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ASSISTANCE TO THE LEATHER INDUSTRY IN SRI LANKA

DP/SRL/83/003

SRI LANKA

Terminal report *

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

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Explanatory Notes

The monetary unit in Sri Lanka is the Rupee (Rs) divided into 100 cents.

During the period covered by the report, the value of the Rupee was US\$ 1.00 = Rs 29.00

CLPC refers to Ceylon Leather Products Corporation.

DSM refers to Deci Square Meter (a tenth of a square meter)

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I. INTRODUCTION

A. Background

The fairly rich livestock population of Sri Lanka is generating adequate raw hides and skins to satisfy the requirement of the local medium-sized tanning industry. Until about 1970 the country's tanning industry was mainly engaged in the production of vegetable tanned leather catering for the domestic needs and export. With the setting up of a new chrome tanning complex at the Ceylon Leather Products Corporation in Colombo, Mattakkuliya, leather of different types and properties, more acceptable to the changing requirements of the footwear industry has been introduced to the market. Following the diversification of the leather industry and leather production UNIDO provided the first technical assistance to this industrial sector in Sri Lanka by fielding a consultant in leather goods manufacture.

During the course of this period new shoe manufacturing plants were established in and around Colombo creating a higher demand of finished leather which as a consequence thereof provided the impetus for the embarkation on a programme to modernize the country's leading tanneries, both, of the public and private sector.

In spite of the subsequent increased demand for raw material generated by the upgraded leather production facilities, not all raw hides could be absorbed by the local tanning industry. A considerable volume of wet-salted bovine hides were for this reason exported, mainly to Asian countries; reportedly a very profitable business taking into account the much higher prices obtained on the international market. To curb the outflow of raw material which otherwise could be processed into leather locally a ban on the export of raw cattle hides was effected. These measures are now also applied with regards to raw buffalo hides as from 1. April 1987. Concurrently with the gradual decline raw hides exported the export of leather goods made from locally produced leather has increased substantially.

The poor quality of the local raw hides and the resulting low grades, of finished leather has been identified as one of the reasons impeding the further product development in the leather footwear and leather goods manufacturing sector.

Focussing on this problem and to reduce the unduly high waste of raw hides and skins as well to enhance the quality of the locally produced leather assistance from UNDP-UNIDO was requested and in the following the project "Assistance to the Leather Industry in Sri Lanka" has been approved and implemented.

B. Official Arrangement

The project DP/SRL/83/CO3 provided initially with a budget of US \$ 118.500 of which were US \$ 112.000 in convertible currency inputs and US \$ 6.500 in Government contribution payable in Sri Lanka Rupees was approved on 26.3.1984. Extensions of the project activities were financed through additional UNDP/UNIDO funding resulting in major budget revisions as follow:

Revision " C"	US \$ 149.818	—	25.06.1985
" D"	US \$ 179.718	—	22.10.1985
" E"	US \$ 236.718	—	24.01.1986
" G"	US \$ 293.474	—	08.06.1986
" J"	US \$ 433.841	—	13.11.1986
" K"	US \$ 433.841	—	25.05.1987

The Chief Technical Adviser (Leather Industry Consultant, post 11-01) arrived after briefing in Vienna in the field on 15. July 1984, followed by the expert in leather goods manufacture fielded on 23.08.1984 for a period of three month. The assignment of the CTA initially planned for one year was extended twice for six month and after that for ten month and finally for two month concecutively. During September/October 1986 the CTA carried out a tannery project appraisal mission in Lesotho and Malawi.

During the project life time additional international expertise was provided, namely:

post 11.03	Expert in Industrial Leather Glove Manufacture - 4 wm- (02/87- 06/87)
post 11.04	Expert in Leather Garment Manu- facture - 3 wm- (02/87-05/87)
post 11.51	Consultant in Tannery Effluent Treatment - 01 wm-(06/87)

C.OBJECTIVES

The objectives of the project were:

a) Development Objectives

- i Improved utilization of available resources in the leather industry so as to assure the present and future demands for the leather and leather products industry.
- ii Improved performance and competitiveness of the local leather industry so as to be able to compete in the international market and contribute to foreign exchange earnings through export.

b) Immediate Objectives

- i A programme designed to reduce wastage of raw materials and semi processed leather by at least 10% throughout all stages of preparatory works as well as throughout the actual processing operation in the Sri Lanka tanning industry.
- ii Increased plant utilization and improved quality control of the leather in the Ceylon Leather Products Corporation tannery.
- iii Improved leather goods design and production capacity at the Leather Goods Factory of the CLPC.
- iv Setting up of an industrial leather glove manufacture unit at the CLPC tannery complex. (Revision "I" and "J")
- v Quality enhancement and better design/styling of the CLPC leather garment unit. (Revision "I" and "J")
- vi Assistance in the planning and design of the CLPC tannery effluent treatment plant. (Revision "J")

D.SUMMARY OF RECOMMENDATIONS

In addition to the recommendations made for each project output as listed in the subject report the Government is advised to request a project follow up mission two to three years after completion of this project. The follow-up mission will evaluate the project's impact and contribution towards the short-and long term development of this industrial sector. Further, it is recommended that the transfer of know-how through the technical personnel trained under this project abroad shall also be made available to the non-public tanning sector. As the local leather industry finds itself in a transitional period of development at present, it is recommended to await the outcome of this consolidating process and assess thereafter the needs of this industrial sector with regards to possible further assistance.

II. ACTIVITIES CARRIED OUT AND OUTPUTS PRODUCED

Activities related to the immediate objectives: quality improvement of raw hides/skins and reduction of leather waste.

- i Collection of relevant data on local hide and skin production, preservation and marketing.
 - ii Drafting up a plan of action for a nationwide improvement programme of raw hides and skins
- } = Output no: one

Findings

At the start of the project the prevailing situation was as follow. The operative system of raw hide marketing was directly linked to the export of semi processed leather (bark tanned cattle hides and goat skins) and raw buffalo hides was considered inflexible to provide sufficient incentives to the hide/skin producer. The established internal marketing system of raw hides and skins was found to be a constraining factor for the improvement of the raw material quality. Traders of raw hides and tanners who wished to export vegetable (bark) tanned cattle hides were required to apply for an export licence which was usually recommended through the Ceylon Leather Products Corporation and endorsed by the Government. In order to obtain a recommendation for the issuance of an export licence by the CLPC the trader/tanner was required to offer the collected and accumulated hides for inspection and subsequent selection carried out by an CLPC official (table 1). For every one cattle hide selected and purchased by the CLPC on an agreed price basis the potential exporter is given the recommendation to export on a ratio of 1: 1,25 vegetable tanned cattle hide and 1 : 1,5 in respect of supplies exceeding the quota. On that basis it was understood that only low quality raw cattle hides which have been rejected by the CLPC are processed into vegetable tanned leather destined for export. With regards to buffalo hides of which a substantial quantity was exported in the wet salted stage a ratio of 1 : 3 applied (the CLPC recommends the export of three raw buffalo hides in return for one hide supplied to the Corporation)

Through this mechanism the CLPC was able to obtain its basic raw material requirements without being involved in the actual hide and skin collection activities. This system was finally abolished as per 31. March 1987. The extremely low prices paid for the raw material does not provide enough incentive to the hide/skin producer for a meaningful hide and skin improvement, considering the fact that a bag of coarse salt (50 kg) available to the market at about Rs 75.- equals at present the value of one medium sized cattle hide (10 kg) purchased by the CLPC. The intermediate price paid by the collector to the hide producer is considerable less favourable. For this reason a gradual upward adjustment of the raw hide price system is necessary in co-ordination with the implementation of an effective grading system of raw hides and skins.

Activities and outputs produced

Four reports resulting from the activities were produced:

- a) - Proposal for the countrywide hide and skin improvement.
- b) - Recommendations on the technical grading system of raw hides and skins.
- c) - Constraining factors on the improvement of raw hides and skins.
- d) - Background information for a request to implement a hide and skin improvement programme.

a) Proposal for the countrywide improvement of hide and skins

Raw material

At present the country's availability of raw hides and skins is estimated per month:

40.000 - 43.000	cattle hides
6.000 - 8.000	buffalo hides
30.000 - 40.000	goat/sheep skins

the collection rate, depending on the area is expected to be around 80-90%. The information obtained from the field indicates a nearly 100% collection with regards to established and registered slaughter-houses operating in municipal areas. (table nos: 2, 3, 4, 5,)

It is estimated that about 70-75 % of the cattle hides and 50-60% of the buffalo hides are processed into chrome tanned leather.

Flaying, Curing and Collection

Flaying:

It is felt that the current methods of flaying and skinning are inadequate to produce raw material of a reasonable quality due to the obvious lack of interest shown by the meat producer. There is no doubt that the skinner employed by the meat producer—mostly on a contract basis—are not enough encouraged to render hides and skins free of post mortem defects. The initial complaint communicated by the meat producer to the hide trade and tanners that they receive only about Rs 15.00-20.00 per cattle hide (1984) is not anymore valid. The average price paid to the butcher (1987) is in the region of Rs 40.00-70.00 per cattle hide. It has been noticed, that the higher price paid in the course of the last three years did not produce the expected results with regards to improved flaying methods. The tanners are prepared to pay higher prices for hides and skins reasonable free of most mortem defects. The obvious problem seems as to how the skinner can benefit from a better quality material, in most cases they operate under an arrangement which neglects the importance of quality hide/skin production.

Considering the market value of an averaged sized cattle of Rs 2300.- Rs 2600.-, the amount of Rs 40.- to 70.- paid to the butcher for a cattle hide is relatively low and does not provide sufficient incentives needed to improve the quality of the raw material, as the hide represents only about 2% of the animals value. In most countries the hide is worth approximately 5%-7% of its animal alive.

Curing:

The curing and preservation of hides and skins are in many instances not carried out in the required manner and are often completely neglected. The treatment of the hide and skins immediately after the animal has been slaughtered and skinned is most important in order to stop the onset of putrefaction. Therefore, it is suggested that the butchers themselves, wherever possible shall carry out the first stage of preservation which refers to cleaning and salting. Hides such treated and preserved can be stored for one-two weeks until the stock is collected by the trade or delivered to the tanneries.

Collection:

The country's primary objective for the collection of hide and skins is to meet the requirements of the local tanning industry to satisfy the demand of the of finished leather as required by the allied leather industry for the manufacture of foot wear and leather goods for domestic consumption and to export value added products including, thus contributing to the country's foreign exchange earnings. Therefore, an efficient hide and skin collection system is required to provide the mechanism for a fast, reliable and professional handling of the raw material to reduce the high risk of stock deterioration. It shall be possible that hides/skins are delivered to the tanneries within 2-3 weeks after slaughtering.

To achieve this goal, well functioning collection centres, one for every district should be established as single commercial units or attached to some other already existing enterprises having the infrastructure to ensure a swift handling of the valuable raw material. The collection centres - 22 are recommended in total - shall be suitably located and provided with the required necessities. The hide/skins delivered or collected will be graded, resalted and marked either through stamping or tagging. To overcome transportation problems the meat producer are expected to deliver their hide and skins to the centres where payment should be effected, as soon grades, weights, areas have been established. The centres are also expected to carry sufficient stock of salt which can be purchased by the butchers.

The hides /skins stocked at the collection centres in the various districts would then be transported, organized through a central hide/skins depot based in Colombo where the hide and skins are expected to be sold through auction. To define the guidelines under which the hide/skin improvement, collection and marketing shall operate, it is recommended that a committee representing the :

- Meat Producer Association
- Tanners Association, including CLPC
- Ministry of Industries and Scientific Affairs
- Ministry of Rural Industrial Development
- Export Development Board

shall be formed to provide the forum for mutual discussions, working out the frame for a realistic and market oriented approach to overcome the constraints of the present arrangements.

Table 1

BOVINE HIDES OFFERED BY THE NON-PUBLIC TANNERIES TO THE CLPC DURING 1982-1986Cattle Hides:

Name of Company	1982			1983			1984			1985			1986		
	offered	selected	%	offered	selected	%	offered	selected	%	offered	selected	%	offered	selected	%
E.N.Kader Saibo & Co.	39929	17772	44	28563	16500	58	29308	16976	57	31463	16450	52	63113	33400	53
N.N.Mohideen & Co.	28630	9820	34	24953	11134	45	51087	12699	23	39810	14924	37	23236	9892	43
S.A.Perera & Co.	17769	5459	31	15819	5776	37	19730	3804	19	-	-	-	-	-	-
Rahaman Saibo & Co.	31209	3606	9	15799	3884	25	24612	3909	16	4062	967	24	-	-	-
M.A.M.Cader & Co.	12254	3873	32	20310	3979	19	56376	16063	28	48425	21733	45	44095	16275	40
Mubarak Tannery	17323	5120	32	24998	3028	12	22239	7270	33	32820	14637	46	43168	14696	34
Silva & Co.	15190	6238	41	11198	4130	37	27594	8762	32	22373	7643	34	8396	3260	39
Hajah Mirba & Co.	13437	2693	20	3710	640	17	-	-	-	-	-	-	-	-	-
Indo-Ceylon Leather Co.	41488	13154	32	24566	8183	33	-	-	-	-	-	-	-	-	-
Sultan Leather Co.	6844	1032	15	2003	240	12	-	-	-	-	-	-	-	-	-
N.N.Mohamed Mohideen	50164	9202	16	29831	17904	60	51365	32329	62	32575	18240	56	-	-	-
P.P.K.Vellapa Nader	5390	1955	36	18066	13998	76	22765	14802	65	18628	7514	40	10100	4440	44
Narayanan Chettiar	6794	1022	15	-	-	-	-	-	-	-	-	-	-	-	-
Others	-	-	-	-	-	-	-	-	-	10046	9208	92	-	51662	-
Total:	286421	80946	28	219816	89391	26	315338	122370	39	257322	116759	45	200178	137337	64

Buffalo Hides:

1982	offered:	29273	selected:	5688	= 19 %
1983	"	31580	"	15930	= 50 %
1984	"	32463	"	9999	= 31 %
1985	"	20783	"	19283	= 93 %
1986	"	22798	"	22798	= 100 %

Recommendations for a technical grading system
of raw hides and skins

Introduction:

The distinction between "hides" and "skins" is one of size and thickness. The larger and heavier skins are termed "hides" while the smaller and lighter ones are called "skins". The term hide refers to the skin from larger animals, such as cattle, buffalo, horse. "Skins" are the integral coverings of small animals such as calf, goat, sheep, goat ect. The weight of the hides and skins taken immediately after flaying is called "green" or "fresh" weight. The weight established after the hide/skin has been cured by first treating with salt either by sprinkling with solid salt or immersing in brine and then dried out is referred to as dry-salted, whereas the term wet-salted refers to hide/skins treated in the wet state with solid salt sprinkled on the flesh side and mostly resalted if stored for longer periods.

The grading of raw hides and skins will take into account any defects and damages visible.

The successful implementation of an effective grading system for raw hides and skins depends largely on the practicability of the implemented system itself. The required measures to introduce a new and meaningful grading system are not to alienate the established hide and skin traders in their effort to collect and treat the valuable raw material on a country-wide basis. The new proposed grading system shall be seen as an improvement of the present grading criterias and as such it shall also provide the mechanism towards standardisation of this commodity.

Classification of wet-salted hides/skins in respect of their weights

In Sri Lanka the hides/skins are classified in the following categories:

<u>Cattle hides</u>	light	5-10 kg
	medium	10-12 kg
	heavy	12 kg upwards

<u>Buffalo hides</u>	light	under 13 kg
	medium	13-18 kg
	heavy	18 and over
<u>Goat/sheep skins:</u>	small	50 cm-70 cm long
	medium	70 cm-90 cm long
	large	90 cm and longer

Grading

To elaborate on the criterias on which a hide or skin is selected for the various grades (first, second, third, rejects) the relevant circumstances and the prevailing enviromental conditions under which the hide or skin is produced shall be an integrated part of the directives specifying the different quality characteristics. A practicable and effective grading system will to a certain extent reflect the overall quality of the hides and skins produced and available in the country, Therefore, a useful grading system will take into account the appearance and quality of both sides of the hide/skin which is flesh-and hair side. The quality as such has no direct linkage to the weight classes, however it is known that smaller and medium sized skins deriving from younger animals featuring a better texture, finer grain structures and less pre-mortem def' ts.

With regards to the weight classification of cattle and buffalo hides, heavy hides are usually yielding better quality leather and fetching comparable better prices. For this reason it is natural that heavy hides of first quality are achieving the highest market prices. A distinctivte price difference for hides of the same grade but categorized in different weight classes shall be in the interest of the trade and the tanning industry.

The characteristics of the different quality distinctions

Bovine hides:

First grade (A) First grade hides are those which have no visible knife defects. Slight scores and gouges may be overlooked. The shape of the hide is regular or symmetrical. No branding marks except on the lower part of the legs and cheeks. Properly cured, no hair slip.

Second grade (B) Second grade hides have a good shape or pattern and are reasonable free from knife damage, the area may show concentrated scores and gouges. Up to five flay cuts are accepted, if not more than one hand breadth away from the edges. Up to two branding marks are accepted if inflicted on the centre part of one side not exceeding in total more than one square foot. Properly cured, no hair slip.

Third grade (C) Third grade hides have irregular shape and up to half of their area shows knife damages such as cuts, scars and gouges. Hides showing excessive damage on the back portion do not however fall into this category. Up to two brand marks in the butt or centre on both sides. Properly cured no hair slip.

Rejects (D) Reject grade hides include all hides which show knife damage and/or brand marks than any of the other grades including those with badly damaged parts of the butt. The shape is very irregular, improperly cured with possible hair slip.

Goat and sheep skins:

Goat and sheep skins are traded either in "cases" referring to skins which have been peeled from the carcasses without slitting the skins lengthwise and usually disposed "flesh-cut" or open and flat similar to bovine hides.

First grade (A) First grade skins are those of symmetrical shape which have no knife damage on any part of the skin. Slight scores may be overlooked if the underlying tissues are not affected. Properly cured, no hair slip.

Second grade (B) Second grade skins have a good shape, one knife cut is tolerated if not more than four fingers breadth away from the edges, scores and gouges are permitted as long they are not concentrated in the centre area. Properly cured, no hair slip.

Third grade (C) Third grade skins are of reasonable good shape, allowed to have up to two knife cuts at the edges, four finger breadth away, and one flay cut in the centre area. Scores and gouges unevenly distributed over the whole skin. Properly cured, no hair slip.

Rejects (D) Reject skins are of irregular shape having more knife damages as in any other grades, improperly cured with possible hair slip.

Pricing Policy

In order to achieve a price related distinction between the various grades and weight categories, the grading of raw hides and skins has to be carried out for each single weight class. The following percentual price difference between the established grades and weight classes is considered appropriate:

A. Cattle Hides:	Heavy	Medium	Light
first grade = 100%	Rs 10.00 per kg	Rs 9.00 per kg	Rs 8.00 per kg
second grade = 80%	Rs 8.00 "	Rs 7.00 "	Rs 6.00 "
third grade = 40%	Rs 5.00 "	Rs 4.00 "	Rs 4.00 "
rejects = 20%	Rs 3.00 "	Rs 3.00 "	Rs 3.00 "
B. Buffalo Hides:			
first grade = 100%	Rs 8.00 "	Rs 8.00 "	Rs 6.00 "
second grade = 80%	Rs 6.00 "	Rs 6.00 "	Rs 5.00 "
third grade = 40%	Rs 5.00 "	Rs 4.00 "	Rs 3.00 "

It is worth to note that at the end of 1984, the CLPC has paid for first grade cattle hides, wet-salted, Rs 2.70 per kg and for wet-salted buffalo hides Rs 1.75 per kg. At present, May 1987, the CLPC, is paying for first grade cattle hides Rs 7.50/kg, for seconds Rs 6.00/kg and for thirds Rs 4.00/kg. With respect to wet-salted buffalo hides Rs 5.25 is paid per kg of first quality for heavies and Rs 4.00/kg for medium and lights. Seconds and thirds are at present not accepted by the CLPC.

C. Goat and Sheep Skins:

Due to the small quantities of goat skins collected from the various establishments it was recommended by the trade to classify these skins into three groups only, namely:

large skins, measuring from head to tail at least 90 cm
 medium skins, _____"_____ at least 70 cm
 small skins, _____"_____ at least 50 cm

At present, May 1987, CLPC is paying for large skins Rs 32.00, mediums Rs 28.00 and small Rs 22.00

Ungraded and unselected goat skins are made up of approximately

10% large skins + 5% extra large (over 110 cm)
 65% medium skins
 20% small skins

Future Proposal:

In view of the interdependence of the tanning-and hide/skin trading sector it is realistic to propose that the prices paid for raw hides and skins by the tanning industry to the trade shall reflect a healthy proportion of the leather price realized in the domestic and foreign market. The tanner get what he is paying for...

Constraining factors on the hide and skin improvement

To improve the quality of raw hide and skins the constraining factors experienced in the implementation of such a programme have been identified as follow.

- Branding of animals on areas other than cheeks and legs

The owner of the animal is naturally more concerned with the identification of his property than with the tanner's problem deriving from the practise of incorrect branding. Better understanding and information is required to implement the already existing legislation in regards to the branding of animals, preferable in co-operation with the department of Livestock Development and the Veterinary Service of the Ministry of Rural Industrial Development.

- Hides deriving from old animals resulting resulting in leather of of poor substance.

A reduction in the production of such raw material would require a more economic approach in animal husbandry.

- Post mortem defects due to incorrect flaying and skinning.

There is an obvious lack of motivation on the part of the meat producer to engage and instruct their staff in proper flaying and skinning methods. Even the bare necessities like a skinning knife and a sharpening stone are often not made available or not used by the butchers. However, in many instances it was noticed that the skinners are fully capable to produce good quality hides/skins free of cuts and gouges, given the correct tools, more time and the proper working environment. Further, in most cases the freshly produced hides are not cleaned immediately after skinning/flaying, they may remain untreated over a period of 24 hours, resulting in to the exposure of bacterial activities which in turn produces low quality leather (mainly grain damage). Salt for curing is also applied scarcely.

- Collection of raw hide and skins

During the years 1985-1986 the collection of raw hides and skins has improved considerable. Deterioration of raw stock due to non-collection by the trade was not reported, however the quality of preservation is still considered low. Hides/skins are generally not properly opened and spread before salting. The common practice to purchase hides/skins from the meat producer on an agreed flat rate price basis regardless of the quality is impeding the measures needed to introduce a country-wide accepted grading system for raw hides and skins. The quantity and quality of salt used for curing is in most cases insufficient and improper. A higher price level for better quality raw material will certainly motivate the meat producer to exercise more care in flaying, skinning, handling and pre-curing. A possible alternative to the present collection arrangement which, taking into account the shortcomings of the technical and organizational framework—would be as previously recommended the setting up collection centres in major towns.

In order not to interrupt unduly the present arrangement of raw hide supplies and deliveries through the established channels of trade, any substantial change of this structure has to be carried out in a rational manner. Further, the subject on premises, staffing, payment of raw stock deliveries, acceptance of the grading by the trade and marketing requires more information and proper planning.

- Information Service

Most of the shortcomings in the improvement of the raw hide and skin quality can be attributed to the poor information on the subject. Therefore it is recommended that to begin with, one or two districts shall be selected for a programme, designed to disseminate information on the correct brand marking (if required at all), proper flaying, skinning, curing and handling. Such a programme should be considered as a test project.

Results of quality checks of raw hides and limed hides (medium) which have been graded and traded as first quality raw material

Cattle hides of medium weight classes and purchased by the CLPC as first quality hides were re-graded over a period of two weeks to assess the actual qualities. The results are as follow: (Dec. 1986)

Supplier "A"	first grade: 63%	second grade: 23%	third grade 14%
Supplier "B"	" 65%	" 27%	" 8%
Supplier "C"	" 43%	" 27%	" 30%
Supplier "D"	" 65%	" 23%	" 25%
Supplier "E"	" <u>50%</u>	" 16%	" 34%

During May and June 1985 spot checks on the extent of damages were carried out, producing the following results:

Hides with no holes and visible grain damage	20%
Hides with 1-2 holes, no visible grain damage.....	32%
Hides with 3-5 holes, slightly grain damaged.....	18%
Hides with more than 5 holes, up to a quarter area grain demag.	14%
Hides with more than 5 holes, grain damage up to half of area	16%

The obvious cause of the defects and damages are:

Flaying.....	63%
Curing.....	15%
Barbed wire....	11%
Parasites	40%
Branding	12%

Note:one hide might show any of the above defects on the same area.

Utilization of project results

Follow up actions on the recommendations made by the project on the improvement of raw hides and skins have resulted in intergovernmental agency meeting conveyed on 26.9.1984, 3.10.1984, 21.08.1985, 10.10.1985, 30.05.1986, 13.06.1986 including discussions on the subjects during the periode Jan-April 1987 at the Ministry of Rural Industrial Development.The first step in this direction was to launch a poster campaign on a country-wide basis focussing on the correct branding of livestock.In addition two film shows on the subject Hide and Skin Improvement were arranged with a total participation of 28 persons,representing the tanning industry,meat producer and the departments of livestock development,animal production and veterinary service.

Conclusion

The project immediate objective was achieved to the effect that since the begin of 1986 no information was received on the existence of hide/skin stocks not collected either by the trade or by the tanneries. In actual fact a slight shortage of raw material is being felt lately, mainly due to the restriction of the movement of livestock in certain areas of the country.The virtual ban on the export of raw buffalo hides effective fro 1.April 1987 has improved the supply position of the local tanneries.The increase of the CLPC leather production and capacity utilization from a daily input of 4500 kg raw hide in 1983/84 to daily input of 9000 kg hides during the first quarter of 1987 has created a higher demand of raw material which as a consequence thereof has resulted in a more efficient hide skin collection,shorter

storage periods, thus contributing to the reduction of defects attributed to improper hide/skin preservation. Further the substantial increase in prices paid by the CLPC to the trade for first grade cattle hides (Rs 7,50 per kg, May 1987). In comparison, Rs 2,70 /kg was paid in July 1984 for the same material.

Recommendation

A meaningful and effective hide and skin improvement programme requires the implementation of a project designed for the very purpose, adequately funded and staffed, capable to carry out measures considered necessary to achieve the objectives of such a project. A background information for a drafting up a government request for such a project has been prepared as follow:

Subject: Request for a project designed to improve
the raw hide and skin quality in Sri Lanka

Hides and skins are by-products of the meat industry. The country's of hide and cattle is deriving from local slaughtering of cattle, buffaloes, goats and sheep. The quality standard of the hide and skin produced either in municipal slaughter houses or rural establishments are mostly of poor grades due to improper flaying, holes and incorrect curing. In addition to these faults pre-mortem damages inflicted to animal like branding are restricting to a great extent the manufacture of quality leather. The prevailing animal husbandry system and the mode employed for the transport of livestock, together with the techniques used in slaughtering affects the quality standards of the hide and skins.

The subject matter has been discussed frequently between the leather industry, meat producer association and the various government agencies involved, however no assessable progress towards the implementation of a country-wide hide and skin improvement programme has been achieved so far. The need to embark on such a programme was identified by all parties concerned and it is generally accepted that the quality of the available hides and skins could be substantially improved provided this sub-sector would receive adequate assistance to enhance the performance of the operations in these specific areas.

The Ministry of Rural Industrial Development, which is the sole government executing agency for livestock promotion in the country has been acting on a rather informal basis in upgrading the quality of raw hides and skins. However, it is felt that this Ministry of R.I.D. should take the lead in promoting and assisting the implementation of measures designed to enhance the overall raw hide and skin quality at the producer level including handling and storage. Since the UNIDO (United Nations Industrial Development Organization) through its project entitled "Assistance to the Leather Industry in Sri Lanka" is providing technical assistance with the objectives to enhance the leather processing capabilities and to improve the leather quality it was revealed that any further substantial improvement of the leather qualities is constrained by the poor raw material quality. Based on the estimated country-wide availability of about 40,000 bovine hides per month only 15%-20% of these hides are free of holes and visible grain damages, which in total is resulting in the following approximate grading yield of finished leather.

First grade ...	10%
Second " ...	20%
Third " ...	30%
Fourth " ...	40%

It may be quoted that the price difference between first and fourth grades is about Rs 30.00-Rs 50.00 per square meter of leather. The country's production of area leather is at present around 55,000 m² per month indicating a "quality loss" for the same periode valued at Rs 1-2 million incurred to the tanning industry.

It is felt that for the implementation of a meaningful and effective Hide and Skin Improvement Programme external assistance is needed.

Table 2

LIVESTOCK POPULATION 1950-1983
(Specieswise)
(000)

<i>Year</i>	<i>Cattle</i>	<i>Buffaloes</i>	<i>Goats</i>	<i>Sheep</i>	<i>Pigs</i>	<i>Poultry</i>
1950	1,105	522	370	44	74	n.a.
1951	1,112	568	411	73	74	n.a.
1952	1,189	627	446	84	69	n.a.
1953	1,228	656	499	104	74	n.a.
1954	1,277	707	564	95	83	n.a.
1955	1,432	795	491	89	43	n.a.
1956	1,450	789	471	65	43	n.a.
1957	1,449	701	464	64	72	n.a.
1958	1,417	723	433	52	74	n.a.
1959	1,486	781	487	49	77	n.a.
1960	1,562	812	491	52	76	3,409
1961	1,517	772	492	66	58	3,841
1962	1,326	667	454	49	69	3,600
1963	1,589	852	538	33	106	6,129
1964	1,853	1,002	567	37	127	6,279
1965	1,904	1,051	600	35	117	6,090
1966	1,746	772	590	26	122	6,500
1967	1,659	765	880	25	128	6,256
1968	1,660	783	584	25	124	6,748
1969	1,784	765	543	28	108	6,578
1970	1,596	736	558	27	108	6,856
1971	1,625	737	546	29	85	6,693
1972	1,617	748	562	29	102	9,127
1973	1,677	714	549	27	91	7,529
1974	1,686	736	547	30	49	6,521
1975	1,712	818	547	28	33	5,684
1976	1,744	854	562	30	36	5,700
1977	1,692	797	545	27	36	5,833
1978	1,541	814	450	23	41	4,912
1979	1,623	844	461	24	49	5,882
1980	1,227	843	493	28	71	5,341
1981	1,720	898	512	30	94	6,296
1982	1,699	879	512	28	75	6,249
1983	1,700	910	519	27	77	6,481

Note: Estimates based on returns by Revenue Officers

Source: Department of Census & Statistics

Table 3

LIVESTOCK POPULATION BY DISTRICTS - 1983

(Number)

District	Cattle	Buffaloes	Goats	Sheep	Pigs	Poultry	Ducks
Colombo ...	21.300	12.800	5.500	—	4.000	467.200	1.200
Gampaha ...	67.600	28.900	21.600	700	26.000	1.135.600	4.300
Kalutara ...	40.700	32.900	11.400	—	3.000	317.900	400
Kandy ...	54.700	25.600	21.300	300	400	460.800	800
Matale ...	46.800	31.600	10.100	200	900	132.700	300
Nuwara Eliya	37.900	8.200	9.900	—	600	104.200	1.000
Galle ...	31.100	13.900	8.800	100	300	178.700	500
Matara ...	30.500	13.700	4.900	100	200	97.900	100
Hambantota	74.300	81.600	5.800	1.400	100	93.700	200
Jaffna ...	167.400	2.600	132.000	17.400	500	535.600	300
Mannar ...	52.000	4.700	25.100	200	2.300	79.200	3.500
Vavuniya ...	42.800	2.300	6.900	—	100	73.400	100
Mullativu ...	52.200	10.400	12.700	500	100	88.600	—
Batticaloa	132.100	63.100	39.100	900	600	169.400	1.900
Amparai ...	84.500	43.400	8.800	100	—	124.700	1.300
Trincomalee	92.600	70.600	28.200	200	300	165.700	2.300
Kurunegala	202.000	176.200	48.500	4.100	14.700	578.900	1.500
Puttalam ...	92.900	22.400	31.400	1.800	16.900	727.700	2.600
Anuradhapura	148.900	90.100	31.100	—	800	182.100	200
Polonnaruwa	41.100	57.900	5.300	—	800	52.300	200
Badulla ...	61.500	19.000	13.600	600	300	186.700	200
Monaragala	40.600	22.600	3.300	—	100	77.200	—
Ratnapura	45.900	32.300	11.200	—	300	218.200	300
Kegalle ...	27.000	29.900	18.900	—	2.900	191.100	400
Mahaweli*	11.400	13.300	3.900	—	500	17.200	—
SRI LANKA	1.699.800	910.000	519.300	28.600	77.000	6.456.900	23.600

Note: Estimates based on returns furnished by Revenue Officers

*Denotes area under the Mahaweli Development Authority

Source: Department of Census & Statistics

Table 4

ANIMALS SLAUGHTERED AND PRODUCTION OF MEAT

Year	Animals Slaughtered (n)				Meat Production (t)		
	Cattle	Buffaloes	Goat&Sheep	Pigs	Beef	Mutton	Pork
1968	179.276	466	123.935	12.908	12.254.1	1.236.5	468.3
1961	181.946	462	125.453	11.566	12.434.6	1.251.7	419.6
1962	214.980	697	123.600	16.101	14.704.9	1.233.2	584.2
1963	183.077	5.339	121.430	13.406	14.367.0	1.211.5	486.4
1964	187.065	3.501	129.185	14.505	15.656.9	1.288.9	526.3
1965	201.663	3.848	140.166	13.735	15.446.1	1.398.5	498.3
1966	213.673	5.642	139.282	17.162	15.239.6	1.389.7	622.7
1967	217.957	5.177	160.717	19.954	15.472.6	1.603.5	723.9
1968	229.239	3.464	146.325	18.612	16.024.8	1.459.9	675.3
1969	237.413	3.336	125.903	18.542	16.567.1	1.256.2	672.7
1970	234.720	3.343	130.503	18.499	16.383.9	1.302.1	671.2
1971	251.850	3.710	122.762	22.188	17.595.7	1.224.8	805.0
1972	242.324	1.994	113.773	20.524	16.733.7	1.135.2	744.6
1973	251.154	1.405	124.725	16.859	17.260.2	1.244.4	611.7
1974	247.756	366	137.502	15.481	16.899.6	1.371.9	561.7
1975	246.022	230	141.340	12.881	16.764.0	1.410.2	467.3
1976	222.493	485	133.360	13.236	15.196.5	1.330.6	480.2
1977	194.911	29	128.156	19.077	13.262.6	1.265.5	692.1
1978	189.269	29	126.876	18.426	12.878.6	1.265.9	668.5
1979	175.158	07	123.630	23.021	11.916.9	1.233.5	835.2
1980	178.048	—	136.877	31.508	12.112.0	1.365.7	1.1431
1981	182.874	—	137.137	24.389	12.442.0	1.368.5	885.0
1982	182.659	—	162.963	21.551	12.420.0	1.629.6	775.8
1983	191.824	—	134.091	17.303	13.044.0	1.340.9	622.9

Note The number of animals slaughtered at slaughter houses for consumption having obtained licences from the Local Government bodies is included here. Animals slaughtered without authority are not included. Meat production is estimated on the basis of animals slaughtered by using the following conversion factors: cattle (68 kg per head, buffaloes 113 kg per head) goat and sheep (10 kg per head), and pigs (36 kg per head).

Source Department of Census & Statistics (modified)

Table 5

The distribution of slaughter houses in Sri Lanka

There are approximately 140 registered slaughter houses spread throughout the country. Slaughter houses where more than 15 heads of cattle are slaughtered per day are as follow:

Moratuwa	average 26	cattle/day
Wattala	" 23	"
Negombo	" 20	"
Kandana	" 15	"
Kochchikade.....	" 25	"
Kurunegala.....	" 15	"
Kandy.....	" 50	"
Hatton/Dickoya...	" 18	"
Pussellawa.....	" 30	"
Nuwara Eliya.....	" 16	"
Matale	" 15	"
Badulla	" 15	"
Irravalu South ..	" 15	"
Trincomalee	" 15	"
Jaffna	" 30	"

Slaughter figures : Colombo Municipal Abattoir

Year	Cattle	Sheep/Goats	Pigs
1978	27.859	81.381	16.947
1979	25.810	73.988	16.568
1980	25.747	88.631	21.373
1981	23.740	89.761	19.046
1982	19.461	109.387	14.900
1983	16.270	79.369	9.172
1984	13.157	91.625	12.050
1985	13.472	100.326	10.760
1986	13.719	77.368	9.020

Note: there is a complete ban on the slaughter of female cattle at the Colombo Municipal Abattoir since 1980, being a government decision.

The daily slaughter rate of legally slaughtered cattle is estimated between 700-800 heads over the island.

Source: Colombo Municipal Slaughter House (27.05.1987)

Preparation of a programme for the improvement of tanning, dyeing
and finishing (CLPC)

Activity no: fourlinked to Output no: two

Finding :The CLPC tannery in 1984

The installed production capacity of the tannery departments combined is assessed being: for area leather approx. 180.000 DMS }
for sole leather about 10.000 kg } per month

Chrome tanning department:

This department is fairly well equipped featuring all the basic machinery required, however a good part of the equipment is considered on a run-down condition. Only one soaking/liming drum was functioning, the second drum was under repair. The purchase of one locally manufactured drum was approved at the end of 1984. The liming drums have a capacity to handle at least 3000 kg but could be loaded with up to 4000 kg raw hides. Two tanning drums of 2500 kg loading capacity each and four dyeing drums capable to process batches of 200 kg shaved wet-blue leather. One large fleshing machine, one functioning splitting machine (the other one was not being used after the new machine was installed) together with sammying - and one setting out machines are forming the part of the equipment in the chrome tannery's wet-section. The shaving machine, throughfeed type, (1500 mm) and three smaller units (600 mm and two 800 mm) of the conventional type could cope with the work in progress. Drying was carried out on two toggle dryer units of 60 frames each. One vibrating staking machine and four buffing machines, two large, two small and one dedusting machine are installed in the dry section of the chrome tannery. The finishing section consists of hydrolic presses, one rotary spraying machine connected to a steamheated drying tunnel, There is also one spraying chamber for smaller production lots. The pigment base coating is done manually using pads and tables, the pigmented leather is dried in five chambers. For the measurement of leather a pinwheel measuring machine is employed.

During the end of 1984 one large tanning drum with a processing capacity of up to 6000 kg limed stock, one dyeing drum capable to retain and dye up to 600 kg at a time and one vacuum dryer, two table version, were installed.

Shortcomings identified:

The irregular and inconsistent flow of work in progress is impeding an effective control of the overall leather processing operations aggravated further by the frequent mechanical breakdowns of key production equipment and the poor attendance of the regular work force in particular with regards to the afternoon/night shift. A proper production planning, costing, quality control and evaluation of the different operations appears under this condition impossible to implement.

The production mix:

Due to the manifold defects of the local raw hides the quantity of certain types of leather, eg. full grain leather, which can only be produced out of a good raw material is limited, the bulk of the production is only suitable for corrected/embossed grain leather. A substantial part of the regular production can only be turned into shoe lining leather. The production mix for the periode from March 1985 to November 1985 was as follow:

Full grain leather....	12%
Corrected grain "	29%
Embossed grain "	27%
Lining leather	24%
Others(suede, ect.)....	<u>8%</u>
	100%

Vegetable tanning department (bark tanning)

This tanning section is housed in two buildings constructed in 1941. One shed like construction accommodates about 50 tanning pits each capable to hold 5000-6000 l tanning liquor. Depending on the type vegetable leather processed it is estimated that this unit is capable to produce approximately 10 ton of sole leather or similar type of leather per month. The consumption of tanning material, mainly imported wattle tanning extract, is relatively high due to the inconsistency of the production flow associated with the unfavourable working condition in that section.

The main building contains the lime yard with one large fleshing machine, three concrete vats and nine concrete liming pits, two pretanning drums having a loading capacity of 500 kg each, one setting out machine, one hydrolic leather press, a dry splitting machine, a jaw arm staking machine and one leather spraying unit.

Shortcomings identified:

The outdated constructions with regards to passages, supporting pillars, clearances and limited floor space constrains the accesibility to the key production production equipment by mechanical means (fork lift). Further the whole water supply system is incaplable to provide the volume of water required by the various units. Taking into consideration the forecasted lower demand for sole leather in the future and the increased demand for other vegetable tanned leather the project is recommending the phasing out of the pit tanning operation. The installation of a drum specially designed for the vegetable tanning process is recommended. During 1985 most of the lime yard areas was demolished in order to provide the space needed for the setting up of the goat skin tanning unit.

Production mix:

Vegetable tanned leather is mainly produced in accordance with the specific requirements of sole leather, sandal leather (kattai) belt leather, and soft leather (natural) for the manufacture of

travel bags. The correct percentage of the production mix can not be assessed due to the prevailing practice of intermixing and different terms of recording, eg: kg for sole leather, DSM for area leather. However production figures for the years 1984, 1985, 1986 and the first quarter of 1987 are indicating the following production mix:

	1984	1985	1986	1987 (Jan-March)
Sole leather (cattle+buffalo)	37%	64%	45%	44%
Sandal and similar leather	55%	32%	58%	50%
Others, like belting leather	8%	4%	7%	6%

Note: to obtain a comparable estimate one kg sole leather, regardless of substance and thickness, was considered equal to 2.50 DMS.

The Modernization and Expansion Programme of the
CLPC Chrome Tannery

The modernization programme of the chrome tannery was split into three phases, namely:

- phase I: installation of
- a) Vacuum Dryer (one)
 - b) Rotary Spraying Machine
- August-Sept. 1984
- Eight Gun Model (one)
 - c) Large Tanning Drum (one)
 - d) Dyeing Drum (one)

total cost of equipment and machinery including installation Rs 3,770,572

- phase II: installation of
- a) Through Feed Shaving Machine (one)
 - b) Through Feed Samming Machine (one)
 - c) Fleshing Machine (one)
 - d) Liming Drum (one)
 - e) Tanning Drum (one)
 - d) Dyeing Drum (one)

} for
} Goat
} Skin
} Pre-
ject

total cost of equipment and machinery including installation Rs 6,133,684

Phase III: planned installation of a) Reverse Roller Coating Machine (one)

The experimental drum was installed December 1986

b) Experimental Tanning Drum Stainless Steel (one)

c) Electronic Weighing Machine (one)

the total cost of the machinery and equipment including installation was expected to be in the region of Rs 2,500.000

Initially the expansion programme ,phase III, has also provided for one large vegetable tanning drum (3.00 m X 3.50 m) was however considered, due to the financial constraints as a second priority investment. The earmarked drum would have cost US \$ 47.000 complete, basis ,CIF Colombo. Realizing the need of streamlining the vegetable tanning process the CLPC Board has decided in April 1987 to purchase the vegetable tanning drum as already recommended by the project.

Justification of the Tannery Expansion Programme. Phase III.

With the completion of the expansion programme, phase II and in order to retain the momentum of the development the acquisition of additional modern machinery was considered essential to consolidate the achievements attained through the implementation of phase I, and phase II.

a) Roller Coating Machine:

With the completion of the tannery expansion programme, phase II the tannery could increase its hide intake by 50% (from 6 ton to 9 ton per working day) and also in addition provided with a production capacity to process up to 20.000 goat/sheep skins per month. The bottle neck experienced in key areas of the finishing section is constraining the smooth work flow. The increased production will generate on average 650-900 pieces of chrome tanned hides or 1300-1800 sides (halved hides) per day. This volume of leather, measuring approximately 15.000 - 18.000 DSM can not be processed further in the conventional manner without the risk

of quality inconsistency. The processing of lower type raw material requires in most cases a different technological approach in particular with regards to finishing. Therefore, the enhanced utilization of such raw material, processed into higher quality leather through the application of modern pigmenting techniques would be instrumental to achieve this objective.

The installation of a Reverse Roller Coating Machine specially designed for this purpose will not only provide the needed infrastructure to streamline and rationalize the leather finishing operations but it will also make it possible to manufacture leather splits into coated shoe upper material. The economic benefit deriving from the installation of the recommended Roller Coating Machine interlinked with a Drying Tunnel (required to dry the pigmented leather on a conveyor system) can be expressed as follow: total production of chrome leather

15.000 - 18.000 DSM /day, or

300.000 - 360.000 DSM /month

of which approximately 25% is considered suitable for the manufacture of lining or similar leather, totalling about 75.000 - 90.000 DSM. Out of this quantity roughly 40%, being 30.000 - 35.000 DSM could be upgraded into pigmented shoe upper leather (corrected grain leather). The price difference (CLPC internal transfer price) between lining leather and corrected grain leather varies between Rs 4.00 - 7.00 per DSM. The cost of chemicals and pigments needed to upgrade this basically low grade leather into corrected grain leather is approximately Rs 1.50 per DSM, which would indicate a total leather improvement worth between Rs 80.000 - 180.000 per month (basis 32.500 DSM). In addition to, 6000 - 8000 DSM of potentially available leather splits could also be processed into upper material valued around Rs 90.000 - 130.000 per month.

Taking into account the technological advantage together with the economic benefit expected from the operative performance of a Roller Coating Machine it is felt that the investment for such an equipment is fully justified.

b) Electronic Weighing Machine:

With the streamlining of the transport operations between the various production departments, made possible through the acquisition of a forklift, the work in the raw hide store could be rationalised.

As the accuracy of the weighing machine presently used is questionable and the weight range of this equipment is limited to 500 kg only, the correct weighing of the daily raw hide transfer - 9000 kg - is not possible. It would also be impossible to weigh the prepared raw stock palleted. For this reason the purchase of a suitable weighing machine is necessary, this will allow for the proper weight assessment of the soaking lots splitted up into pallets loaded with 1000 kg of raw hides each. By assessing the actual weight of the soaking lots (3000 kg/lot) the relevant demand of the liming chemicals can be properly calculated.

Required is a weighing machine featuring a capacity of up to 2000 kg, having a platform of approximatel 1,20 m X 1,30 m made of stainless steel. In consideration of the prevailing environmental conditions in the raw hide store, particular with regards to the formation of rust, an electronic load cell operated machine is proving superior in comparison to the mechanical type.

c) Laboratory Equipment - Experimental Tanning, Dyeing Drum

In order to carry out reliable and reproduceable tests of leather tanning, dyeing chemical as well as to enable the Tannery Research and Development Section to engage in meaningful and practice oriented experiments in leather processing so as to assist the tannery management in their efforts to produce better quality leather at a competitive price, a suitable experimental tanning drum, preferable made of stainless steel equipped with automatic devices for temperature and speed control. A holding capacity of 50 l is considered sufficient.

d) Vegetable Tanning Drum

The existing facilities where vegetable tanned leather is processed are completely outdated, using the afore mentioned pit methode. The tanning process in non-agitated tanning liquors

is slow, varying from two weeks to over one month. The capital employed to finance the tanning stock during this long process is unproportionally high in comparison to the drum tanning method where within 2-3 days a complete tanning can be achieved. The drum recommended, equipped with temperature and speed monitor devices would be capable to increase the vegetable leather production substantially and achieve a high standard of quality consistency of the leather manufactured. The installation of a vegetable tanning drum would also streamline the whole tanning operation.

The initial requirement of wattle tanning extract needed to obtain the necessary concentration of the tanning liquor is extremely high, on the average 1200 kg per pit. Taking into account that about 40 pits are filled with tanning liquor—the others are used for washing purposes—it would indicate that about 45,000 kg of wattle tanning extract is needed to achieve the average strength of the tanning liquor. One ton of imported wattle tanning extract, delivered at CLPC cost at present Rs 35,000. The drum tanning method requires about up to 10% less vegetable tanning extract.

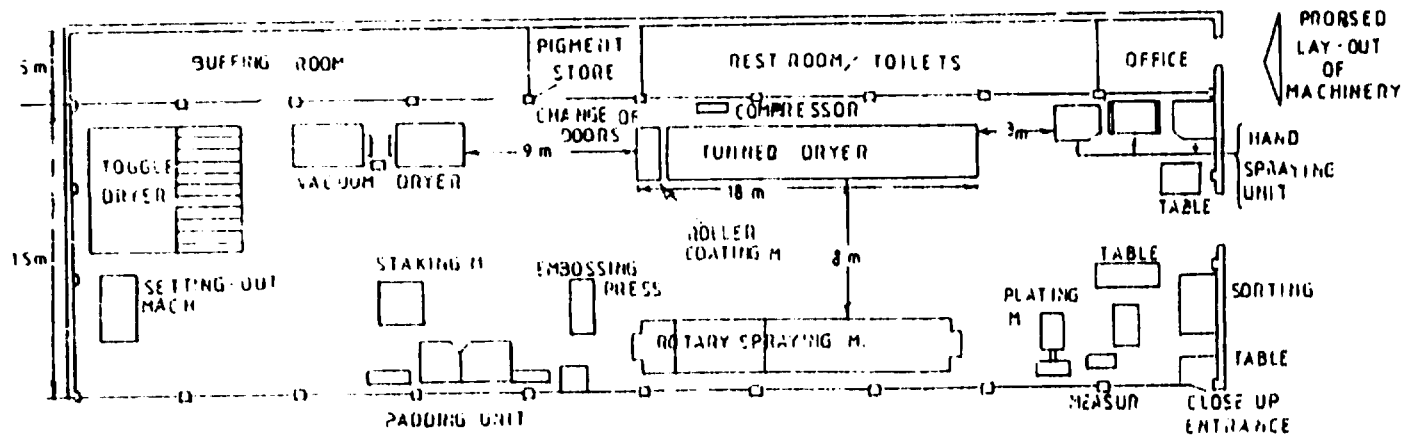
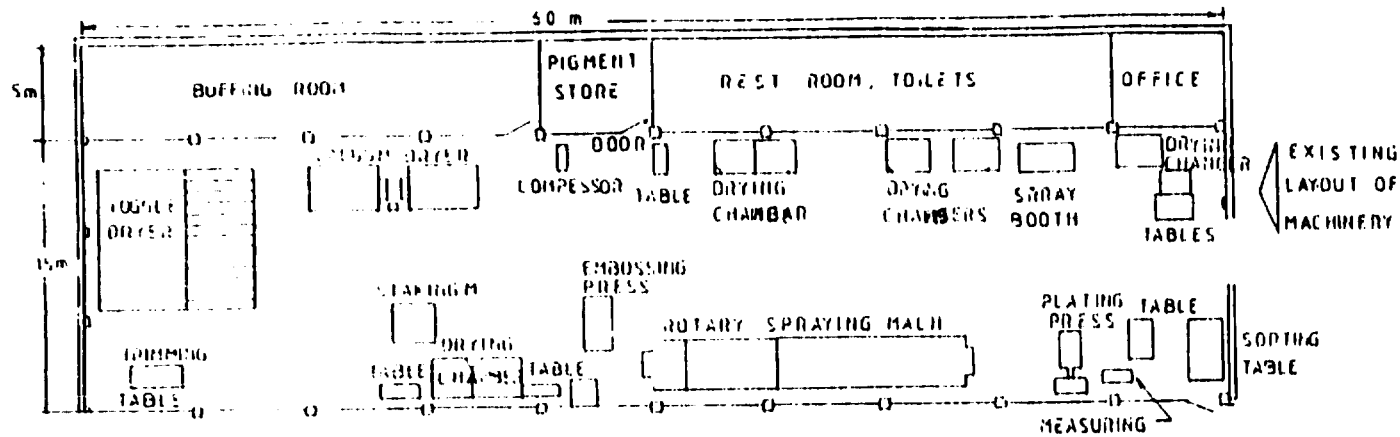
Further, the prevailing environmental conditions (building) in the vegetable tanning department are considered detrimental to any meaningful enhancement regarding productivity and motivation of the work force employed.

With the commissioning of the recommended tanning drum it is expected that approximately

50,000 DSM of area leather (depending on the
thickness)

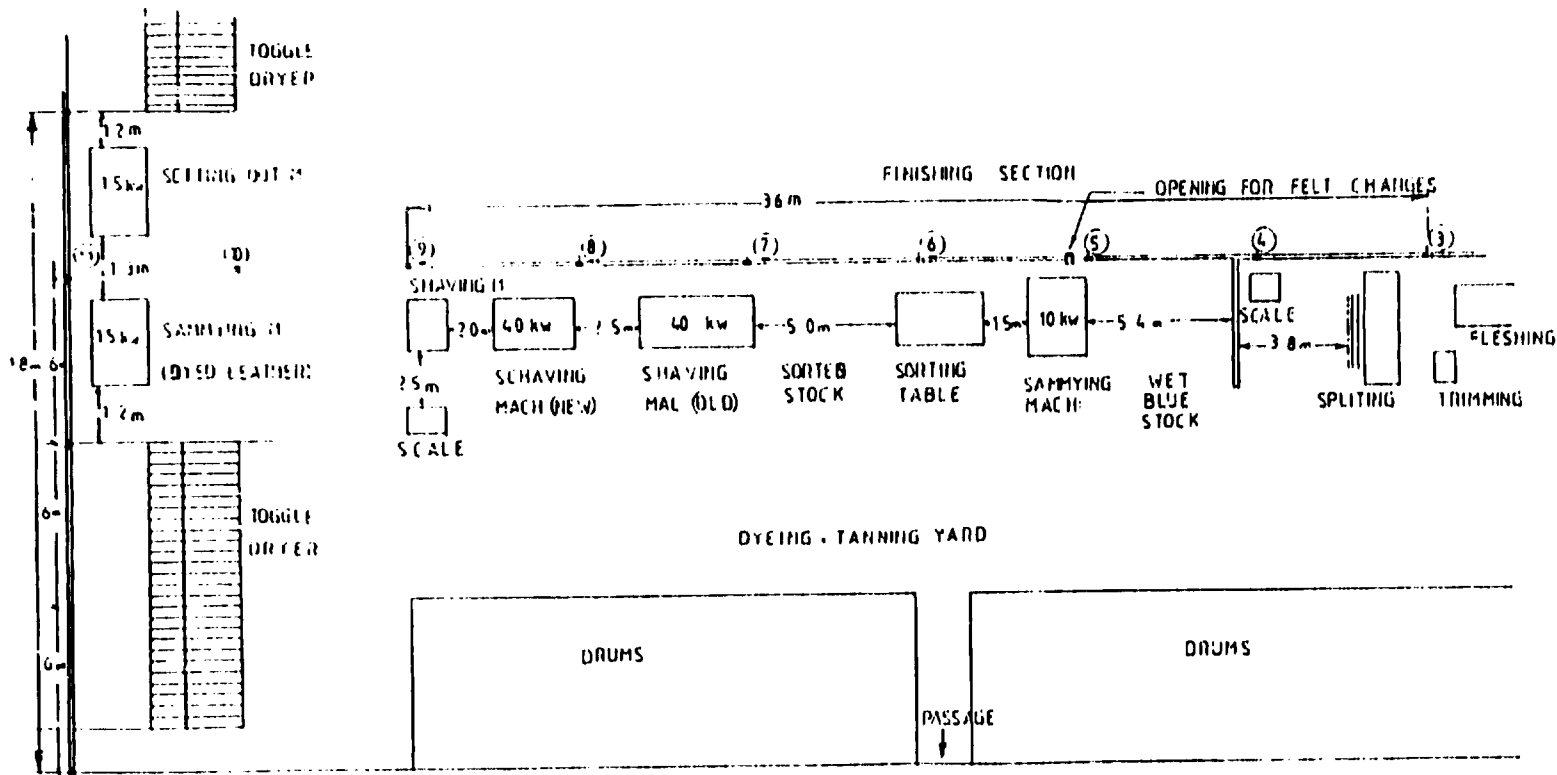
10,000 kg of sole leather

could be produced per month.



CHROME LEATHER
TANNERY- FINISHING DEP
-CLPC-

FIGURE NO. 97 Plan Phase-III
SCALE - 1/300
DRAWN BY - K A JHEEPALA
APPROVED BY - S. FELCHER
DATE - 1985-07-26



PROPOSED ARRANGMENT
 OF MACHINERY IN THE
 CHROME TANNERY
 C. L. P. C.
 FIGURE NO 01 PHASE II
 SCALE 1:100
 DRAWN BY - K. A. J. HANAPALA
 APPROVED BY - S. S. SETHI
 DATE - 1995.4.15

Recommended Time Management Plan for the CLPCChrome Leather Tannery (Wet-Section)

The increase of the soaking and liming capacity of wet salted bovine hides by 50% was made possible through the installation of a third soaking/liming drum. The capacity was increased from 6000 kg to 9000 kg per day, a further increase to 12,000 kg/day is realistic, however might not be required. To carry out all the operation on a timely basis a strictly adherence to a time management plan for the different integrated production processes is required for the planned flow of work in progress.

1. Preparation of raw material

The soaking lots, as referred to in the monthly Soaking Plan must be prepared one day before the raw material is required by the liming section. The hides of one individual soaking lot are staked on three pallets, carrying 1000 kg hides each, therefore nine pallets are needed for the timely preparation of three soaking lots of 3000 kg each. The lots have to be prepared in the morning, being the first operation in the raw hide store, and will therefore if started early not interfere with the sorting, weighing, classification and salting of fresh hide deliveries. The emptied pallets have to be returned to the raw hide store and will remain under the responsibility of the same.

2. Soaking and liming

The soaking and washing of wet salted hides should be carried out at least for five hours. The soaking operation is followed by the liming process in the same drum for another 16 hours. In order to achieve the desired soaking and liming effects within the available period of time—in total 22 hours—all three soaking/liming drums have to be reloaded with the new soaking lots by 9 a.m. However, this will only be possible, if the drums have been off loaded by 7 a.m. To achieve this performance the rinsing and washing operation of the limed stock must commence at 6 a.m., continuing for one hour.

The off loading of the washed limed stock and the loading of the fresh hides has to be done simultaneously (a team of two workers assigned per drum). This measure will ensure the timely availability of the emptied drums at around 8.30 a.m.

3. Fleshing

The fleshing operators (have) have to start with the fleshing operation not later than 7.30 a.m. They are expected at their designated working place at 7.00 a.m. The time from 7.00 a.m. to 7.30 a.m. should be utilized for checking and setting the fleshing machine. The fleshing operation, on the average 300-500 hides per day, shall be completed within six hours (150 - 180 hides/hr). After the fleshing has been completed the operators shall be allowed to leave the factory premises. Cleaning and servicing of the machine together with the splitting machine should be carried out by another team assigned for this particular purpose.

4. Trimming of fleshed hides

The increased quantity of fleshed hides ready for trimming within the periode needed for fleshing does not pose any unmanageable problem to the trimmer (a team of four). However, arrangements, preferable the same team assigned to the liming drums should be made available to remove the hide trimmings. The trimming will commence with the fleshing operation and be completed at the same time.

5. Selection of limed hides

A preselection of the fleshed and trimmed stock according to the suitability of the material should be carried out. The selection can be done by one person and one helper during the fleshing and trimming operation. The main purpose of this selection is to determine the type of leather which can be most profitable processed out from a given limed hide material. In most instances it will be at this point decided if a certain material is chrome or vegetable tanned at a later state.

7. Weighing of splitted hides

This work is directly linked to the splitting operation and to avoid the accumulation of splitted stock, which might congest the surrounding areas, the splitted hides are palleted and weighted as they are released from the splitting machine. One person and four pallets are required to carry out this work. The recording of the weight of the pallets is done on a blackboard.

With the last hides running off the splitting machine, the weighing operation will be completed too, at about 2.30 p.m.

3. Offloading and loading of the chrome tanning drum

- a) Offloading: The final pH control of the chrome tanning liquor and if required the necessary adjustments to obtain the needed basicity should be made at 7.30 a.m., followed by the boiling test at 8.00 a.m. If the laboratory control officer is satisfied with the results the drum is ready for off loading at 8.15 a.m. Six pallets are needed to pile up the chrome tanned hides, approximately 6000 - 7000 kg, for which three persons are required. The loading of the tanned hides (wet-blue) onto the pallets shall be completed at around 11.30 a.m. However, the reloading of the drum with the first batch of splitted hides can commence intermittently at 10.00 a.m.
- b) Loading: The loading work will be completed around 2.45 p.m. and is directly followed by the rinsing, delimiting, pickling and tanning operation for which one trained operator and one helper is needed.

9. Chrome tanning

The tanning operation will be completed by 6.00 a.m. the following day where the tanning liquor is checked subsequently.

10 Sammying

The newly installed through feed sammying machine is capable to dewater about 150 - 180 whole hides per hour, which ascertains that the average daily production of wet blue made up 300 - 500 hides can be handled by the leather press within 5 - 6 hrs. The chrome tanning stock offloaded the previous day and stored on six pallets next to the sammying machine over night will be sammyed during the morning, from 7.30 - 11.30.

Cleaning and greasing of the sammying machine will demand one hour and it is expected to be carried out by the same operators (three persons).

11. Selection and halving of wet-blue hides

The rewatered hides as delivered by the sammying machine will be directly afterwards spread out onto the sorting table for halving and immediate selection. The sides are graded, selected individually according to thickness, substance, grain structure, area and defects. For spreading out,

cutting the hides into halves, selection and removal, three workers and one selector is needed. The assorted sides are staked on pellets, properly marked and transported to the shaving machines. The grading of the wet-blues will be completed simultaneously with the sammying operation (2.30 p.m.). During the following spare time the workers are expected to clean the work area and sharpen their cutting knives. The selector has recorded the results of the day's grading on the sorting sheet , table 6 .

12. Shaving of wet-blue leather

The shaving capacity of both through feed shaving machines is about 110 - 130 sides per hour each. Therefore the expected output of shaved sides for an eight hour working period is conservatively assessed of around 800 sides per machine, together 1600 sides. Depending on the requirement of vegetable tanned leather which are selected already at the stage of fleshing/splitting, the total quantity of hides chrome tanned is reduced accordingly. At least four permanent shaving machine operators, two for each machine (including a trainee /standby operator) are required to cope with the daily work load. As a rule, no accumulation of unshaved stock must be allowed and under no circumstances unshaved or shaved hides to become dry. The removal of chrome shavings has to be carried out on a continuous basis without interrupt the actual shaving operation (two worker). A team consisting of one mechanic and one helper will be assigned to service the machines after the work is completed (about 5 p.m.)

13. Trimming of shaved stock

It requires three workers to trim off loose parts, strands and useless areas from the shaved sides, thus saving not only chemicals and dye stuff but improves the performance of the slicking operation at the vacuum dryer, as well as minimizing the need for trimming after dyeing and finishing

14. Weighing of shaved and trimmed wet-blue leather

One person is needed to prepare, weigh and issue the identification cards of the assorted lots in accordance with the requirements of the leather dyeing program.

15. Retanning and dyeing

On the average 1600 - 1700 shaved wet blue sides will generate eight lots for retanning and dyeing, weighing either 400 kg or 200 kg each. The work will be carried out in five drums by three operators and three helpers, which under normal circumstances enable the team to complete

Table 6

SCOTTING TABLE OF WET - BLUE CHROME LEATHER

DATE	LOT NO.	TYPE OF HIDES	QUANTITY	TIME	HALE OF SORTER

SPECIFICATION

CIVIL	CORRECTED GRAIN					FULL GRAIN					LINED	SUEDE	
	MARKET	OTHER	ANT LINE	BATA	SP	NAPPA	C - CRUST	V-BALL	UPH				
10	10	5	10	10	5	10	10	5	10	5	10	5	10
20	20	10	20	20	10	20	20	10	20	10	20	10	20
30	30	15	30	30	15	30	30	15	30	15	30	15	30
40	40	20	40	40	20	40	40	20	40	20	40	20	40
50	50	25	50	50	25	50	50	25	50	25	50	25	50
60	60	30	60	60	30	60	60	30	60	30	60	30	60
70	70	35	70	70	35	70	70	35	70	35	70	35	70
80	80	40	80	80	40	80	80	40	80	40	80	40	80
90	90	45	90	90	45	90	90	45	90	45	90	45	90
100	100	50	100	100	50	100	100	50	100	50	100	50	100
110	110	55	110	110	55	110	110	55	110	55	110	55	110
120	120	60	120	120	60	120	120	60	120	60	120	60	120
130	130	65	130	130	65	130	130	65	130	65	130	65	130
140	140	70	140	140	70	140	140	70	140	70	140	70	140
150	150	75	150	150	75	150	150	75	150	75	150	75	150
160	160	80	160	160	80	160	160	80	160	80	160	80	160
170	170	85	170	170	85	170	170	85	170	85	170	85	170
180	180	90	180	180	90	180	180	90	180	90	180	90	180
190	190	95	190	190	95	190	190	95	190	95	190	95	190
200	200	100	200	200	100	200	200	100	200	100	200	100	200
210	210	105	210	210	105	210	210	105	210	105	210	105	210
220	220	110	220	220	110	220	220	110	220	110	220	110	220
230	230	115	230	230	115	230	230	115	230	115	230	115	230
240	240	120	240	240	120	240	240	120	240	120	240	120	240
250	250	125	250	250	125	250	250	125	250	125	250	125	250
260	260	130	260	260	130	260	260	130	260	130	260	130	260
270	270	135	270	270	135	270	270	135	270	135	270	135	270
280	280	140	280	280	140	280	280	140	280	140	280	140	280
290	290	145	290	290	145	290	290	145	290	145	290	145	290
300	300	150	300	300	150	300	300	150	300	150	300	150	300
310	310	155	310	310	155	310	310	155	310	155	310	155	310
320	320	160	320	320	160	320	320	160	320	160	320	160	320
330	330	165	330	330	165	330	330	165	330	165	330	165	330
340	340	170	340	340	170	340	340	170	340	170	340	170	340
350	350	175	350	350	175	350	350	175	350	175	350	175	350
360	360	180	360	360	180	360	360	180	360	180	360	180	360
370	370	185	370	370	185	370	370	185	370	185	370	185	370
380	380	190	380	380	190	380	380	190	380	190	380	190	380
390	390	195	390	390	195	390	390	195	390	195	390	195	390
400	400	200	400	400	200	400	400	200	400	200	400	200	400
410	410	205	410	410	205	410	410	205	410	205	410	205	410
420	420	210	420	420	210	420	420	210	420	210	420	210	420
430	430	215	430	430	215	430	430	215	430	215	430	215	430
440	440	220	440	440	220	440	440	220	440	220	440	220	440
450	450	225	450	450	225	450	450	225	450	225	450	225	450
460	460	230	460	460	230	460	460	230	460	230	460	230	460
470	470	235	470	470	235	470	470	235	470	235	470	235	470
480	480	240	480	480	240	480	480	240	480	240	480	240	480
490	490	245	490	490	245	490	490	245	490	245	490	245	490
500	500	250	500	500	250	500	500	250	500	250	500	250	500

TOTAL SIDES/HIDES SORTED :

The work will be carried out in five drums by three operators and three helpers, which under normal circumstances enables the team to complete their work within the regular hours (7.30 - 17.00 hrs).

16. Sammying and setting out

The capacity of the roller type sammying machine used for the leawatering of retanned/dyed leather is around 100 - 140 sides per hour, however not all retanned hides are sammyed, therefore two operators for each machine are needed to cope with the regular daily production. Their working hours will be from 7.30 in the morning to 17.00 in the afternoon and if required from 17.00 hrs to 22.00 hrs. The servicing of both machines is carried out by the team assigned for the same work at the fleshing and splitting/sammying/shaving machines (14.00 - 23.00).

table 7 shows the time chart for the chrome tanning department

The assessment of the production capacity of the chrome leather finishing section is shown as per Annex III.

Possibilities to reduce leather waste and saving of chemicals in the CLPC chrome leather production.

To reduce the volume of trimmed off areas at the various stages of the leather processing operations will not only enhance the yield of the leather manufactured but will also contribute to the saving of leather processing chemicals and dyeing auxiliaries used in the leather production.

Focussing on the following operation such as:

- Trimming of raw hides prior weighing and acceptance
- Weighing before soaking
- Trimming after fleshing
- Utilization of splits and trimming for gelatine manufacture
- Trimming after shaving
- Trimming after toggling or vacuum drying
- Trimming after finishing before measuring

suitable measures for an effective waste reduction are recommended.

Trimming of raw hides:

Raw hides should be trimmed off their cheeks, ears and the lower part of their tails. Checking through a consignment of cattle hides stored at the CLPC it was found that 2% of hides have been left with ears, in case of buffalo 4%. Two ears weighing on the average 950 g. The weight of an average sized tail end is 130 g.

Last year (1986), 154.600 bovine hides were put into production which would account for 20.100 tail ends in addition to 3.600 kg of ears totalling 29.700 kg raw material for which in the form of untrimmed raw hides has been paid for. At the present average price of Rs 7.00 per kg raw hide, the loss incurred was around Rs 208.000 for 1986.

Weighing of raw hides before soaking:

For a proper process control it is absolutely necessary to obtain the weight of the raw hides destined for soaking. Knowing the correct weight the quantity of the liming chemicals can be worked out accordingly.

In instances where the soaking lots are underweight, the liming chemicals are wasted proportionally. The loss of weight experienced in the raw hide store can be as much as 10% which should be considered when the hides are prepared for soaking. The tannery's input per working day is at present 5000 kg - estimated. The cost to lime the estimated 5000 kg hides requires chemicals worth about Rs 300.-. An underweight of 10% would indicate a daily loss of Rs 30.

Trimming after fleshing:

The trimming after fleshing is carried out still too generously and is not always in line with the actual purpose of the trimming operation. Assessing the area of unnecessarily trimmed off hides substances a loss in area of approximately 0.75 DSM per hide appears quite realistic. Based on the last years (1986) tannery throughput, 116.00 DSM of lined stock was lost through negligence and incorrect trimming. Taking into account an estimated value of Rs 10.00/DSM for a material of this lined product the total loss during 1986 could be as high as Rs 1.16 mill.

Utilization of low grade splits and trimmings for gelatine manufacture:

As an average, the splitting of lined hides generates about 1200 kg of splittings with no further use for the tanning industry. This quantity of splits when dried yield approximately 350 kg substance. The export value per ton is at present US \$ 360.00, in other words US\$ 126.- (Rs 3.600.-) could be realized per day if all splits are dried up. Further, even dried trimmings are excepted, this waste could be dried out on a concrete base.

Trimming after shaving:

Loose strands and non-utilizable parts of leather substances attached to the shaved hides (sides) shall be trimmed off prior weighing, retanning and dyeing. The volume of trimmings obtained after shaving represents about approximately 7-11% of the total weight of shaved material, which means that for every 1000 kg shaved and untrimmed wet blue leather to be dyed, 70 - 110 kg of it will consume unnecessarily chemicals for no economic benefit.

The retanning, dyeing and finishing process of 1000 kg wet blue leather selected for full grain leather (1.7mm shaving thickness, 370 - 400 sides) will require chemicals and auxiliaries in the value of Rs 14.722 (based on 1.25% acid dyes). Based on the usual volume of shaved leather earmarked for retanning and dyeing—about 2500 kg per day—and calculated conservatively on 5% potential trimmings, it emerges that about 200 kg fibre strands and odd parts which are further processed will absorb chemicals worth Rs 2900.- per day. As a good part of the shaving strands are bound to be rubbed off during the drumming and subsequently discharged into the sewer system, the sludge accumulation is unproportionally high. Further, as a consequence, provided the material is trimmed prior retanning, the dyeing capacity of the drums could be increased by 3%.

Trimming after toggling/vacuum drying:

This operation can if necessary at all be reduced to the bare minimum. Emphasis on correct trimming should be given to leather earmarked for buffing of corrected grain or suede leather.

Trimming before measuring:

Only in instances where absolutely required as in case of upgrading of leather destined for export.

Conclusion:

If the required measures are implemented to reduce the leather waste and enhance the utilization of leather processing chemicals the monthly saving during 1986 could have been as follow:

Raw hides.....	Rs 17.300
Liming(5% underweight)...	Rs 3.400
Lime yard trimming.....	Rs 96.600
Saving of chemicals through trimming after shaving....	Rs 58.000
Trimming of dried leather based on saving of 1 DSM leather per hide:12.330 hides month, Rs 10.- DSM. Rs 25.600	
<hr/>	
total saving per month	Rs 431.300 *****

The CLFO Leather Production

With the completion of the streamling of the key production areas and the improved raw hide supply position the increase in the total leather production is expressed as follow:

For the inputs table no 3 refers to.

<u>Outputs Production:</u>	1984	1985	1986	1987 (Jan-Mar)
Chrome tanned leather	1.903.585 DSM	2.314.330 DSM	2.420.700 DSM	758.491 DS
Vegetable tanned "	177.108 DSM	122.435 DSM	129.220 DSM	47.280 DS
	<u>2.080.696 DSM</u>	<u>2.436.765 DSM</u>	<u>2.669.980 DSM</u>	<u>805.771 DS</u>
 Vegetable sole leather	 48.303 kg	 68.176 kg	 68.263 kg	 24.561 kg

Conclusion: the figures given above indicate an increase of leather production with respect 1984-1986 of 28% regarding to area leather and 41% in case of sole leather.

The production of goat skin leather during 1986 was 93.100 DSM. However, the production of area leather for the first quarter of 1987 shows an increase of 55% compared to the 1984 average figure. Sole leather worked out on the same basis indicated an increase of 117%

Utilization of project results

With the installation and commissioning of the new leather production equipment the tanning capacity utilization based on raw material input of 2000 kg per working day is for the period 1984-1987 as follows:

1984: 56% (1200 ton)

1985: 72% (1551 ton)

1986: 84% (1806 ton)

1987: Jan-March 106% (574 ton, due to overtime)

The implementation of the recommendation covering a wide range of issues in the leather production has contributed to the overall project results.

Conclusion

The project immediate objective was achieved, the substantial increase in the leather production and the introduction of a system enabling the smooth flow of work in progress together with a better process monitoring of the technologies employed have resulted in the improved quality of finished leather. Through the implemented modernization programme the working conditions and environment have improved considerably.

Recommendation

Stricter adherence to the time management plan. The eight hour day shift has been introduced and is in force since 20 April 1987.

Preparation of an evaluation report of the present grading system of finished leather and recommendation of more market-oriented alternatives.

Activity no: eight = output no: three

Introduction

An integrated system of grading and selection of hides and skins at the different levels of the leather processing operation shall provide the necessary control mechanism designed to reduce the percentage of lower quality material at the final grading of the finished leather.

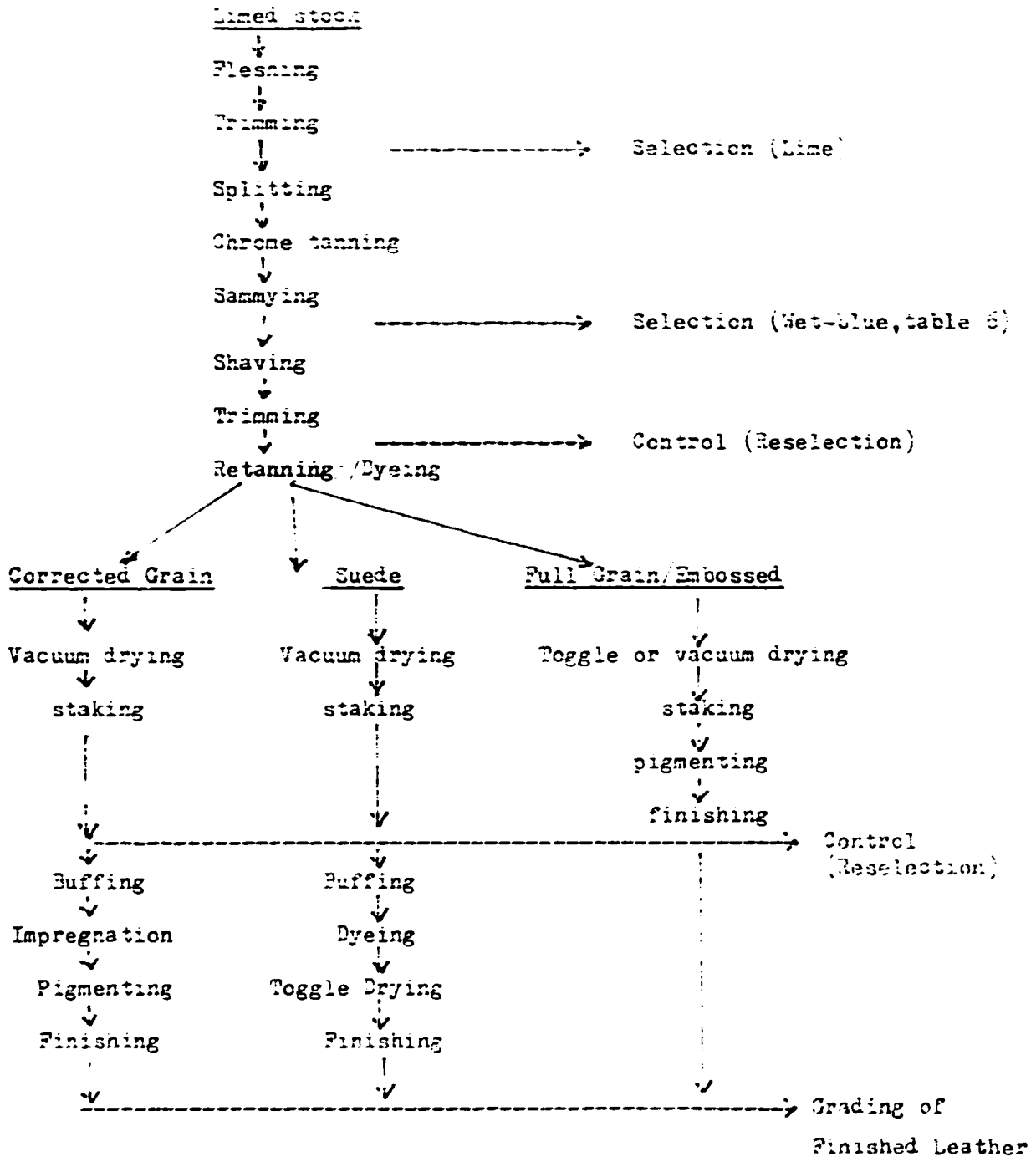
An effective and market-oriented grading system of area leather is based on the exclusion of non-suitable material from the final processing into a distinctive type of leather. In order to avoid the on-processing of material not considered suitable together with leather selected for its suitability at least two independent control measures providing for possible re-selection are essential to reduce the probability that unsuitable semi tanned leather is reaching the processing stage of dyeing and finishing.

Findings: The present grading and selection

Due to the lack of an effective control mechanism for the leather selected and destined for the processing into different types of finished leather it is experienced that in many instances the yield of better quality leather could be improved, provided the earlier selections of semi-processed materials would show a better consistency with regards to the standards guiding the sorter's decision making. No re-selection of shaved and crusted leather is carried out. Further, the present grading and the subsequent marking of finished leather does not necessarily reflect the actual quality of the leather as in many instances the leather is down-graded for the reason that leather areas are vaguely estimated and being only of limited use for the onward utilization.

The selection and grading of leather within the different stages are generally carried out at the following operation as shown in table no 9.

Table 2

SEQUENCES OF OPERATIONS

Finished Leather

The existing grading of finished leather provides for the following different grades: first, second, third, fourth, 5, 6, 7, 8, 9 of which the last four grades are indicating the lower quality (5, 6, 7, 8) representing over 90% of the total chrome leather production as shown in table no 10.

The improvement of the overall yield together with the enhancement of the leather quality depends mainly on the availability of suitable raw material for processing. It would be unreasonable to expect from light weighted hides the same percentage of full grain leather or corrected grain leather as yielded from heavy raw hides. Therefore, the proportional quantities of heavy, medium and light hides put into production has a direct bearing on the type of leather obtained as well as on the area yielded, which is explained on page no 47, table no 10 and no 11.

Utilization of project results

The CLPC has decided to reduce the number of grades from nine to five which will make the grading more understandable and realistic and at the same being in line with the international practice.

Conclusion

- a) Assessing the grading results of the total area leather production, the bulk of the leather manufactured is categorized in four different quality standards (grades). Taking this evaluation in consideration it is obvious that the first, second, third and the fourth have no practical value as during the time of the exercise no first, second and third grade (with a minor exception) leather were produced including about 0.2% fourth.
- b) In order to reduce the volume of lower grade leather to an acceptable level, trimming of semi processed leather which is conveniently done after shaving has to be introduced. Measures for reselection together with quality checks prior the pigment finishing operation is required.

Recommendation

It is recommended to reduce the existing grades from the recorded nine to five only, being:

Super Grade,	having a cutting yield of	70-100%
First "	"	60-70%
Second "	"	50-60%
Third "	"	40-50%
Fourth "	"	35-40%

Incentives: The existing incentive scheme operational in the tannery is linked to the volume of the leather produced and as such does not reflect the finished leather quality. For this reason it is recommended that the tannery's performance based on the yield of the different leather grades should be taken into consideration when the "production bonus" is computed. To assess the different grades of the various types of leather manufactured the yields have to be recorded separately, similar as expressed in table no 11 and made known on a blackboard.

It is recommended that the weighted average composition of grades extracted from table no 10 shall form the basis for the computation of the "quality incentive bonus"

e.g. Grade I	(R)....	7%
Grade II	(D)...	17%
Grade III	(E)...	31%
Grade IV	(F)...	44%

Any percentual upward movement of any grade shall be calculated individually and paid monthly independently from the production bonus. e.g. 1% recorded upward movement may be equal to 1% of the amount paid representing the production bonus.

Note: The proposed incentive scheme has been accepted and introduced.
(since January 1987)

Production of Chrome Leather indicating the Quantity, Average Area per Side, Total Area and the relevant Percentage of specific type of Leather manufactured
Table 10

	March 1985				April 1985				October 1985				1-15 Nov. 1985			
	Sides	Aver. DSM	%		Sides	Aver. DSM	%		Sides	Aver. DSM	%		Sides	Aver. DSM	%	
Embossed Pebble-Cattle	4193	10.91	42609	18.6	3416	9.50	32472	21.3	1189	11.46	13554	6.3	63	10.89	707	0.
Embossed, Country-Cattle	1313	10.70	14047	6.1	1076	9.62	10348	6.8	1559	10.77	16794	7.8	1158	10.26	11608	12.0
Embossed - buffalo	2498	10.78	26903	11.8	591	9.77	5776	3.8	3231	10.89	35189	16.5	1127	11.07	13186	13.
Full Grain, Softy - Cattle	638	10.50	6794	3.0	834	9.90	8254	5.4	339	10.78	3655	1.7	48	12.17	584	0.6
Full Grain, Aniline - (Ekala)	725	7.76	5633	2.4	332	10.33	3431	2.2	1503	10.26	15427	7.2	531	8.11	4307	4.5
Cow Crust - Export	1429	7.99	11411	5.0	868	7.33	6365	4.2	695	7.36	5108	2.4	288	7.13	2054	2.5
Cow Crust - Pigmented	868	8.29	7193	3.1	163	7.20	1174	0.8	654	8.15	5228	2.4	185	7.66	1417	1.5
Sports leather (Volley)	177	12.24	2176	1.0	128	11.71	1499	1.0	107	13.15	1487	0.6	110	13.60	1517	1.6
Corrected Grain	5378	9.67	52103	22.8	4644	9.10	42284	27.7	5209	11.69	60985	28.3	3398	9.65	32785	31.6
Lining - Pigmented	5481	7.91	43379	19.0	4857	7.73	37462	24.6	5713	9.01	51478	23.9	2888	7.49	21492	22.7
Lining - Pigmented/Crushed									423	8.66	3637	1.6	625	7.22	4515	4.8
Lining -Undyed	608	7.84	4765	2.1	353	8.01	2829	1.9					41	8.67	351	0.3
Upholstery					14	13.00	192	0.1	159	8.17	1299	9.6	19	8.26	157	0.2
Suede, Cattle					43	6.63	285	0.2	155	10.56	1637	0.7				
Suede, Goat	113	4.12	465	0.2												
Nappa, Goat																
Shoe Upper, Goat																
Splits	59	5.89	347	0.2												
Various (Reprocessed for Sale)	77	8.22	633	4.7												
	23557	9.27	218457	100.0	17319	8.13	153610	100.0	20936	10.28	215418	100.0	10463	9.06	94800	100.0

Table 11

YIELD OF GRADINGFINISHED CHROME LEATHER IN DSM

	1st	2nd	3rd	4th	R	D	E	F	G	Cow		Crust		Lining Crust
										A	B	C	C	
March 1985				1081	16907	35223	61956	94784	-	204	5566	4939		
				0.5%	8%	16%	28%	43%	-		2.5%	2%		
April 1985				285	6351	17172	30534	56791	-	747	3298	1221		
				0.3%	5.7%	15%	27%	52%	-	1%	2%	1%		
Oct. 1985				53	7705	27682	67416	94920	-	417	1630	1726	5173	
				-	4%	14%	33%	46%	-	0.1%	0.4%	0.5%	2%	
Nov. 1985 (1-15.)		16	102		2803	11830	28310	46723	82	837	1479	1403	1227	
		-	-		3%	12%	30%	49%	-	1%	2%	1.5%	1.5%	
Jan. 1987					8568	45080	71247	83566	-	1094	4707	2231		
					4%	21%	33%	38%		0.5%	2.5%	1%		
Feb. 1987					13098	61841	69632	78067	-	-	-	-		
					6%	28%	31%	35%						
March 1987					15462	69332	79930	112264		9080	3575	16211		
					5%	23%	26%	37%		3%	1%	5%		

Results: The overall improvement of the leather quality achieved during the periode 1985-1987 (first quarter) is expressed as follow.

	1985	1987
First grade (basis new grading)	5%	5%
Second -----"	14%	24%
Third -----"	28%	30%
Fourth -----"	48%	36%

which indicates a considerable reduction of fourth grades (-12%) and at the same a substantial increase in second grades (+10%). The percentage of first grades remains unchanged due to the defects of the raw material.

Table 12

Sorting results of wet-blue leather produced Nov.-Dec.1985

Type of leather produced	November 1985		December 1986	
	number of sides	%	number of sides	%
I. Corrected Grain				
a) Civil (for CLPC)	682	7%	1514	12%
b) Market (others than CLPC)	2232	24%	2840	23%
c) Embossed	138	1%	601	5%
II. Full Grain				
a) Aniline (Naked)	664	7%	375	3%
b) Local orders others than CLPC	1155	12%	2011	16%
c) Cow crust f. Export	1044	11%	1318	10%
d) Sport ball	71	1%	335	3%
e) Upholstery	14	-	75	1%
f) Lining	3312	35%	3337	26%
III. Suede				
	149	2%	137	1%
	<u>9461</u>	100%	<u>12543</u>	100%

Report on the CLPC-tannery effluent treatment and actions to be recommended.

Activity no:twelve = Output no:four and thirteen

Background

With the extension and modernization of the CLPC leather production facilities the input of raw material was increased substantially, thus resulting in a higher generation of pollutants for which the existing effluent treatment system has become inadequate. The existing physical structure of the rudimentary treatment (equalization cum sedimentation pit) is considered under sized and therefore incapable to cope with the volume of the effluent discharges generated by the chrome tanning department. The fast accumulation of sludge in the sedimentation causes blockages throughout the whole drainage system constraining even simple treatments such as screening and sludge retention and as a consequence thereof unnecessarily high polluted tannery effluent is discharged into the vicinity of the nearby Kelani River.

A report on effluent of industries situated along the Kelani River which - inter alia - covered also the CLPC tannery was produced by the Ceylon Institute of Scientific and Industrial Research in 1983 (Annex IV). The subject report has identified the problem areas particular with respect to the high content of Sulfides and Chromium III found in the effluent.

In the following, at the begin of 1985 a chrome recycling unit was constructed next to the chrome tanning department in order to reduce the discharges of spent chrome liquor into the sewer system and at the same contribute to the savings of tanning chemicals. However, the chrome recycling unit disintegrated due to faults of the construction work after one month successful operation.

Findings

For the tannery production input of 9000 kg raw hides, equivalent to an average of 780 cattle/buffalo hides it is estimated that the following

volume of effluent is generated per day:

lime yard section.....	150 m ³
deliming/tanning.....	60 m ³
retanning/dyeing	<u>70 m³</u>
	310 m ³
spillage/washing(25%)..	<u>80 m³</u>
total discharge per working day.....	<u><u>390 m³</u></u>

There is no provision made for the individual discharges from the different tannery sections, all the effluent generated in the tannery is piped into one large channel connected to the sedimentation tank. To assess the sludge content of the effluent generated by the different operations the following results have produced expressed in dried sludge substance per 1000 l:

soaking, during the first washing	14 kg
soaking, after the last washing	5 kg
liming, first discharge	21 kg
chrome tanning	1.1 kg
main channel (man hole).....	0.8 kg
equalization tank, stirred up	5 kg

in addition to it was assessed that one kg lime fleshings produce 220 gram of dry substance. One thousand kg salted raw hide generating about 0.14 m³ fleshings, therefore 9000 kg raw material inputs generate approximately 1.26 m³ fleshings weighing around 1360 kg, which would produce roughly 300 kg dry sludge substance per day or 1500 kg per week.

The sedimentation time for volatile supernatants taken from the equalization tank is for :

3 hours ..	8%
4 hours ..	10%
24 hours ..	12%
48 hours ..	15%

Conclusion

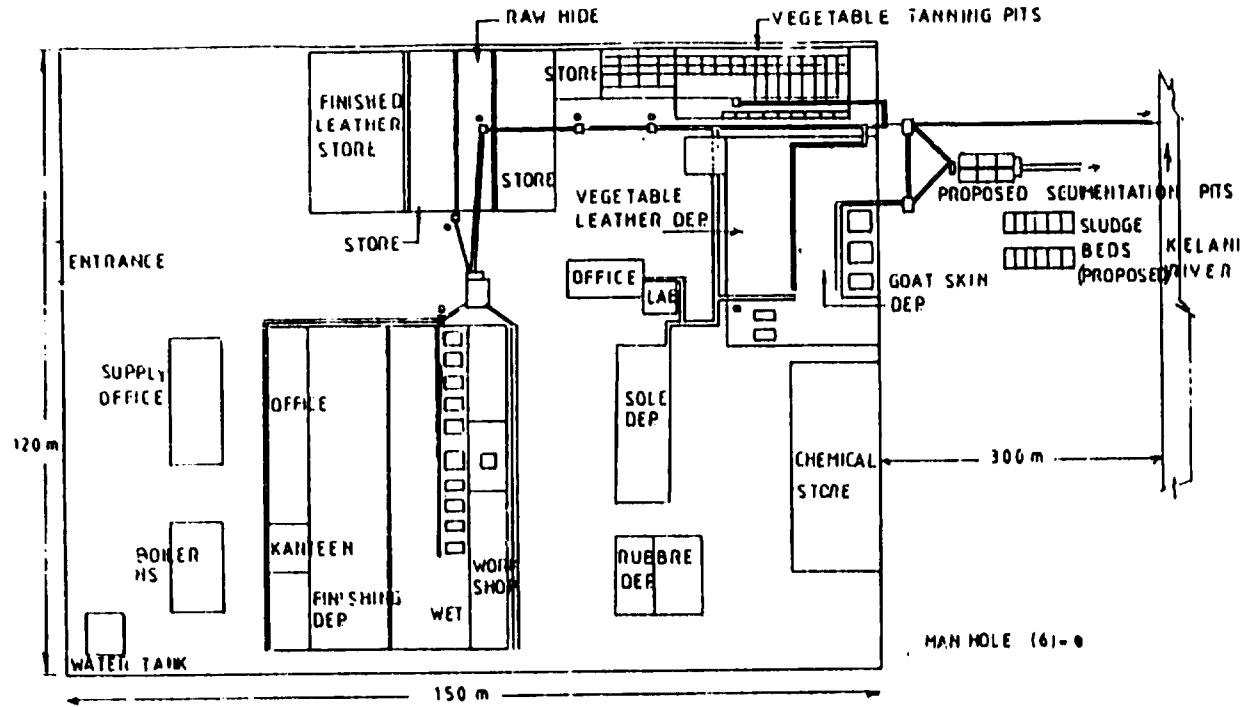
Taking into consideration the relatively large funds required to finance a complete tannery effluent treatment plant it was decided to break down this project into two phases, namely

- phase I :sedimentation and sludge treatment
- phase II :further treatment of the effluent through lagooning and or other means still to be decided upon.

Phase I initially included the construction of the sedimentation pits only for which a suitable site was selected. The holding capacity of the interconnected pits in total was planned to be 100 m³ divided into two large sections so as to simplify the sludge removal without interfering with the flow of the effluent. Plan no 01 and 02 are showing the tannery effluent collection system and the present sedimentation/equalization tank. The construction cost for the sedimentation tank was estimated to be Rs 180,000 and the construction of the pits was planned to commence in October 1985.

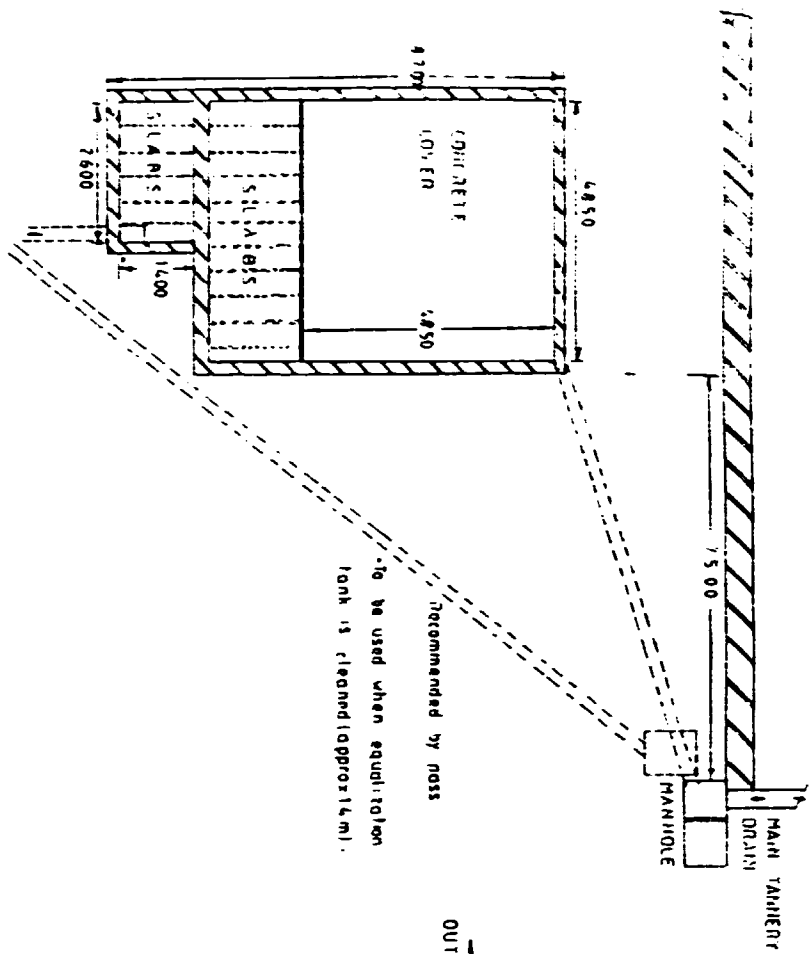
During 1985 efforts were made to obtain internal and external funds to assist in the financing of the envisaged project. It was at the end of 1985 when the Dutch Government has indicated their interest to provide assistance through a dutch based consulting and engineering company. In the following a prefeasibility study was carried out by the referred company. In the following it was recommended to stop the construction of the sedimentation pits as the area would be used for a larger treatment plant envisaged.

It is expected that the Dutch Government will provide the required funds for the construction of the tannery effluent treatment plant, to assist in the planning and design of the plant an UNIDO tannery effluent consultant will be fielded during June 1987.

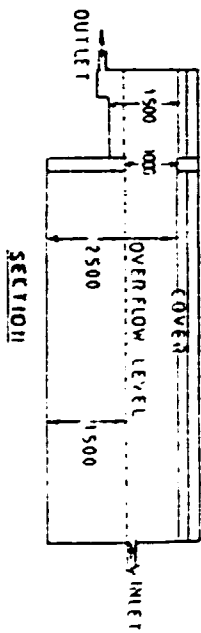


LAY-OUT OF THE
C.L.P.C. TANNERY

FIGURE - 0: /Plan 03
 SCALE - 1:100
 DRAWN BY - K A J HEMAPALA
 APPROVED - G FELSNER
 DATE - 1986 01 70



to be used when equalization tank is cleaned (approx. 4 m).
 recommended by mass



SECTION

NOTE

Total holding capacity of the tank = 6,550 m³
 Up to the over flow level = 3,780 m³
 All dimensions are in millimetres

EQUALIZATION TANK

CLPC

FIGURE NO - 05/Plan 04
 DRAWN BY - K A J HEGADAL
 SCALE - 1:100
 APPROVED BY - G FELSNER
 DATE - 1986 01 20

Provision of extension service to the non-public tanning industry of Sri Lanka with regards to the tanning, dyeing and finishing operations.

Activity no: one and four = Output no: five and eighteen

Findings

The private tanning sector comprises at present eight functional tanneries of which three have mechanized chrome tanning facilities; the other five are featuring mainly basic installations suitable for the traditional vegetable tanning process. With the exception of one tannery, located in Kandy, all other tanneries have their production facilities around Colombo. Approximately 45 - 55% of the bovine hides collected are processed by the non-public tanning sector, employing around 280 people. A substantial part of the vegetable leather production is exported in the form of "kips" mainly to UK. The steady increases of the raw hide and tanning material prices, mainly imported wattle extract, has made the economies of such operations more and more questionable. The prices obtained on the overseas market for this type of leather have remained static over the last two years. At present about £ 1,40 - 1,70 basis FOB is paid per kg of vegetable tanned leather (kips).

The following rough calculation shows the narrow margin for the production of this type of leather.

Raw material: e.g. 85 wetsalted cattle hides	
approx. 1000 kg @ Rs 7.50/kg	Rs 7500.00
Chemicals: based on pelt weight of 250 kg	
not splitted, liming, deliming	
fat liquor ect.	Rs 1800.00
Tanning extract (wattle), based on 35% of	
pelt weight, 300 kg @ Rs 34.-/kg	Rs 10200.00
Labour:	Rs 800.00
	<hr/>
	Rs 20000.00
Overheads: estimated 30%	Rs 6900.00
	<hr/>
	Rs 27200.00
Total yield of leather: approx. 400 kg (4.7kg/hide)	
at £ 1.55 average price (Rs 62.-)	Rs 30380.00
Operational gross profit:	<hr/>
	Rs 3180.00

Note: It may be expected that the price paid for wet salted cattle hides will go up to Rs 10.00 (US\$ 0.34) per kg by the end of 1987 and the wattle price will certainly be increased to Rs 36.00 (also already indicated) per kg, therefore additional Rs 2500.00 for raw hides and Rs 600.00 for wattle extract have to be accounted for, leaving the "bark tanner" with virtually no profit margin at all.

Recommendation/Conclusion

With the limited leather processing facilities and technologies available to the "bark tanners" it will be difficult for them to operate even in the near future on a profitable basis. As the "chrome tanner" are able to afford higher raw hide prices which are beyond the reach of the bark tanner it would be of no surprise if some of the bark tanners will go out of business. The present prevailing local raw hide price structure is showing a substantial upward trend, reflecting the increased demand of the country's chrome tanneries. However, even to achieve a price level equal to 30 - 35% of the value obtained for comparable material of similar qualities on the international market (US\$ 1.30 - 1.50 per kg) a considerable increase of the raw hide price structure could be reasonably expected during 1988/89. The price per kg wet salted cattle hide could reach the Rs 12.00 - 14.00 mark. This view is based on the new export opportunities of wet blue and chrome crust leather open to the local tanning industry since April 1987. The new government directive (1.4.1987) prohibits also the export of raw buffalo hides (actually under licence) in addition to raw cattle hides and goat skins. There is no obvious reason why wet blue local cattle hides should not fetch US\$ 0.60-0.70 per square foot or about US\$ 13.00 - 15.00 equal to Rs 380.00 - 440.00 per hide on the international market, a development the bark tanner can not cope with.

Output:

During the period February-May 1987 in addition to occasional visits in 1984-1986 three interested private tanneries have been provided with extension service, namely:

a) SA Perera & Co, Kalanidya, Colombo (five visits)

This tannery employs at present about 60 people in the tannery, having a monthly throughput of around 10,000 - 11,000 bovine hides. Most of the hides are chrome tanned, the larger part is processed into industrial glove leather, but also shoe upper and leather for travel goods is produced. The glove leather is utilized in the own leather glove manufacture plant, producing about 4500 industrial leather gloves per day for export. This factory employs 95 people. The price per leather glove varies from US\$ 1,30 - 2,70 per pair basis FOB. Tanlanka & Co. a new tannery situated 15 km from Colombo and owned by the SA Perera Group will be commissioned by the end of this year. The planned production will be initially 8000 hides per month, focussing mainly on the utilization of buffalo hides for the shoe upper, leather goods and glove manufacture sector. The project provided technical assistance in the selection of certain machinery for the new plant and has advised on the positioning of the leather processing equipment in order to achieve an easy work flow and streamlined production.

b) N.M.M. Mohideen Ltd. Rajagirya, Colombo (seven visits)

Situated on the outskirts of Colombo, this tannery has no mechanized equipment and its production is about 1500 cattle hides per month which are all vegetable tanned using the pit method. The tannery employs about 20 workers, the leather produced is of low quality, mainly due to the liming process carried out over seven days. In order to reduce the period of liming the project recommended the strengthening of the liming liquor by adding a moderate quantity of sodium sulphide, which was opposed by the work force fearing about the effects the chemical recommended might have on their bare feet, as rubber boots are considered too inconvenient for this climate. Other production problems have been solved where possible particular with regards to irregular leather colour. Due to the non-availability of a 3-phase power supply the project has recommended to construct two concrete paddles/vats driven by diesel engine, one for delimiting the other one for pre tanning. This measure would enhance the uniformity and improve the leather quality. The area where the tannery is situated has been declared a residential area lately.

c) M.A.M. Abdul Cader & Co, Helikada, Colombo (four visits)

This tannery manufactures vegetable tanned leather, having a capacity of 6000 bovine hides and 3000 goat skins and employing around 80 people. The project assisted in technical matters of tanning particular with respect to reduce the processing time. This tannery realizing the future problems with the production of vegetable tanned leather, has entered into a joint arrangement with a local private chrome tanner. Further, the above company has plans to set up a new tannery for chrome leather production.

Other tanneries visited on occasion were:

Mubarak Tannery, Colombo: production about 1000 cattle hides/month;
employed 15 people ,vegetable tanning

E.N.Kader Saibo, Kandy: production: 2100 cattle hides, 2000 goat skins/month
employed: 42 people vegetable tanning

M. Narayan Chettiar, Colombo: production: 3000 bovine hides, 5000 goat skins
chrome and vegetable
employed: 30 people

Anthony Leather Products

Colombo production: 1500 cattle hides, vegetable and chrome
tanning,
employed: 25 people

Export of vegetable tanned leather and raw bovine
hides during 1984 and 1985

-1984-

Name of Company	Quantity	Value Rs	Quantity	Value Rs
<u>S.E.Silva & Co</u>				
bark tanned cow hides	41.405kg	13.461.395		
<u>E.N. Kader Saibo & Co.</u>				
salted cow hides, pieces			17,730	1.449.870
bark tanned goat skins, pc.	12.150	655.980		
salted buffalo hides, pc.			5.200	264.600
<u>Mubarak Tannery</u>				
salted buffalo hides, pc			15.150	1.251.870
salted cow hides, pc			15.305	891.489
salted goat skins, pc			2.000	52.318
<u>Narayan Chettiar & Co</u>				
bark tanned buffalo hides, sqft	20.000	142.389		
bark tanned cow hides, sqft	37.147	230.696		
salted buffalo hides, pc			10.300	658.833
<u>N.M.Mohideen Ltd.</u>				
bark tanned cow hides and goat skins	82.664 kg	3.150.830.		
<u>Rahman Saibo & Co</u>				
bark tanned cow hides	35.360 kg	1.157.710		
<u>M.A.M.Abdul Cader & Co</u>				
bark tanned cow hides,	73.730 kg	2.926.036		
bark tanned goat skins	3.500 kg	262.520		
salted cow hides, pc			10.895	677.549
salted buffalo hides,			50.500 kg	1.000.246
<u>S.A.Perera & Co</u>				
unspecified		3.353.546		

value: finished leather Rs 25.341.302

value; raw Rs 6.246.775

-1985-

S.A.Perera & Co 2.876.800

bark tanned leather

N.Kadar Saibo & Co

bark tanned cow hides 17.020 kg } 2.532,771

bark tanned goat skins 10.700 kg }

N.M.Mohideen Ltd.

bark tanned leather 82.664 4.136.112

Source: Ministry of
Industry

Table 13

EXPORT OF SKINS, HIDES AND LEATHER

<i>Year</i>	<i>Quantity (kg)</i>	<i>Value (Rs)</i>
1960	443,673	395,352
1961	350,509	322,954
1962	542,487	563,826
1963	644,153	662,260
1964	784,509	758,161
1965	697,760	679,199
1966	341,447	361,102
1967	517,644	2,414,339
1968	839,898	3,131,350
1969	938,305	3,743,518
1970	1,008,662	3,954,564
1971	1,114,909	4,525,182
1972	1,009,985	4,464,712
1973	1,223,040	7,845,842
1974	837,098	7,650,357
1975	1,148,662	7,234,761
1976	987,649	9,385,562
1977	1,031,504	12,624,244
1978	705,130	20,845,614
1979	986,538	33,393,692
1980	732,074	36,382,908
1981	716,834	27,605,408
1982	841,257	28,001,765
1983	1,195,225	29,332,565

Source: Sri Lanka Customs Returns

CLPC : Export of leather

1984	value Rs 3,299,069
1985	Rs 2,646,561
1986	Rs 1,234,308
1987	Rs 841,285 (Jan-May only)

Recommendation of a process control system including trained staff to monitor different operations of the CLFC tannery (resulting in the increase of the leather cutting yield from 40% to 60% during the life of the project.

Activities:

Output: no six

The subject project activities are technically not clearly defined and are in actual fact connected to the activities nos four and eight, linked to output no two and three.

Findings

To assess the increase in the leather cutting yield from any given figure requires exact information on production details as well as a method of recording the different leather quality produced. The implementation of the programme as defined in output number three, namely the exact and continuous recording of the leather quality at any stage of selection and grading is a prerequisite for the factual assessment for the improvement of the leather cutting yield. However, it has been proved that the overall leather quality has improved (see table 11 and 12) and at the same time the waste was reduced considerably through the introduction of quality controls covering the entire leather production, referred to in output no two.

Conclusion

The implementation of an effective process control system requires the co-operation of all departments concerned with the leather production, further a meaningful production control and process monitoring needs the strict adherence to a time management plan. The previous arrangement to operate a second shift is counterproductive to any process control mechanism, caused by the lack of proper supervision.

Recommendation

The introduction of the one shift system provides the means and mechanism to carry out the process control operations during the time when the

technical staff (tannery and laboratory) is present. The implementation of the grading system as earlier recommended by the project does provide the required information on the leather quality and allows the pro per assessment of the leather cutting yield.

A study on the economic viability to set up a leather fibre board
manufacturing plant

Activity: no eleven = Output: no seven

The following report on the above subject was prepared by the project.

CONSIDERATIONS ON THE VIABILITY TO SET UP
A LEATHER FIBRE BOARD PLANT IN SRI LANKA

Background Information:

The technology to manufacture Leather Fibre Boards (LFB) on an industrial basis is known for about 50 years. However, significant developments in regard to Leather Board manufacturing equipment and production methods took place during and after second World War, due to the overall shortage of leather. In the following years, the utilisation of Tannery waste together with the recycling of some base chemicals used for leather processing was encouraged through the availability of newly developed technologies designed for this purpose. The technology to manufacture LFB is similar to the paper board production process for which some of the same basic equipment is employed. Generally speaking, the only difference is the raw material and the relatively high percentage of bonding material required such as rubber or similar materials.

The Products:

Leather Fibre Boards are used mainly in the

- Shoe Industry (insoles, stiffeners, toe puffs, heels)
- Leather Goods manufacture,

having a thickness of between 1.0 and 3.0 mm. However, the bulk of the LFB production concentrates on boards 1.6 - 2.4 mm thick. The LFB, depending on the final use are either left in their natural colour (greyishbrown) or dyed and if required also pigmented and embossed.

Raw Material:

The basic raw materials for the manufacture of LFB are by or waste products of the tanning and footwear industries such as chrome shavings, chrome splits, trimmings, sole and upper leather scraps from both chrome vegetable and tanned leather, as well as a bonding agent to provide the required adhesion to form an interlinked network of fibres. Apart from other suitable bonding materials like synthetic rubbers, polyvinylacetate, polyacrylate, however, natural latex is recognised as the best bonding agent for the LFB manufacture.

Both essential raw materials for the LFB manufacture are in sufficient quantities available in Sri Lanka. At present, due to the lack of other appropriate outlets, all the waste from the local Tanneries, Shoe and Leather Goods Factories is dumped. Therefore the waste utilisation particularly in regard to chrome shavings will ensure some positive measures in view of curbing pollution and improve the prevailing environmental conditions in the areas of the established Tanneries with chrome tanning facilities.

Availability of Raw Material:

It is estimated that approximately

35,000 - 38,000 Cattle Hides

5,000 - 7,000 Buffalo Hides

40,000 - 45,000 Goat/Sheep Skins

are collected monthly in Sri Lanka, which are at present processed into leather as follows.

	<u>Chrome</u>		<u>Vegetable</u>	
	<u>C.L.P.C.</u>	<u>Private</u>	<u>C.L.P.C.</u>	<u>Private</u>
Cattle	11,000	12,000	2,000	12,000
Buffalo	1,000	-	1,000	1,000
Goat/Sheep	1,000	-	-	-

Further, it has to be taken into account that during 1984 approximately 55,000 raw buffalo hides were exported and it may be expected that this raw material will be converted into leather by the local tanning Industry in future.

The potential quantities of leather fibre in either form locally available for the LFB production is estimated being for the

37

Ceylon Leather Products Corporation

A. Chrome Tanned Waste Material:

- Chrome Shavings

The generation of chrome shavings based on a monthly output of 11,000 chrome tanned hides is at present in the region of 19,000 Kg. computed on the following assessment.

Lining Leather shaved to 1.0 mm generates	- 800 g shavings per
Cow Chrome Crust Leather shaved to 1.2mm generates	- 900 g " side
Full Grain " " 1.6 - 1.8mm " "	- 600 g " "
Embossed " " 2.2 - 2.4mm " "	-1000 g " "

The thickness to which the chrome tanned leather side of the average production is shaved to, indicates approximately the quantity of shavings produced.

Taking into account the average composition of the chrome leather production in regard to hide area, weight, blemishes -

Approx. 40%	are shaved to 1.0 - 1.2 mm	producing 1800 g shavings per hide
40%	" 1.6 - 1.8 mm "	1200 g "
20%	" 2.0 - 2.4 mm "	2000 g "

Therefore, the shaving of 1200 sides per day is generating about 950 kg. chrome shavings (19 ton/month).

- Chrome trimmings obtained by trimming after shaving the quantity of these trimmings represent about 7% of the weight of the shaved lots - approximately 110 - 120 kg. on 1200 sides are generated (2000 kg. per month).

- Chrome leather scraps

it is estimated that about 20 kg. leather scraps of unpigmented leather may be obtained per day (500 kg/month).

The total present availability of wet chrome tanned leather fibre is therefore close to 22 ton per month which with the ongoing Tannery Expansion and Modernisation Programme is expected to increase 25 - 28 tons/month.

In addition to the regular generation of chrome leather waste from the Tannery the accumulated shavings in the vicinity of the Tannery dumped during the last years provides a valuable source of raw material. It is estimated that about 400 - 600 tons of chrome leather shavings are readily available for further use.

B. Vegetable Leather Trimmings and Scraps:

Trimmings and scraps from vegetable tanned leather are available in smaller, however, regular quantities. The Tanneries are generating approx. 300 kg., the Shoe Factory about 800 kg. and the Leather Goods Factory in the region of 200 kg. non pigmented leather waste per month.

Private Sector Tanneries

The private sector Tanneries of which two are having mechanised chrome tanning facilities are estimated to supply about 12 ton of chrome shavings, 10 ton of split trimmings and approx. 2 tons of vegetable leather trimmings per month.

The total country-wide availability of leather waste fibre per month suitable for the manufacture of LFB is therefore between

42 - 44 tons of chrome shavings/trimmings

3 - 4 tons of vegetable leather trimmings/scraps.

Properties of Fibrous Raw Material:

- Chrome Leather shavings and splits

Chrome leather shavings is the most commonly used material for the LFB manufacture. It is easy to handle and possible to store for long periods. However, care should be taken not to allow the material to become completely dry. If stored in the open, it shall be kept free from sand and other impurities as these particles can cause serious problems during the refining process. As regards to splits, they can be used in either form, wet-blue or dried (mostly neutralised and fatliquored).

- Vegetable Tanned pieces and scrap

- Vegetable Tanned pieces and scrap

The storage period of wet vegetable scrap and split is limited to a few days, after that time the material will degenerate and render useless for the LFB production.

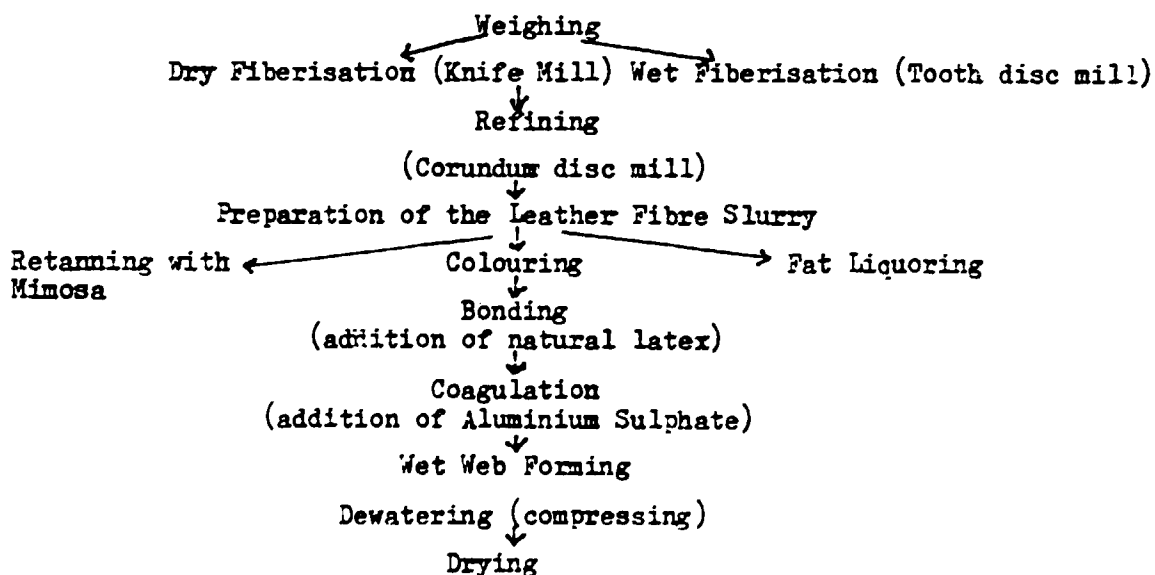
- Shavings, trimmings from goat and sheep skin are not suitable for the LFB process as well as finished leather scrap which might come in many colours and various finishes. The fibre of finished leather scraps is of low quality compared to those obtained from chrome shavings. Therefore scrap from the Shoe Factories have to be carefully sorted, no synthetic material can be included in the LFB manufacture.

- Cellulose fibre from used cardboards, large paper bags, craft paper can be used, but no newspapers - up to 20% can be incorporated into the fibre mix. The possibility to use to a certain extent also natural fibre such as coir shall be explored.

The basic Technology of Leather Fibre Board manufacture:

The Leather Board can be made from virtually any tanned scrap leather, a by-product of the leather production and shoe/leather goods manufacture. A diagram of the process indicates the basic sequence of operations and technologies employed.

Inspection and Selection of Material for Fiberisation Process:



Requirements of Chemicals and other materials for the manufacture of leather Board:

The approximate required inputs other than leather fibre to produce one ton of leather board are as follows.

- Retanning Agent	50 - 70 Kgs.
- Acid dye stuff if Boards are to be coloured	Up to 5 Kgs.
- Sulphonated oil	30 - 50 Kgs.
- Aluminium Sulphate	40 - 50 Kgs.
- Sodium Bicarbonate	20 - 30 Kgs.
- Natural Latex	150 - 200 Kgs.

Between the leather fibre inputs and the resulting weight of the leather board manufactured having a moisture content of 12% and a binder of 15% - a distinct relationship exist. For example to produce one ton of leather board 2,000 kg. of chrome shavings of 60 - 65% moisture content is required. Based on the availability of raw material it would be reasonable to assume a potential monthly production output of leather fibre board between 18 - 22 tons.

F I N D I N G S

1. Market outlets for Leather Fibre Boards:

The present local demand of leather fibre boards is in the region of approximately 80 tons per year of which the local Bata Shoe Company requires approximately 70 - 75 tons and the C.L.P.C. 3 - 6 tons. The fibre boards are imported from Belgium and Thailand. As most of the smaller local Shoe Manufacturers prefer to use for their insole component vegetable tanned sole leather, instead of leather fibre board a meaningful increase in the consumption of LFB will have initially come from the larger, fully mechanised footwear manufacturers. A certain quantity of LFB will also be required by the Leather Goods Manufacturers. However, it may be assumed that along with the expected upward trend in the price of local leather, components made from LFB will be used in larger quantities by the local footwear and leather goods industry. Taking into account the prevailing international

price structure of LFB a possible export of locally manufactured LFB appears for economic reasons at present not rewarding, as existing plants around the world producing up to 1,000 tons LFB per year and unit. For example, LFB sheets measuring 9 sq.ft. are available in Asian countries between US\$ 1.00 - 1.60.

Conclusion and Recommendations:

The present volume of leather fibre board required by the local Footwear and Leather Goods Industry is considered not sufficient to justify at this stage the employment of capital required to set up a suitable sized plant for the manufacture of leather fibre board which even in its modest form would call for an input of machinery and equipment alone, between 10-12 million rupees . Therefore the following measures are recommended.

1. To obtain a report on a full techno-economic study on the viability of setting up a leather fibre board manufacturing plant in Sri Lanka elaborating particularly on
 - Actual cost of machinery and equipment including estimated requirement of spare parts and expendable items for a period of two years.
 - Production, cost of installation and commissioning of the plant.
 - Demand on utilities particularly steam in regards to the existing capacity of the boiler installed at the C.L.P.C. Tanneries.
 - Cost for the construction of the building accommodating the plant considered.
 - Estimated cost of the leather fibre board produced at the subject plant.
 - Pay back periods of capital employed.
2. To obtain a report on the expected demand of the leather fibre board by the local industry taking into consideration possible changes of consumer buying habits particularly in regard to footwear in view of the country's rising standard of living. The subject report should forecast the estimated demand of leather fibre board for the periods

of 1986 - 1991 with a detailed breakdown of the past consumption for the years 1983 - 1985.

It may be suggested that the report covering technical-economic matters shall be carried out by a Consultant experienced in this special field of industry or by a party experienced in producing, setting up, and commissioning of leather fibre board manufacture plant on a turn key basis. The report on the expected demand on leather fibre board can be carried out by a local footwear manufacturing and marketing expert.

Offers from interested companies, capable to delivery machinery and equipment as required for the setting up of a suitable sized plant and to provide technical assistance during the initial stage of the plant operation have been received by CLPC.

In the following the project has been trying to identify possible donor countries which might be interested in financing the setting up of the envisaged plant.

One staff trained abroad in leather tanning, dyeing and finishing processes.

Activity: no ten = Output: no eight

During the project's life time technical training was provided in the following fields:

a) on the spot training—seven members of the technical staff
(executive level)

- five foremen
- two raw hide/skin sorter
- four leather grader
- three quality controller

b) trained abroad: post 31.01.... Mr.U.Chandrasiri, in leather technology
Nene College, UK, one year course, Sep.85-
July 86, One month practical training in
FRG and Switzerland.

post 31.03.... Mr.K.Sahabandu, in leather technology,
Nene College, UK, one year course, Sept.86-
July 87, One month practical training in
FRG and Switzerland,

post 31.04.... Mr.G.Wickremasinghe, in leather goods
production, Cordwainers College, London,
one year course, Sept.86-July 1987.

post 31.05.... Mr.S.Nonis, in leather technology, Nene
College, UK, one year course, Sept.87-
July 1988.

post 31.06.... Mr.J.Fernandopulle, in leather technology,
Nene College, UK, one year course, Sept.87-
July 1988.

post 31.07.... Mr.S.Gunasekara, in tannery machinery
maintenance, at factories in FRG, CSSR,
Italy, four month, March 87-June 87

post 31.C8 Mr.K.Amarasiri, in leather goods/sport balls design and cutting, three month in Pakistan, Sept 87- Nov 87 (planned)

post 31.C9.... Mr.L.Wijesinghe in leather goods/sport balls production and management, three month in Pakistan, Sept.87-Nov.87 (planned)

post 32.C1.... Mr.W.Wickremasinghe, study tour of the factory manager (tannery) to visit tanneries and attend leather fairs in Pakistan, Italy, France, UK, Netherland, and FRG. Sept.86-Oct.86 (six weeks)

c) training financed through bilateral assistance:

- Mrs.M.Boderagama: design in leather goods, three month course in Italy at P.I.S.I. Jesi/Ancona Dec.1985-March 1986
- Mr.R.Rodrigo: in leather technology, two and half year at the Westdeutsche Gerberschule, FRG, Reutlingen, Sept.1987-Feb.1990

Utilization of project results:

The impact of the training carried out on the spot has contributed to the improved overall performance of the tannery. The awareness of the process control and monitoring has created among the staff a feeling of quality consciousness. With the return of the fellows from their technical training received in overseas institutions the transfer of know-how will strengthen the capabilities of the technical cadre and provide the needed expertise for the further expansion and product development of the leather and allied industries in Sri Lanka. In total the project is providing 99 m/m fellowship training abroad of which 65 m/m are funded through UNDP-UNIDO started with an initial provision of 3 m/m.

Conclusion:

The volume of the training programme provided by the project is considered adequate for the immediate needs of the industry.

Recommendations:

With the reorganization and expansion programme taking place within the non-public sector tanneries, the need for qualified technical personnel to assist these enterprises in their product development is obvious. It is therefore recommended that in case technical staff employed by the CLPC, who has received comprehensive training in leather technology (Nene College, UK) financed under the UNDP-UNIDO fellowship training programme and wishes to join local private sector tanneries shall be allowed to do so. The present system where an "ex fellow" is tied to the CLPC through a bond for a certain number of years after the fellow has returned from the study shall not be applicable as long the trained person resides in the country and renders his/her service to the local tanning/leather industry. It may be suggested that the salaries paid by the CLPC to the fellow(s) during the time of training shall be reimbursed to the CLPC by the respective private company with the "ex fellow" is entering an employment contract. It is thought that such a recommendation would be well justified and could be accommodated under subject project title "Assistance to the Leather Industry in Sri Lanka".

Improved design capability and design facilities as well as enhanced production capacity through changes in production planning, work flow and layout.

Activities

=

Output: no nine and ten

related to the objectives of the project as listed in the subject consultant's report being nos 2.1 and 2.3

Findings:

The CLPC Leather Goods Factory in Ekala, approximately 20 km distant from the CLPC complex in Mattakkuliya, Colombo is accommodated in a reasonable sized modern building featuring a two floor construction. The total work force at present -May 1987- is 162 including administrative support staff. The product-mix is made up of between 10 - 12 different types of leather goods which are manufactured by small working groups and teams concentrating on one type of product each. The many partitions of the building constrain the possibilities to improve the work flow through better layout design.

Utilization of project results:

The new design of a range of leather goods introduced by the consultant was well received by the market, in particular gents belts and casual leather travel bags. In addition to, more modern design in the field of ladies hand bags were developed after the return of the fellow trained in Italy. During the years 1984 - 1985 the value of the goods produced at the Leather Goods Factory in Ekala has nearly doubled (97%).

The Value of the Leather Goods Production at the CLPC Leather
Goods Factory in Ekala

1984	1985	1986
Rs 6.221.963 of which Rs 1.538.556 (25%) was exported	Rs 9.622.165 of which Rs 1.921.757 (20%) was exported	Rs 12.245.558 of which Rs 1.548.245 (13%) was exported

The present order level for export (May 1987) is around US \$ 48,000.-

The above figures indicate an increase of the production value for

1984 to 1985 of 55%

1985 to 1986 of 27%

Conclusion:

Taking into consideration the growth potential of the local leather goods manufacturing industry and the resources available in the country the prospects to achieve further improved results are good, however it will be difficult to introduce modern production lines within the limited space available.

Recommendation:

To improve further the performance of the Leather Goods Factory which include also the streamlining of the main production the provision of new premises allowing for an "one floor" operation is recommended. The CLPC shall be advised to consider premises close to the CLPC tannery or in Colombo, where the communication does not cause any problems.

The leather goods manufacturing consultant recommends in his report basically the following:

- introduction of job description for each member of the production team
- in-service training for unskilled operators for each team specialized in certain manufacturing techniques.
- selection of a wider variety of models designed and to introduce these in smaller numbers to the market.
- the use of better quality fittings ect.

Proposals to set up a Goat Skin Tanning Unit within the CLPC tanning complex and develop suitable technologies for the processing of goat skins for the footwear, garment and leather goods manufacture.

Activity : no seven and eleven = Output : no eleven

Assessment of the requirements to set up a goat skin tanning unit with a capacity to process 20.000 goat/sheep skins per month.

Range of products:

- wet blue leather for export
- crust leather for export
- finished leather suitable for the manufacture of fine leather goods and foot wear.

Location: Within the premises of the CLPC, using the existing area of the vegetable tannery's lime yard (29,5 m X 11.5 m) together with the space of the adjoining building (13,5 m X 10.5 m) which was only partly utilized could comfortably accommodate the necessary equipment and machinery required for the envisaged production of goat skin leather on industrial basis.

For the preparation of the proposed working space actions in the following areas are required.

- Demolishing of nine liming pits including one paddle
- Foundation of the liming and tanning drums
- Laying of concrete floor
- Relaying of the sewer channel
- Repair of the roof and supporting structures
- Repair of the water storage and water supplies.
- Enlargements of both factory entrances to allow the fork lift to pass through.
- Removal of partition walls
- Electrical installations for a demand of up to 120 KW

Requirements of machinery and equipment:

- one soaking/liming drum, loading capacity up to 3000 kg
- one tanning drum, loading capacity: 1000 kg
- one dyeing drum, loading capacity: 500 kg

- one fleshing machine ,working width:1600 mm
- one scudding machine,working width:1600 mm
- one throughfeed sammying machine,working width:1600 mm
- one setting-out machine,working width:1600 mm
- one sorting table with illuminated glass cover

Estimated capital requirement to finance the investment:

Foreign capital-GIF Colombo:

three wooden drums,complete (2.0 X 2.3m)	US\$ 48.000
one fleshing machine,1600 mm	US\$ 26.000
one throughfeed sammying machine,1600mm	US\$ 43.000
one scudding machine,1600mm	US\$ 25.000
one setting-out machine,1600mm	US\$ 29.000
+ 10% contigency for spares	US\$ 17.100
total:	<u><u>US\$ 188.100</u></u>

Local currency contribution:

Based on the estimates on the contract works to set up the foundations,concreting of the floor,modification on constructions,repair of the roof and the water system, and electrical installations

Rs 1.800.000.

Employment of existing machinery and equipment:

The following already installed machinery will be employed for the leather production.

- | | |
|----------------------|--------------------|
| -liming pits | vacuum dryer |
| -setting-out machine | -spraying machine |
| -shaving machine | -glazing machine |
| -drying chambers | -measuring machine |

Creation of employment opportunities:

For the production of 20.000 goat skins per month at least 28 workers and two foremen would find additional employment

Justification and background information.

The countr's goat population for the year 1983 was estimated to be around 520.000 of which 134.091 have been slaughtered. The local tanning industry is only partly engaged to utilize and transform this valuable raw material into higher quality products, mainly carried out by the a few private tanneries. The product, a semi finished vegetable tanned leather is exported, however during the last few years the demand for such type of leather has declined as the international market prefers rather wet-blue or crust-tanned skins, for which a good price is paid. Comparable prices vary from US 0.60 - 1,00 for wet blue and US\$ 0.90 - 1,30 for chrome crust leather per square foot. The average size of a local goat skin is about 4,5 square ft. indicating a possible export value of Rs 90.00 to 150.00 per skin. Goat skin leather is required for the manufacture of leather garment, travel goods, hand bags and light weight foot wear.

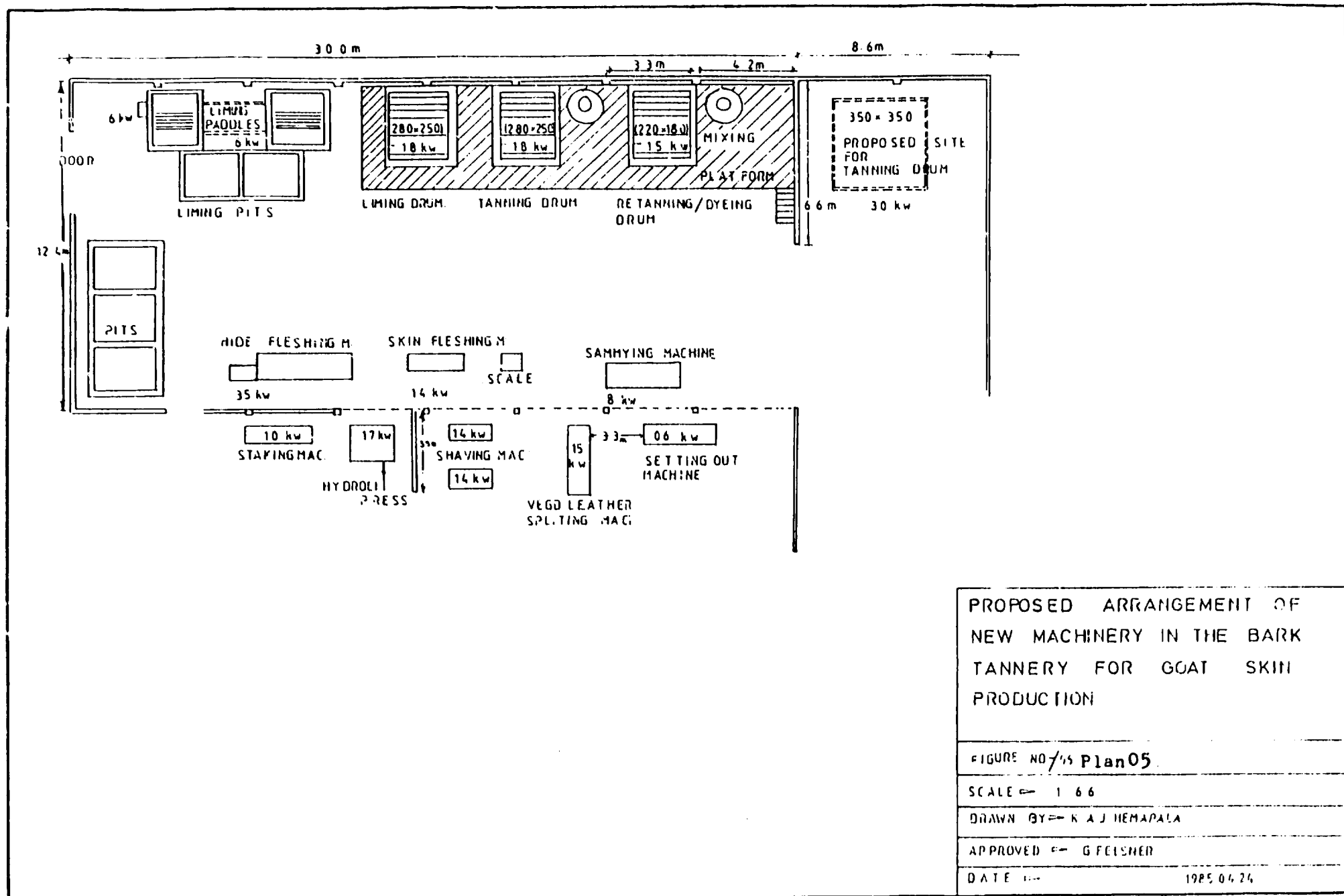
Layout of the machinery and equipment for the goat skin tanning unit are shown in plan nos ; three, four, five.

Utilization of project results:

During 1986 about 21.000 goat skins have been processed into various types of leather sold in the local market. In the following the export market for wet blue and crust processed leather was explored, resulting in exports of approximately 55.000 sq.ft of wet blue tanned goat skins to Europe during the first half of 1987. It is planned to export for the periode July -Dec. 1987 100.000 sq.ft. of wet blue goat skin leather.

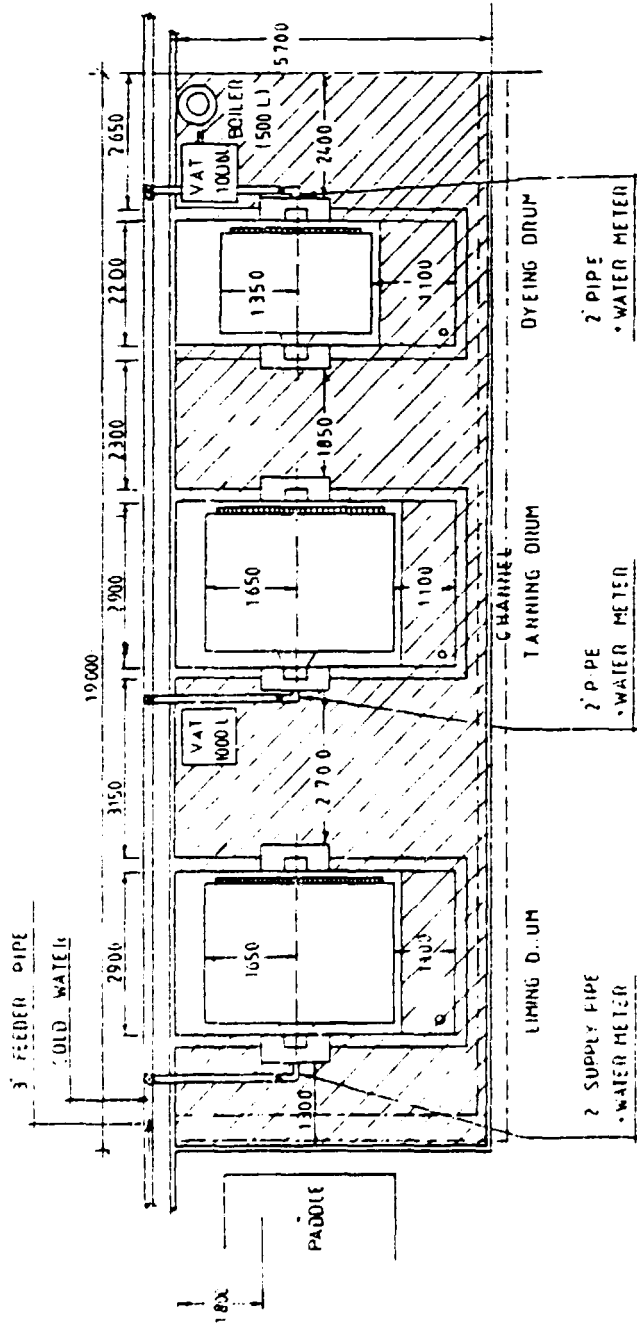
Recommendation:

To utilize to a better extent the installed tanning facilities the supply of raw goat skins to the CLPC needs a structural change; it requires a more market oriented approach to compete on the local market, for the sought raw material. Prices offered to the trade should be attractive and in relation to the proceeds generated from the manufactured product.



PROPOSED ARRANGEMENT OF
NEW MACHINERY IN THE BARK
TANNERY FOR GOAT SKIN
PRODUCTION

FIGURE NO/15 Plan 05.
SCALE = 1 : 66
DRAWN BY = K A J HEMAPALA
APPROVED = G FELSNER
DATE = 1985.04.24



GOAT SKINS PROJECT
LAYOUT OF DRUMS

CLPC

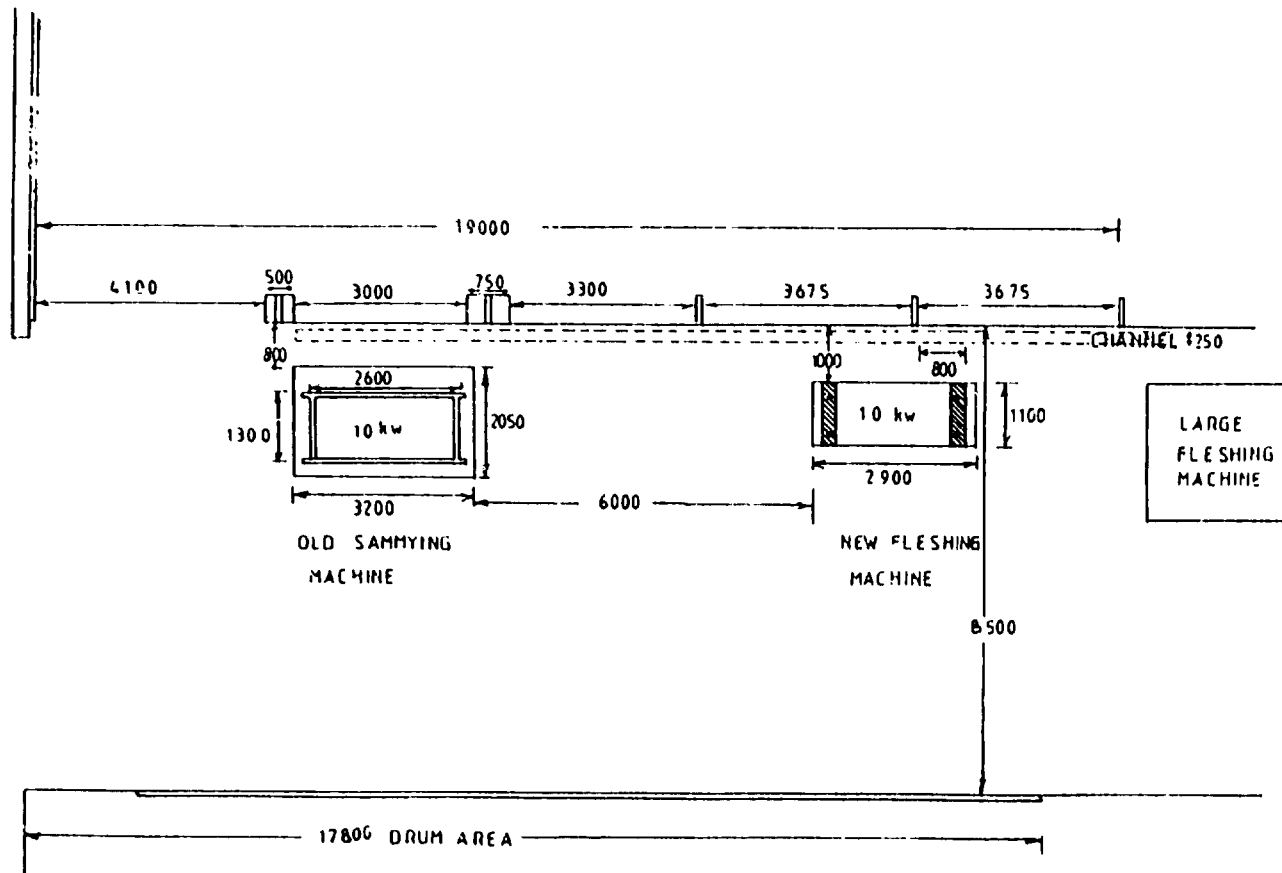
FIGURE NO. 01 Plan 06

SCALE - 1:100

OPAWII BILU - K.A.J. MEMADALA

APPROVED - G. FELDMAN

DATE - 1985.01.24



GOAT SKIN PROJECT

POSITION OF SAMMYING
AND FLESHING MACHINES

FIGURE NO	= 1/3 Plan Of
SCALE	= 1/100
DRAWN BY	= K A J HEMAPALA
APPROVED	= G FELSHFR
DATE	= 1986 07 22

A techno- economical concept for the processing of buffalo leather with regards to the suitability for the manufacture of:

- upper leather for injection moulded sole shoes
- industrial leather gloves
- fashionable, light weighted leather goods

Activity no: twelve, fifteen, sixteen, seventeen, = Output no: twelve, fifteen, sixteen, seventeen,

Utilization of project results:

The increased leather production capacity of the CLPC tannery has resulted in a higher intake of buffale hides which were for 1984 72 ton (6% of total raw material intake) and 286 ton (20% of the raw material put into production). This increased utilization of raw buffalo hides allowed also a better selection of the semi processed stock, thus providing a sound basis for a wider production of different types of buffalo leather. Buffalo leather is now used apart from the manufacture of vegetable tanned sole leather for shoe upper parts, industrial leather gloves and leather goods.

Conclusion:

With the new regulation in force to prohibit the export of raw buffalo hides (as from April 1987) the availability of this material to the local tanning industry has improved, it is estimated that about 70.000 - 90.000 raw buffalo hides per year are now being offered to the tanning sector. New developed technologies to process this raw material will contribute to the better product utilization and the creation of additional job opportunities in the leather and allied industries.

Recommendation:

As still a substantial part of the raw material is showing serious grain defects, it is recommended to take more care in the post mortem hide treatment, particular with regards to salting.

A detail report covering the subject activities and outputs is under Annex I

Recommendations on further measures for the streamlining of the CLPC
leather production:

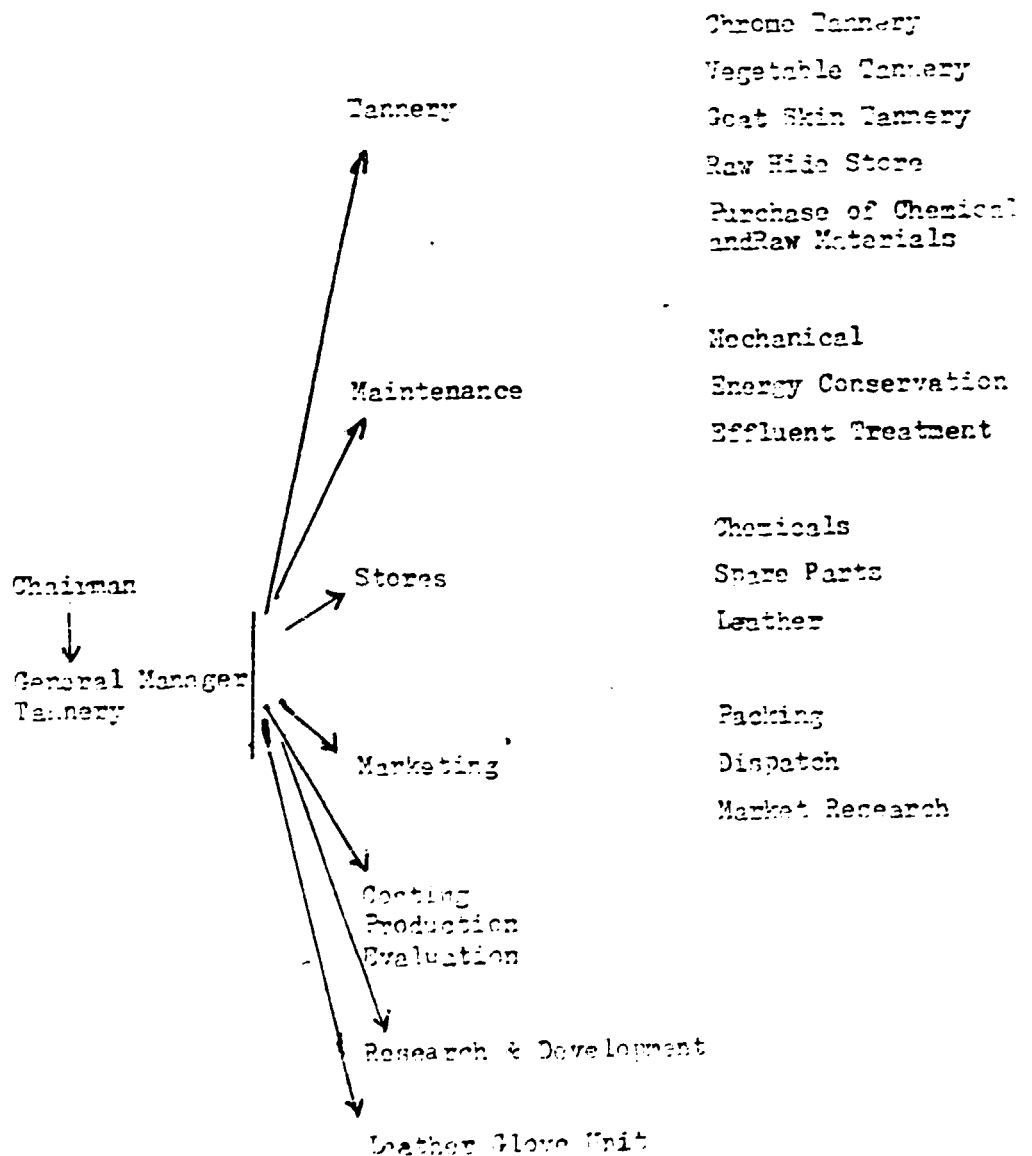
Activity : no fourteen = Output : no fourteen

To improve the efficiency and to enhance further the performance of the combined CLPC leather manufacture operations, it is necessary that the present management system is to be restructured. The increased production capacity of the leather processing plant and the resulting higher throughput of raw hides/skins requires a different managerial approach to safeguard the smooth function of the leather manufacture operation. It is for example paradox that the tannery manager has only limited control over the raw hide store, considered vital for proper production planning. A plant the size of the CLPC tannery requires for its smooth function a General Manager/Works Director to be in charge of the overall responsibility of the factory. The General Manager shall also serve on the Board of Directors and in his capacity report directly to the Chairman. The GM (tannery) main responsibility shall be seen in the co-ordination of activities and functions of the different departments so as to maximise the installed leather processing capacities and produce leather to the best economic benefit of the plant. Further it is recommended that:

1. The GM (tannery) shall be assisted by a costing clerk/economist to provide reliable information on all aspects of the processing economies including raw material and purchases of chemicals as well as to report on conservation/savings of utilities.
2. Proceedings of the leather exported and sold to the local market- not reflecting the transfer of leather from the tannery to the CLPC whole sales outlet including the shoe and leather goods factories- shall be paid into a different bank account for the purpose to finance the purchase of most needed leather processing chemicals, raw materials and machinery spare parts.
3. To overcome the time consuming procedure usually required to establish a letter of credit, even in case of urgent needed machinery spare parts and in respect of dyeing/finishing auxi-

liabilities, it is suggested to consider the possibility to open in agreement with the local authorities a bank account in London. 25% of the total proceedings from export of leather and leather goods shall be transferred to this account and used for the direct payment of goods ordered in emergency.

4. The present Tannery management system does not allow for further operational streamlining and should therefore for the purpose of a better integrated function be restructured as suggested in the chart below.



Recommendations for the Upgrading of
the Existing Machinery and Equipment

The following machines are considered due for replacement during the next three years.

<u>Year of replace- ment</u>		<u>Estimated Cost</u>
1989	Two Soaking Drums (3.30 m x 3.50 m) complete.	US\$ 90,000
1989	One Retanning Drum (3.30 m x 3.50 m) complete	US\$ 45,000
1989	One Setting Out Machine 2.20m	US\$ 30,000
1990	Three Dyeing Drums (2.90 m x 2.40 m) complete	US\$ 105,000
1990	One Toggle Drying Unit (Automatic type)	US\$ 110,000

Equipment considered necessary for the further improvement of the leather quality.

1988	One Roller Coating Machine	US\$ 45,000
1989	One Staking Machine, vertical operated.	US\$ 25,000
1989	Complete overhaul of Splitting and Fleshing Machines.	US\$ 40,000
1990	One Finiflex Ironing Machine	US\$ 85,000

Leather Production Capacity:

(A). Bovine Leather, Chrome:

The soaking and liming capacity with the present equipment installed is assessed, being 12,000 kg wet salted hides per day (three drums 4,000 kg each) or 240 ton per month. Based on inputs of 80% cattle and 20% buffalo hides it would indicate that about 192 ton or 17,500 cattle hides and approximately 48 ton or 3,200 buffalo hides are required per month. The production output in total per month (20 working days) would be in the region of 340,000 DSM, excluding vegetable tanned leather made from buffalo

hides (50% = 1,600 hides). The installed facilities in the Tannery Wet Section are capable to cope with that volume of leather in working progress. Bottle necks with regards to the drying operations could be solved by strict adherence to the suggested time management plan. The installation of a roller coating machine as already evaluated and recommended by the project would to a great extent eliminate the manual application of pigment mixtures, thus enhancing the finished leather quality consistency and streamline the overall finishing process.

(B). Goat Skin Leather:

The machinery and equipment installed up to the wet bulk processing stage is geared to handle up to 6,000 skins per week (3 lots per week a 2,000 skins). This quantity however could be increased to 7,500 skins/week if the white lining could be carried out in a different drum. In case of crusting only about 600 skins/day could be dried within the available hang drying facilities. With regards to the production of nappa and suede leather the existing finishing facilities as installed in the vegetable tanning department and used for the goat skin leather finishing about 120 skins can be completed per day.

Setting up of an industrial leather glove manufacturing unit at the
CLPC tannery complex

Activity no:nineteen = Output no:nineteen

A separate intermediate technical report was produced and submitted by the consultant fielded. To increase the leather glove production capacity to 5000 pairs per month additional sewing machines and cutting presses had to be ordered which are expected to arrive on site during October 1987. For this reason it was decided to utilize of the initially planned four work month only three for the implementation of phase I and use the remaining one work month in the form of a split mission to carry out phase II immediately after the equipment has arrived on site.

Quality enhancement and better styling/design of the CLPC leather
garment unit

Activity no : twenty = Output no : twenty

A report covering the activities and outputs produced was prepared by the consultant on the completion of this three month mission (Feb - May 1987). As a result of the mission and the recommendations implemented the order level and productivity of the unit has increased substantially, which was for the month of May 1987 Rs 28.000 compared to the usual monthly average of Rs 15.000 - 18.000 worth of leather garments.

W O R K P L A N
DP/SRL/83/CC3/A/G1/37

(Consultant Leather Industry)

During the Projects life time the following activities necessary to achieve the Project's outputs will be carried out in the indicated periods of time as listed.

Work Schedules

- (1). To collect relevant data on:
 - local hide and skin production, preservation, handling and marketing July - October 1984
 - local tanning industry and assess the capacity as well as the capability to improve their performance on the local and export markets.
- (2). Preliminary report August 1984
- (3). Drafting up a plan of action for the nation-wide improvement of raw hide and skins. October 1984
- (4). Recommend and assist in the implementation of leather processing technologies aimed to enhance the existing production methods. July 1984 - July 1985
- (5). Prepare a master plan designed to improve the quality control system throughout the tanning and finishing operations. November - December 1984
- (6). Recommend and demonstrate suitable tanning and finishing methods to make better economical use of lower grade raw materials, thus reducing wastage. August 1984 -
- (7). Assess the requirement on machinery and labour needed to start up a Goat Skin Tanning Unit on an industrial scale. September 1984
- (8). Evaluate the present grading system of finished leather and recommend measures to streamline the operation. November 1984
- (9). Preparation of mid-term report. January 1985

Work Schedules

- | | | |
|-----|--|--------------------------|
| 10. | Training of local counterparts. | July 1984 -
July 1985 |
| 11. | Prepare an economic viability study on leather board production. | April 1985 |
| 12. | Collect data and recommend improvement on the tannery effluent treatment system. | June 1985 |
| 13. | Final Report | July 1985 |



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

24 February 1984

Project in the Democratic Socialist Republic of Sri Lanka

JOB DESCRIPTION

DP/SRL/83/003/11-01/31.7.D

Post title Leather Technology Expert

Duration Twelve months

Date required July 1984

Duty station Colombo with travel within the country as required.

Purpose of project The project is designed to improve utilization of available resources in the leather industry sector and improve the performance and competitiveness of the local leather industry.

Duties The expert will be attached to the Ceylon Leather Products Corporation (CLPC), a parastatal organization under the Ministry of Industry, and will mainly be working at the CLPC tannery located in Colombo, Mattakuliya. In particular he will be expected to:

1. Review the present status of the leather industry in Sri Lanka with special emphasis on the CLPC tannery;
2. Prepare a hides and skins improvement scheme focussing on flaying, preservation, collection and handling of raw materials;
3. Suggest methods for improvement in tanning, dyeing and finishing processes and introduce a quality control system at the CLPC tannery;
4. Evaluate the present grading system of finished leather and recommend more market-oriented alternatives;
5. Introduce measures to improve the leather so as to reduce the wastage and increase the cutting yield of leather;
6. Study the economic viability of the establishment of a leather board plant;
7. Collect data on the tannery effluent treatment and suggest measures on how to improve the existing treatment system.

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

...../..

Applications and communications regarding this Job Description should be sent to:

Project Personnel Recruitment Section, Industrial Operations Division
UNIDO, VIENNA INTERNATIONAL CENTRE, P.O. Box 300, Vienna, Austria

Qualifications

Leather technologist with several years of practical experience in the tanning industry and alround knowledge in raw material improvement and leather production from wet department to finish. Experience in quality and process control and knowledge of effluent treatment. Previous experience in developing countries tanning industry.

Language

English.

Background information

Sri Lanka has a fairly rich livestock population; based on the census held in 1981 there are 1,720,400 cattle, 898,100 buffaloes, 512,200 goats, 29,500 sheep and 93,700 pigs in the country. The off-take rates for 1980 were for cattle 22 per cent (365,612), buffaloes 5 per cent (.679) and for goats 52 per cent (358,835). Inadequate hides and skins preservation methods and the absence of a well-functioning collection system have resulted in a recorded wastage of valuable raw materials worth Rs. 1,355,244 in 1980 which stands for 12 per cent of the cattle hides (43,322), 5 per cent of the buffalo hides (2,041) and 9 per cent of the goat skins (32,052) produced.

In Sri Lanka, there are twelve tanneries, of which five dispose of chrome tanning facilities with a combined production capacity of some 180,000 cattle hides per annum; they also produce vegetable leather together with the other seven tanneries. The tanning industry provides employment for about 500 people. A substantial part of the cattle hides are processed into vegetable tanned leather known on the market as East Indian Kips which are mainly for export. Most of the buffalo hides are exported in the wet-salted condition, whereas 95 per cent of the goat and sheepskins are processed either into wet blue or semi-vegetable tanned leather for export markets.

The Ceylon Leather Products Corporation (CLPC), a parastatal organization founded in 1956, consists of:

1. one tannery located in Colombo - Mattakuliya - with an annual production capacity of 1.2 million sq.ft. of chrome leather and 0.8 million sq. ft. of vegetable tanned leather;
2. one shoe factory in proximity of the tannery having a production capacity of 345,000 pairs of footwear per year and the facility to manufacture various kinds of leather goods;
3. one leather goods factory situated in the Ekala Industrial Estate with production facilities to manufacture leather goods on an industrial basis.

Under the ongoing project "Assistance to the Ceylon Leather Products Corporation "(DP/SRL/81/007), assistance is being rendered in the field of footwear production, shoe design and training. The achievements of the first phase of the project under rather modest inputs have been satisfactory. During the implementation of this project which only concentrated on the improvement of the operations of the CLPC footwear factory, it was realized that no further improvements

could be expected until the quality of leather from local sources, including the CLPC tannery, was improved to an acceptable level. The new phase concentrates on this aspect. Any possibilities for manufacturing exportable leather products or footwear will depend on the quality improvements of leather.

The leather and leather allied industries of Sri Lanka have a substantial growth potential disposing of adequate raw material resources. The further development of this industrial sector will contribute favourably to the national economy and increase the revenues received through export of leather and leather products.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

Project in the Democratic Socialist Republic of Sri Lanka

DRAFT

JOB DESCRIPTION

DP/SRL/SB/603/II-01/31.7.85

- Post title** Leather Technology Expert
- Duration** Six month (extension)
- Date required** July 1985
- Duty station** Colombo with travel within the country
- Purpose of project** The project is designed to improve the utilization of available resources in the leather industry sector and improve the performance and competitiveness of the local leather industry.
- Duties:** The expert will during the six month of the extended assignment be attached to the Ceylon Leather Products Corporation (C.L.P.C.), a para-statal organization under the Ministry of Industries and Scientific Affairs, and will work mainly at the C.L.P.C. tannery located in Colombo, Mattakkuliya.
- In addition to the already assigned duties (Nos. 1-7 as listed in the Job Description of 24.2.1984), the expert will concentrate on the implementation of the tannery expansion programme, Phase II as designed, (Goat Skin Project).
- The expert will also be expected to prepare a technical report setting out his findings and recommendations to the Government on further action which might be taken.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
UNIDO

Project in the Democratic Socialist Republic of Sri Lanka

DP/SRL/83/003/11-01/31.7.D

DRAFT

JOB DESCRIPTION

Post title **Leather Technology Expert**

Duration **Six Month (Extension)**

Date required **January 1986**

City/Station **Colombo with travel within the country**

Purpose of posting

The project is designed to improve the utilisation of available resources in the Leather Industry Sector and improve the performance of the local Leather Industry.

Duties:

The Expert will be attached to the Ceylon Leather Products Corporation (C.L.P.C.) a parastatal organisation under the Ministry of Industries and Scientific Affairs and will mainly be working at the C.L.P.C. Tannery in Colombo, Mattakkuliya. In particular he will be expected

- (1). Develop further processing technologies for the tanning and finishing of goat skins suitable for the footwear manufacture and leather goods/garment production.
- (2). Prepare a technical concept including costing for the processing of buffalo hides into chrome tanned light leather.
- (3). Assist in the co-ordination of preliminary works aiming to set up a Tannery effluent treatment plant within the C.L.P.C. tanning complex.
- (4). Recommend ^{additional} measures leading to the further streamlining of the overall C.L.P.C. leather production.

The Expert will also be expected to prepare a technical report setting out his findings and recommendations to the Government on further actions which might be taken.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

Project in the Democratic Socialist Republic of Sri Lanka

DP/SRL/S3/C03/11-01/31.7.D

DRAFT

JOB DESCRIPTION

- Post title** Leather Technology Expert.
- Duration** Ten Month (Extension).
- Date required** July 1986.
- Entry station** Colombo with travel within the country.
- Purpose of project** The project is designed to improve the utilisation of available resources in the leather industry sector and improve the performance of the local leather industry.
- Duties:** The expert will be attached to the Ceylon Leather Products Corporation (C.L.P.C.) a parastatal organisation under the Ministry of Industries and Scientific Affairs and will mainly be working at the C.L.P.C. Tannery in Colombo, Mattakkuliya. In particular he will be expected to:
- (1). Develop tanning and finishing technologies for the processing of buffalo hides suitable for the manufacture of upper material for the injected moulded sole - shoe production.
 - (2). Develop further processing methodologies of buffalo leather with the required soft handle suitable to manufacture industrial leather gloves for export.
 - (3). Introduce processing technologies for the production of buffalo leather acceptable for the manufacture of fashionable leather goods.
 - (4). Provide intensive technical extension service to the non-public sector tanning industry engaged in vegetable leather manufacture.
- The Expert will also be expected to prepare a technical report setting out his findings and recommendations to the Government on further actions which might be taken.

Qualifications: Leather Technologist with several years of practical experience in the Tanning Industry and a broad knowledge in raw material improvement and leather production from wet department to finish. Experience in quality and process control and knowledge of effluent treatment. Previous experience in developing countries tanning industries.

Language English

Background information

Sri Lanka has a fairly rich livestock population, based on the census of 1983, there are 1,699,800 cattle, 910,000 buffalo, 519,300 goats, 28,600 sheep and 77,000 pigs in the country. The off take rate for 1983 were for cattle 11% (191,824), for buffalo 12% (75,000 estimated) and for goat and sheep 24% (134,091). There is no production of pig skins. Inadequate hide and skin collection as well as poor conservation is causing substantial loss in volume and value for the country's leather industry.

In Sri Lanka there are nine Tanneries of which three have functioning chrome tanning facilities, the combined production capacity is some 35,000 bovine hides per month. Vegetable tanned leather is produced by all Tanneries but exclusively only in six establishments mainly due to the lack of suitable processing equipment required for chrome tanning. The local tanning industry provides employment for about 550 people. A substantial part of the cattle hides are processed into vegetable (Bark) tanned leather known as kips and exported. During 1983 1,195,225 kg of leather valued Rs. 29.3 million was exported. Most of the buffalo hides are exported in the wet salted condition however the share of hides turned into leather locally is increasing. Goat and sheep skins are predominately processed into vegetable or chrome crust for export. The Ceylon Leather Products Corporation (C.L.P.C.) a parastatal organisation founded in 1956 consists of:

- One Tannery located in Colombo, Mattakkuliya, having a present annual production capacity of 3 mill square feet of upper leather, 100 ton of sole leather and 0.5 mill square feet of various types of fine leather made from goat/sheep skins.
- One Shoe Factory in proximity of the Tannery having a production capacity of 550,000 pairs of footwear per year.
- One Leather Goods Factory situated in the Ekala Industrial Estate with production facilities to manufacture leather goods on an industrial basis.

The C.L.P.C. employs in total about 1,200 people.

Under the ongoing projects "Assistance to the Ceylon Leather Products Corporation" DP/SRL/81/007 and DP/SRL/83/003 entitled "Assistance to the Leather Industry in Sri Lanka" assistance is being rendered in the field of footwear production, leather and leather goods manufacture. The ongoing project DP/SRL/83/003 focussed in the earlier stage of implementation mainly on the increase of the leather production thus creating a higher demand of raw hide and skins reducing as a subsequence thereof the waste of raw material considerably. During this period the Tannery expansion programme Phase I and II were implemented, which resulted in the streamlining of the chrome tanning section and the setting up of a goat skin tanning unit. In the following new types of leather made from goat skins and buffalo hides have been introduced to the production process. The leather and leather

allied industries of Sri Lanka have a substantial growth potential disposing of adequate raw material sources. The further development of this industrial sector will contribute favourably to the national economy and increases the revenues received through export of leather and leather products.

CEYLON LEATHER PRODUCTS CORPORATIONAssessment of Production Capacities in the
Chrome Leather Finishing Department in regards
of Machinery and Equipment

Note: One shift is referred to as 8 working hours.

(1). DRYING:

Toggle Dryer: Two units of 60 frames each. The capacity is 120 sides per unit, the drying time 3 - 4 hours employing 6 workers. They are capable to toggle 480 - 640 sides per shift depending on the thickness of the leather to be dried. The toggle drying units are used to full capacity.

Required 6 workers.

Vacuum Dryer: Two tables, 3 - 4 sides can be dried per table, drying time 2 min. for light and 2½ - 3 min. for heavy leather, employed 4 operators.

Capacity : Heavy sides 60 - 75/hr.
480 - 600/shift.

Light sides 90 - 120/hrs.
630 - 960/shift.

At present : 500 - 550 heavies.
550 - 650 lights.

The operational output could be increased slightly as soon each table is provided with two horses - one for staking dried leather, the other for the setted out leather.

Required 4 operators.

(2). TRIMMING:

Two Trimming Tables.

Capacity : 100 - 120 sides per person hourly
and table. 800 - 960 sides/person/
table/shift.

At present : About 75 sides/person/table/hour
(528 sides per shift).

Note: The replacement of the commonly used Shaving Blades by proper trimming knives will reduce the time spent on trimming.

Required 2 workers.

(3). BUFFING:

Installed one large machine 2,100 mm
one " " 1,800 mm
two small " 250 mm

Capacities : 2,100 mm 300 - 360 sides/hr.
2,100 - 2,520 sides per shift (7 hr)

2,100 mm 240 - 300 sides/hr.
1,680 - 2,100 sides per shift (7 hr)

250 mm 45 - 60 sides/hr.
300 - 420 sides per shift (7 hr).

At present : 900 sides/passages for the 2,100mm machine.
600 " " " 1,800mm "
300 " " " 250mm "

Note: As for the production of corrected grain leather the side leather are buffed thrice - twice before impregnation (flesh + grain side) and once after impregnation, the maximum output on 3 times buffed sides earmarked for CG leather will be 840 - 1,050 sides per shift. For the buffing operation one hour (8 less 1) is considered necessary to be allocated for the change of paper and dust removal.

Required 4 operators.

(4). AIR BLASTING: The hourly capacity is 350 - 500 sides per hour - 2,450 - 3,500 per 7 hour shift which is sufficient to handle the work load of one shift production being 840 - 1,050 sides buffed 3 times.

At present : 1,500 per shift (8 hour).

Required 2 Operators.

(5). STAKING: The throughfeed staking machine has a capacity of 240 - 300 sides per hour = 1,920 - 2,400 per shift if for some reason the leather is staked twice the output of finished staked sides is reduced accordingly.

At present : 528 sides per shift.

Required 10 operators
01 helper.

(6). PADDING: There are five padding tables employed for the work and one worker for each table. The capacity per table/worker in relation to the drying capacity of the pigmented leather is 85 - 90 sides per hour = 600 - 720 sides per shift: for one coat.

Embossed leather are coated twice and corrected grain leather thrice. Therefore one unit (one table, one worker) is capable to produce per shift 300 - 360 sides of leather destined for embossing or 1,500 - 1,800 sides using all five tables.

At present : 225 sides (one coat) per unit and shift.

Required 5 workers.

(7). PLATING:

One Hydraulic Press.

Capacity : 140 - 160 sides per hour or
1,120 - 1,280 sides per shift.

At present : 95 sides/hr. = (750 sides per shift).

Required 01 operator
01 helper.

(8). EMBOSsing:

One Hydraulic Press.

Capacity : 120 sides per hour or
960 sides per shift.

At present : 56 sides/hr. (450 sides per shift).

Required 01 operator
01 helper

(9). AUTOMATIC SPRAYING MACHINE:

Capacity : 480 - 640 sides per hour or
3,360 - 4,480 sides per shift (7 hr.)

(one hour is considered necessary for
cleaning and changing of different
applications).

Note: In most cases at least two passages are needed
for the finishing operations which reduces the
actual output per shift to 1,680 - 2,240 sides
per shift.

At present : No decision made so far in regards of
output.

Required 01 operator
01 - 02 helpers.

(10). MEASURING MACHINE:

The capacity of the measuring machine is 300 - 350 sides
per hour or 2,400 - 2,700 sides per shift.

At present : 750 sides per shift.

Required 01 operator
01 helper.

(11). GRADING:

Capacity : One grader can be expected to grade 300 -
600 sides per hour, equal to at least
2,400 sides per shift.

Required 01 grader
01 helper.

(12). PACKING:

Capacity : There should be no limit to the volume of
leather to be packed and recorded.

With the use of the electronic adding machine coupled with the print out device, it is expected that one bundle of leather consisting on the average of 8 - 10 sides can be recorded and bundled up within one minute. One table could therefore handle about 30 bundles (240 - 300 sides) per hour. To speed up the recording of accumulated stock, two tables should be used. The recording and bundling should for the convenience of the grading section done twice a day. e.g. 10 - 12 hr. and 15 - 16 30hr.

For the employment of one table the following personnel is required.

- one Helper (laying out the leather on to the table).
- one counter (calling out the leather area).
- One Packer (bundling up and remove the bundles).
- one adding machine operator.
- one Clerk from the Store to register the individual grade and area of the bundles.
- one Security man.

In case two tables are used simultaneously only a second packer is required.

Using only one table 1,000 sides should be recorded and bundled within $3\frac{1}{2}$ - 4 hours.

CONCLUSION:

The installed capacities of machinery and equipment in the Chrome Leather Finishing Section is - with the exception of the toggle drying units - capable to generate a daily (8 working hours) production output of various types of chrome tanned leather, totalling between 13,500 - 15,000 square feet (1,500 sides) equal to a monthly production of 270,000 - 300,000 sq.ft. per month. This capacity utilisation based on 80% can be achieved provided:

- (a). the flow of leather from the Wet Department (Dyeing) experiences no constraints;
- (b). no serious break-down of machinery which could not be repaired after the day's or over week ends;
- (c). chemicals, pigments and finishing auxiliaries on hand in sufficient quantities.

ANNEX IVREPORT ON EFFLUENT OF INDUSTRIES
SITUATED ALONG THE KELANI GANGA.

Report No. IS:B-0740

PART I - LEATHER PRODUCTS CORPORATION -
TANNING FACTORY.

1. Client : Chairman,
Central Environmental Authority,
Maligawatte New Town,
Colombo 10.

2. Reference : Clients letter of 18 August 1983.

3. Purpose of Study : This takes the form of a preliminary study.
 - (i) To determine the nature and volume of effluent being discharged into the Kelani river.
 - (ii) To focus attention on areas where problems could arise.
 - (iii) To identify areas for a detailed examination.

4. Date of Visits & Sampling : The factory was visited on 17th and 18th February by
 1. Mr. E.E. Jeyaraj
 2. Mr. W.G. Rajendram
 3. Mr. H.L.P. Silva
 4. Mr. G.G. Weerawansa
 5. Dr. R.H. Wickremasinghe (CEA)and in October 1983 by Mrs. K.D. Attanayake and Mr. W.G. Rajendram.

Samples were collected with the help of Miss M. Narangoda, Chemist of the Corporation.

5. Background Information

5.1 Location

The tannery is situated 300 m from the bank of the Kelani ganca approximately 1.2 km from the river mouth.

5.2 Premises

The outlay of the factory is shown in Figure 2.

5.3 Outline of Processes

Two types of tanning are carried out in the factory

- (i) Chrome tanning
- (ii) Vegetable tanning

Flow diagrams for the two processes are shown in Figures 3 and 4.

Both processes share common features until the delimiting stage. The common process is as follows.

The skins which are received in the factory in salted condition are first soaked in water in rotating drums for 0.5 h. The skins are immersed in lime and sodium sulphide for 24 h. to remove hair. The skins are then de-haired and fleshed to uniform thickness; the latter process is carried out by machine. At this stage solid waste referred to later is produced. The skins are then delimiting using ammonium sulphate.

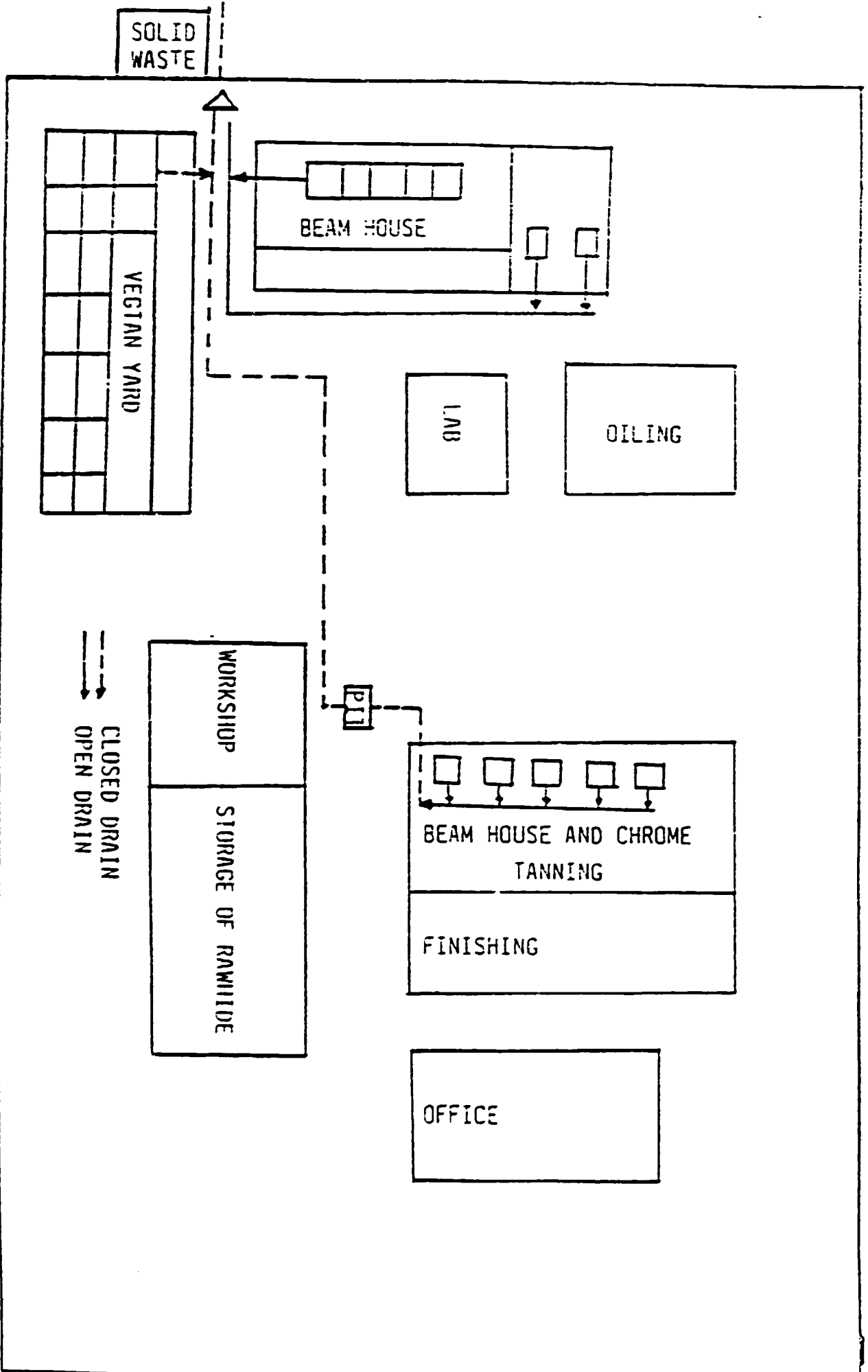
Chrome tanning

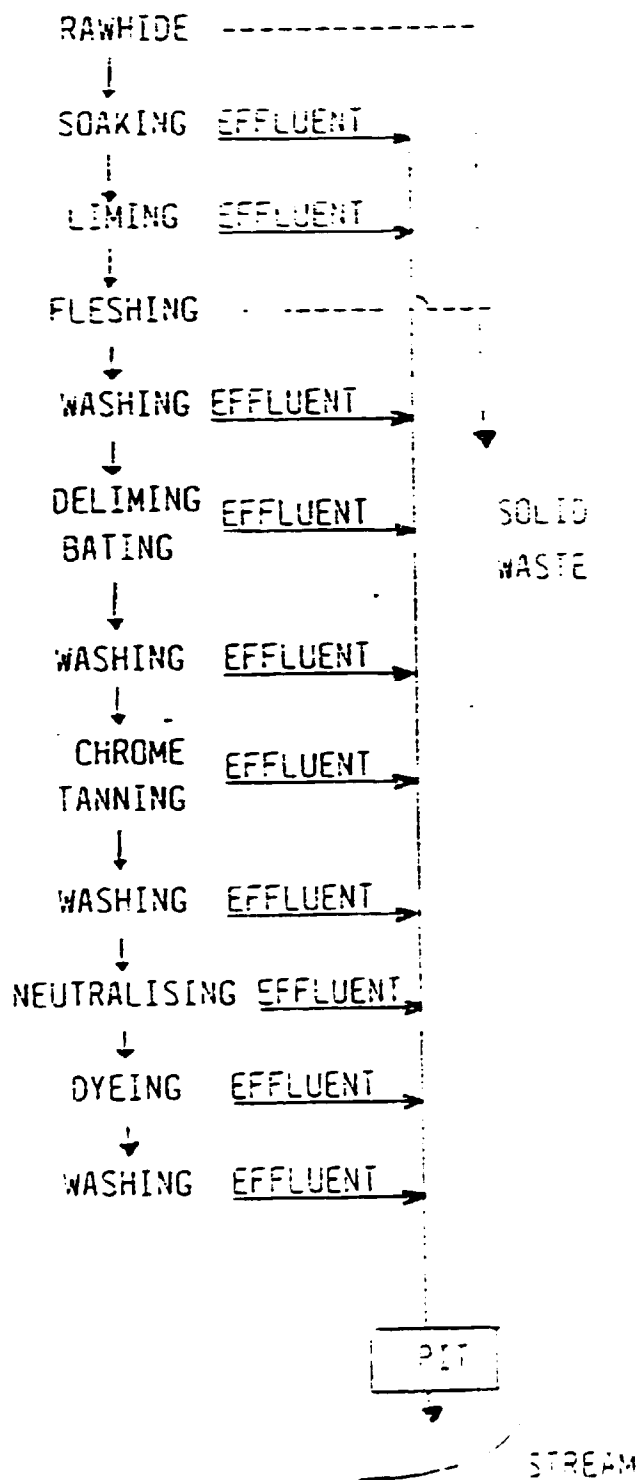
The delimiting skins are then 'bated' which is primarily treatment with a proteolytic enzyme and then pickled in a mixture of sulphuric acid and NaCl. The pickled hide is then chrome-tanned using basic chromium sulphate. After chrome tanning the leather is treated with sodium carbonate. The last three operations are carried out in the same drum. The final stages are dyeing, fat liquoring and re-tanning.

Vegetable tanning

The delimiting skins are immersed in a series of infusions of vegetable tanning material contained in pits. The leather is then immersed in myrcalans to reduce colour and then oiled with vegetable oil.

A summary of the inputs operations and effluents are given in Table 1.



CHROME TANNING EFFLUENT FLOW CHART

VEGETABLE TANNING
EFFLUENT FLOW CHART

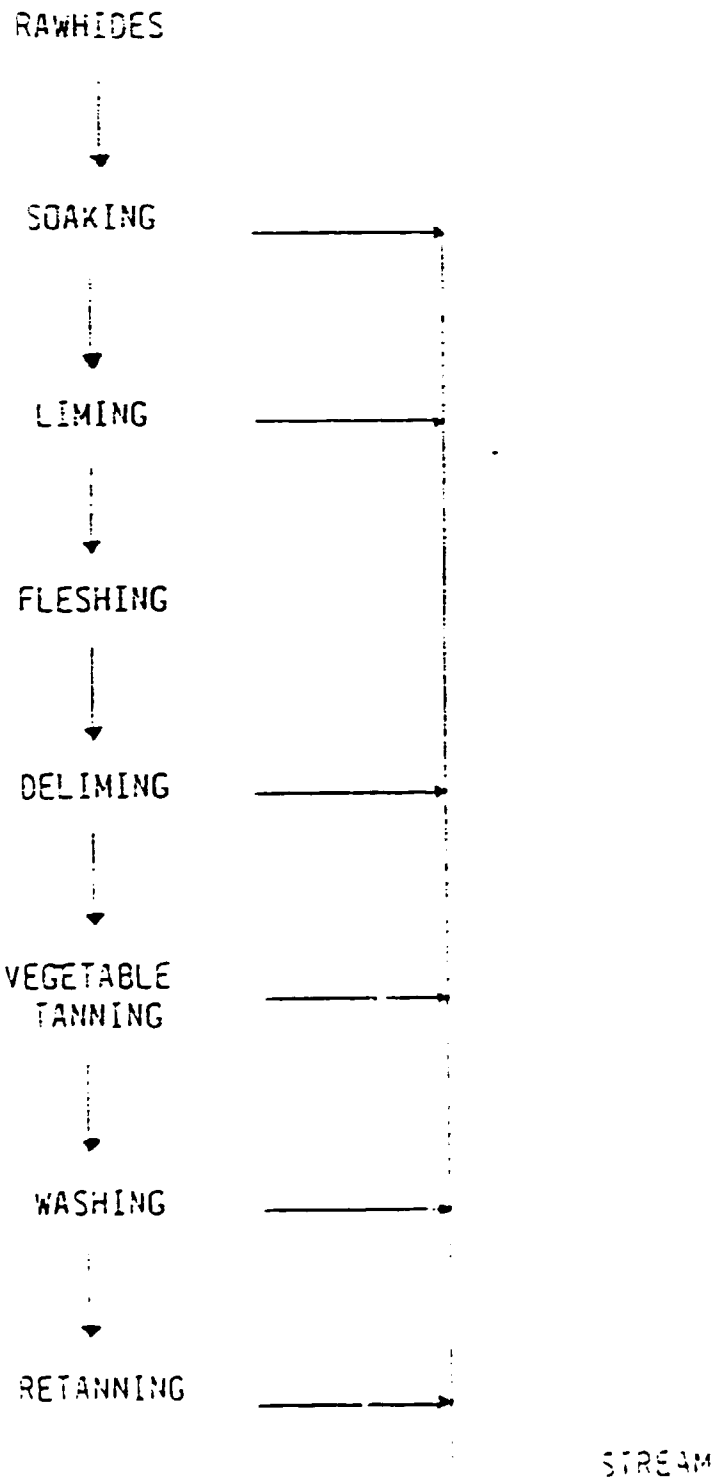
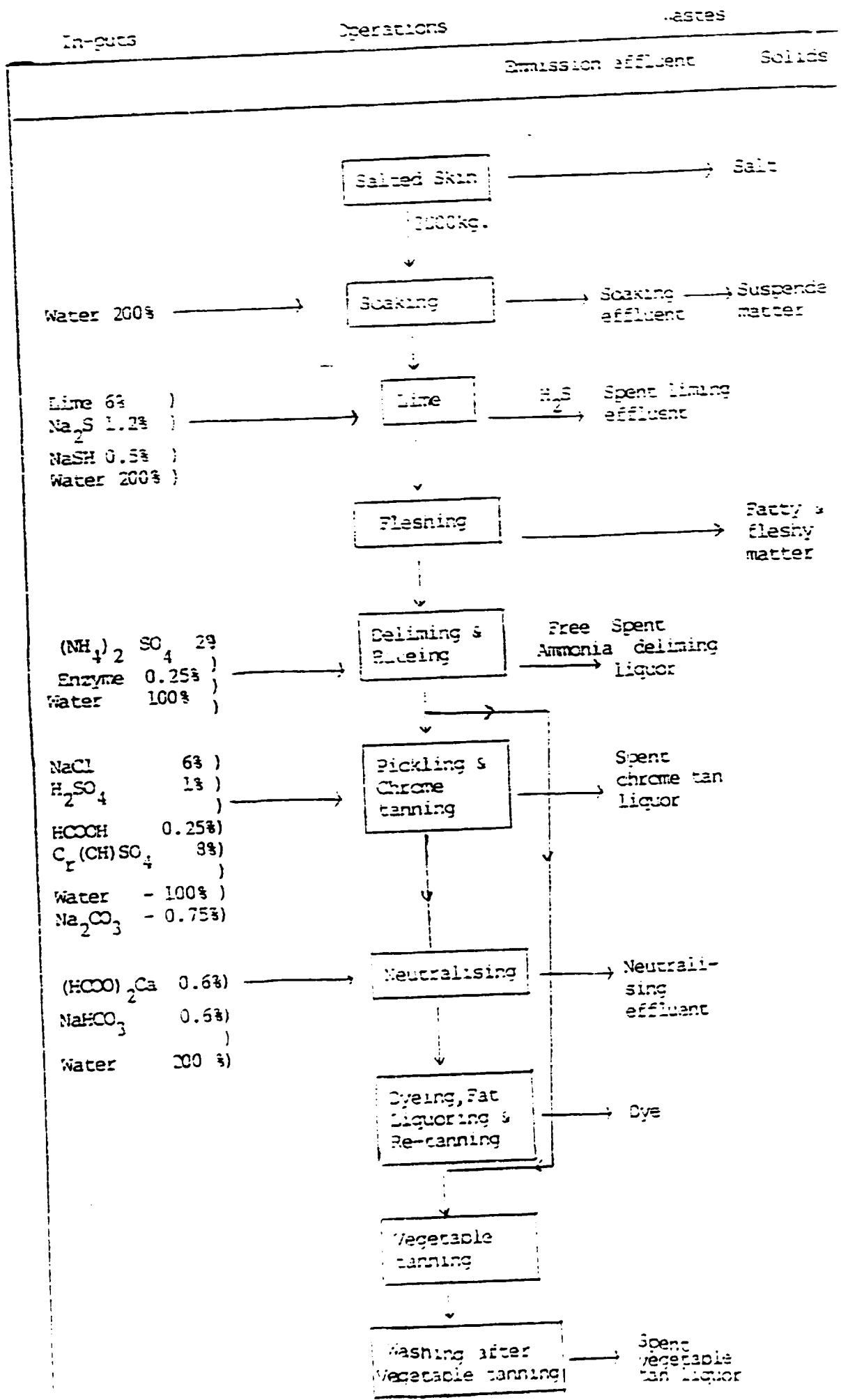


Table 1

INPUTS, OPERATIONS AND EFFLUENTS



6. Results

Table 2 gives the characteristics of the washings after vegetable tanning.

Table 2 - Characterisation of effluent from Vegetable Tanning.

pH	-	5.5
Total solids (mg/l)	-	13,200
CCD (mg/l)	-	5,900
Nitrogen (mg/l)	-	54

Details on the effluent of vegetable tanning is recommended. Although total volume will be small, the % solids is bound to be large.

Table 3 gives the results of analysis of tannery effluent from the main stages of chrome tanning. In addition to the volume of water indicated in the last column, additional water is used for washing at various stages. Namely, at stage 2, 3 and 6 : 9,000, 7,500 and 3,200 litres of water is used per day for washing. Therefore the total volume of effluent from chrome tanning per day will be of the order of 55,000 litres (12,000 gallons).

TABLE 3

ANALYSIS OF TANNERY EFFLUENT

Sl. No.	Effluent	pH Value	Cr ³⁺ mg/l	Total Solids mg/l	Suspended Solids mg/l	Sulphide mg/l	COD mg/l	Nitrogen ppm. Total	Volume of water litres/day
1.	Soaking	8.1	-	28,000	2416	-	5200	377	9000
2.	Lining	11.3	-	10,200	-	2516	380	414	6000
3.	Delimiting Bating	8.9	-	6,500	-	-	580	778	2500
4.	Pickling Chrome Tanning	2.7	4175	12,000	-	-	-	119	7500
5.	Neutralising	4.4	-	18,000	-	-	1680	315	3200
6.	Dyeing	-	-	-	-	-	-	53	1600

-, not determined

7. Conclusions

The chrome tanning effluent fails to meet the specifications for effluent to be discharged into inland water in respect of all the parameters tested. Even if the total effluent were bulked before disposal, it would fail to meet specifications. The main offending parameters are total and suspended solids, COD, sulphide and chromium.

High total solids and COD are also manifested in the vegetable tanning effluent which also is highly coloured as it presumably has a high content phenolics.

Study of the water at the river bed both up-stream and down-stream to the point of discharge showed pH was normal but total solids appeared high.

Grab sampling of the river bed mud resulted in the strong smell of H_2S . This was confirmed by analysis. Chromium was also detected in the mud. The bank of the river up to 100 M was stained, presumably from the effect of residual vegetable tannins.

Therefore the river is subject to many forms of pollution from this factory and waste treatment is an urgent necessity.

It is also noted that besides water pollution, another source of pollution from the factory is the dumping of solid wastes (including trimmings and shavings) behind the factory resulting in a strong smell emanating from the area thus affecting the neighbourhood.

NOTE: The Analyses in this report were carried out by the Environment Unit, Analytical Chemistry, Industrial Microbiology and Agro-Industries sections of the CISIR. Drawings were done by Mrs. K.D. Attanayake and Mrs. K. Gunasekera.

A N N E X V

Mr. C.R. Dias Desinghe,
Chairman of Ceylon Leather Products
Corporation,
141, Church Road,
Colombo 15.

Date 26th February 1986
Our ref
Encl
Re Tannery Wastewater Treatment

Dear Sir,

Referring to our discussion on 20th February 1986 in your office, we are hereby submitting a proposal that describes preliminary design guidelines for a wastewater treatment plant for your corporation's tannery.

Three alternative designs are described.

The selection of one of these alternatives will depend greatly on the availability of land.

In a table the three alternatives are compared on some aspects such as treatment efficiency and costs.

We discussed already the possibilities for financing this project.

Soon we will send you more information on the subject of financing.

We would like to discuss this proposal with you as soon as possible, preferably before March 6th.

If you need more information, please contact us any time.

Proposal for preliminary design of a wastewater treatment plant for the Ceylon Leather Products Corporation.

1 INTRODUCTION

At this time the wastewater from the tannery of the Ceylon Leather Corporation is discharged virtually without any treatment into the Kelani River.

In the tannery 10 tons of hides (mostly cow and buffalo) per day are processed.

A complete sequence of unit processes is carried out in a continuous system.

Processes include soaking, liming, defleshing, deliming, chrome and vegetable tanning, dyeing fat liquoring and leather finishing. The wastewater of all these processes is collected at one point, and it flows after passing some sedimentation pits, via a concrete channel into the Kelani River.

In this report a proposal is made for preliminary design of a wastewater treatment plant.

The proposal consists of two sections:

a. preliminary studies:

This implies a thorough characterisation of the wastewater, i.e. of the different unit process effluents.

Based on these data design guidelines for pre-treatment systems for the effluents may be made.

b. Preliminary design of treatment plant:

Design guidelines for a wastewater treatment plant will be given.

Hereby some alternative systems will be described.

2 WASTEWATER CHARACTERISTICS

Daily wastewater flow is averagely about 350m³.

Each unit process in the tannery produces its typical wastewater.

Each wastewater has to be studied before going into designing a treatment plant, so that may be decided whether a single wastewater flow needs some particular pre-treatment.

Table 1 gives some data on some unit process wastewaters (Source:CEA)

Table 1 - Analysis unit process effluents

Effluent	pH Value	Cr ³⁺ mg/l	Total Solids mg/l	Suspended Solids mg/l	Sulphide mg/l	COD mg/l	Nitrogen ppm. Total	Volume of water litre day
Soaking	8.1	-	28000	2416	-	5200	377	90
Liming	11.3	-	10200	-	2516	380	414	600
Deliming Bating	8.9	-	6500	-	-	580	778	250
Pickling Chrome Tanning	2.7	4715	12000	-	-	-	119	750
Neutralis- ing	4.4	-	18000	-	-	1680	315	320
Dyeing	-	-	-	-	-	-	53	160

2.1 Guidelines for pre-treatment of unit process effluent

From these data it may be decided which types of pre-treatment on unit process effluents have to be applied, such as:

- screening
- fat traps
- chrome removal
- pH correction
- dye removal

Each of these pre-treatment systems has to be evaluated on its applicability, with special attention to costs, availability of space, and reliability, simple operation and possibilities to fit in the present flow systems.

PRELIMINARY DESIGN GUIDELINES FOR WASTEWATER TREATMENT PLANT

After the separate treatment facilities for the unit process effluents, all flows may be combined to one flow, that is to be treated in one wastewater treatment plant. Selection of a treatment system depends greatly on availability of land and the price of land.

Other important criteria for system selection are:

- construction and investment costs
- operating costs (incl. labour, energy, mechanical, electrical, structural, monitoring and depreciation)
- qualifications of operators

A system characterized by a simple construction, by as little as possible mechanical and electrical features, by low energy requirements and by simple operation and maintenance is preferred.

Here under some treatment system alternatives are described and analysed for above mentioned criteria.

Dimensions are based on following wastewater characteristics:

flow	= 350m ³ /day
BOD ₅ (20°C)	= 1500 mg/l
total nitrogen	= 600 mg N/l
pH	= ± 7 (after correction)
total solids	= 16000 mg/l
chromium	= ± 105 mg/l (after Cr removal)

3.1 Ponds System

Following guidelines are proposed for the design of a wastewater treatment plant of the ponds system.

The system consists of a collection chamber, in which (pretreated) wastewaters are conveyed, followed by a series of anaerobic, facultative and maturation ponds.

3.1.1 Anaerobic Ponds (2 alternatives)

In anaerobic ponds organic matter is biodegraded by anaerobic micro-organisms.

Hereby H_2S , CH_4 , CO_2 and NH_3 gases are formed.

Solids settle on the bottom of the pond, building up a sludge layer,

The sludge has to be removed.

Optimal temperature for anaerobic processes is 30 - 35°C.

Most efficient retention times vary between 2 and 5 days depending on the strength of the wastewater.

Longer retention times are ususally not economic.

Here under design guidelines for 2 alternative systems are given.

For both alternatives the retention time is 5 days.

Pond volume is $5 \times 350 = 1750m^3$.

Alternative 1

A system of 3 parallel ponds will be applied.

At the same time two ponds are used for treatment, while the 3rd pond is out of use for desludging, when it is full.

Thus,

$$\begin{aligned} V \text{ (total)} &= 1750 + 0.5 \times 1750 = 2625m^3 \\ \text{water depth} &= 4m \\ \text{area} &= \underline{+} 1000m^2 \text{ (incl. embankments)} \end{aligned}$$

Alternative 2

Also a retention time of 5 days and a depth of 4m are outlined, but the system contains only one anaerobic pond.

By constructing a sludge pit in the bottom of the pond and by installing a sludge pump, it is possible to remove sludge permanently.

$$\begin{aligned} V &= 1750m^3 \\ \text{depth} &= 4m \\ \text{area} &= \underline{+} 600m^2 \text{ (incl. embankments)} \end{aligned}$$

BOD removal efficient = $\pm 50\%$
 BOD₅ effluent = ± 750 mg/l

In anaerobic treatment bad smell will develop, which can create serious nuisance for the surroundings.

Therefore the location of the anaerobic pond(s) has to be selected carefully.

3.1.2 Facultative Ponds

Facultative ponds are relatively shallow ponds. Biological processes in these ponds effect biodegradation of organic matter. In the top layers of the pond aerobic micro-organisms are active. Oxygen is mainly supplied by algae. At the bottom of the pond settling of solids and anaerobic biodegradation take place.

dimensions: BOD loading = 200 kg/ha day
 waste load = $305 \times 0.75 = 252.5$ kg BOD₅/day
 area facultative pond = ± 1.3 ha
 depth = 1.2m
 volume = 15600m^3
 retention time = 44 days

At a BOD₅ removal, efficiency of 90%, the pond effluent BOD₅ is 75 mg/l.

Facultative ponds should have a rectangular shape (length/width ration = 1/3) and a series of for instance three ponds is better than, one big pond. Since the influent of the facultative pond still has a high BOD₅, it will be advantageous to dilute the influent 3 to 4 times.

Hereby aerobic conditions in the pond will be promoted.

For diluting water pond effluent can be used.

3.1.3 Maturation Ponds

The effluent of the facultative ponds is conveyed into another pond, in which there is a further removal of BOD_5 and suspended solids.

dimensions: loading rate	= 100 kg BOD_5 /1a day
actual waste load from facultative pond	= $350 \times 0.075 = 26.25$ BOD/day
pond area	= $2625m^2 = \pm 0,3$ ha
depth	= 1.5m
volume	= $\pm 4000m^3$
retention time	= 11.5 days
effluent BOD_5	= ± 40 mg/l

Maturation pond effluent may be used for dilution of facultative pond influent.

Total area of ponds system = ± 1.8 ha

4 ALTERNATIVES FOR FACULTATIVE POND

The facultative pond (see Chapter 3.1.2) takes a lot of space. If this space is not available, alternative treatment systems have to be applied.

Two possible alternatives are here described, an aerated lagoon and an oxidation ditch.

4.1 Aerated Lagoon

In an aerated lagoon oxygen is supplied mechanically, usually by surface aerators. In the lagoon aerobic micro-organisms realize a biodegradation of organic matter.

wastewater flow	= $350m^3$ /day
wastewater BOD_5	= 750 mg/l = 0.75 kg/ m^3
BOD_5 reduction	= 80%
Effluent BOD_5	= 150 mg/l = 0.15 kg/ m^3
Oxygen requirement	= $1.5 (0.75 - 0.15) \times 350$ = 315 kg O_2 /hour
Retention time	= 10 days
Pond volume	= $3500m^3$
water depth	= 2.5m
area	= $\pm 1500m^2$

Oxygen transfer rate of aeration equipment is = 1.05 kg O_2 /
 Power requirement for aeration = $13/1.05 = 12.5$ kW

The effluent of the aerated lagoon is further treated in the maturation pond, as described in (Chapter 3.1.3)

4.2 Oxidation Ditch

In an oxidation ditch wastewater is treated according to the same principle as in an aerated lagoon but in the oxidation ditch aeration and mixing is more intense so that the retention time can be much shorter.

Oxidation ditches are usually built of concrete.

The oxidation ditch has to be combined with a sedimentation tank so that sludge can be recirculated to the oxidation ditch.

Design guidelines oxidation ditch:

wastewater flow	= 350m ³ /day
wastewater BOD ₅	= 750 mg/l
ditch volume	= 700m ³
depth	= 3m
area	= ± 240m ²

Oxygen requirement is about 525 O_2 /day.

Design guidelines sedimentation tank:

retention time	= 2 hours
surface loading rate	= 1m ³ /m ² . hour
area	= 350/24 = 15m ²
volume	= 350/24 x 2 = 30m ³

BOD₅ removal efficiency is about 98% so that the BOD₅ of the effluent is approximately equal to 15 mg/l

For this system no maturation ponds are needed.

COMPARISON OF DIFFERENT TREATMENT SYSTEMS

The following alternative treatment systems were described:

I	anaerobic ponds (alt. 1 or 2) - facultative ponds - maturation ponds
II	" " (" ") aerated lagoon " "
III	" " (" ") oxidation ditch - sedimentation tank

In the following table the three alternatives are compared on some important aspects.

Hereby was supposed that land is available free of costs.

(++ = excellent, + = good, + = moderate, - = bad)

ALTERNATIVE	I	II	III
investment costs	++	<u>+</u>	-
operation costs	++	<u>+</u>	-
maintenance costs	++	<u>+</u>	-
need of skilled operators	++	<u>+</u>	-
energy costs	++	-	-
treatment reliability	+	+	+
land space needed	-	<u>+</u>	++
treatment efficiency	+	+	++

Annex VI

REPORT ON LAMINATED LEATHER (PERMAR PROCESS)The History of the Leather Substitute Materials:

In general, the need for substitutes arises when a shortage of the hitherto used material - in this case leather - is experienced. Corlon, the trade mark for the first composite man-made soft leather substitute was introduced by Du Pont in 1963. A similar Japanese product named Clarine was marketed soon afterwards. Many more leather substitutes, although less known, appeared on the scene in the years to follow with the object of gaining some share on the traditional leather market catering for the Footwear, Garment, Upholstery, Gloves and Leather Goods Industry. The creation and existence of such leather substitutes was justified by the need to fill the growing gap between availability of raw material for the leather manufacture (Hides + Skins) and the demand for leather products. Further, the claimed properties of the leather substitutes in regard to hygienic comfort, wearability, vapour permeability, assisted the acceptance by the market. However, the price structure of these permeable leather substitutes remained quite high in the comparison to the genuine leather.

The wear properties evaluated by the consumer of footwear and garments made from permeable leather substitutes indicated insufficient hygiene and comfort. Also, the appearance and feel of products made from these substitutes were accepted by a certain group of consumers only. Therefore, in the following simpler and cheaper leather substitutes have been developed like woven or knitted fabrics coated with PVC (Polyvinyl Chloride) or PUR (Polyurethane). The reasons for substituting natural leather, exercises also a strong influence on the leather manufacturers' industry. As the availability of raw hides and skins depends largely on the take off rate of livestock, collection network, price structures, transport facilities, religious traditions, the consequent production of leather is in many cases not constant at all times, and if in such cases and for other reasons the Tanneries are not able to provide the leather products manufacturers with adequate quantities of the type of leather required, the manufacturers have to use alternatives like substituted leather.

Amongst the various methods and technologies to produce substituted or simulated leather, the term "laminated leather" applies when homogenous PVC or PUR-foils are used for covering splits or otherwise lower grade leather materials considered not suitable for the grain or corrected grain leather production. One of such process is known as the PERMAIR PROCESS using breathable microporous polyurethane foil (film) bonded on to the leather materials, splits or specially prepared grain leather which would have otherwise limited application in the Footwear Industry.

The Possibility to Manufacture Laminated Leather (Permair Process) and the expected impact on the Sri Lanka Tanning Industry as a result thereof:

The established Tanning Industry in Sri Lanka which at present converts around 37,000 - 40,000 raw bovine hides per month into various types of leather, experiences serious constraints in the production of quality full grain leather, due to pre and post mortem defects of the local raw material such as branding marks, scratch marks, flay cuts through unskilled skinning and improper curing methods.

The quantities of the raw hides suitable for the Shoe Upper Leather production is further reduced by the high proportion of medium and light weighted hides (7 - 12.5 kg. salted) which because of their thinner substance are only limited suitable for Upper Leather processing. The demand of the Footwear Industry concentrates on leather of 1.4 - 1.8 mm thickness.

Therefore to sum up, only about 8 - 10% of the total local Chrome Leather production is considered suitable for the manufacture of full grain Upper Leather. In addition, approximately 15 - 20% corrected grain leather can be processed out of the total in the conventional manner. Corrected grain leather refers to a leather which grain surfaces has been slightly buffed to remove blemishes and then moreover less restored by application of finishes containing pigments, synthetic resins, etc, and finally hot plated.

Taking into consideration the ongoing development of the Country's livestock sector and the slow, however noticeable improvement of the overall raw hide quality, the output of Shoe Upper Leather, either full grain or corrected grain is expected to increase. With the employment of additional modern leather processing machinery in key production areas, and also being a part of the C.L.P.C. extensive modernization programme, it would be reasonable to assume that the local Tanning Industry in particular, the C.L.P.C. is capable to cater for future needs of the local

Footwear Industry. With reference to C.L.P.C. the non-sole leather production capacity after the installation of the new equipment will be approximately 350,000 - 350,000 DSM per month.

To assist in overcoming the inherited problems of visible grain defects on a large percentage of leather which causes the exclusion of otherwise good leather from processing into full grain Upper Leather, more emphasis should be given to the further utilisation of corrected grain leather by the local Footwear Industry.

In order to speed up the production of corrected grain leather, the C.L.P.C. is in the process of ordering a rotary roller coating machine, which apart from the application for the manufacture of corrected grain leather, enables also heavy pigment coating on splits and otherwise lower grade Upper Leather. Using a rotary roller coating machine for the leather pigment film formation, the process is designed to cover up deficiencies related to raw material and structural irregularities of the leather substance. The waste of material inputs (leather and pigmented finish) is nearly nil in comparison to the production of laminated leather - PERMAIRE - process where a waste factor of 12 - 15% is considered favourable. The relative high waste factor up to 25 - 30% is attributed to the trimming of unutilised foil areas overlapping the irregular shapes of such treated leather.

The making of laminated leather using PERMAIR foils would, according to the available information, indicate the following price computation on material inputs.

Price per square metre of foil - £2.37	=	Rs. 97.70
Customs duty 45% (estimated)	=	Rs. 39.46
Transport and handling 12% (estimated)	=	Rs. 10.52
		Rs. 157.68
Waste 15% (after trimming)	=	Rs. 20.65
Adhesive	=	Rs. 15.54
Chrome tanned split	=	Rs. 100.00
		Rs. 273.37
Per square metre	=	Rs. 273.37
or		Rs. 27.39 per DSM

Note: 1 £ = Rs. 37.00
1 DSM = 0.10 square metre

The projected cost of material inputs does not include any provision for capital outlay required for machinery, utilities, building, labour, capital, etc., working.

Therefore it will be seen that the bare cost of material needed to produce laminated leather is about 37% higher than the best full grain Upper Leather available on the local market, which in turn is approximately 52% more expensive than corrected grain leather.

The full grain leather is at present marketed at Rs.20/= and the corrected grain leather at Rs.18/= per DSM.

Forcussing on the existing price structure of the local leather market, the introduction of laminated leather for the footwear production would create at least for the time being an unique situation where the substitute has to be higher priced than the genuine leather, which in other words mean that footwear made from simulated leather have to be retailed at a higher price than those produced from genuine leather. Such a situation might cause some justified confusion among the consumers.

Conclusion:

Taking into account the extensive modernisation programme of the local Tanning Industry as implemented at present aiming to enhance the value added utilisation of the available raw material with the ultimate object of increasing the output of leather processed together with quality improvement and a wider range of products manufactured, the raised need to introduce laminated leather for the local footwear production appears therefore, at this stage of development as premature.

The Sri Lanka Tanning Industry would through the introduction of laminated leather for the local manufacture of footwear be deprived of established sales outlets for their Upper Leather and as a consequence thereof certainly discourage to modernise and equip further their plants with up-to-date machinery.

The obvious advantages, using laminated leather for the manufacture of footwear such as better production condition, higher productivity, lower skill requirements, less waste, shall in a country, where labour and finished leather are available at reasonable costs, not be the dominating factor in support of leather substitutes.

Recommendations:

To establish the actual manufacture cost of laminated leather - employing the PERMAIR process - under local conditions, large representative production test trials involving some 1000 - 2000 square metre Permair foils should be carried out by interested Tanneries already equipped with the required machinery, e.g. hydraulic leather press and spraying cabin. In order to save foreign exchange and utilise to a better extent locally tanned chrome leather instead of importing leather splits for this purpose, the trials are recommended to be carried on leather otherwise not suitable for full grain or corrected grain leather production.

Thereafter, the situation regarding the economic viability and market requirements should be re-assessed.