in this field. It is needless to emphasize that any amount of improvement in processing techniques of leather will not be able to cover many of these defects.

4.2 Recognising these, the Government had requested the assistance of FAO, Rome and an Expert of FAO in hides and skins improvement has been functioning from the beginning of 1981 so as to find ways and means of improving the quantity and quality of raw hides and skins.

4.3 The hide and skin improvement is a long drawn process as an appreciable quantity is available only with rural people who have to be trained and instructed regarding the increased value obtainable by prevention and elimination of ante and post-mortem defects. As raw hides and skins form the basic raw materials for the leather and leather products industries, a training course on ' Hide and skin improvement' with considerable emphasis on field work is of utmost importance. Personnel, working in live stock development like Hide inspectors and assistants and also from the organisations connected with this, have to be trained periodically who in turn will do

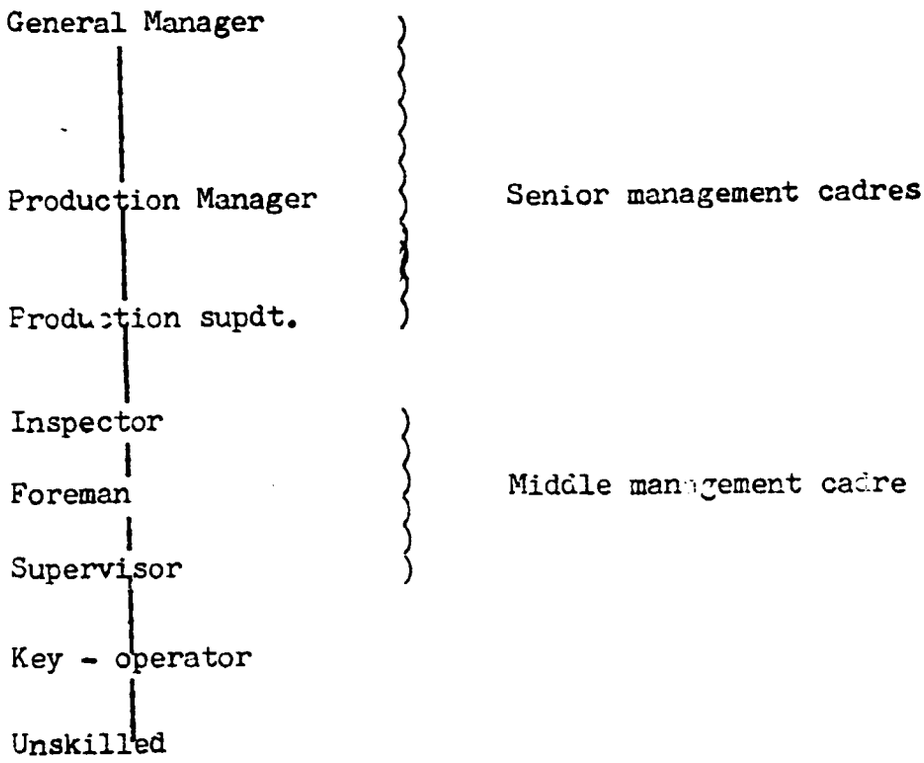
intensive extension work to train the artisans/ butchers including in rural places so as to get hides and skins of quality and quantity.

5. Production, process and quality control:

5.1 This is the most vital department in the whole tannery set-up as it is directly concerned with product making. As pointed out earlier, the overall output of the three tanneries is well below their capacity and the quality of the products turned out also needs improvement. The UNIDO project 'Leather and leather products industries development' (DP/URT/78/010) right from its inception has been helping these tanneries and shoe units to overcome many of their short comings by technological improvements, periodical training by conducting practical courses, maintenance of machinery, marketing etc. and thus has been contributing a lot to the growth of this industry. But a major constraint identified is lack of suitable qualified technical personnel at all levels down from key-operators. This will be felt more accute when the industry completely switches over to finished leathers which is the ultimate objective of the country.

5.2 Excepting Tanzania Tanneries, Moshi which has been functioning for the past 15 years, the other tanneries have been in operation only for the past 3 to 4 years. In the absence of any training institute in leather technology, it is being found difficult to recruit manpower with adequate educational and technical background. The Government has rightly recognised the need for training and decided to build the insitute at Mwanza.

5.3 The cadre of existing technical personnel in the production department of the tanneries is as follows:



5.4 Education level and experience of existing personnel:

(i) In the senior management cadre it is seen that persons who have qualified for a course in Leather Technology abroad have been recruited. They are few in number and some of the posts in that cadre have not been filled up due to want of qualified people. Even the present personnel lack industrial experience and training. In leather processing one attains more skill and practices as one puts up years of experience under able and experienced senior staff. Realising that technical qualification in leather technology will be beneficial in the long run, selected national personnel are being helped by UNIDO leather project on fellowship training programmes to go abroad to qualify for a course in leather technology.

(ii) In the middle management cadre, fresh school leavers who have done their primary school education (Standard VII) or secondary school education (Form IV or VI) are recruited, given certain amount of training in tannery and then absorbed.

In the absence of their being trained in leather technology, they are not exposed to the theoretical aspects which are very necessary for applying practices. So much so the middle management personnel who form the backbone of the industry and who have to look after the day to day's production have very minimum undertstanding of:

a) objects of various operations in leather processing
b) the effect and control of various operations on the end product
c) various chemicals and auxiliaries used and their functions
d) process improvement and updating of the processes
e) selection, grading, yield factors and proper product mix
f) quality control and standardisation
g) newer trends and developments in view of the constant changes taking place in leather and leather consuming industries
h) programming and planning
i) cost appreciation
j) house keeping

(iii) In the case of key-operat esh recruits are given on the job training in machine/process operations and are then absorbed. A high standard of ability is required for many operations in leather processing. This is possible only when the key operator acquires sufficient skill and technological competence and does the job more accurately and effectively. Here again in the absence of effective training under able persons, the skills have to be improved.

6. Tannery plant maintenance:

The plant maintenance in all the three tanneries is inadequate due to various factors like lack of trained personnel, technical know-how and programming and planning for essential spare parts and consumables. Frequent breakdowns and defective operation of machinery and equipments

affects not only the quality but also the volume. A training course on tannery machinery maintenance is absolutely necessary to improve the professional skills and knowledge of maintenance staff to increase the efficiency and productivity.

7. Material Management:

Very often export contracts are not met within the stipulated time by the tanneries due to shortage of chemicals, raw hides and skins, spare parts, conusmables etc. thus affecting the output flows in terms of volume, quality and selection. The personnel in the stores and purchase have got a great role to play in proper planning and programming and in store stocking to prevent production stoppage. A short course on material management will be of immense benefit for the personnel from stores and purchase to improve their skills and ability so as to implement effective material management.

A national personnel had already been sponsored by UNIDO leather project for training abroad in material management and perhaps after his return his services could be utilised whenever necessary for supplementing the training programme.

8. Utilisation of animal and tannery by-products:

8.1 The by-products of the meat industry other than hides and skins are almost totally wasted at present. Various types of animal by-products like bones, blood, intestines, glands, organs, horns and hooves and tannery by-products like hide trimmings and fleshings, chrome and vegetable shavings, hair and wool (if saved and not pulped out) are not collected and made use of. To a neglegible extent horns and hooves are used for handicraft items and fat collection is done in a very small way in a crude manner without refining. A leather board plant in Morogoro is being set up by TLAI to make use of the shavings and cut pieces from tanneries and shoe factories.

...../

8.2 Some of the by-products like blood, bone, hide trimmings and fleshings can be profitably utilised even in rural areas with the minimum of capital investments for making into animal feeds, fertilisers, glue and gelatine. The local manufacture of these items to start with, will have a considerable foreign exchange by import substitution and export markets might eventually be avaialable. In view of the great potentiality for the various by-products, a training course on 'Utilisation of animal and tannery by-products' will be useful as it will create an awareness among prospective enterpreneurs.

8.3 Future plans should aim at converting the other by-products mentioned above into various end products like blood plasma, haemoglobin, sausage casings, surgical sutures, musical instruments strings, sports guts, pancreatine, bates, cholic acid, lever extracts, ossein, bone ash, bone charcoal, fire extinguishing compounds, electronic gadgets, carpets, druggets, under felts, packing and cushioning materials etc. which will have export potentiality besides domestic consumption.

9.0 Training programmes:

9.1 It is evident from the above findings and analysis that training courses, if conducted periodically by TILT for different levels, will help the existing personnel and new recruits if any, to develop better skills and technical competence and also for the future needs. The following training courses are suggested to be organised and conducted by TILT. Details about the objectives, duration, terms, course content, admission requirements, examinations and syllabi are given in the Annexures indicated against each course.

1) Quality control and stardisation - Annexure (2)
2) Refresher course for middle management personnel of Inspector/Foreman/Supervisory/ level in theory and practice of leather manufacture and quality control - Annexure (3)
3) Training in grading and assortment - Annexure (4)
4) Processing of games skins, reptiles and other exotics - Annexure (5)
5) Operative certificate course - Annexure (6)
6) Hide and skin improvement - Annexure (7)
7) TANNING MACHINERY MAINTENANCE - ANNEXURE (8)

8) Material management - Annexure (9)

9) Utilisation of animal and tannery by-products - Annexure (10)

The type of certificate to be issued to the participants fulfilling the training courses is given in Annexure (13).

9.2. Orientation course :

In addition to the above courses, orientation courses for senior level staff may be organised for a short duration of 1 to 2 weeks to acquaint them with the newer concepts and modern trends in leather making. The fields may cover (a) Upper leather manufacture (b) Retanning and dyeing (c) Finishing (d) garment leather (e) Sole leather (f) Quality control and standardisation (g) Tannery effluents (h) Production management etc.

9.3. Extension lectures :

Whenever possible, extension lectures by senior management personnel from industry, technologists, scientists, technical service personnel from auxiliary and machinery firms, management institutes should be arranged both for the benefit of the participants and for the staff of TILT.

9.4. Other courses :

In the near future there may be needs to run special short term courses for staff from Export and Import agencies, Customs, Railways, Forestry, SIDO, Financial Institutions, etc. to suit to their specific needs as number of problems may be referred to TILT by these organisations for expert opinion in case of arbitration etc. Such short term courses will provide the personnel with the necessary background informations to make correct, fair and on the spot appraisal which will save a lot of time and money spent on correspondence, consultation, expert opinion etc.

10.0 Diploma course in Leather Technology :

10.1 The advantages of having qualified personnel in Leather Technology in tanneries have been already dealt with. In the absence of any educational institute within the country for such a course, persons are at present going abroad to qualify for such a course. In the event of TILT conducting such a course, the details

regarding the course like syllabi, duration, admission requirements ,scheme of examinations are given in Annexure (11). The type of certificate to be issued for students passing this course is given in Annexure (12). Having described the course it is necessary to indulge in a bit of heart-searching and consider the pros and cons whether it is to be implemented or not.

10.2 Advantages :

a) The Diploma holders in leather technology will be considerably better in all respects than fresh school leavers who have not done any course in leather both for the immediate and long range objectives of the leather industry.

b) Considering the outlets for students passing out of this course, the demand can be as follows :

(i) While switching over to completely finished leathers both for export and for domestic leather products industries which is the ultimate objective of the country, the industry has to enter into a more competitive market. The employment of Leather Technologists right from the middle cadre of supervisor/ foreman will be necessary as they will be more useful to take care of the production and productivity problems, quality control, frequent changes in demands and trends, business management, marketing etc. As such leather qualified personnel may be in demand by the industry when it switches over to more and more of finished leathers.

(ii) Some of the multi-national leather auxiliary and chemical firms who are at present marketing their products in this region may be employing such qualified persons with experience for technical services, to apply and sell their products in tanneries.

(iii) With the development of chemical and auxiliary firms locally for leather, qualified persons may be needed similarly.

(iv) Organisations like financial institutions, Government bodies etc. may be absorbing a few persons for developmental work.

(v) Some of the existing units in private sector may be needing a few hands in case of their diversification.

(vi) There may be job opportunities outside the country particularly in the surrounding developing countries.

(c) One of the long range objectives of TILT is to train persons also from neighbouring countries. In the absence of any institution, offering such course, students from neighbouring countries are likely to join the course who on their return will be useful for the growth of this industry in their respective countries.

(d) In the event of TILT becoming an International Training Centre for leather and leather products industries in this East African region, a diploma course like this will be useful for all the countries in this region.

10.3 Disadvantages:

(a) Additional infrastructure will be required for TILT by way of expansion of buildings, more facilities in laboratory and pilot tannery, additional staff etc. and this requires further investment.

(b) Any educational cum training institution will be incurring considerable expenditure on each student for the training and the tution fees collected will only be negligible.

(c) The present three state owned tanneries have been built up with capacities to process all the raw materials available in the country including those which are not collected at present.

While switching over to completely finished leathers, some additional infra-structure by way of buildings, finishing machinery etc. may be required which can be added to the existing units. As such further growth of the leather industry is unlikely unless raw materials are imported which is rather remote.

(d) The demand by the industry, auxiliary firms and other agencies for such qualified persons could be easily met within a few years of starting this course after which these organisations would have reached a state of saturation. The absorbtion afterwards within the country will be practically nil. There is no point in the institute remaining like a show piece without students.

(e) The object of TILT is not to spend money on students for whom there are no employment potentials within the country and to force them to seek job opportunities outside the country.

(f) There is no justification to assume that students from neighbouring countries will be coming in sufficient numbers every year to join this course.

(g) Whether it is more practical and economical to select a few fresh school leavers of merit, employ them in tanneries for a year or two and then send them to recognised educational institutions abroad to qualify for a course in Leather Technology to meet the demands of the industry in the coming few years has to be looked into.

10.4 As such it is very necessary for various agencies like TLAI, TILT, representatives from Manpower committee, Technical education, industry and other organisations if any, to meet as many tines as possible to take stock of the above and to throughly analyse objectively before taking any decision with regard to this course. It is not possible for the Expert within the short time at his disposal to give any concrete suggestion in this regard when so many aspects have to be considered.

11. Training aids :

11.1. Though there are various devices that will assist the lecturer to transmit to a learner the facts, skills and knowledge for quicker grasping and better appreciation, the following modern training aids will be very useful.

1. Overhead projector for film as well as for paper documents
2. Projector with slides
3. Movie projector with sound
4. Tape recorder which can be connected to projectors
5. Camera for photographs
6. Xerox copying machine/Plain photo copying machine
7. Calculators
8. Television
9. Video with video camera

11.2. Other conventional training aids like charts, diagrams, sketches, black board, technical manuals, handouts, case studies, discussions, specimen etc. are also necessary for imparting effective training.

11.3 An up to date library containing books, magazines, journals, manuals, pamphlets, abstracts etc. on the various subjects connected with leather industry is a must for any training cum research institute. The training and research activities would remain incomplete if they are not supplemented by related readings. Library hours should be set apart for the participants and they should be required to submit a condensed record of their study. The lecturers should also take pains to keep themselves well informed of the latest developments in their particular subjects and should give reference in their lectures, handouts and manuals to published work in the journals and books.

11.4. Field trips like visits to tanneries and other related enterprises will also be very informative and stimulating as these can reinforce the knowledge of technique and practices acquired during training.

11.5. Finaly the most effective training aid in leather processing on which lot of emphasis should be laid is the actual practice one does with his own hands and as such the theoretical lecturers should be closely linked with practices.

V. ORGANISATION OF INFORMATION UNIT

Information is the life line of any industry and undoubtedly so, is its importance for the leather and leather products industry. With the rapid advancement of science and technology particularly after the second world war, the need has been felt for the efficient transfer of know-how to keep the scientists and technologists abreast of the developments in the field of leather and leather products industry. This has necessiated the development of many types of information services and systems to bridge the communication gap between the point of generation to the point of utilisation of knowledge. One important factor for the R & D activities is the transfer of information nascent as well as retrospective. Information has thus an important role, considering the advancement of leather and allied industry currently in the developing countries.

Tanzania Institute of Leather Technology (TILT) should have an information unit whose main efforts should be to evolve effective information systems and services which would be of use to users community inclusive of (a) manufacturers of leathers, footwear, leathergoods, by-products, auxiliary and chemicals, tanning machinery and related products (b) R & D personnel engaged in the generation of appropriate know-how for these industries (c) rural artisans (d) the trade which exports and imports and (e) the policy making and development agencies at the regional and national levels.

In addition to the technical know-how, the scientific and technical information have to be disseminated to the industry and allied agencies. The information demands made on TILT from these organisations may range widely from specific items of information to consolidated information. They may relate to (a) names and addresses of the suppliers and manufacturers (b) details about the products and processes developed at TILT (c) details about the various training courses and facilities (d) information about testing, national and international standards pertaining to the field of leather and leather products (e) statistics about exports, imports, production and also consumption of different items (f) opening for trained technical personnel etc. As such enough information and data have to be collected so that the technical enquiries on the above can be answered/replied.

The wide range of information that has to be supplied requires a strong base of information sources and TILT has to build up a well equipped library with good collection of documentary sources of different types like technical books and monographs, periodicals and journals, bulletins, reports, standards etc. A list of technical books, periodicals, journals connected with leather industry is given in Annexures (14 & 15). Books and journals must be catalogued and issued to the research and teaching staff and also to the students as and when necessary. A large number of back number of research journals must be procured. Books on organic, inorganic, physical chemistry, polymer, analytical chemistry, dyes and pigments, paints and varnishes, surface coating, synethetic resins and rubber, adhesives, solvents and plasticizers, microbiology, entomology, biochemistry, chemical technology, chemical engineering, environmental pollution, industrial, production and business management etc. should also find a place in the library. A specific budget allotment is necessary.

A number of other systems and services like reprography, audio-visual dissemination on selected topics, projectors, photostat copying, photographic services, publication of a journal (technical), and information services in local language may also have to be added up in due course. A priced technical journal (quarterly or once in two months to start with) may be brought out by TILT covering leather and leather products and the journal has to cover the R & D work, the process papers, abstracting of journals, and papers, trends in the leather world, dates of international fairs and other events, fashion and style trends, new products, domestic market, news items of economic importance like policies and development, export and import figures, special lectures of eminent scientists and technologists visiting TILT, seminar and symposia, other activities and events of TILT etc. The journal should also serve as a very good medium for advertising the products for the manufacturers of leather, leather products, auxiliaries, chemicals and machinery and also for the services rendered by TILT.

Various technological and technical problems posed by the trade have to be collected periodically by this unit so as to help in drawing up the R & D programme for the institute, to suit the specific needs of the trade. The unit should also be closely involved in R & D programming, monitoring and evaluation. Quarterly, half yearly and annual reports on the R & D and other activities should be prepared based on the monthly individual reports of the staff.

The information unit should act as a principle link between the institute and its customers, particularly industry, in order to ascertain client's problems, arrange for assistance to be provided to them by institute, arrange for exploitation of institute's research results and arrange contracts for research, technical services, testing etc. The section should also establish close links with industrial information sources in other countries, educational, training and research institutes (local and abroad), universities, technical colleges and institutions, management and productivity institutes, TIRDO, TISCO, TBS, SIDO, Livestock development and various ministries concerned.

The unit should also handle the publicity and public relations of TILT. VIPs and visitors should be received and shown around the institute. Periodic publicity notes highlighting the activities and achievements of the institute have to be prepared for the press, radio, television etc.

Periodical guest lectures, extension lectures, practical demostrations, internal seminars should also be arranged by this unit for the benefit of staff, students and trade.

In course of time the unit should also plan and help TILT in organising an annual trade fair coupled with a technical seminar with the close collaboration of the trade, Government organisations, parastatal organisations like TLAI, THS, chemical auxiliary and machinery firms. This will not only help in educating the public but also in creating a better rapport amongst the various agencies of leather and allied industry.

The sections of the information unit and the various functions to be attended by each section are given below:

1. Technical information and liaison :

1.1. Technical enquiries

1.2. Trade councelling

1.3. Transfer of know-how for commercial exploitation

1.4. Coordinating trouble shooting and solving adhoc problems at the production units by TILT staff

1.5. Coordinating techno-economic survey, feasibility and project reports undertaken by TILT

1.6. Filing of patents by TILT staff

1.7. Participation by TILT staff in seminars, symposia, meetings, trade fairs etc.

1.8. Arranging guest lectures, extension lectures, practical demonstration, audio-Visual demostration, seminars, symposia, get-together, trade fairs etc.

1.9. Membership of TILT and its staff in different organisations

1.10. Liaison with organisations like TIRDO/TISCO/Live stock improvement /Technical institutes/universities/Management Institutes etc.

1.11. Liaison with Tanzania Bureau of Standards in drafting standards

1.12. Liaison with other international research institutes, education and training institutes, trade councils/associations/societies

2. Programming, monitoring and evaluation of R & D, training and other activities in TILT.

3. Data Bank :

3.1. Collection and compilation of data, statistics, market information, trends in the leather world, fashion & style trends.

3.2. Collection and display of various types of finished leathers and leather products made by Tanzanianindustry.

3.3. Collection and display of products made by artisans and also age old leather products of the country, if any.

4. Library, documentation, reprography and publications :

4.1. Collection and addition of books, periodicals, monographs, bibliographies, standards etc. on leather, leather products and allied industry.

4.2. Procuring journals, magazines.

4.3. Collection of up to date literature, brochures, leaflets, catologues, manuals, shade cards from auxiliary chemical and machinery firms.

4.4. Fashion and styles - Mode Europe card

4.5. Abstracting services

4.6. Reprographic services like reprints, Xerox copies of articles, photographic services, preparation of slides, audio-visual dissemination.

4.7. Publication of trade journal by TILT

4.8. Publication in local language

4.9. Preparation of brochure describing the objectives, activities and achievements of TILT.

5. Publicity and public relations :

5.1. Visitors and VIPs to TILT.

5.2. Periodic publicity notes highlighting the activities and achievements of TILT.

5.3. Publicity through press, radio, television

5.4. Publicity through international journals/bodies/agencies.

VI. RESEARCH & DEVELOPMENT (R & D) :

R & D in applied field should be another activity to be carried out by TILT not only to help the industry but also the training staff to keep abreast of modern developments and thus stimulate and keep their interest alive in the various subjects. Another important reason is that it will help to build a healthy and lasting partership with the industry.

In the first years of the life of any insitute, R & D constitutes a minor activity but this gradually grows in scale and scope. To start with, TILT can initiate R & D in the following areas.

1. Testing, analysing and evaluating chemicals and auxiliaries used in leather processing.

2. Testing and analysing products for standardisation, quality control and certification.

3. Trouble shooting in industrial plants and solving adhoc problems posed by trade.

4. Process and product improvement and cost reduction in the present processes followed by plants.

5. To study the curing properties of different types of salts and preservaties and also the methods of curing adopted at present in the various regions of the country and to standardise the process of curing and preservation.

6. Techno-economic survey.

For (1) and (2) the testing section of TILT can act as a valuable service to local manufacturing units many of which may not be able to carry out by themselves. Trouble shooting: Trouble shooting means technical service dealing with a wide range of practical problems encountered in tanneries. They may involve about raw materials, controlling operations, testing and evaluation of chemicals and auxiliaries, selection/erection/adjustment/ repair of machinery and equipment, dealing with complaints or enquiries from customers etc. Trouble shooting is however a valuable service to industry and it broadens the experience of staff. TILT should attach lot of importance to this activity as it will not only create a goodwill but also help to reveal some important problems which may later result into a research oriented project.

Process and product improvement and cost reduction :

The existing methods of production in the tanneries have to be studied in detail in the plants and R & D should be carried out by TILT in its pilot tannery towards process and product improvement and cost reduction. The know-how developed should be transferred immediately and effectively by practical demonstrations to tanners at TILT or by inplant work in the plants. Another activity under this, may be to develop suitable know-how to suit the individual buyer's requirements.

Curing and preservation :

This should be given top priority as for successful production of quality leather, quantity and quality of raw hides and skins are very important.

Techno-economic survey :

Of fundamental importance to the industry and country is a detailed knowldge of the quality and quantity of indigenous natural resources which may ultimately prove to be not only as an import substitute but also have export potential. The institute has to take initiative for carrying out the survey and also performance and evaluation tests which may in turn result in additional research work being carried out.

Many of the activities discussed above can be of immediate value to the industry. During the first phase it is needless to emphasise that the staff should periodically visit the tanneries and get exposed to the type of raw materials, prevailing conditions, industrial practices, products made and problems encountered. This will help the research staff to modify or adjust their R & D accordingly. As the institute grows up, more R & D work on the following lines can be thought of which have again relevance to the industry.

Raw hides and skins :

(i) Research to eliminate the damages in raw hides and skins

(ii) Histological, biological, entomological and microscopical studies for improvement of raw hides and skins.

Process know-how development :

By adaptive research suitable processes have to be generated for indigenous conditions to manufacture a variety of finished leathers of good quality to compete in the international and national markets.

(i) Sophistigated and fashion leathers from cattle hides

(ii) Various types of finished leathers from goat skins like uppers, shoe suedes, lining, printed leathers, woven leathers, chamois etc.

(iii) Various types of finished leathers from sheep skins like garments, gloves, shoe uppers, lining, printed leathers, gas meter leathers etc.

(iv) Upper leather from cattle for army and ammunition upper.

(v) Other types of leather like cycle saddle, harness & saddlery, sportsgoods leathers like football, handball, cricket ball, industrial leathers like belting, picking band etc. from cattle hides.

(vi) Vegetable tanned leathers out of hides and skins which are unsuitable for chrome selection

(vii) Utilisation of splits.

(viii) Processing game skins, reptile and exotics.

(ix) Use of other tanning agents to cut the cost of chrome.

(x) Processing techniques to reduce pollution load.

(xi) Upgrading the lower ends

(xii) Productivity studies

(xiii) Cost reduction and energy savings techniques

(xiv) Transfer of technology

Products know-how developments :

Based on the techno-economic survey, R & D work should be initiated in developing suitable chemicals and auxiliaries towards import substitution and export potential.

The probable areas may be

(i) vegetable tanning materials

(ii) Fatliquors

(iii) Adhesives

(iv) Pigment pastes

(v) Protein binders, wax emulsions

(vi) basic chemicals

For doing the survey TILT should liaison with various organisations like TIRDO, TISCO, TBS, Livestock improvement, Universities, Educational institutions, Financial institutions, Ministries and other agencies.

Development of know-how for simple tanning equipment /machinery :

(i) Drums

(ii) Paddles

(iii) Wooden horses, duck board, trolleys, toggle boards etc.

(iv) Beams for unhairing, fleshing, scudding by hand and suitable knives for the same.

Utilisation of tannery and animal by-products :

(i) Glue and gelatine from hide trimmings and fleshings

(ii) Leather boards from shavings, leather cut pieces etc.

(iii) Utilisation of hair/wool (in case of hair saving)

(iv) Animal feeds and fertilisers from bone and blood

(v) Utilisation of other animal by-products

Tannery effluents :

(i) Intensive investigation and know-how for treatment of tannery effluents.

Some of the R & D mentioned above embrace several disciplines and in order to deal with them effectively, personnel from other disciplines have to be added to TILT progressively in course of time. There is no hard and fast rule that all the R & D programmes should be taken simultaneously and that too in that order. Depending upon the specific need of the industry and the staff available, priority may be assigned to the problems which are of immediate interest to the industry. R & D should be a continuous activity of the insitute in view of the constant changes and trends taking place in leather and leather consuming industries.

Liaison with industry :

The success of any ~~technical~~ training cum research insitute is made possible only by establishing fruitful partnership with the industry. The success or failure of training and research is gauged by the industry's response to it. Annexure (16) indicates how the industry can be tied up in every phase of the TILT's activities. If technical training in leather and leather products is to be more meaningful, the authorities concerned with TILT should be prepared to let the industry tell them what is wrong with the methods of training or research if the latter are not satisfied with them. The institute must be prepared to conduct the training courses and reasearch to suit the specific needs of the industry and suitably change the syllabi and R & D accordingly. Senior level staff from the industry must be chosen and permitted for delivering a course of extension lectures at TILT to the participants and staff. Similarly the staff of TILT should be deputed to the industry. These will provide an opportunity for institute's staff to keep in touch with current trends and industrial practices.

VII. ADMINISTRATION, ORGANISATIONAL STRUCTURE AND STAFFING :

Administration :

Diagram 1 in Annexure (17) explains the administrative set-up of TILT. The Director of TILT occupies a pivotal position whether it is a question of laying down a policy or carrying it out or the day-to-day administration of the institute. Administratively speaking he is directly responsible to a higher official/authority of the concerned Ministry. Policy making will, however, be done by the Governing Body. The constitution of a Governing Body as shown in diagram 2 in Annexure (17) is most essential. It should consit of Director TILT, an educationalist, one or two outstanding university trained technologists/ scientists, an administrator from corcerned Ministry; an administrator from Ministry of Manpower/National Education/Livestock development and two or three representatives from the industry who are capable of contributing a lot technically. The numbers quoted above are only by way of example and may very well be varied depending upon the importance attached to various sectors. It has always been true that the Governing Body, functions well when its membership is small (say 7 or 9). The Governing Body should be given full authority to establish policy guide lines, salary scales, growth rate, to approve and evaluate the programme of the work and to approve the budget of the institute. It should, however, take care not to interfere with the day-to-day administration of the insitute. TILT though it may be part of the Government should be made autonomous. Traditional civil services, financial and administrative rules and regulations should not apply to TILT. It must be made possible for the Director with the approval of the Governing Body to hire staff temporarily and rapidly or even to discharge unsuitable staff. Government salary scales are usually low to attract and retain the calibre of staff required for the successful operation of a training cum research insitute. The head of the institute should be vested with powers within the overall budget for procurement of raw materials, chemicals, spare parts, consumables and other inputs or to repair

a machine/equipment in the easiest and quickest way possible without observing the usual and cumbersome procedures of the Government. Foreign exchange should also be made available for import of spare parts or other items which are required for carrying out the activities. The institute activities should not suffer for want or delay of inputs. Similarly a seperate budget should be alloted for building up the library and other documentation services.

Director of TILT :

The qualities required of a Director of a training cum research insitute like TILT are manifold. He should be well qualified in Leather Technology/Leather Chemistry/Science/ Chemical Engineering and possess a record of achievement in the industry. He may not have had opportunity to have the experience in all areas when he is appointed but he should have the capability to quickly know and grasp the various disciplines involved. His interest should be in the direction of applied research, training, technical services like testing and analysis, information and public relations. He should be an able organiser besides being a good judge of personnel. He should have the cooperative attitude towards people outside the organisation as well as within the institute and should have the ability to inspire his own staff to effective action. Finally he must be a good public relation man and also act as a salesman in promotion and exploitation of the know-how and research results achieved. The Director must concentrate more on technical work as far as possible leaving the routine administrative duties to administrators. He should constitute an internal committee drawn from senior staff and administrative chief to assist him in his task of technical and administrative matters. No doubt by virtue of his being the chief of the institute he is responsible to Governing Body for all technical and administrative matters.

Technical staff for research and training :

The success of the institute depends primarily on the quality and ability of the staff. The staff should have sound knowledge of scientific technological background, be good organisers and have the personal qualities necessary to work as a team and to win the confidence and respect of the clients, particularly industry. They must strive to be more techo-logically advanced then the persons in the industry with whom they will be in contact. The other requirements are sincerity, dedicated spirit, ability to do hard work, good knowledge of commercial practices, keenness of observation and ability to understand and quickly grasp the problems and requirements of the industry and above all an intutive sense to detect faults in the products and processes. A sense of purpose and even of urgency should prevail in their research activities. For effective transfer of technology the staff should be capable of doing field work. Field work is not merely confined to giving oral advice or suggestions but to prove convincingly the improvements or new processes by inplant work in the plants. As such one should have a flair for this type of work with lot of zeal and enthusiasm. Hence systematic attention must be given for their selection. Persons who have the correct aptitute for research, training and field work have to be recruited with right qualification and experience. Not all academicians or persons with lot of industrial experience can be good in training and research. Persons for senior positions should have also the qualities of leadership, drive and managerial competence. In the junior level, if necessary, they may have to undergo a vocational course in training and teaching so that they may grasp the rudiments of teacher-student relationship. They should be properly trained by the senior staff so that they can pick up the required qualities besides becoming mature and experienced. In course of time when they prove to be good they may replace or occupy senior level posts.

Information unit :

This unit must be headed by an information scientist/Leather Technologist who with his amiable manners should be a go-getter.

He should have a good command of english and local language and should be capable of writing technical reports. He should have the capacity to collect information from various sources and should feed to the client as well as to the staff. Besides being conversant with all documentary systems and devices he should be a good organiser and a public relation man. He should have a deep understanding of the various activities of the institute and should be able to provide general information, direct the enquiry to the appropriate section wherever necessary and take up follow-up action.

Administrative support staff :

A considerable number of administrative support staff are also needed for the institute e.g. administrative head, purchase, stores, accounts, steno-typists, clerks, telephone operator cum receptionist, drivers, messengers, security, cleaners, canteen etc.

Organisational structure of TILT :

Based on the initial scope the optimum size of the initial staff is indicated and due consideration must be given to the projected growth rate. The organisational structure is given in Annexure (18). Depending upon the increase in the activities, more technical staff have to be added including in other disciplines with proper justification. It is very difficult to indicate the progressive growth rate as there is no set rule or precise method of calculation.

Need for outside assistance :

The scarcity of properly trained personnel will pose a problem in initial stages of running the institute and it is quite necessary to ensure managerial and technical guidance from a group of international experts or established research institute for a period of 2 to 3 years. Under such an arrangement, the outside agency will train the counterparts, supplement the local staff and carry out the activities of the institute. As this type of assistance constitutes a major expense in the initial budget, goverment should make all attempts to see that the assistance is given by UN organisations or under bilateral aid programme.

Training programmes for the technical staff of TILT :

Due to lack of expertise in training and research, selected national personnel employed in TILT should be sent on fellowship programmes to well established research insitutes for a period of 1 to 4 months depending upon their level so as to get exposed or trained in research and training.

Equipment and machinery :

The various laboratory equipments and machinery for the tanning and footwear pilot plants of TILT are being supplied by UNIDO under project (US/URT/79/240) financed from a special donor contribution of Government of Italy to UNIDF, amounting to US $ 533,126. From the scrutiny of the list of items ordered it is seen that most of the essential items are covered but some more additional equipments and chemicals as indicated in Annexure (19) are also required. As the institute grows with its enhanced activities more equipments and machinery depending upon the need have to be periodically added.

Sources of financing :

In a country like Tanzania where the industrial base is still in a relatively early stage of development, the finance support both for the operating cost as well as additional capital cost for the institute may have to be necessarily come from the Government. It may not be possible for the institute to function strictly over the income from the services and sponsored research just as in some of the developed countries. As the activities of TILT are oriented to the needs of the industry it is desirable that the leather and leather products industry may be encouraged to make some contribution for the operating cost by paying some cess on their production or sales. Any difference could be supplemented by Government. Support for additional equipment and machinery may be supplemented by an aid programme of a more developed country or by international organisations. To conclude TILT can contribute substantially to the growth of the leather and leather products industry and thus to the economic and social development of the country by :

a) producing technically qualified personnel

b) retraining personnel at all levels

c) adaptive research

d) techno-economic information.

VIII. CONCLUSIONS AND RECOMMENDATIONS :

1. Suggested actions by Government:

(i) For efficient functioning of Tanzania Insitute of Leather Technology (TILT) at Mwanza, from the point of carrying out training programmes and applied research to suit to the specific needs of leather and leather products industry, Government should:

a) take immediate steps to appoint a competent person to be in charge of TILT who can ultimately be considered for the post of Director.

b) take steps to recruit persons of right calibre for the technical key-posts as suggested in the organisational structure so that the activities can commence as soon as the building construction is over.

c) consider the suggested administrative set up, the Governing Body constitution and organisational structure for TILT and implement them.

d) make the institute autonomous without strictly following the civil procedures and regulations.

e) allot and sanction a seperate budget for TILT to carry out its various activities.

f) see that the institute carries out its activities of research and training smoothly without any hindrance like delay or want of various essential inputs required.

g) consider whether a cess on the sales of the leather and leather products industry can be levied so as to meet part of the operational cost of the institute in case Government finds it difficult to bear the entire cost.

(ii) Due to lack of properly trained personnel and experience at present, outside managerial and technical guidance will be required in the initial

stage
to train the national personnel, supplement local staff and carry out the objectives of the institute. Government should seek the help from a group of international experts or established research institutes for a period of 2 to 3 years.

(iii) Staff in the senior level employed in TILT should be deputed on fellowship programmes for a period of 1 to 4 months to well established research cum training institutes abroad Annexure 20 to get exposed or trained in research and training.

(iv) For additional machinery and equipment which the institute may require when it increases its activities and also for equipping the library, Government may seek the assistance through international organisations or under bilateral aid.

2. Suggested actions by TILT:

(i) TILT once it starts its activities should strive to have close liaison with the industry as its objectives are only to aid the industry by training and adaptive research.

(ii) TILT should orient their activities like training, R & D, services etc. to suit to the specific and immediate needs of the industry.

(iii) Transfer of know-how should be immediately disseminated to the industry by field work at the plants.

(iv) The various training courses should be conducted efficiently so that the participants attain/improve their skills, practices and technical competence and apply them in their plants for better efficiency.

(v) All scientific, technical and trade information should be collected by information division and catered to the clients and staff of TILT.

(vi) A well equipped library, various documentary devices and training aids have to be built up at the earliest for helping the participants as well as staff of TILT.

(vii) TILT should be more technologically advanced than the industry whom it is supposed to help.

(viii) R & D should be a continuous one, keeping in view of the rapid changes taking place in science and technology and in trade.

3. Suggestions for U N Organisations:

Assistance of UN organisations like UNIDO is required for TILT:

(i) for giving managerial and technical guidance right from the initial stages, for a period of 2 to 3 years by fielding Experts so as to train the counterparts, to supplement the national personnel and to carry out the activities. Details of expert services required are given in Annexure (21).

(ii) to offer fellowship programmes for the technical staff to be sent to well established research cum training insitutes abroad as mentioned in Annexure (20) for a period of 1 to 4 months depending upon their level, so as to get exposed or trained in research and training activities.

(iii) for installation of machinery and equipment.

(iv) in donating UN publications regarding leather, leather products, research, training, information etc. and also in helping TILT to procure technical books, journals including back issues etc. from other countries/ institutes.

(v) Assistance from organisations like FAO is also required for (a) supplying tools, equipments, audio-visual aids etc. for effectively conducting, the training programme on Hide & Skin improvement (b) Supplying pilot plant equipment for utilisation of animal and tannery by-products and (c) fielding a short term expert specialised in byproducts to be associated with the training programme on utilisation of animal & tannery by-products.

ANNEXURE I

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO 19 March 1982

PROJECT IN THE UNITED REPUBLIC OF TANZANIA

JOB DESCRIPTION

DP/URT/78/010/11-52/31.7.D.

Post title Consultant in the Leather Industry/Training Expert

Duration Three months

Date required July 1982

Duty station Dar es Salaam and Mwanza, with possibility of travel within the country.

Purpose of project To work out syllabi and an initial R&D programme for the Tanzania Institute of Leather Technology (TILT) in the field of training, quality control and applied research in leather processing and finishing according to the Tanzania Leather Associated Industries (TLAI) Corporation and the country's needs.

Duties The consultant will be attached to the TLAI and, under the guidance of the Chief Technical Adviser and in close co-operation with the other team members, will specifically be expected to:

1. Analyse and evaluate the training needs of the leather industry with special reference to the local conditions, existing manufacturing techniques, and the basic education system of the country;

2. Work out detailed syllabi for the training activity to be undertaken by the TILT in Mwanza, specifying the levels of training, the content, and the ratio of the theoretical and practical training as well as the kind of certificate to be issued;

3. Prepare proposals for technical literature, training aids and didactic methods to be used in the training processes and give advice on staff requirements;

4. Give advice on the organisation of an information unit in TILT, recommend technical information, books, journals, etc., to be obtained and later systematically collected;

5. (Analyse the needs of the leather products industry) for R&D programmes, and recommend a suitable initial technical development programme to be carried out by TILT, paying special attention to the availability of raw materials and the quality problems of the local leather products.

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

Qualifications: Extensive experience in leather processing technology; knowledge of modern professional training methods and current trends in R&D for leather industry.

Language: English

Background Information: The country's livestock could provide the raw materials required for the development of the leather and leather products industries. TLMI controls three tanneries of a total capacity of 28.4 million sq.ft. per year, two shoe factories of a capacity of 11 million pairs of leather and canvas shoes, and beach sandals. A new leather goods plant started operation in Morogoro at the end of 1981. Apart from these factories, a considerable number of small manufacturing units are producing various leather and leather products and new units are to be installed throughout the country.

The capacity utilisation and the quality of products manufactured are both rather low. A large-scale project was started in 1979 in order to assist the TLMI to increase productivity, improve technology and marketing, and organise appropriate maintenance services in the Bora Shoe Factory.

One of the major drawbacks of the leather subsector in the country is the shortage of qualified technical personnel at all levels. Realising the need to train key-workers, supervisors, technologists, designers, maintenance technicians, quality controllers etc. the Government decided to establish the TILT which will have training facilities (including a tannery and a leather products pilot plant), two quality control R&D laboratories, lodging and servicing facilities and will be located next to the existing tannery in Mwanza. Construction work will be finished by the end of 1982. The equipment for the pilot plants and the laboratories will be supplied from a UNIDO project and will be installed at the same time.

The TILT will render training, quality control and technical development services (to the entire footwear and leather goods industry in the country). Later, it will also be expected to train specialists from the neighbouring countries. The institue will start its operation at the beginning of 1983 and will gradually provide training and retraining of specialists for the footwear and leather products manufacturing units. The syllabi and the initial R&D programme are required for starting up TILT's operations.

CANDIDATES REQUESTED BY 14 MAY 1982

ANNEXURE 2

TITLE: QUALITY CONTROL AND STANDARDISATION

DURATION: 20 weeks (for new entrants)
12 weeks in case of retraining

OBJECTIVES: The aim of the course is to train/retrain the participants as Laboratory Technicians (Tannery) and prepare them to be effective in quality control & standardisation in leather processing.

An important requirement for marketing is the quality of products being made and marketed. This very well applies to leather as well as more so, as it is an internationally marketed commodity. It is the mark and consistency in the quality that reflect reputation, ready consumer acceptance and competitiveness in internal and external markets. The theme of quality control and standardisation assumes greater importance and significance in leather processing when the raw hide or skin is a natural heterogenous material which is non-uniform in size, shape, thickness, weight, fibre structure etc. In leather processing quality control starts with raw material inputs through each process in production line up to final product and packing. At the end of course the participants should be able to:

1. Develop and /or upgrade skills and practices in physical and chemical testing of leathers;
2. Acquire experience in analysis, testing and evaluation of chemicals, auxiliaries etc.
3. Interpret the data obtained
4. Apply tools and techniques to identify the defects and damages caused in processing and suggest remedies and prevention.
5. Help the production personnel in quality control and standardisation.

TERMS: The course will be conducted in english and the course content will cover both theoretical lectures (25%) and practical classes (75%).

ADMISSION REQUIREMENTS: Science graduates with chemistry, physics and mathematics who are familier with leather processing are eligible. Participants with minimum educational qualification level of Form VI with science subjects who are already employed and fairly conversant with this subject will also be given preference. All the participants have to be sponsored by tanneries.

EXAMINATIONS: A panel of examiners appointed by TILT at the end of the course will conduct examinations as follows:

a. Two written papers of three hours duration each

b. Practical cum oral test of approximately three days duration

THEORY	SESSIONAL MARKS	EXAMINATION MARKS
1. Analytical chemistry of leather manufacture -I	25	75
2. Analytical chemistry of leather manufacture -II	25	75
PRACTICALS		
3. Leather chemistry practical	75	200
4. Laboratory records	-	25

AWARD OF CERTIFICATE:

A certificate will be awarded with grades endorsed to all participants who will fulfill the following requirements:

1. Pass the written and practical examinations (Both sessional and examination marks taken together)
2. Satisfactorily complete the course
3. Have their conduct satisfactory throughout the course
4. Attend not less than 80% of all clasess (theory & practice)

SYLLABUS:

THEORY:

Theme of quality control and standardisation - Their significance and importance in leather manufacture - Chemical analysis, physical testing and other useful tests for process control

Symbol, formula, valency, chemical equation, balancing the equation, atomic weight, equivalent weight, molecular weight, elements, compounds, mixtures, periodic table etc.

Explanation of common properties and terms like hygroscopic, deliquicent, porosity, flexibility, elasticity, plasticity, tensile strength, malleability, ionisation, hydrolysis, neutralisation, oxidation, reduction, colloids, emulsions, pH, buffer solutions, indicators, normality, standard solutions, titration etc.

Qualitative and quantitative analysis and identification of acidic and basic radicals - Acidimetry, alkalimetry, premanganemetry, iodimetry, preparation of standard solutions.

Specific types of leather and their important characeteristics and properties required.

Useful simple tests for identifying the defects and stains and also for process control.

Full water analysis - suitability of water for tanning purposes and boilers - Methods of softening.

Principles and analytical methods employed for various chemicals and auxiliaries used in beam house operations - Analysis of curing materials - Analysis of soak liquors and soaking agents - Analysis of lime in full - Analysis of sodium suphide - Analysis of limed pelt and used lime liquors - Analysis of deliming and bating agents - Comparative testing of bates for their effects - Analysis of used and unused pickle liquors.

Analysis of vegetable tanning materials - Methods of sampling - Grinding and extraction - Qualitative and quantitative analysis of vegetable tanning materials - Sampling and analysis of tanning extracts, liquids and solids - Analysis of spent tan liquors.

Analysis of vegetable tanned leathers - Sampling and preparation of the sample - Analysis in full - Determination of acidity of vegetable tanned leathers - Determination of adulteration.

Analysis of chrome tanning salts and liquors - Determination of percentage purity and percentage basicity - Analysis of chrome tanned leathers.

Analysis of synthetic tanning agents.

Dyestuffs - Systematic tests and evaluation of properties - Dyeing test with various types of leathers.

Analysis of oils and fats - Iodine and saponification values - Theory of saturation and unsaturation - Tests for sulphited fatliquors - Synthetic fatliquors - Analysis of fatliquors.

Effluent, their treatment and disposal - Solid wastes - Analysis of untreated and treated effluents.

Analytical study and quality control of various operations in leather processing. Testing, trials and evaluation of various auxiliaries, chemicals, finishes, finishing agents etc. used in leather manufacture.

Physical testing - Introduction - Sampling, preparation and conditioning-Various types of physical tests to be conducted on upper, sole, lining, industrial, and sportsgoods leather like tensile strength, elongation, stitch and split tear, crackiness and bursting strength, air permeability, water vapour permeability,real and apparent density, resilence and compression, water absorbtion, water proofness, abrasion resistance, flexing endurance, dry and wet rub fastness, adhesion of finish, hydrothermal stability, scuff resistance, light fastness, resistance to hot plating, cold crack resistance etc.

Non-destructive tests and evaluation of various types of leathers like general appearance, uniformity of colour and grain, grain smoothness, fullness, break, tear strength, crackiness on double folding, key test dry and wet rubbing, scotch test , crepe test, solvent fastness, water spotting, scuff reistance, level dyeing, penetration, nap, crockiness, etc.

Interpretation of the data obtained by physical and chemical testing. Recommended quality requirements of the main types of leathers. International standards - Standards in other countries - National standards if any - Importance of national standards.

Fire and health hazards - Importance of storage and handling of chemicals - Inflamable stores - Safety measures and first aid.

PRACTICALS:

1. Preparation of standard solutions of acids, alkalis and salts
2. Simple titrations and testing of commercial acids, alkalis and salts
   a) acidimetry
   b) alkalimetry
   c) permanganametry
   d) iodimetry
3. Study of the reactions of the following radicals including flame test, charcoal test.
   Carbonate, sulphate, sulphide, thiosulphate, nitrate, chloride, bromide, iodide etc.
   Chromium, aluminium, zinc, calcium, barium, magnesium, [illegible], silver, mercury, copper, lead, iron etc.
   Qualitative and quantitative analysis and identification of acidic and basic radicals,
4. Full water analysis
5. Determination of percentage purity of common salt
6. Determination of available lime and total bases in commercial lime
7. Determination of available sulphide in commercial sodium sulphide
8. Determination of lime in limed pelt
9. Determination of lime and sulphide present in used lime liquors

10. Determination of acid and salt in unused and used pickle liquors
11. Qualitative analysis of vegetable tannins
12. Quantitative analysis of vegetable tannins
13. Analysis of used/spent tan liquors
14. Analysis of chrome salts and chrome liquors
15. Analysis of vegetable tanned leathers
16. Analysis of oils, fats and fatliquors
17. Analysis of effluents
18. Evaluation of dyestuffs and comparative dyeing trials, testing and assessment on various types of leathers
19. Laboratory trials, testing and evaluation of the various auxiliaries and finishing agents like pigments, dyestuffs, impregnating agents, resin binders, protein binders, wax emulsions, lacquers and emulsions, polyurethanes, special additives, if any and other auxiliaries
20. Simple tests for identification of defects and for process control
21. Non-destructive tests for evaluation of various types of leathers
22. Physical testing of uppers, linings, sole, industrial and sportsgoods leathers like tensile strength, elongation, stitch tear, split, tear, cracking and bursting strength, water absorption (static), water proofness (dynamic), air permeability, water vapour permeability, apparent and real density, resistance to flexing, dry and wet rub fastness, resistance to fastness and perspiration, resistance to heat, light, cold crack resistance etc.

    Fastness properties of garment and glove leathers against light, water, washing, dry cleaning, perspiration etc.

ANNEXURE 3

TITLE: REFRESHER COURSE FOR MIDDLE MANAGEMENT STAFF OF FOREMAN AND SUPERVISORY LEVEL

DURATION: 12 weeks

OBJECTIVES: The aim of the course is to enhance the capabilities of middle management cadre through developing new knowledge and increased skills in fields related to their work.

For efficient functioning of any industry from the point of productivity and quality, the middle management personnel who form the back bone of the industry play an important role. In leather processing with the constant changing of techniques and practices, the staff of the middle management cadre have to be periodically trained to improve and sharpen their skills and update their knowledge and techniques for better efficiency. On completion of the training the participants should be more effective in carrying out their tasks and specifically should be able to:

1. Develop and improve the theoretical and practical knowledge regarding leather manufacture in general and in particular more about the fields related to their work.

2. Develop a broader and deeper understanding of modern concepts, tools, techniques and practices in their fields of work.

3. Update their knowledge about production programme policies, strategies, techniques and practices related to their fields and operate and implement them.

4. Apply check and quality controls in various stages of processing.

5. Have an improved understanding of the goals, roles and functions.

6. Be cost conscious.

TERMS: The course will be conducted in english and the course content will cover theoretical lectures (25%) linked with practical demontrations of processing few important types of leathers (75%).

COURSES OF TRAINING: The course has been designed in four alternate sections to correspond to the following major departments of leather manufacture:

A. Raw to wet blue
B. Wet blue to crust
C. Finishing
D. Sole, heavy, industrial and sportsgoods leathers

The course in the above sections will be conducted separately.

ADMISSION REQUIREMENTS: Participants employed at middle management level like supervisors, foreman, inspectors etc. who are sponsored by the tanneries are eligible. Participants with good knowledge of spoken and written english and of minimum educational qualification of Form IV will be given preference.

EXAMINATIONS: A panel of examiners appointed by TILT at the end of the course will conduct examinations as follows:

a. A written paper of three hours duration
b. Oral test of approximately one hour duration

AWARD OF CERTIFICATE: A certificate endorsed for the section passed will be awarded to the participants who will fulfill the following requirements:

1. Pass the written and oral examinations
2. Satisfactorily complete the course
3. Have their conduct satisfactory throughout the course
4. Attend not less than 80% of all classes (theory and practice).

SYLLABUS: PRINCIPLES OF LEATHER MANUFACTURE

Introduction - Types of hides and skins used - Various types of finished leathers - Their properties and end uses - Leathers versus synthetics.

Measurement of volume - Capacity of pits, paddles and drums - Specific gravity, B^e, barkometer - Conversion weight/volume - Elementary principles of heat, temperature, latent heat, humidity etc. - Control of humidity and temperature.

Names of common chemicals and auxiliaries used in leather processing and their chemical formulae - Acids, alkalis and salts - pH and its importance in leather processing - Determination of pH by pH meters, indicators and indicator papers.

Common terms and terminologies used in leather manufacture.

Histology and anatomical structure of raw hides and skins - Defects.

Physical and chemical properties of skin protein - Reaction with acids and alkalis -Swelling - Isoelectric point.

Water - Sources of water supply - Impurities - Suitability of water for different operations in leather processing and for boilers. - Methods of softening.

Principles of pretaining processes like curing and preservation, soaking, liming, deliming, bating, pickling, depickling, degreasing.

Tanning - Objectives and criteria - Different types of tanning and their principles - Vegetable tanning - Chrome tanning - Aluminium tanning - Zirconium tanning - Synthetic tanning - Aldehyde tanning - Oil tanning - Resin tanning - Combination tanning.

Post tanning operations - Neutralisation - Retanning- Various types of retanning-Dyeing-Fatliquoring, oiling, currying and stuffing.

Post dyeing operations including different methods of drying. Finishing.

Appreciation of various characteristics and properties required of wet blue, crust and finished leathers.

Knowledge of the specific characteristics and usages of various machinery and equipment used in different operations of leather manufacture.

(Note: As the course is conducted seperately in the four major departments this subject should be taught in general to all the participants so as to acquaint them with the principles of leather manufacture from raw to finish. While conducting course for a particular department more emphasis should be laid on the various operations involved. It should cover in details the technology and techniques in the manufacture of some important types of leathers, process controls, chemicals and auxiliaries used and type of machinery and equipment involved in that department).

2. ELEMENTS OF QUALITY CONTROL AND SUPERVISION

Quality Control:

Definition of and necessity for quality control in leather manufacture - Role of international, national and buyers' standards - Specifications required -Process and check controls to meet the specifications and standards - Measurement of quality and standards.

Importance and storage of raw materials and part processed products under correct conditions.

Visual and subjective inspections and other tests at various stages. Choice of inspection stages relative to possible reprocessing or correction. Grading and assortment at various stages for proper product mix and their importance.

Various parameters like float, temperature, pH, drum speed, mixing and addition of chemicals, duration etc. for pack uniformity.

Appreciation of chemical and physical testing of the final end product.

Production planning and control: Inventory of raw stock, part processed, chemicals, consumables and other inputs for smooth production - Their consumption and feed back to superiors and stores - Machine operations and their performance - Diagnosis and fault finding and feed back to maintenance - Flow charts and their importance - Maximum yield from hides and skins - Correlation at various stages- Output performance and quality -Upkeep of machinery, equipment and yards- Inter departmental cooperation and communication.

Cost appreciation: Foreman/Supervisor's contribution to cost reduction - Economy of materials - Use of labour force and machinery - Internal transport and delay avoidance - Approximate cost of various inputs like raw materials, chemicals etc. - Significance of costing - Direct and indirect costs - Materials, labour, fuel, power, fixed overheads etc. - Choice of chemicals and auxiliaries to be used depending upon the end product, quality and cost.

Staff relations: General appreciation of the organisation - Organisational chart - Duties, responsibilities and qualities of foreman/supervisor - Relationship with superiors, equals and subordinate in the section - Relationship with the other departments - Periodical meetings among the section staff - Training of subordinates and operatives.

(Note: The subject should be taught ind depth with case studies and discussions and it should also be closely linked with the planned practical training and exposure to industry practices).

Practicals: Processing few important types of leathers on experimental scale in pilot tannery.

ANNEXURE 4

TITLE: TRAINING IN ASSORTMENT AND GRADING

DURATION: Two weeks

OBJECTIVES: The short term course is particularly intended to train/ retrain participants in assortment and grading of raw hides and skins, part processed products (limed, wet blue and crust) and finished leathers. In leather manufacture sorting and grading are very essential at various stages of processing for yield factors and proper product mix besides maintaining consistency in quality and selection in case of export. The success of a tannery depends to a large extent on proper selection and grading and hence sorters have an important role to play. Considerable experience over years coupled with technical knowledge and certain amount of judgement and intution makes a person to be a good sorter. Particularly in the exportable items it is necessary not only to meet the buyers' requirements and specifications but also to maintain consistency in quality and grading without variation from consignment to consignment. This will help in ready consumer's acceptance and avoid buyer's claims. At the end of the course the participants should be able to:

1. Have better appreciation of the various defects in raw hides and skins (ante and postmortem) as well as process defects.
2. Upgrade their technical knowledge in diagnosis of defects
3. Develop better skills or revise and update their previously acquired skills and practices.

TERMS: The course will be conducted in english and the course content will cover theoritical classes (20%) closely linked with practices (80%).

ADMISSION REQUIREMENTS: Participants of minimum qualification level of Standard VII with good knowledge of spoken and written english who are sponsored by firms are eligible. Participants who are already conversant with selection and grading will be given preference.

EXAMINATIONS: A panel of examiners appoined by TILT at the end of the course will conduct examinations as follows:

a. A written paper of two hours duration
b. Practical cum oral test of approximately 2 to 3 hours duration.

AWARD OF CERTIFICATE: A certificate will be awarded to all participants who will fulfill the following requirements:

1. Pass the written and practical examinations
2. Satisfactorily complete the course
3. Have their conduct satisfactorily throughout the course
4. Attend not less than 80% of all class (theory and practice)

SYLLABUS: Main features of different parts of hides and skins - Their value and importance in relation to making of leather and leather products.

Defects and damages in hides and skins (ante and postmoterm) with emphasis on the origin, source and preservation. - Process defects including machinery damages - Their correlation and identification at different stages of assortment.

Buyer's requirements and specifications - Appreciation of international and national standards - Selection and grading to meet the above.

Importance of parameters like substance, thickness, area/weight, pattern, colour etc. Non-destructive tests and evaluation of properties like general appearance, uniformity of colour and grain, grain smoothness, fullness, break, tear strength, crackiness on double folding, key test, dry and wet rub fastness, adhesion of finish, scotch test, crepe test, level dyeing, penetration, nap, crockiness, water spotting etc. other tests like chrome panetration, boil test and shrinkage temperature, chrome content etc.

Types of tanneges and various types of finished leathers - Grain & suede selection.

Cutting value - Its importance for grading. characteristics and properties of leather as required by leather consuming industries.

Importance of light (natural and artificial) for grading and assortment -Fatigue.

Practicals: Examination and inspection of leather at various stages of processing - Visit to tanneries.

ANNEXURE 5

TITLE: PROCESSING OF GAME SKINS, REPTILE AND OTHER EXOTICS

DURATION: 4 to 6 weeks

OBJECTIVES: The aim of the course is to provide the participants with skills, practices and technical competence in tanning and finishing of game skins, reptile skins and other exotics.

Tanzania is known for games sanctuary and as such potentialities are there for the availability of games skins in appreciable quantities. If the skins are cured properly and processed into finished skins with hair on with improved techniques they will have a ready market as leather and leather products as well as for taxidermists. At the end of the course the participants should be able to:

1. acquire or revise and update the technique of processing
2. acquire expertise to process on a cottage or small scale in the case of new participants.

TERMS: The course will be conducted in english and the course content will cover both theory (25%) and practicals (75%).

ADMISSION REQUIREMENTS: Persons already in processing such skins and entrepreneurs interested in this trade with minimum educational qualification of Standard VII and good knowledge of spoken and written english are eligible.

SYLLABUS: Theory:

1. Principles of leather manufacture as under the course for middle management cadre (as per Annexure 3).
2. Technology of manufacture of games skins, reptiles and other exotics covering the various process controls, chemicals and auxiliaries used and type of machinery and equipment involved.

PRACTICE: Processing of games skins, reptile and other exotics.

ANNEXURE - 6

TITLE: OPERATIVE'S CERTIFICATE COURSE

DURATION: 8 to 12 weeks depending upon the level of the participants.

OBJECTIVES: The course leading to operative's certificate is particularly intended for the participants concerned with the principal operations of the five major departments in leather manufacture. The course is meant for the unskilled personnel working in that particular department to develop skills and improve their knowledge so as to take up more skilled jobs. Partcipants who are already skilled in a particular operation/job who need retraining or refresher course to update their skills and knowledge can also join this course.

A high standard of ability is required for many operations in leather processing and as such it is necessary to develop skills and technical competence for doing a particular job more accurately and effectively which is very essential for quality production. At the end of the course, the participants should be able to:

1. Develop skills or revise and update the previously acquired skills.
2. Acquire sufficient technical knowledge applied to practice.
3. Upgrade their technical knowledge in diagnosis and fault finding.
4. Communicate effectively.
5. Know about their role, contribution and importance in overall production and quality upkeep within their fields of experience.
6. Know and practice the safety measures at their work post.

TERMS: The course will be conducted in english and whenever necessary it will be translated and explained in 'Swahili' for the benefit of the participants.

COURSES OF STUDY: The course has been designed in five alternate sections to correspond to the following major departments of leather processing:

A. Beam House
B. Wet tanning yard
C. Retanning, dyeing, fatliquoring and post operations upto crust
D. Finishing
E. Sole, heavy, industrial and sportsgoods leathers.

ADMISSION REQUIREMENTS:

Partcipants employed in a tannery who are sponsored by the industry are eligible. Partcipants of educational level of Standard VII will be given preference. At the time of applying for the course, the sponsors have to forward to TILT regarding details of the course for which the participant is to be trained and also the practical operations pertaining to the course.

SUBJECT TREATMENT: The treatment of the subjects in the various courses shall be purely elementary in nature with more emphasis on the practical operations as the participant is expected to acquire better skills and practical knowledge. The practical operations of machines and equipments will be covering (i) adjustment and setting up, for different applications (ii) safety precautions (iii) regular maintenance of ancilliary items and (iv) maintenance and upkeep. Depending upon the facilities, the practice will be taught in TILT and/or Mwanza and other tanneries.

The course content will ne covering theoretical clas.es (25%) and practical operations with on the spot guidance and instructions (75%).

EXAMINATIONS: A panel of examiners appointed by TILT at the end of the course will conduct examinations as follows:

a) written paper of one hour duration

b) practical cum oral test of approximately one day duration on the performance of practical operations.

The written paper will require answers of simple, direct and factual type. For the practical cum oral test participants must select their operations under each section/department and the operations must be related to the section of the industry covered by written paper. For practical test the partcipants will be individually examined on the practical operations they have selected. In addition they will also be orally examined and assessed to judge if they have a satisfactory knowledge on what they have been doing.

RESULTS: The performance of the participant for the written paper will be indicated in 5 grades, grade 1 being the highest of the 3 "Pass" grades and grades 4 and 5 being "Fail" grades. For the practical cum oral test, two grades will be used "Passed" and "Failed" (P & F).

AWARD OF CERTIFICATE:

A certificate endorsed for the course passed, indicating the grade as well as the practical operations attached to the course will be awarded to the participants who will fulfill the following requirements:

1. Pass the written and practical examinations.
2. Satisfactorily complete the course.
3. Have their conduct satisfactory throughout the course.
4. Attend not less than 80% of all classes (Theory and practice).

SYLLABI

(A) BEAMHOUSE DIVISION:

Types of raw hides and skins used by the leather industry - General methods of curing and preservation - Common defects (ante and post mortem).

Main features of different parts of hides and skins - Their value and importance in relation to leather making.

Raw hides and skins godown/storage - Receiving raw stock - Verification - Checking - Assortment - Grouping as per source, type of cure, size/weight ranges - Resalting if necessary - Handling and piling of raw stock - Importance of correct storage of raw stock - Maintaining records indicating origin, grades, defects, number of pieces, size/weight ranges - Inventory - Grouping into lot for processing - Lot numbers - Trimming - Filling up and importance of flow sheets.

Description of the pretanning operations like soaking, liming, delining, bating, pickling, depickling, degreasing - Sequence of operations for the manufacture of main types of leathers - Functions of various unit operations, mechanical operations, equipments & hand tools involved.

Chemical and auxiliaries used - Storage and handling of chemicals - Calculation of quantity, float to be used - Weighing - Mode of dissolving and addition to drums, paddles and pits - Duration - Containers and vessels to be used for chemicals.

Importance of float ratio, temperature, pH, baume & barkometer, drum speed, duration, check & quality controls at various stages and simple tests for the same, - Feel and visual tests - pH testing of leathers and liquors with indicator solutions and narrow range indicator papers.

Loading, unloading methods - Mode of piling and transport at various stages - Avoidance of stains.

Importance of assortment at various stages - Recording of grades, weights etc. for yield factors - Correlation.

Trimming, cutting into sides, rounding etc. and their importance - Common problems encountered in beam house and their prevention - Prevention of damages and defects caused in machine operations and equipments like drum, paddle etc.

Process flow sheets and their importance. - Commonly used terms and terminologies in leather manufacture.

Cost consciousness - Contribution to cost reduction - Economy of materials - Maximum yield from hides & skins - Avoidance of delay in transport - Housekeeping of the various divisions in the beam-house-Relationship with fellow workers and superiors-Safety measures, fire and health hazards.

PRACTICAL OPERATIONS IN BEAM HOUSE:

I. SORTING/SELECTING:

B.1 Raw stock
B.2 Limed stock
B.3 Pickled stock

II. GENERAL TANNERY HANDLING:

B.4 Raw stock handling, opening up & trimming.
B.5 Soaking
B.6 Painting
B.7 Liming
B.8 Delining & bating
B.9. Pickling & depickling
B.10. Degreasing.
B.11. Drum operation
B.12. Paddle operation

III. MACHINE OPERATIONS:

B.13. Unhairing
B.14. Fleshing
B.15. Scudding
B.16. Lime splitting

IV. Simple tests, operations, measurements, preparation & addition of chemicals.

Candidates for practical operations will be required to choose any one of the following combinations.

(i) Two operations from III or (ii) one operation from II and any two operations from I, II and IV or (iii) any three operations from I, II and IV

(B) TAN YARD WET WORK:

THEORY:

Preparation of stock for chrome tanning - Brief description and objectives of wet tan yard work like chrome tanning, basification, piling, storage, sammying, assortment, splitting, shaving, weighing, Grouping etc.

Chemicals and auxiliaries used - Storage and handling of chemicals - Calculation of the quantity of chemicals, float etc. - Mode of dissolving and addition - Duration - Containers and vessels to be used.

Importance of float ratio, temperature, Ph, speed, duration - Check and quality control - Simple tests like penetration, exhaustion, pH, boil test and shrinkage temperature.

Basification and its importance - Chrome stains and patches and their avoidance - Use of preservatives.

Loading, mode of piling and transport - storage - Avoidance of stains.

Wet blue assortment - Storage - Measurement and packing for export. Machine operations like sammying, splitting, shaving and their importance-Uniformity of thickness and supervision.

Recovery of splits its importance - Trimming - Assortment - Grouping - Storage.

Assortment of wet blue for the correct end product - Grouping into lots and weighing for subsequent processing. Trimming and cutting into sides and their importance. Common problems encountered in wet tan yard work including damages and defects caused by machine operations and equipment - Their prevention.

Process flow sheets and their importance - Yield factors - Correlation-Cost consciouness - Contribution to cost reduction - Economy of materials - Maximum yields - Avoidance of delay in transport.

Commonly used terms and terminologies in leather manufacture.
House keeping of the various sections in the yard.
Relationship with fellow workers and superior officers.
Safety measures - Fire and health hazards.

PRACTICAL OPERATIONS:

I.	SORTING/ SELECTING:	III.	MACHINE OPERATIONS:
T.1	Blue stock	T.4	Sammying
T.2	Splits	T.5	Splitting
		T.6	Shaving
II	GENERAL TANNERY HANDLING:	IV.	TECHNICAL ASSISTANCE:
T. 3	Drum operation	T.7	Simple tests, operations, measurements, substore handling preparation of chemicals, inventory etc.

Candidates for practical operations will be required to choose any one of the following combinations:

(a) Two operations from III or (b) one operation from III and two operations from I, II and IV or (c) Any three operations from I, II and IV.

(c) RETANNING, DYEING, FATLIQUORING AND POST DYEING OPERATIONS UPTO CRUST

THEORY:

Preparation of wet blue stock for retanning, dyeing and fatliquoring - Brief description and objectives of the various unit operations involved in processing main types of leather - Mechanical operations and equipments used and their functions. Chemicals, auxiliaries, retanning agents, dyestuffs, fatliquors etc. used - Calculation of the quantity, float etc. Weighing - Mode of dissolving and addition to drums - Duration - Containers and vessels to be used.

Importance of float ratio, temperature, pH, speed of the drum, duration etc. - Simple tests for quality control.

Loading and unloading - Mode of piling and transport - Storage - Avoidance of stains.

Mechanical operations like sammying, setting conditioning, staking toggling, buffing, dusting etc. - Drying operations like hanging, tunnel drying, paste drying - vacuum drying - Defects and damages caused in the various operations including machine operations and their prevention.

Process flow sheets - Yield factors - Correlation and its importance. Crust leather assortment for export - Grading, measurement and packing. Trimming and its importance.

Assortment of crust for the various types of finishing. Commonly used terms and terminology in leather manufacture. Cost consciousness - Contribution to cost reduction - Economy of the materials - Maximum yields - Avoidance of delay in transport.

House keeping of the various sections in the yard. Relationship with fellow workers and superior staff - Safety measures and health hazards.

PRACTICAL OPERATIONS:

I. SORTING/SELECTING

D. 1 Crust assortment

D. 2 Suede assortment after buffing

II. GENERAL TANNERY OPERATION:

D. 3 Drum operation

III. DRYING:

D.4 Hanging

D.5 Toggling

D.6 Nailing

D.7 Paste drying

D.8 Vacuum drying

IV MACHINE OPERATIONS:

D. 9 Setting

D.10. Machine conditioning

D.11 Staking

D.12 Buffing

D.13 Suede buffing

D.14 Dusting

D.15 Wheeling

V. TECHNICAL ASSISTANCE:

D.16 Simple tests, measurement and weighing, preparation and dissolving of chemicals, inventory and substores handling.

(D) FINISHING YARD

THEORY:

Preparation of crust for finishing - Brief description and objectives of the various types of finishing, unit operations, machinery and equipments used in finishing main types of leathers.

Chemicals, auxiliaries, finishes and finishing agents used like pigments, dye solutions, impregnating resins, resin binders, protein binders, wax emulsions, fillers, penetrators, thickening agents, lacquer and lacquer emulsions, solvents and diluents, plasticisers, polyurethanes, formaldehyde, slip agents, matting agents etc. - Handling and storage - Calculation of the quantity - Matching the shade - Mode of preparation of finishes and seasons with sequence of addition of ingredients and their importance - Containers to be used for mixing and storage - Use of soft water - Importance of filteration, viscosity and stirring.

Finishing and testing trial lots before lot processing. Application of finish by hand padding, brushing, machine padding, curtain coating, hand spray, auto spray etc. - Simple tests for absorbtion and adhesion of finishes Checking for proper and uniform coverage and shade matching - Adjustments if any - Storage of leathers at various stages of finishing.

Mechanical and other operations in between and after finishing like drying, plating, buffing, dusting, polishing, embossing, glazing, ironing, dry drumming etc. and their importance and effects.

Different types of finishing like aniline, semi-aniline, mock aniline, pigmented, resin finish, protein finish, lacquer finish, plain, printed and two tone etc.

Appreciation of properties of finished leathers and simple tests. Assortment, selection and grading of finished leathers - Measuring - Packing Trimming and its importance.

Process flow sheets - Yield factors - Correlation and its importance. Defects and damages normally encountered in finishing operations including machine operations and their prevention.

Commonly used terms and terminology in leather manufacture. Cost consciouness - Contribution to cost reduction - Economy of materials - Maximum yields - Avoidance of stains and delay in transport.

House keeping of the various sections in the yard - Dust nuisance and prevention - Cleaning and maintenance of spray guns, auto spray, machine padding, curtain coater, pads, brushes, containers etc.

Relationship with fellow workers and superior staff-Safety measures - Fire and health hazards.

PRACTICAL OPERATIONS:

I. SORTING/SELECTING

F.1 Finished leathers from hides

F.2 Finished leathers from skins

II. GENERAL FINISHING OPERATIONS:

F.3 Hand padding

F.4 Season mixing and preparation

F.5 Finish stores assistance

III MACHINE OPERATIONS:

F.6 Polishing

F.7 Machine padding

F.8 Curtain coating

F.9 Auto spray

F.10 Hand spray

F.11 Plating & embossing

F.12 Glazing

F.13 Ironing

F.14 Boarding and graining

F.15 Measuring

Candidates for practical operations will be required to choose any one of the following combinations:

(a) Two operations from III or (b) One operation from I or III and one operation from II or (c) two operations from II

(E) SOLE, HEAVY, INDUSTRIAL AND SPORTSGOODS LEATHERS

THEORY:

Different types of sole, heavy industrial and sportsgoods leathers like sole, insole, harness & saddlery, belting, picking band, pickers, cycle saddle, lace leather hydraulic, pneumatic and oil seal leathers, sportsgoods leathers like foot ball, hand ball, cricket and hockey balls, grip leathers etc.

Description and objectives of various pretanning operations like selection, soaking, liming, deliming, bating, pickling, depickling etc. and machinery and equipments used for important types of leathers.

Preparation of stock for tanning - Preparation of tan liquors - Leaching-Running down the liquors - Suspenders, handlers, layers, dusters etc. - Pit and drum tanning - Combination tanning - Scouring, bleaching, fatliquoring/oiling/stuffing/currying - Finishing - Rolling - Sequence of operations with machinery and equipments Chemicals, auxiliaries, tanning agents, syntans, finishing auxiliaries used - Caculation of the quantity - Weighing - Mode of dissolving and addition.

Importance of float ratio, temperature, barkometer and baume, pH, drum speed, duration etc. - Simple tests for quality control.

Mechanical and other operations like machine and hand setting, drum tanning, drying, finishing, rolling and their functions.

Mode of loading and unloading - Storage and transport - Handling in the tan pits-Defects and damages encountered in processing including machine operations and their prevention - Avoidance of stains. Trimming and its importance.

Process flow sheets - Yield factors - Correlation and its importance. Appreciation of the properties of finished leathers - Commonly used terms and terminologies in leather manufacture - Assortment, selection and grading of finished leathers and packing-Cost consciousness - Contribution to cost reduction - Economy of materials - Maximum yields.

House keeping of the various sections in the yard-
Relationsip with fellow workers and superior staff-
Safety measures - Fire and health hazards.

PRACTICAL OPERATIONS:

I SORTING/SELECTING

S.1 Lime stock for various leathers
S.2 Finished leathers.

II. GENERAL TANNERY HANDLING:

S.3 Rounding
S.4 Pit handling
S.5 Drum operation
S.6 Scouring & bleaching
S.7 Oiling, stuffing and currying
S.8 Hand setting.

III. MACHINE OPERATIONS:

S. 9 Machine setting
S.10. Rolling

ANNEXURE 7

TITLE: HIDE AND SKIN IMPROVEMENT

DURATION: Eight weeks

OBJECTIVES: The aim of the course is to provide the participants with an improved knowledge of techniques, capabilities, strategies, and practices combined with related theoretical technical subjects in the field of raw hides and skins which are the basic raw materials for leather industry.

With improvements in livestock and the adoption of better flaying techniques, proper collection, curing and storage, the quality and quantity of raw hides and skins will improve to a great extent which in turn will contribute to making quality leather and leather products thereby maximising the foreign exchange earnings. At the end of the course the participants should be able to have:

1. An increased awareness of the importance and value of raw hides and skins
2. Technical competence for improving the quality and quantity
3. An improved level of techniques and skills in training of personnel actually engaged in flaying, collection, curing and storage by demonstration and inplant work
4. Ability to identify problems and recommend how solutions to these problems may be best implemented

TERMS: The course will be conducted in english and whenever necessary it will be translated and explained in 'Swahli'. The content will cover theoretical lectures (25%) and practices (75%)

ADMISSION REQUIREMENTS: Participants with minimum educational qualification of level Standard VII sponsored by organisations and who have fairly good knowledge of spoken and written english are eligible. Participants like hide inspectors and instructors who are already connected with raw hides and skins will be given preference.

AWARD OF CERTIFICATE:

A panel of examiners appointed by TILT at the end of the course will conduct examinations as follows:

a) written paper of two hours duration

b) practical cum oral test of approximately one day duration

A certificate will be awarded to all participants who will

fulfill the following requirements:

1. Pass the written and practical examinations
2. Satisfactorily complete the course
3. Have their conduct satisfactorily throughout the course
4. Attend not less than 80% of all classes (theory & practice)

SYLLABUS:

THEORY:

1. Types of raw hides and skins used by the leather industry - A general survey of markets, sources of supply and types of raw hides and skins within the country and in other neighbouring countries.
2. Different parts of hides and skins and their value and importance for leather making
3. Flaying tools and equipments - Manual and mechanical - Their uses and maintenance - Opening or ripping procedures and the importance of pattern - Flaying procedures in modern abattoirs, slaughterhouses, open ground and houses - Flaying techniques followed at present and their improvements - Incentives for better flaying.
4. Different methods of curing of hides and skins - Air drying, dry salting, wet salting and pickling - Different methods of air drying adopted - Their advantages and disadvantages - Washing, after cleaning, trimming - Causes of damage - Their identification and prevention.
   Advantages and disadvantages of the various methods of curing and preservation - Economics, cost and benefit
   Types of salt available and other curing agents used - Other ingredients like disinfectants and preservatives
   Relation of green weight and area to air dried, dry salted and wet salted weights.
5. Defects and damages caused to hides and skins during the life time of the animal (ante-mortem) - Prevention and elimination
   .Defects and damages caused after slaughter or death (post-mortem)- Prevention and elimination
   Defects and damages caused during storage and transportation - Prevention and elimination
6. Drying shed - Curing and storing places - General management - collection - Purchasing - Costing - Recording - Grading and selection - Standards - Weights - Sizes - Baling & packing - Transport

7. Standards prevalent in the different parts of the world and in the country - World market and price trends.

PRACTICALS:

1. Ripping and flaying practice of hides and skins in
   a) modern slaughterhouses/abattoirs
   b) slaughterhouses
   c) field conditions
2. Washing and preparing hides and skins by different methods of curing (cattle, goat, sheep, reptile and games skins)
   a) Air drying (frame drying, rope drying, peg drying, case drying)
   b) Dry salting (c) wet salting
3. Treatment of hides and skins with insecticides
4. Folding, storage and baling practices
5. Identification of damages and defects, grading, grouping and selection of hides and skins
6. Damages and defects present in the various stages of leather processing and finished leathers due to ante and post-mortem defects
7. Audio-visual demonstration of flaying and curing techniques
8. Study visits and practical industrial exposure in enterprises and organisations concerned with raw hides and skins.

ANNEXURE 8

TITLE: TANNING MACHINERY MAINTENANCE

DURATION: 12 weeks

OBJECTIVES: The maintenance of tanning machinery, equipments and service plants is recognised in this course as a critical function in the production programme from the points of productivity and quality. This course is designed to provide the participants with an improved knowldge of management policies, strategies, techniques and practices that can be applied in the maintenance of tanning machinery. At the end of the course the participants should be able to implement and operate planned preventive maintenance systems which will ensure optimum utilisation of machinery, equipments and plants without breakdown and production stoppage.

TERMS: The course will be conducted in english and the content will cover both lecture classes (20%) and practice(80%).

ADMISSION REQUIREMENTS: Participants working in the maintenance division of the tanneries who have fairly good knowledge of spoken and written english with engineering background are eligible.

AWARD OF CERTIFICATE: A panel of examiners appointed by TILT at the end of the course will conduct examinations as follows:

a. written paper of two hours duration
b. practical cum oral test of approximately three days duration

A certificate will be awarded to all participants who will fulfill the following requirements:

1. Pass the written and practical examinations
2. Satisfactorily complete the course
3. Have their conduct satisfactory throughout the course
4. Attend not less than 80% of all classes (theory and practice)

SYLLABUS:

THEORY:

Concpets, procedures and techniques having general application in the execution and supervision of maintenance process, including planning, decision making, leadership, control, delegation, coordination, follow-up, motivation, discipline.

Types of tanning machinery, equipments and service plants - General introduction on materials of construction- Mild steel, cast iron, stainless steel, alloys, wood, glass, fibre glass etc.

Good knowledge of various types of tanning machinery and equipments - Their make and functions - Method of working and mechanism - Functions of various parts (static and dynamic) and lubricating mechanism.

Foundation and erection of machinery and equipment - Dismantling the working parts for overhaul, repair, renewal and assembling-Checking up alignment of machines and setting right the defects-Functioning of mechanical hydraulic, pneumatic and electronic systems - Importance of drawings, circuit diagrams etc.-Renewal and replacement of parts-Adjustment and setting up for different applications and operations - Optimum productivity/output of each machine.

General check up of all electrical equipments -Motors, starters, switches, fuses etc. and acquiring sound knowledge of repairing/replacing the parts. Renewal of belts - Fastening - Checking up the slackening of belts and its remedies - Checking up of pulleys, shafts, bearings, other alignments, speed, stroke etc. and setting them right.

Maintenance procedure for machinery and accessories - Preventive maintenance - Routine maintenance - Breakdown maintenance - Maintenance scheme as stipulated by manufacturers.

Lubrication and oiling procedures in routine maintenance- Development of lubrication charts.

List of spare parts, accessories and consumables - Coding and classification - Their programming and planning - Machinery storage - Inventory control- Coordination with production, purchase and stores departments. Preparation of machinery manual and their importance - Training of machine operators.

Periodic supervision - Feed back from production department and quality control - Estimation of repairs, renewals etc.

Maintenance of heating systems, boilers, compressed air equipment, exhaust systems, air conditioning etc.

Importance of upkeeping of the machine/equipment after the work. Organisation and lay-out of maintenance department - Tools, equipments and machinery required - Staffing and allocation of the work - Management of personnel.

Safety measures - Reasons for occurence of accidents - Prevention and precautionery methods - Fence of wards and protection to machinery - Factory acts. First aid kits and training in first aid.
Visits to tanneries.

ANNEXURE 9

TITLE: MATERIAL MANAGEMENT

DURATION 2 weeks

OBJECTIVES: The aim of the course is to provide the participants with an improved knowledge of policies, strategies, techniques and practices which could be applied in the management of materials in a tannery.

At the end of the course the participants should be able to plan, implement and operate effective material management systems in material stocking and usage, to avoid production stoppage and in prevention/minimising deterioration and damage in storage.

TERMS: The course will be conducted in english and the content will cover lectures, case studies, visits to tanneries and organisations.

ADMISSION REQUIREMENTS: Participants holding responsible positions in tannery stores/purchase like managers, supervisors, assistants etc. who have fairly good knowledge of spoken and written english are eligible.

AWARD OF CERTIFICATE: A certificate will be awarded to all participants who will fulfill the following requirements:

1. Show keen interest throughout the course and actively participate in the discussions
2. Satisfactorily complete the course
3. Have their conduct satisfactory throughout the course
4. Attend not less than 80% of the classes

SYLLABUS: Management concepts, procedures, techniques and practices in the execution and supervision of material storage, stocking and handling processes as applied to tannery.

Types of materials, spare parts, accessories, consumables etc. (local and imported) required - Classification and coding - Specifications - Consumption - Coordination with production, maintenance administration and other departments - Estimating requirements -

Ordering methods - Choice of ordering systems- Economics of purchasing and methods of purchase- Terms of purchase (local and imported) - Selection and control - Sample and bulk testing - Quality control and standardisation-storage and inventory control- Coding and classification of inventory- Objects of inventory control - Various methods of analysis -Lead time - Recorder level - Economic order quantities - Evolving stock level.

Stock control - stock record systems - Stock taking, analysis and verification - Receipts,issue and indenting of stores. Materials handling equipments and techniques. Stores design, planning and operation and management systems. Shell life of materials - Clearance of old stock. Toxicity, health and fire hazards - Prevention -House keeping.

ANNEXURE 10

TITLE: UTILISATION OF ANIMAL AND TANNERY BY-PRODUCTS

DURATION: 4 to 6 weeks

OBJECTIVES: The aim of the course is to create an awareness among the prospective entrepreneurs and other participants regarding the immense value of the various by-products which could be converted into useful and products of commercial importance.

At the end of the course the participants should be able to acquire:

1. Expertise in processing bones, blood, hide trimmings and fleshings for animal feeds, fertilisers, glue, gelatine etc. on cottage and small scale production.
2. General knowledge on the various aspects of processing and utilising by-products.

TERMS: The course will be conducted in english and the content will cover theoretical lectures (25%) and practice on laboratory and pilot scale processing of few end products coupled with visits (75%).

ADMISSION REQUIREMENTS: Participants interested in setting up units or sponsored by related organizations with a minimum educational level of standard VIII with fairly good knowledge of spoken and written english are eligible.

AWARD OF CERTIFICATE: A certificate will be awarded to all participants who will fulfill the following requirements:

1. Have shown keen interest throughout the course and actively participated in the discussions/ practical demonstrations
2. Satisfactorily complete the course
3. Have their conduct satisfactory throughout the course
4. Attend not less than 80% of all classes (theory and practice).

SYLLABUS:

THEORY:

Animal by-products:

Types of animal by-products and availability - Bones, blood, intestine, glands, organs, horns and hooves- Collection, handling, preservation and storage methods. Processing of bones (green and dry) and bone sinews for tallow, bone meal, ossein, bone glue, gelatine, bone ash, bone char etc. and their uses. Processing of blood into blood meal, blood plasma, haemoglobin etc. and their uses.

Processing of small intestine of cattle, goat, sheep and pig for sausage casings, surgical sutures, sportsguts, musical instrument string etc. and their uses.

Processing of glands and organs into pancreatine, insulin, bates etc. and their uses.

Processing of horns and hooves for fertlisers, fire extinguishing compound, handicraft items, electronic gadgets etc. and their uses.

Tannery by-products: Types of tannery by-products and availability - Hair, wool, bristile, hide trimmings, fleshing, shavings etc. Collection, handling, preservation and storage methods.

Processing hair, wool and bristle for carpets, druggets, under felts, packing and cushioning materials etc. and their uses.

Processing of hide trimmings and fleshing for animal feed, glue and gelatine and their uses.

Processing of shavings into leather board and their uses. Unit operations involved and equipment and machinery used for cottage, small and organised units in making the above products.

PRACTICE: Demonstration on processing the by-products into various end products on laboratory and pilot scales, with special emphasis on bones, blood, hide trimmings and fleshings for animal feeds, fertilizers, glue and gelatine. Visits to slaughterhouses, tanneries and other units.

ANNEXURE 11

DIPLOMA IN LEATHER TECHNOLOGY
(THREE YEAR DIPLOMA COURSE)
REGULATIONS

1. CONDITIONS OF ADMISSION:

Candidates for admission to the first year of the three year Diploma course shall be required to have passed Form IV of the Secondary school national examination of Tanzania with science subjects like physics, chemistry and mathematics. Candidates from other countries shall be required to have passed an examination, accepted by the Tanzania National Education as equivalent to Form IV.

All candidates shall also satisfy such conditions regarding age and physical fitness as may be prescribed by the authority.

2. DURATION OF THE COURSE:

The course for the Diploma in Leather Technology shall be for a duration of three academic years followed by three months industrial training in an approved tannery/firm.

3. COURSE OF STUDY:

The course of study shall be Leather Technology according to the syllabi to be prescribed from time to time.

4. REQUIREMENTS OF EXAMINATIONS AND ATTENDANCE:

Examinations shall be conducted in both theory and practical by the Tanzania Institute of Leather Technology (TILT).
A candidate will be permitted to appear for the examinations only if

a) he or she earns a progress certificate from the head of the institute of having satisfactorily completed the course of study prescribed for the academic year.

b) his or her conduct has been satisfactory.

c) he or she attends at least 75% of the lecture and practical classes

*) A candidate not satisfying regulations (4) shall not be sent for examinations and may be asked to repeat the course.

5. EXAMINATIONS:

There shall be one main examination at the end of first, second and third year of the course and a candidate is eligible for being awarded the Diploma in Leather Technology if he or she has passed the three examinations viz. first, second and final examinations.

Main final examinations will be conducted at the end of each academic year viz. in the months of ..... Supplementary examinations for candidates who have failed in one or two subjects will be held in the month/s of ..... with suitable time schedules.

6. SCHEME OF EXAMINATION:

The scheme of examination for Diploma course in Leather Technology is given at the end.

7. PASSING MINIMUM AND CLASSIFICATION OF SUCCESSFUL CANDIDATES:

a) A candidate shall be declared to have passed in a subject (theory or practical) if he or she secures not less than 50% of the marks in the final examination after each academic year and the sessional marks for that academic year, taken together in that subject.

b) A candidate who has passed all subjects except two either in theory or practical will be permitted to proceed to the subsequent year of the course.

c) A candidate who fails in more than two subjects will not be permitted to proceed to the subsequent year of the course. He or she has to repeat the course and has to appear for all the subjects and pass.

d) A candiate who fails in one or two subjects in the final examination will be deemed to have passed the final year examination if he or she obtains passing mark in that subject or subjects on subsequent occasion.

e) Candidates who pass the second and third year examinations at the end of the academic year in the first sitting itself and secure an aggregate of not less than 60% of the final two years (examination and sessional marks) shall be declared to have passed the examination for Diploma in Leather Technology in FIRST class.

f) Candidates satisfying the conditions as in (e) but securing an aggregate of not less than 75% shall be declared to have passed in FIRST class with DISTINCTION.

g) All other successful candidates shall be declared to have passed the examination for the Diploma course in Leather Technology in SECOND class.

h) Diplomas will be awarded only after satisfactory completion of the compulsory industrial training period of three months.

i) Candidate shall complete the course within a period of five years from the time of joining the course after which the candidate will not be permitted to appear for the Diploma in Leather Technology examinations.

CURRICULUM OF STUDY AND SCHEMES OF EXAMINATIONS

Subjects	Internal assessment	Duration of Examination	Exam. Marks
First year:			
Theory:			
1. English	25	3 hours	100
2. Inorganic Chemistry	25	3 hours	100
3. Organic & Physical Chemistry	25	3 hours	100
4. Physics	25	3 hours	100
5. Mathematics	25	3 hours	100
6. General & Chemical Engineering	25	3 hours	100
7. Introductory to Leather Manufacture	25	3 hours	100
Practical:			
a. Chemistry Practical	50	3 hours	100
b. Workshop Practical	50	3 hours	100
c. Tannery Practice	50	1 day	100
Second Year:			
Theory:			
8. Chemistry of Leather Manufacture-I	50	3 hours	100
9. Technology of Leather Manufacture-I	50	3 hours	100
10. Introductory to Footwear & Leather goods Manufacture	50	3 hours	100
11. Leather Trades Engineering	50	3 hours	100

Subject	Internal assessment	Duration of Examination	Exam. Marks.
Practical:			
d. Tannery Practice - II	50	3 days	100
e. Leather Trades Engineering	25	1 day	100
f. Fabrication Practice (Footwear &LG)	25	2 days	100
Third Year:			
Theory:			
12. Chemistry of Leather Manufacture-II	50	3 hours	100
13. Technology of Leather Manufacture-II	50	3 hours	100
14. Analysis of chemicals, Leathers, Bacteriology & Microscopy	50	3 hours	100
15. Industrial & Production Management	50	3 hours	100
Practical:			
g. Tannery Practice - III	50	3 days	100
h. Physical & Chemical Testing Bacteriology and Microscopy	50	3 days	100

For the subjects in the first year of the Diploma course, like english, inorganic chemistry, organic & physical chemistry, physics, mathematics etc. the syllabi may be the same as for Form V & VI or may be revised to suit the course.

8. CHEMISTRY OF LEATHER MANUFACTURE - I

THEORY:

1. Histology and anatomical structure of hides and skins
2. Proteins - Physical and chemicl properties with special reference to skins proteins - Reaction of proteins with acids, bases and salts - Classification of protein present in hides and skins and their constitution - Swelling of hides and skins in acid and alkaline medium - Isoelectric point.
3. Water - Sources of water supply- Impurities - Suitability of water for tannery use and boilers - Methods of softening.
4. Chemistry and priciples of pretanning processes like curing and preservation, soaking, liming, deliming, bating, pickling, depickling, degreasing.

5. Vegetable tanning - Types of vegetable tanning materials their classification and general structure - Leaching and preparation of extracts- Factors involved in vegetable tanning - Theory and mechanism of vegetable tanning.

6. Synthetic tannins and their classification - General methods of preparation and their uses in leather manufacture.

7. Chemistry and principles involved in aldehyde and oil tanning.

9. TECHNOLOGY OF LEATHER MANUFACTURE - I

THEORY:

Processes and techniques in the manufacture of different types of finished leathers from calf skins and hides.

Light leathers:

Full chrome upper - Softy upper - Retan sides - Hunting suedes - Nappa garment - Upholstery- Shrunken grain - Linings - Printed and two tone leathers - Army and ammunition upper.

Splits and their processing into shoe suedes, upper (plain, printed and two tone), lining, industrial gloves etc.

Heavy and sportsgoods leathers:

Vegetable tanned sole and insole leathers - Harness & saddlery - Belting - Picking band - Pickers - Cycle saddle-Lace leather -Hydraulic, pneumatic and oil seal leathers - Sportsgoods leathers like foot ball, hand ball, cricket, hockey ball etc.

Formulation and methods of application different chemicals, auxiliaries, tanning agents, dyestuffs, fatliquors and finishes in the manufacture of above leathers. Unit operations involved including mechanical operations and equipment. Process controls and standardisation at various stages.

10. INTRODUCTORY TO FOOTWEAR MANUFACTURE

Anatomy of human feet, foot comfort, foot care and their relationship to footwear. - Common terminology in footwear - Different types of footwear. Types of last, their functions and materials used. Definition of forms - Types - Their method of cutting - Preparation of patterns for different footwear - Grading of patterns by hand and pentograph. Tools, machinery and equipments used in different departments like pattern making clicking, upper and bottom preparation, closing, lasting, finishing, dressing. Types of upper materials and linings - Characrreristics and properties required for their suitability for different types of footwear - Economical way of cutting patterns - Comparison between hand cutting and machine clicking - Layout of fabrics and cutting of the same - Closing of uppers for different types.

Types of materials for bottom components - Characteristics and properties required - Their preparatio[illegible].

Description of various processes of construction viz. machine sewn, revetted, stiched, welted, cemented, DVP, DIP, etc. and their comparision. Footwear grinderies and accessories - Types of materials used. Purpose of finishing and dressing - Types of materials used - Quality control- Elementary knowledge of layout, designing, styling, costing and marketing.

INTRODUCTION TO LEATHER GOODS MANUFACTURE

Leathergoods industry- Its impact and importance in modern life- Classification of leathergoods - Ranges of products- Common terminology in leathergoods. Characteristics and properties of leather and various other materials required and their selection.

Modern methods of fabrication and machinery used - Unit operations and sequence of operations involved in fabrication.

Designing, styling and pattern cutting.
Standardisation of materials, accessories, fittings, hand tools etc. - Quality control - Inventory control.

Elementary knowldge of layout, costing and marketing.
Study of manufacture of leather based sportsgoods. Leather goods versus synthetics.

(Note: The treatment of the subject shall be purely elementary as the student is expected to acquire only a general knowledge.)

11. LEATHER TRADES ENGINEERING

THEORY:

Sources of water supply - Storing - Overhead tanks - Distribution of water by pipe lines, valves etc.

Fuel- Production of steam-Steam boilers and their different types - Their main components and functions - Construction and maintenance of steam pipes, valves etc. Transmission of motor and power - Belt drive-Slipping of the belts - Reversing motion - Fast and loose pulleys - Rope and chain drive - Power transmitted by gear - Shaft and coupling - Different types of bearings - Bush, ball and roller bearings -Lubrication.

Drums and paddles- General construction- Descriptive ideas of various tanning machinery like unhairing, fleshing, scudding, splitting, shaving, sammying, setting machines etc. - Different types -Mode of working-Mechanical, hydraulic, pneumatic - Sizes- outputs - Power and fuel required - Type of drive for each machine - Defects due to machine operation - Rectification - Probable repairs - Adjustments and setting up for different applications - Maintenance of ancilliary items and consumables - Safety precautions - General maintenance and upkeep.

Finishing machinery and other equipments - General construction - Descriptive ideas of various machines and equipments like driers, paste drying, vacuum drying, staking, toggling, buffing, dusting, polishing, padding, curtain coater, autospray, hand spray, glazing, ironing, hydraulic press, measuring etc. Different types - Mode of working - Mechanical, hydraulic, pneumatic, electronic - Sizes - Output -Power and fuel required - Type of drive for each machine - Defects due machine operations - Rectifications - Probable repairs - Adjustment in setting up for different applications - Maintenance of ancilliary items and consumables - Safety precautions - General maintenance and upkeep.

General idea of construction of the tannery-Layout - Construction and arrangement for free air, light (natural and artificial), ventillation etc.-Construction of stores,sub-stores, inflamable stores, power house, boiler house, generator house etc.-Maintenance and upkeep of effluent treatment appliances.

Accidents - Reasons for occurence - Prevention and precautionry methods - Fence of wards - Protection to each machine - Fire and health hazards - First aid and first aid kits.

12. CHEMISTRY OF LEATHER MANUFACTURE - II

THEORY:

1. Mineral tannages (i) Chemistry of chromium salts and basic chrome complexes - Preparation of chrome liquors and extracts - Hydrolysis, basicity, pH, olation, oxolation and aggregation - Charge characteristics - Effect of addition of masking salts - Factors governing chrome tanning like condition of pelt, leather, pH, basicity, concentration, salts, temperature etc. - Basification- Chrome fixation - Modern concepts - Floatless tanning - Self basifying chrome salts - Chrome exhaustion aids - Mechanism of chrome tanning.
(ii) Alum and zirconium tanning - Chemistry of aluminium and zirconium salts - Study of the other mineral tanning agents like iron, titanium etc. Comparison and contrasts of other mineral tanning with chrome tanning.

2. Combination tannages involving vegetable, syntans, chrome, aluminium, zirconium. aldehyde, oil, resin tannages- Their priciples and mechanism.

3. Neutralisation - Priciples and chemistry behind neutralisation - Salts used and their effect.

4. Dyeing - Dyestuffs used and their classification - Properties and their testing - Principles of dyeing of vegetable, chrome, chrome retan, semi-chrome, oil, aldehyde and combination tanned leathers- Factors governing dyeing - Mordants, levelling agents, dye fixing agents, wetting and dispersing agents - Natural/vegetable dyestuffs- Metallic strikers.

Colour spetrucm - Absorbition and reflection - Colour triangle-Mechanism of dyeing.

5. Fatliquoring - Emulsions - Types of oils used - Principles and methods of sulphation, sulphamation, sulphitation of oils - Types of fatliquors - Anionic, cationic and nonionic- Synthetic fatliquors.-Oiling, currying, stuffing and fatliquoring and their mechanism.-Water resistance, water proofing and shower proofing.

6. Drying - Mechanism - Moisture content - Drier requirement - Theoretical aspects of drying - Different drying methods like air drying, tunnel drying, paste drying, vaccum drying etc.-Newer concepts.

7. Finishing and other miscellaneous operations - Various types of finishes and finishing - Protein, resin, lacquer and polyurethane finishing - Role of various ingredients present in the formulation of various finishes like pigments, dyes, protein binders, resin binders, impregnating agents, wax emulsions, penetrators, fillers, thickening agents, lacquers and emulsions, polyurethanes, formaldehyde, special additives etc. - Methods of preparation - Problems encountered in finishing and their prevention.

13. TECHNOLOGY OF LEATHER MANUFACTURE -II

THEORY:

Processes and techniques involved in the manufacture of different types of finished leathers using skins and exotics.

Goat skins:

Glace kids and goats - Resin upper - Shoe suede-Garment and gloves - Lining - Printed leathers - Chamois.

Vegetable tanned goat skins and their dressing into semi-chrome glace kid/upper, shoe suede, suede garments, lining, printed, plaited/woven leathers etc.

Sheep skins:

Nappa and suede garment-Gloves-Lining-Printed leathers- Shoe upper-Vegetable tanned sheep skins and their dressing into grain and suede garments, shoe upper, shoe suedes, lining, printed leather, gasmeter leather etc.

Reptile skins:

Processing of snake skins, lizards and crocodiles

Game skins and fur tanning:

Hair on tanning of game skins

Fur tanning of sheep and other furs.

Formulation and methods of application of different chemicals, auxiliaries, tanning agents, dyestuffs, fatliquors and finishes in the manufacture of above leathers - Unit operations involved including machinery and equipment - Process control and standardisation at various stages.

14. ANALYSIS OF MATERIALS AND PRODUCTS, MICROSOPY AND BACTERIOLOGY

Theme of quality control and standardisation - Their significance and importance in leather manufacture - Chemical analysis, physical testing and other useful tests for process control.

Specific types of leathers and their important characteristics and properties required.

Full water analysis - Suitability of water for leather processing and boilers - Methods of softening.

Principles and analytical methods employed for various chemicals and auxiliaries used in beam house operations - Analysis of curing materials, soak liquors and soak aids- Analysis of sodium sulphide, lime, limed pelt and used lime liquors - Analysis of deliming and bating agents - Comparative tests of bates for their bating effects - Analysis of used and unused pickle liquors.

Analysis of vegetable tanning materials - Methods of sampling- Grinding and extraction - Qualitative and quantitative analysis of vegetable tanning materials- Sampling and analysis of tanning extracts, liquid and solids-Analysis of spent tan liquors.

Analysis of vegetable tanned leathers - Sampling and preparation of the sample- Analysis in full - Determination of acidity of vegetable tanned leathers - Determination of adulteration.

Analysis of chrome tanning salts and liquors - Determination of percentage purity and percentage basicity. - Analysis of chrome tanned and combination tanned leathers. Analysis of synthetic tanning agents.

Dyestuffs - Systematic tests and evaluation of properties - Dyeing tests with various types of leathers.

Analysis of oils, fats and fatliquors -Iodine and saponification values - Theory of saturation and unsaturation -Tests for sulphated and sulphited fatliquors - synthetic fatliquors.

Effluents, their treatment and disposal - Solid wastes - Analysis of untreated and treated effluents.

Testing, trials and evaluation of various chemicals, auxiliaries, finishes, finishing agents etc. used in leather processing.

Useful simple tests for identifying the defects and stains and also for process control.

Analytical study and quality control of various operations in leather processing. Physical testing - Introduction - Sampling, preparation and conditioning.
Various types of physical tests on upper, lining, sole, industrial and sportsgoods leathers like tensile strength, elongation, stitch and split tear, cracking and bursting strength, air permeability, water vapour permeability, real and apparent density, resilence and compression, water absorbtion, water proofness, abrasion resistance, flexing endurance, dry and wet rub fastness, adhesion of finish, scuff resistance, light fastness, resistance to hot plating, cold crack resistance etc.

Interpretation of the data obtained by physical and chemical testing. Recommended quality requirements of the main types of leathers. International standards- Standards in other countries - National standards - Importance of national standards.

MICROSCOPY THEORY:

1. Microscopic study: Different types of microscope - Parts of a compound microscope -Setting up of a microscope for visual study.

2. Slide preparation for microscopic study: Preparation of the materials, fixing, embedding, section cutting, staining and mounting.

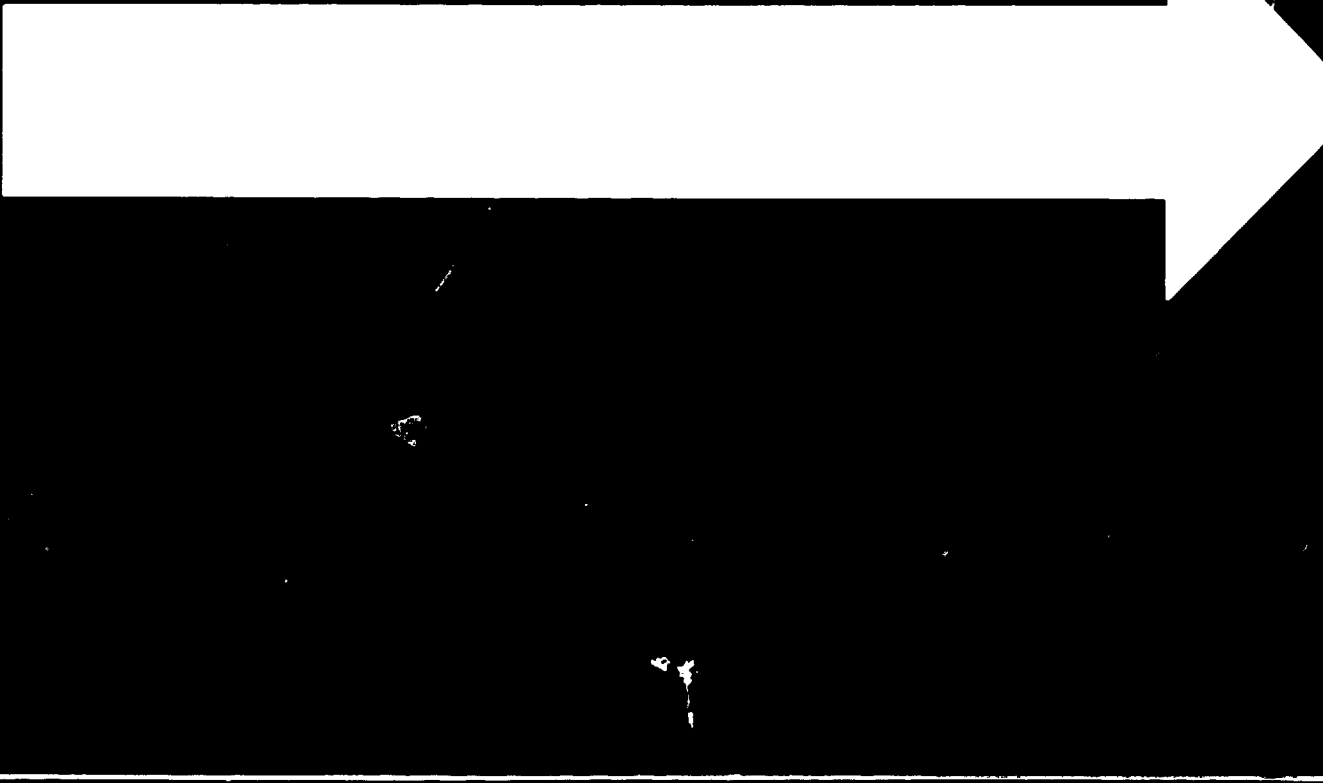
3. Application for microscopy: Anatomical structure of hair and wool - Histology of hides and skins - Grain pattern of hides and skins - Fibre structure of leather - Microscopical assessment of leathers - Application of microscopy to note the changes that may take place in processing i.e. curing, soaking, lining, deliming, bating, pickling, tanning and finishing.

BACTERIOLOGICAL THEORY:

1. Fundamentals of bacteriology: - Microscopic forms of life - Recognition under microscope - Their culture - Preparation of various culture media - Sterlisation - Marphological characteristics of bacteria - Staining of bacteria and classification -Biochemical properties of bacteria - Bacterial count.

2. Action of bacteria on raw hides and skins and in different processes of leather manufacture - Damages caused by bacterial infestation - Hair slip, liberation of ammonia - Halophylic bacteria, problem of 'Red Heat' and its cure - Bacterial analysis of various tannery substracts in the different stages of leather manufacture and their control and prevention of growth by the use of preservatives as bacteriostatic and bactericidal agents - Determination of proteolytic activity of bacteria.

3. Moulds: Moulds and their difference from bacteria- Damages that can be produced by moulds to the leather, tan liquor, pickled skins etc. Mould preservation.



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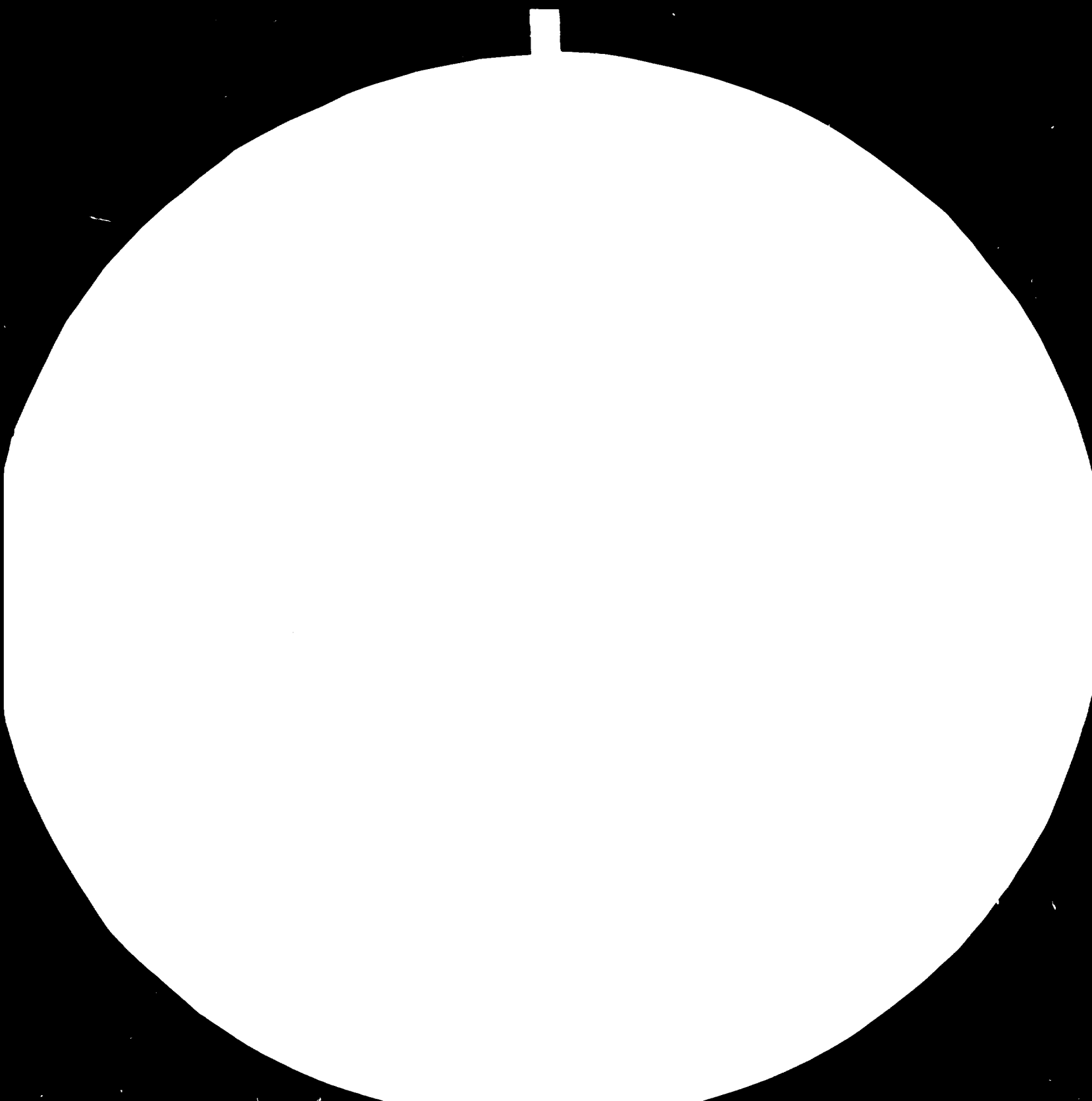

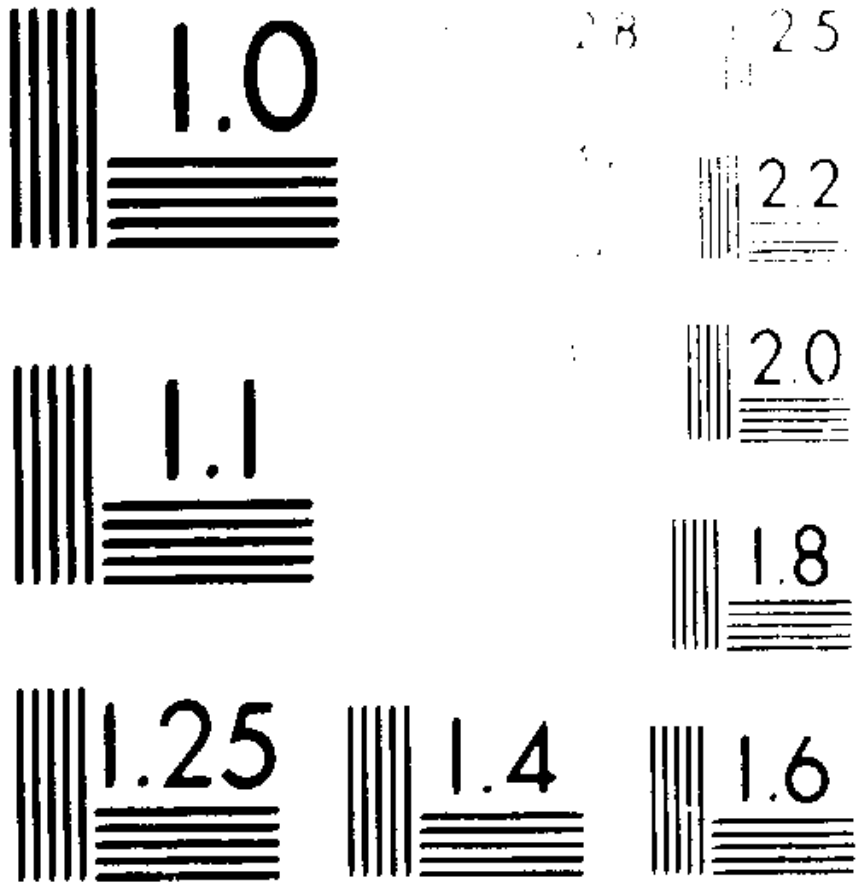
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2.2
2.5

15. INDUSTRIAL AND PRODUCTION MANAGEMENT

General management: Scientific management - Principles of management - Management functions.

Structure of industrial organisations: Types of organisations - Advantages and disadvantages of each type - Public sector, joint sectors, individual, family, private partnership, private limited company, joint stock company etc.

Typical organisational charts of industrial establishments.
Labour and industrial relations: Important provisions of factory acts - Workmen's compensation acts - Wages - Employee's state insurance and provident fund act - Trade unions - Collective bargaining - Causes for industrial disputes - Methods of machinery for settling labour - Management disputes - Human factors in industrial relations - Concept of wages, systems of job evaluation, evolving wage structure - Incentives.

Production management: Productivity concepts and production - Resources input - Technological and human factors influencing productivity - Need for management resources. Production planning and control; Types of production - Job, batch and mass production Preplanning and forecasting - Material planning and allocation - Process planning - Process flow sheets - Calculation of man and machine hour - Scheduling production control - Breakeven analysis - Make or buy decisions.

Material management: Objectives of inventory control - Various methods of analysis - Lead time - Reorder level - Economic stock levels - Store keeping - Purchasing and purchase procedures - Classification and coding - Specifications - Receipts, issues and indenting of stores - Layout and requirement of stores and substores - Principles of material handling and equipments used.

Work study: Method of study - Basic procedures for improvement, recording techniques, operation charts, process flow charts, man-machine chart, multiple activity chart - Principle of motion economy.

Work measurement: Objectives - Stopwatch practice - Performance rating - Relaxation allowances - Establishing standard time - Work sampling techniques - Analytical estimation.

Role of technicians/technologists in leather industry - Duties and responsibilities - Quality of leadership - Relation with sub-ordinates, equals and superiors. Elements of economics: Explanation of basic terms like goods, merchandise, consumption, distribution, services, demand, supply, national income, national budget, taxes, revenues, expenditure, incentives, subsidies etc. Demand analysis and forecasting.cost analysis and pricing - Fixed capital - Working capital - Fixed and variable costs - Depreciation and its calculation - Bank interest.

Marketing: Sales management - Functions-Product research - Market research and forecasting - Fashions and styles - Advertising - Sales promotion - Sales planning - Local and export sales.

Trade: Import and export policies - Incentives, subsidies, drawbacks etc. - Import and export regulations - Import and export of chemicals, auxiliaries, machinery and equipment, spare parts etc. General procedures for export and import - Price quotations - FOB, CIF, bill of lading, letter of credit etc. - Export promotion - Financial assistance.

Leather management: Raw hides and skins - Availability, price structure and marketing - International trade and price structre - Product mix of leathers - Different types - Estimated cost of production - Price fixing - International prices.

7. INTRODUCTORY TO LEATHER MANUFACTURE

THEORY:

Elementary knowldge of various types of raw hides and skins used in leather industry. Defects-Pretanning operations like soaking, liming, deliming, bating, pickling, depickling and degreasing - Their principles and objectives.

Criteria of tanning - Different kinds of tanning. Vegetable tanning - Different kinds of vegetable tanning materials and their classification - Brief method of vegetable tanning.

Chrome tanning - Preparation of chrome liquors and testing - Brief method of chrome tanning.

Other tanning agents like aldehyde, oil, aluminium, zirconium, synthetic tanning agents and their uses.

Post tanning operations - Netralisation - Retanning - Dyeing- Fatliquoring- Drying Leather finishing

Types of machinery and equipments used in leather processing- Unit operations involved.

Common terms and terminologies used in leather manufacture. Different types of finished leathers and their uses. Properties of leathers and substitutes.

(NOTE: The treatment of the subject shall be purely elementary in nature as the student is expected to acquire only a general knowledge.)

ANNEXURE 12

AWARD OF CERTIFICATE (MODEL) FOR DIPLOMA COURSE IN LEATHER TECHNOLOGY

NATIONAL BOARD OF EDUCATION, UNITED REPUBLIC OF TANZANIA

OR

TANZANIA INSTITUTE OF LEATHER TECHNOLOGY, MWANZA, UNITED REPUBLIC OF TANZANIA

This Diploma of
LEATHER TECHNOLOGY
is awarded to

.....

who has completed a course of instruction in

Leather Technology

and

passed in SECOND/FIRST/FIRST CLASS WITH DISTINCTION
At the Boards Final Examinations held in

month year

Signature
Chairman
Board of Examiners
National Board of Education
Or
Director, TILT

Signature
Minister of Technical Education/ Industry
United Republic of Tanzania

ANNEXURE - 13.

AWARD OF CERTIFICATE (MODEL) FOR TRAINING COURSES.

TANZANIA INSTITUTE OF LEATHER TECHNOLOGY, MWANZA

This is to certify that Mr./Miss/Mrs. .....
attended and fulfilled a training course in .....
..... held at the institute from ..... to ....
..... and he/she has passed the examinations (theory & practice)
conducted at the end of the course in ..... class.

Mwanza
Dated.
Signature
G.M. of TLAI / concerned authority in
Ministry

Signature
Director, TILT

ANNEXURE - 14

1. Modern Practice in Leather Manufacture by J.A.Wilson
Reinhold publishing corporation, New York.
2. Chemistry of leather manufacture by J.A.Wilson
Chemical Catalog Co., New York.
3. Chemistry and reactivity of collagen by K.H.Gustavson
Academic Press, New York.
4. Chemistry of tanning processes by K.H.Gustavson
Academic Press, New York
5. Chrome tanning processes by E.W.Merry
6. Tanning processes by A.C.Orthmann
Hide & Leather Publishing Co.
7. Progress in Leather Science by British Leather Manufacturers'
Association, BLMRA, Egham, Surrey, UK.
8. Hides, skins and leathers under microscope by BLMRA
9. Skin, hide and leather defects by J.J.Tancous, Roddy & O'Flaherty
10. Chemistry of leather manufacture by G.D.Mclaughlin & E.R.Theis
Reinhold Publishing Corporation, New York
11. Leather manufacture by D.Woodroffe
12. Fundamentals of leather science by D.Woodroffe
13. Handbook of chrome tanning by D.Woodroffe
14. Leather dressing, dyeing and finishing by D.Woodroffe
15. Standard handbook of industrial leathers by D.Woodroffe
16. Chemistry & technology of leather - Vol. I
Preparation of tannage by F.O'Flaherty, W.T.Roddy & R.M.Lollar
Kreiger
17. Chemistry & technology of leather - Vol. II
Types of tannages by O'Flaherty, Roddy & Lollar
Kreiger
18. Chemistry & technology of leather - Vol. III
Dyeing and finishing by O'Flaherty, Roddy and Lollar
Kreiger
19. Chemistry and technology of leather - Vol. IV
Evaluation of leather by O'Flaherty, Roddy & Lollar
Kreiger
20. Manufacture of sole and other heavy leathers by G.H.W.Humphreys
Pergamon
21. Chemical treatment of hides and leather by J.Patridge
Noyes Data Corporation, Park Ridge, New Jersey, USA.

22. Principles and processes of light leather manufacture by P.I.Smith

23. Leather Workers Handbook by J.H.Sharphouse
Leather Producers Association, London.

24. Leather Technician's Handbook by J.H.Sharphouse
Leather Producers Association, London.

25. Practical Leather Technology by T.C.Thorstenson
Kreiger

26. Theory and practice of leather manufacture by K.T.Sarkar

27. Introduction to principles of leather manufacture by S.S.Dutta
Indian Leather Technologists Association, Lalbazar, Calcutta,

28. Handbook of tanning by B.M.Das.

29. Science for students of leather technology by R.Reed
Oxford, Pergamon, London.

30. The dyeing of leather by G.Otto
Eduard Roether Verlag, Darmstadt, West Germany.

31. Leather manufacture - Correspondence course by Leather Industries
Research Institute, South Africa.

32. Leather by C.Clair
Bruce Publishing Co.

33. Looking at leather by G.E.O'Brien and H.A.Andrews
Staples Press

34. Tanning materials with notes on tanning extract manufacture
by A Harwey , Technical Press

35. A survey of modern vegetable tannage by Tanning Extract
Producers Federation

36. Vegetable tanning materials by F.N.Howes

37. Leather in life, art and industry by J.W.Waterer

38. Gloving, clothing and special leathers by P.S.Briggs
Tropical Products Institute, London

39. Upper leathers by Tuck
Tropical Products Institute, London.

40. Properties and alum dressing of rabbit pelts on small scale by
J.B.Leach & J.C.Barret, Tropical Products Institute, London.

41. Leather dressing by M.C.Lamb
Anglo-American Technical Co. Ltd.

42. Tanning of hides & skins by Lockhart-Smith C.J.
Tropical Products Institute, London.

43. Chemistry of vegetable tannins by Society of Leather Technologists and Chemists
44. Collagen - The anatomy of a protein by Woodhead & Galloway Arnold
45. Fur skin processing by H.Kaplan
Pergamon, Oxford, U.K.
46. Official methods of analysis by Society of Leather Trade Chemists
Society of Leather Trade Chemists, Redbourne, Herts, UK.
47. Methods of sampling and analysis by American Leather Chemists Association
48. Ancient skins, parchment and leathers by R.Reed
Seminar Press
49. Leather finishes by J.S.Mudd
Chemical Publishing Co., A.Harvey, London
50. Indian hides and skins - Histological characteristics by Central Leather Research Institute, Madras- 600020, India
51. Recent advances in mineral tannage by Central Leather Research Institute, Madras, India
52. Technological controls in leather manufacture by Central Leather Research Institute, Madras, India.
53. Dyeing & finishing of leathers (Lecture Notes) by Central Leather Research Institute, Madras, India.
54. Animal By-products - Their processing and utilisation by Central Leather Research Institute, Madras, India.
55. Animal Blood - Its use in food, feed, fertilisers, industry, medicine and laboratory by Central Leather Research Institute.
56. Utilisation of dead animals and condemned animal offals by Central Leather Research Institute, Madras, India.
57. A.P.O.Lecture Notes by Central Leather Research Institute
58. Sportsgoods Leathers by Central Leather Research Institute
59. Aniline Leathers by Central Leather Research Institute
60. Nappa Leathers by Central Leather Research Institute
61. Quality control and standardisation (Lecture notes) by Central Leather Research Institute, Madras, India.
62. Acrylics and their use in leather manufacture by Central Leather Research Institute, Madras, India.
63. Leather by C.H.Spiers
Borax Consolidated Ltd., London.
64. Flaying and curing of hides and skins as a rural industry
FAO publication, Rome.

65. Rural tanning techniques by I.Mann
FAO publication, Rome.

66. Processing and utilisation of by-products
FAO publication, Rome.

67. Chemistry & technology of novelty leathers by K.Fuchs.
FAO publication, Rome.

68. Acceptable quality levels in leather
UNIDO publication, Vienna

69. Inter-relationship between parameters of leather industry
UNIDO publication

70. Footwear, raw hides and skins and leather industry in
OECD countries by Organisation for economic cooperation
and Development, H.M.S.O.

71. Modern rational pit, drum tannage of vegetable sole leather
by J.Mosiewicz, Forestal International Ltd., London.

72. Leather Technical Dictionary in six languages by International
Union of Leather, Wegner

73. Glossary of leather terms by Technologists and Chemists
Society, International Council of Tanners.

74. Glossary of leather terms by British Standards

75. Leather Guide by Leather Guide, Benn

76. Tanners Manual (Chrome) —— BASF publication

77. Tanners Manual (Vegetable) —— BASF publication

78. Dyers Manual —— BASF publication

79. Finishers Manual —— BASF publication

80. Pocket book for the leather technologists —— BASF publication

81. Standards for various types of leathers prevalent in other
countries

82. Information sources on leather and leather products
Unido publication

83. Leather, its origin and fabrication by I.Jullien
Centre Technique du Cuir, Lyon, France.

84. Handbook of tanning chemistry by A.Kuentzel
Theodor Steinkopf Verlag, Dresden, West Germany.

85. Handbook of tanning chemistry and leather processing by
W.Grassman - 4 Volumes, Springer, Vienna.

86. Chemical technology of leather processing by H.Loewe
Roether, Darmstadt, West Germany.

87. Tanning chemistry & technology by F.Stather
Akademic Verlag, Berlin (East).

88. A manual of leather by Clarks Ltd., Somerset, UK.

ANNEXURE - 15

TECHNICAL JOURNALS & MAGAZINES ON LEATHER & ALLIED INDUSTRY

1. LEATHER ..... Monthly

   Publ: Benn Publications Ltd. Sovereign way, Tonbridge, Kent TN9 4RW, U.K.

2. LEATHER MANUFACTURER ..... Monthly

   Publ: Shoe Trades Publishing Co., 15, East Street, Boston Massachusetts 02111, USA.

3. JOURNAL OF THE SOCIETY OF THE LEATHER TECHNOLOGISTS & CHEMISTS ..... Twice a month

   Publ: Society of the Leather Technologists & Chemists (SLTC), 1, Edges Road, Mcultcn, Northampton NN3 1Uj, U.K.

4. JOURNAL OF THE AMERICAN LEATHER CHEMISTS ASSOCIATION

   Publ: American Leather Chemists Association, Tanners Council Research Laboratory, Room No. 5, Campus Section -14, Ohio 45221, USA.

5. SHOE AND LEATHER NEWS ..... Monthly

   Publ: 84 - 88, Great Eastern Street, London \ EC2A 3ED, UK.

6. LEATHER AND SHOES ..... Weekly

   Publ: Rumpf Publishing Co., Nickerson & Collins Co., 1800, Oakton Street, Des Plaines, Illionois 60118, USA.

7. AUSTRALIAN LEATHER JOURNAL, BOOT AND SHOE RECORDER .... Monthly

   Publ: Lawrence Publishing Co., Box. 1813, GPO, Sydney 2001.

8. DAS LEDER ..... Monthly

   Publ: Eduard Roether Verlag, Berliner Alle 56, D-6100 Darmstadt, Federal Republic of Germany.

9. REVENUE TECHNIQUE DES INDUSTRIES DU CUIR

   Publ: Societe des Publications 'Le Cuir', 54, Rue Rene Boulanger, 75010 Paris, France.

10. TECHNICUIR ..... Monthly

    Publ: Societe D'Editions Technique Des Industries Du Cuir, 54, Rue Rene Boulanger, 75010 Paris, France.

11. LEATHER SCIENCE ..... Monthly
Publ: Central Leather Research Institute, Madras- 600020, India.

12. TRENDS IN LEATHER WORLD ..... Monthly
Publ: Central Leather Research Institute, Madras- 600020, India.

13. CURRENT LEATHER LITERATURE .... Monthly
Publ: Central Leather Research Institute, Madras- 600020, India.

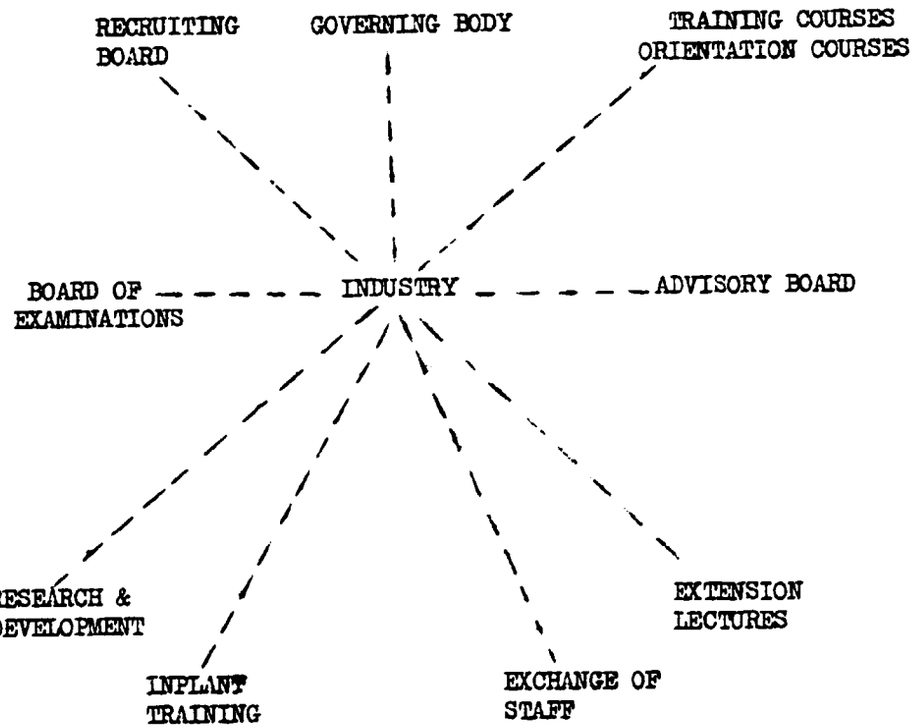
14. THE TANNER .....Monthly
Publ: The Tanner, 32/2, Aga Abbas Ali Road, Bangalore- 560042, India.

15. INDIAN LEATHER .....Monthly
Publ: S.Sankaran, Indian Leather, 120, Vepery High Road,
Periamet, Madras- 600003, India.

16. PAKISTAN LEATHER TRADE JOURNAL .....Quarterly
Publ: 132- A/Block 2, Pechs, Karachi- 29, Pakistan.

ANNEXURE 16

LIAISON WITH INDUSTRY



ANNEXURE 17

DIAGRAM 1:

ADMINISTRATION OF TILT

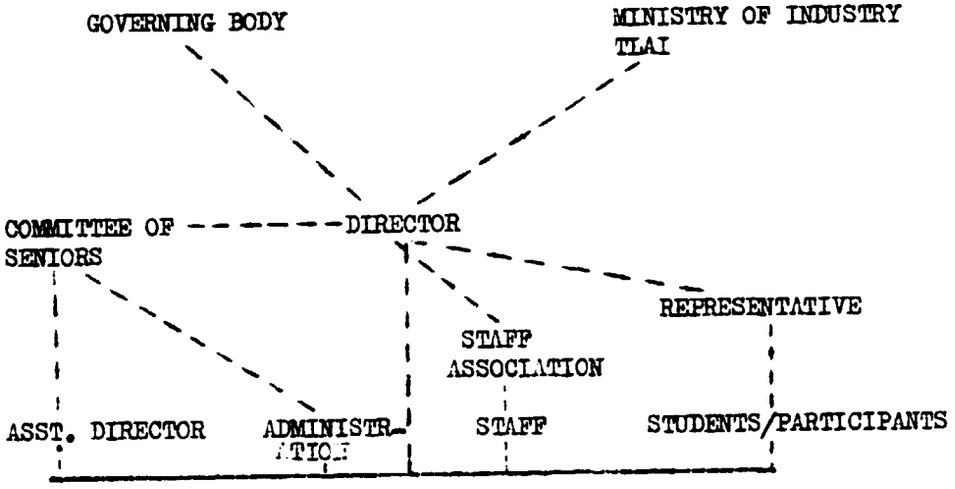
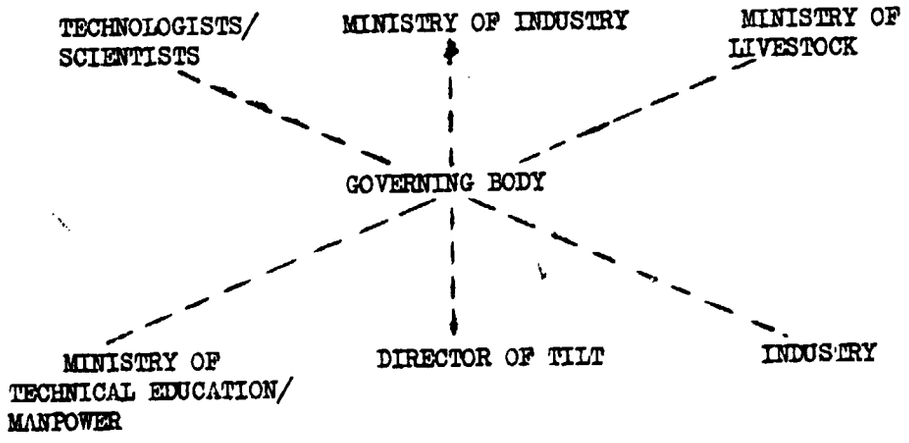


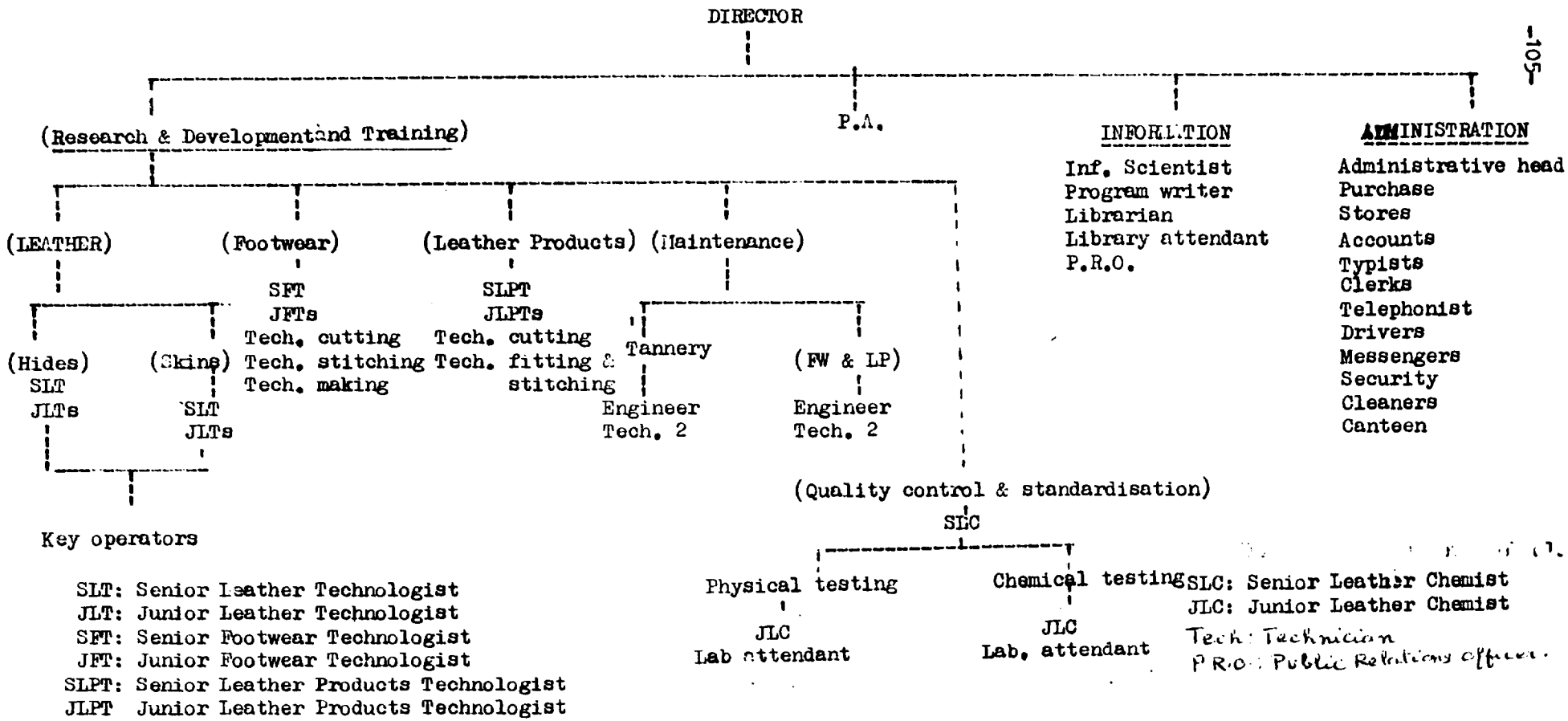
DIAGRAM 2:

CONSTITUTION OF GOVERNING BODY



ANNEXURE - 18.

SUGGESTED ORGANISATIONAL STRUCTURE FOR TILT



SLT: Senior Leather Technologist
JLT: Junior Leather Technologist
SFT: Senior Footwear Technologist
JFT: Junior Footwear Technologist
SLPT: Senior Leather Products Technologist
JLPT Junior Leather Products Technologist

SLC: Senior Leather Chemist
JLC: Junior Leather Chemist
Tech: Technician
P.R.O: Public Relations officer.

ANNEXURE - 19.

ADDITIONAL EQUIPMENTS & CHEMICALS REQUIRED FOR TILT.

1. Wiley mill with knife velocity of 700 -1000 RPM and a sieve with 4 mm diameter.
2. Mechanical shaker machine (50 - 60 RPM)
3. Distilled water unit
4. Dessicators
5. Weighing bottles (wide & narrow mouth) with stoppers
6. Physical balance with weights
7. Fume cup board with chimney, exhaust fan and heating arrangements
8. Watch glasses (different diameters)
9. Filter stands
10. Burette stands with clamps
11. Pipette stands
12. Metal stands with different clamps
13. Tripos stands
14. Clay pipe triangles
15. Porcelain tiles
16. Porcelain dishes
17. Glasstubes of different diameters
18. Glass rods of different thickness
19. Wire gauzes and wire gauzes with asbestos
20. Glass beads
21. Porcelain earthenware
22. Muslin cloth
23. Filter paper thimbles (whatman 33 x 80)
24. Gooch crucibles
25. One platinum crucible
26. Erlenmayer flasks with ground glass stoppers
27. Thistle funnels
28. Mortar and pestle
29. Test tube holders
30. Filter paper Whatman No. 11
31. Indicator bottles
32. Glass bottles of different sizes (wide & narrow mouth) with stoppers
33. Rubber stoppers of different sizes (with & without holes)
34. Cork stoppers of different sizes
35. Rubber bands
36. Distilled water storage vessel with tap.

37. Distilled water containers (Glass or polythene bottles)
38. Test tube racks
39. Absorbtion cotton
40. Nonabsorbent cotton

LABORATORY CHEMICALS.

1. Ammonium oxalate
2. Ammonium sulphate
3. Ammonium carbonate
4. Ammonium molybdate
5. Amyl acetate
6. Ammonium thiocyanate
7. Potash Alum
8. Bromine
9. Iodine
10. Calcium carbonate
11. Calcium hydroxide
12. Cobalt nitrate
13. Ethyl acetate
14. Formic acid
15. Ferrous ammonium sulphate
16. Ferric chloride
17. Chloroform
18. Gelatine (photographic)
19. Kaolin
20. Magnesium sulphate
21. Sodium bisulphite
22. Iron alum
23. Mercuric oxide
24. Potassium permanganate
25. Potassium chloride
26. Potassium ferricyanide
27. Potassium sulphate
28. Potassium persulphate
29. Potassium oxalate
30. Pthalic anhydride
31. Potassium sodium tartarate
32. Zinc chloride
33. Starch
34. Potassium acid Pthalate
35. Potassium flouride
36. Potassium carbonate
37. Borax
38. Sodium ammonium hydrogen phosphate
39. Litmus paper
40. Methyl red

Physical testing equipments

1. Air conditioning of the physical testing room to have a temperature of 20± 2C and a relative humidity of 65± 2%
2. Kubelka apparatus far water absorbtion (static)
3. Ballys permeameter for water proofing of sole leather (dynamic)
4. Water vapour permeability apparatus
5. C & R tester for compressibility and resilence
6. Rubber abrader CAT No. 90D 400 for resistance to abrasion of heavy leathers
7. Taber abraser for resistance to abrasion of light leathers
8. Key testers
9. Grey scale for assessing change in colour
10. Grey scale for assessing change in staining
11. Crepe rubber, scotch tape,

Equipments for tannery pilot plant

1. Wooden horses
2. Wooden duck boards
3. Wooden trolleys
4. Wooden tubs
5. Plastic tubs
6. Plastic buckets
7. Wooden beams for hand unhairing, fleshing & scudding
8. Knives for hand unhairing, fleshing & scudding
9. Hand sleakers (stainless steel)

Physical testing equipments (contd.)

12. Environmental test chamber for determining resistance to cold temperature
13. Scales in mm and inches.

ANNEXURE - 20

LIST OF LEATHER RESEARCH INSTITUTES

1. Central Leather Research Institute, Madras, India.
2. Centre Technique du Cuir and Ecole Francaise de Tannerie, Lyon, France.
3. Shoe and Allied Trades Research Association (SATRA), Kettering, Northamptonshire, U.K.
4. Leather Research and Training Institute, Pendik, Istanbul, Turkey.
5. Institute for Leather Research, Karlovac, Yugoslavia.
6. National Research Institute for Shoe, Leather & Allied Industries, Gottwaldo, Czechoslovakia.
7. Research Institute of Leather, Shoe and Allied Industries, Budapest, Hungary.
8. TNO Leather and Shoe Research Institute, Waalwijk, Netherlands.
9. Leather Research Institute, Lodz, Poland.
10. Max-Planck Institute for Protein and Leather Research, Munich, West Germany.
11. Darmstadt Technical University - Protein & Leather Department, Darmstadt, West Germany.

ANNEXURE - 21.

UN assistance to TILT in fielding Experts

	Man Months
1. Chief Technical Adviser (Leather Institute Expert)	30
2. Leather Technology Expert	24
3. Leather Chemist Expert	24
4. Footwear Expert	12
5. Leathergoods Expert	6
6. Consultants:	18
a) Tanning machinery maintenance	4
b) Footwear & Leather goods machinery maintenance	3
c) Leather auxiliaries & chemicals	3
d) Information	2
e) Techno-economic survey	2
f) Effluent	2
g) By-products utilisation	2